Cleaning, Disinfection, Sterilization and Reprocessing Reusable Equipment

ACH IP Course, 2022

Infection Prevention Training for ACH
Healthcare-Associated Infections Program
Center for Health Care Quality California
Department of Public Health

Objectives

- Describe the role of the environment in transmitting infections
- Discuss strategies to ensure effectiveness of cleaning and disinfection
- Demonstrate use of adherence monitoring tools and feedback
- Review methods for reprocessing reusable medical devices and equipment
- Identify criteria for low, intermediate, and high-level disinfection and the Spaulding classification system
- Provide examples of non-critical, semi-critical, and critical devices
- Discuss instrument sterilization methods

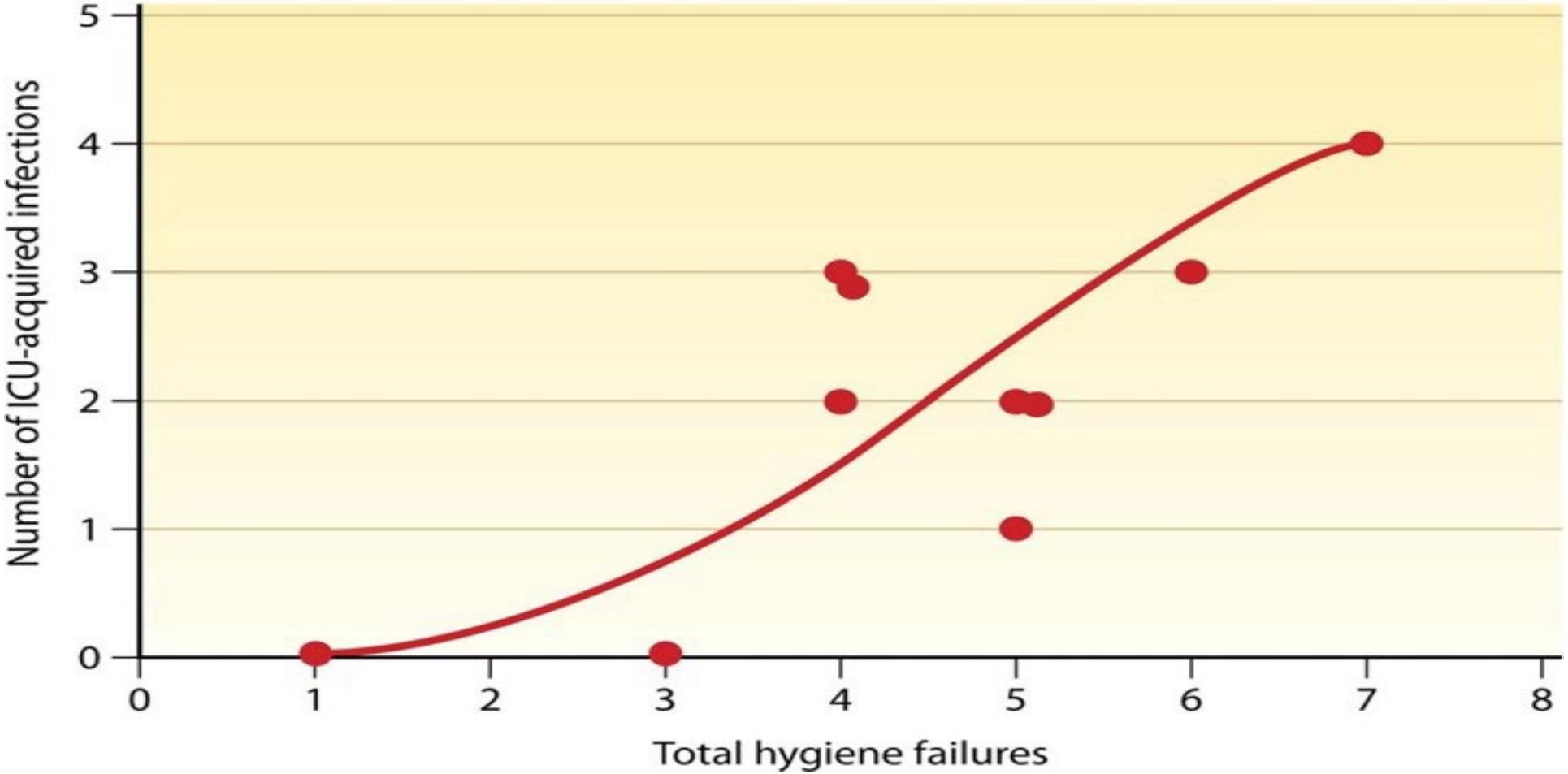
Role of Environmental Surfaces in Disease Transmission

