OBJECTIVES

• Describe basic principles of cleaning, disinfection, sterilization
• Identify when to use cleaning, disinfection, or sterilization
• Describe how to monitor cleaning, disinfection and sterilization processes
TERMINOLOGY

CLEANING
• General removal of debris (dirt, food, feces, blood, saliva and other body secretions)
• Reduces amount of organic matter that contributes to proliferation of bacteria and viruses

DISINFECTION
• Removes most organisms present on surfaces that can cause infection or disease

STERILIZATION
• The killing or removal of all organisms
CLEANING, DISINFECTION AND STERILIZATION IN HEALTHCARE SETTINGS

• Practice standards are based on Spaulding’s Classification system
• Healthcare devices and equipment designated as
  • Critical
  • Semi-critical
  • Non-critical
• Categories define level of reprocessing required
CRITICAL ITEMS

- Require sterilization
- Includes items that enter sterile tissue or the vascular system
- Examples include surgical instruments and accessories, biopsy forceps, cardiac and urinary catheters, implants, needles
SEMI-CRITICAL ITEMS

• Require minimum high level disinfection (or sterilization)
• Includes items in contact with non-intact skin or mucous membranes
• Examples include respiratory therapy equipment, anesthesia equipment, flexible and laryngoscopes, bronchoscopes, GI endoscopes, cystoscopes, vaginal ultrasonic probes
• Cleaning process must precede high-level disinfection
NON-CRITICAL ITEMS

• Require intermediate-level or low-level disinfection
• Includes items in contact only with intact skin
• Examples include BP cuffs, stethoscopes, durable mobile patient equipment
ENVIRONMENTAL CLEANING

• Patient environment can facilitate transmission of bacteria and viruses
  • By direct contact
  • On hands of healthcare personnel
• Contaminated surfaces increase potential for transmission of bacteria and viruses between patients
• Items categorized as non-critical (intermediate or low disinfection) or require cleaning only
POLICY CONSIDERATIONS

• Include in policy all surfaces and equipment that can reasonably be expected to be contaminated by bacteria (high touch surfaces)

• Define responsibility and frequency for cleaning and disinfecting patient care equipment and surfaces

• Monitor compliance with policy

• Staff should be able to answer question “How do you know whether this item has been cleaned and/or disinfected?”

• Cleaned/disinfected items should be labeled (date/time)
HIGH TOUCH SURFACES IN PATIENT ROOMS

• Considered non-critical
• Must be cleaned then disinfected on a regular basis
• Examples include:
  • Bedrails
  • Call bell
  • Telephones
  • TV remote
  • IV pump
  • IV poles
  • Toilet, commode chair
  • Overbed table
  • Light switches
  • Doorknobs
  • Respiratory and other bedside equipment
  • Computer keyboard
  • Chairs
ITEMS REQUIRING ONLY CLEANING

- Floors, walls, and windows
- Chairs and other furniture used by individuals who are clothed
- Private offices and other non-public, non-patient care areas
- Bed curtains should be changed when soiled and w/ terminal cleaning

*Clarify in policy what needs to be cleaned and not necessarily disinfected*
USE MICROFIBER FOR CLEANING

• Densely constructed synthetic strands ~1/16th the diameter of a human hair
• Attracts dust, cleans ~50% better than comparable cotton
• Easier to use, lighter, designed for repeat usage
MONITOR ENVIRONMENTAL CLEANING PROCESSES

• Bioluminescence (outcome measure)
  • Monitors for light emissions produced if organism present
  • Results difficult to interpret because it is unknown whether organism remains viable and thus transmissible
  • Expensive

• Fluorescence (process measure)
  • Monitors for chemical markers that fluoresce with ultraviolet (black) light if not removed during cleaning

• Culturing
  • Should not be done except during some outbreak investigations

• Visual inspection
  • Make routine rounds and provide feedback to frontline staff
LINENS