How a Contaminated Environmental Surface Leads to Patient Infection

1. Surface becomes contaminated by contact or droplet spread
2. Organisms survives on the surface
3. Surface touched by a second person, who picks up enough organisms (sufficient inoculum)
4. Second person omits, or poorly performs, hand hygiene
5. Person transmits the organism to a third person or another object, in sufficient quantity, to cause disease

The Inanimate Environment., Bennett & Brachman's Hospital Infections 6th Ed. 2014
Chou. APIC Text of Infection Control & Epidemiology. 2013
HICPAC /CDC Isolation Guidelines. 2007

Relationship Between Bioburden and HAIs



American Society for Microbiology (2014)
(dx.doi.org/10.1016/j.idc.2016.04.010)

California Department of PublicHealth

Evidence of Environment and Disease Transmission

- Admission to a room previously occupied by a colonized or infected patient is a significant risk factor for infection
- *C.difficile* acquisition
  - 11% patients admitted to an ICU room previously occupied by a CDI patient developed CDI infection afterward
  - 4.6% patients admitted to a room without a prior CDI positive occupant developed CDI

Weber DJ et.al. AJIC 2013 .Shaughnessy et al. Infect Contr Hosp Epidemiol. 2011 (PDF)

(www.idse.net/download/HAI_IDSE13_WM.pdf)

Pathogen Survival in the Environment

- Multiple factors influence duration of survival:
  - Type of microbe – spore formation ability
  - Temperature
  - Humidity

- *Clostridioides difficile* (C. diff) spores are shed in high numbers, are resistant to drying (desiccation) and some disinfectants, and survive on surfaces for months to years

Understanding *Clostridium difficile* colonization. SM Journals.(2018)

(doi.org/10.1128/CMR.00021-17)

Ensure Environmental Cleaning Staff Perform Hand Hygiene

- Emphasize the importance of hand hygiene for all staff in infection prevention
- Change perception that hand hygiene is to protect staff
  - Hand hygiene is to protect the patient
- Orient EVS staff thoroughly to infection control principles and practices prior to starting work in a clinical area

PPE for Cleaning

- Select PPE based on:
  - Type of infection prevention precautions assigned to the patient
  - Chemicals to be used to clean the room
  - Refer to the Safety Data Sheet (SDS), directions sheet, and facility policy
- Appropriate use of PPE is critical
  - Inappropriate use may result in contamination of the HCP hands and the environment

How to Reduce Environmental Bioburden

Bioburden is the number of organisms on an object or surface

To reduce bioburden:

- Perform hand hygiene
- Clean and disinfect high-touch surfaces daily
- Improve cleaning and disinfection of rooms after discharge of patients/residents known to carry healthcare-associated pathogens
- Clean and disinfect portable equipment
- Ensure thorough cleaning and disinfection of all rooms

Donskey. AJIC. 2013

Effective Cleaning Strategies

Terminology

- Cleaning: removal of all visible and invisible soil and other foreign material. For instruments, cleaning includes using an enzymatic detergent per manufacturer's IFU
- Disinfection: destruction of nearly all pathogenic microorganisms on a non-living surface
- Sterile/Sterilization: completely devoid of all microorganisms; the process by which bacteria, viruses, spores, and fungi are destroyed
- Instructions for use (IFU): manufacturer's instructions for cleaning, disinfection, and sterilization of their equipment or product. Using disinfectants not on the IFU could cause irreparable damage and void the product warranty. Must check for the latest ICU versions