• All linen handled as if contaminated with blood or body fluids (Standard Precautions)
  • Bag linen at point of use
  • Wear PPE when sorting and agitate minimally

• Laundry equipment must be maintained to prevent microbial contamination*

• New laundry technologies allow linen washing without requirements for hot water and chlorine
  • Hot water - 160F x 25 min
  • Cold water - 71-77F with 125 ppm chlorine bleach rinse or equivalent detergent
  • Detergents not required to have stated anti-microbial claims*

*Manufacturer’s instructions for use must be followed
CLEANING, DISINFECTION, AND STERILIZATION OF MEDICAL INSTRUMENTS AND DEVICES

You CANNOT achieve disinfection or sterilization without pre-cleaning

• As organic material dilutes disinfectants, bioburden must be reduced for processes to be effective

Clean all medical instruments and devices as a first step

• Remove visible soil
• May need to disconnect or separate instrument parts
• Avoid organic material drying on equipment by rinsing or soaking in an enzymatic solution
PERSONAL PROTECTION

When cleaning soiled medical instruments, wear

• Long sleeved impervious gown
• Eyewear
• Mask or mask with face shield
• Gloves
• Cap
• Chemical goggles (when mixing or changing solution)
DISINFECTION

• Eliminates or kills most bacteria, many virus types, some fungi (not prions)
• Cannot be accomplished without first cleaning
• Time-dependent process
• Levels of disinfection - high, intermediate, or low
• Hospitals must use EPA-approved product for desired level of disinfection
• Has minimally a tuberculocidal label claim
DISINFECTION

• Follow manufacturer’s recommendations to achieve disinfection and to avoid medical device damage method
  • Use correct dilution – more is not better!
  • Use correct contact time
  • Use correct temperature

• Understand employee and environmental safety issues
  • Do not exceed exposure limits
  • Know permissible exposure levels
  • Assess compatibility with gloves, basins, other products
EPA REGISTRATION OF DISINFECTANTS

- Labeled as high level vs. intermediate vs. low level
- May include degrees of approval
- Limited approval, e.g. kills Hepatitis B and HIV but not approved for spores
- Select disinfectant based on what you are trying to accomplish
- Environmental vs. medical device disinfection
- Can search EPA website by product name
  www.epa.gov/oppad001/chemregindex.htm
HIGH-LEVEL DISINFECTION - GLUTARALDEHYDE

• Ensure achievement of temperature requirements
• Test product prior to each use
  • Can get diluted with frequent use
  • Follow facility policy
  • Test strips expire; monitor dates
• Change product as indicated by test and as manufacturer requires
• Maintain log records
• Ensure competency of staff
ENDOSCOPES/BRONCHOSCOPIES

• United States
• Infection: 1/1.8 million procedures
• Professional organization guidelines
• Minimum high-level disinfection
• Ensure competency of personnel performing process
• Outbreaks associated with failure to comply with guidelines for disinfection/sterilization.

Ambulatory Surgery in the United States, 2006. NHSR Number 11.26pp
THE 5 STEPS OF ENDOSCOPE RE-PROCESSING

1. **Clean**: Remove debris/tissue which can impede disinfection process, flush all lumens (water & enzymatic cleaner)

2. **High Level Disinfection**: Perfuse through ALL channels with disinfectant

3. **Rinse**: Sterile or filtered water/tap water followed by alcohol rinse

4. **Dry**: Forced air

5. **Store**: Hang vertically – Promote drying & Avoid recontamination

• To avoid problems, the 5 steps must be performed in sequence

• Do not skip, bypass, shortcut any of the 5 steps
**ENDOSCOPY/BRONCHOSCOPY ASSOCIATED INFECTIONS**

Endoscopy
- >280 Infections transmitted, some fatal
- >70%: Salmonella and Pseudomonas aeruginosa (others: HBV, Strongyloides stercoralis, H. pylori, Trichosporan)