Wet, Contact, or Dwell Time

- Time required for a disinfectant to kill microorganisms on a pre-cleaned surface
- Disinfectant must remain wet on the surface long enough to achieve the claimed level of surface disinfection
- Must follow manufacturer's guidelines for achieving the appropriate wet contact time

Rutala et al. ICHE. 2014

Clean *Before* Disinfection

- Cleaning removes large numbers of microorganisms, organic material and soil from a surface that would otherwise interfere with the disinfection process
  - Disinfectants are not as effective in the presence of organic material (like blood and other body fluids)
  - Some organic materials, like dried blood, are difficult to remove but, if not removed, can inactivate some disinfectants
- **Disinfectants can't work if cleaning doesn't happen first!**

HICPAC /CDC 2017

Detergents and Disinfectants

- Detergent
  - Used for cleaning
  - Contains surfactants; lifts dirt
  - Can become easily contaminated, does not kill microorganisms
  - Less toxic, generally less odor, less costly than disinfectant
- Disinfectant
  - Inhibits growth or kills microorganisms
  - More toxic, more costly than detergent
  - Disinfectants are only for disinfecting after cleaning and are not substitutes for cleaning, **unless** they are a combined detergent-disinfectant product

CDC HICPAC Core Practice Recommendations
(www.cdc.gov/hicpac/recommendations/core-practices.html)

Environmental Protection Agency (EPA) Label Claim for Disinfectant

- The EPA label claim states if the product is
  - Virucidal
  - Bactericidal
  - Tuberculocidal
  - Fungicidal
  - Sporicidal
- Includes the manufacturer's instructions for use (IFU), including wet or contact time required to achieve the desired degree of microbial killing

Environmental Protection Agency (EPA) (2020)

(www.epa.gov)

Selection of Disinfectant

Disinfectant	Strengths	Concerns
Quaternary Ammonium Products (Quats)	• Non-critical items such as floors and furniture • Bactericidal, fungicidal, virucidal against lipophilic viruses	• Not effective against some gram negatives • Not sporicidal • Inactivated by cotton and charcoal • Deactivated by organic material
Phenolics	• Bactericidal, virucidal, fungicidal, tuberculocidal • Not sporicidal	• Absorbed by porous materials • Can irritate tissue • Unsafe for use in nurseries
Chlorine-based	• Broad antimicrobial activity, effective against gram-negatives, tuberculocidal, fungicidal, virucidal • Does not leave toxic residues • Inexpensive • Fast acting • Removes dried organisms, biofilms	• Can cause eye irritation, gastric burns • Inactivated by organic matter • Discolors fabrics • Relatively unstable • Corrosive in high concentrations • Can release toxic chlorine gas when mixed with ammonia
Hydrogen peroxide, Accelerated H_2O_2	• Effective, broad spectrum kill • Bactericidal, virucidal at 30- 60 sec • Fungicidal at 10 min • Low EPA toxicity rating	• Expensive • Corrosive to some materials ***Always consider duration of contact time***

IAHCSMM 2016

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Don’t swap out disinfectants!

- Skin disinfectants, such as isopropyl (rubbing alcohol), should generally not be used to disinfect equipment or surfaces
  - UNLESS the manufacturer IFU state alcohol must be used
  - Isopropyl alcohol can cause damage and is flammable
- Healthcare facilities should avoid homeopathic disinfectants that lack EPA-approval and verified label claims

Why Use Bleach for *C. difficile*?

- C. difficile spores are difficult to kill and adhere to environmental surfaces for extended periods
- Use of a 1:10 dilution of bleach (500 ppm) for disinfection
  - Reduces surface contamination
  - Instrumental in outbreak control
- Alternatives to bleach are also available.
  - EPA-approved disinfectants with label claims for killing *C. difficile* spores (www.epa.gov/pesticide-registration/list-k-epas-registered-antimicrobial-products-effective-against-clostridium)

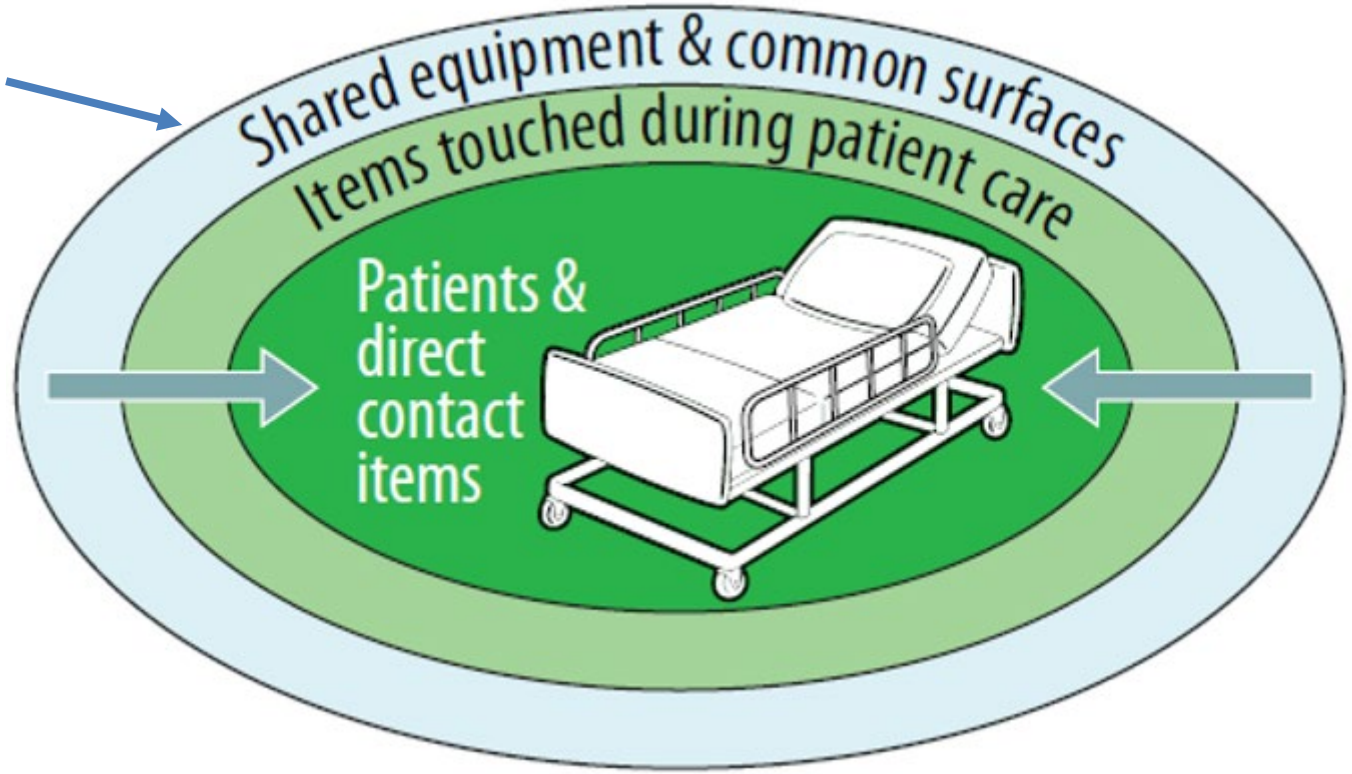
Strategies to Prevent *Clostridioides difficile* Infection in Acute Care Facilities (www.cdc.gov/hai/prevent/cdi-prevention-strategies.html)

Best Practices for Patient Room Cleaning

- Ensure cleaning **equipment and supplies are clean**
- Ensure **proper use of cleaning and disinfecting products**
- Ensure proper **hand hygiene** and use of **gloves**
- Focus on **frequently touched surfaces**
  - See example list in CDC Environmental Cleaning Toolkit (www.cdc.gov/hai/toolkits/Evaluating-Environmental-Cleaning.html)
  - CDC Guidelines for Environmental Infection Control in Health-Care Facilities (www.cdc.gov/hai/toolkits/Evaluating-Environmental-Cleaning.html)