Bronchoscopy
- >90 documented infections transmitted
- Mycobacteria, Pseudomonas aeruginosa
- Mycobacteria are resistant to many disinfectants
- High level disinfectants
  - 2% glutaraldehyde at 20 for 20min is most common

Weber, DJ, Rutala WA. ICHE 2001: 22:403-408
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ENVIROMENTAL DISINFECTANTS

• Phenolics
  • “Gold Standard” in healthcare
  • Toxicity concerns prohibit use in nurseries, NICU
  • Does not kill spores

• Quaternary ammonium compounds
  • Approved for specific pathogens (read the label!)
  • Affected by water hardness
  • Affected by bioburden
ENVIRONMENTAL DISINFECTANTS

• Iodophors
  • Can be used in food preparation areas
  • Inactivated by organic materials, e.g. blood
  • Can stain surfaces

• Chlorine (bleach)
  • Inactivated by organic materials, e.g. blood
  • Kills spores, e.g. C. difficile
  • Corrosive
  • Highly toxic (deadly) if combined with ammonia
ENVIRONMENTAL DISINFECTANTS

• Disinfectant spray-fog techniques for antimicrobial control in hospital rooms
  • Unsatisfactory method of decontaminating air and surfaces
  • Not recommended for general infection control in routine patient-care areas

• Ultraviolet Radiation
  • Dependent on strength and duration of exposure to light, „line of sight“, how well microorganism can withstand UV
  • Limited to destruction of airborne organisms, inactivation of microorganisms on surfaces, and water purification
STERILIZATION

Achieved by
• Steam
• Dry Heat
• Ethylene Oxide
• Peracetic Acid
• Plasma Gas (vaporized hydrogen peroxide)
• Glutaraldehyde (using higher concentrations and exposure times than for high-level disinfection)
STEAM STERILIZATION - AUTOCLAVE

- Achieves rapid heating and penetration
  - Short exposure times (<20 minutes) but temperature must be maintained throughout
  - No toxicity to workers
  - Inexpensive
  - Can damage delicate instruments

- Items to be sterilized must be
  - Clean and free of protein (blood) or other organic material
  - Packaged so that the steam can penetrate

- Autoclave must be loaded correctly
RAPID CYCLE OR FLASH STERILIZATION

• “Unwrapped” steam sterilization
• Should only be used when necessary
  • Do not flash whole trays of instruments
  • Items must be used immediately
  • Avoid by keeping adequate supply of frequently dropped items
• Maintain records or “flash logs”
  • Include all implants
  • Requires same monitoring processes as routine steam sterilization in hospital
  • Use to support need for additional instruments
MONITORING STERILIZATION

• Mechanical Indicators
  • Gauges, displays, printouts
  • Indicates if device working properly
  • Not indicator of sterility

• Chemical Indicators
  • Change color with timed exposure to heat, steam
  • Not indicator of sterility
  • Used to show items have gone through sterilization process

• Biological Indicators
  • Indicator of sterility
  • Demonstrates bacterial spores on test strips or in vials/containers have all been killed
  • Results can be available in 1 hour
STORAGE OF STERILE ITEMS

• Protect sterility until ready to use
  • Store to protect packages from dust, moisture, falling on floor
  • Transport only covered, dry packages
  • Handle to protect package integrity

• Rotate sterile items first in, first out

• Store and label for effective recall system

• Expiration date vs. Event-related sterilization
  • Needs a program flex from L&C
IP ROLE IN CLEANING, DISINFECTION, AND STERILIZATION

• Know the processes; update the policies
• Know directors of environmental services, sterile processing, operating room, endoscope services
• Know where all sterilization and disinfection is being done
• May include
  • Radiology
  • GI dept
  • Cardiac cath lab
  • Wound care center
  • Outpatient clinics
  • Emergency room
  • Same day procedures
  • Ambulatory surgery
• Ensure staff know and follow contact times for products
  • Per manufacturer guidelines; on labels
For more information, please contact any HAI Liaison Team member

Thank you