Working From Clean to Dirty

Start here



CDC Healthcare-associated Infections: Environmental Cleaning Procedures

(www.cdc.gov/hai/prevent/resource-limited/cleaning-procedures.html)

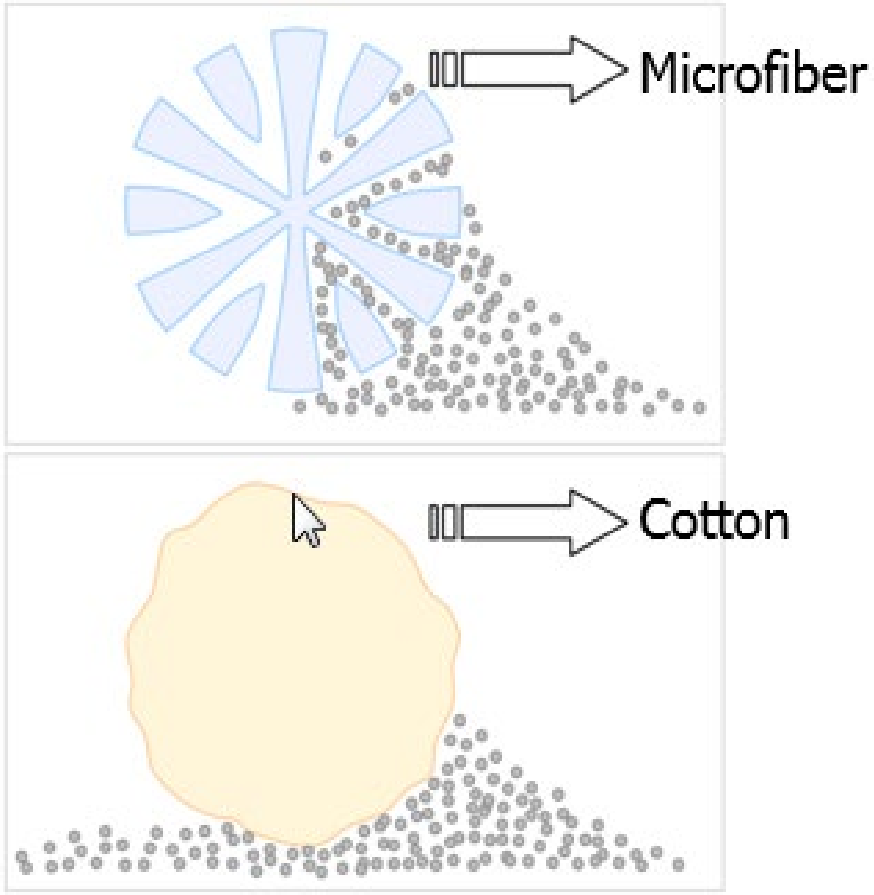
Best Practices for Cleaning a Room (continued)

- Avoid generating aerosols
- Change cleaning cloths between rooms
- Work from cleaner to dirtier
- Work from high to low, top to bottom
- ***Remember***: A surface must be physically cleaned before it can be disinfected
- Staff should be encouraged to **communicate** cleaning issues to their supervisors

CDC Healthcare-associated Infections: Environmental Cleaning Procedures
(www.cdc.gov/hai/prevent/resource-limited/cleaning-procedures.html)

Microfiber vs. Cotton

- Microfiber cleans 50% better than comparable cotton
  - Attracts dust
  - Easier to use, lighter
  - Designed for repeat usage
- Microfiber was initially more expensive than cotton, but cleaned better, used less water and chemicals, and decreased labor costs.



UC Davis Case Study. Nov 2002;
Trajtman. AJIC. 2015; CDC.gov

Linen

- New laundry technologies allow linen washing without requirements for hot water and chlorine
  - Hot water: 160°F x 25 minutes
  - Cold water: 71-77°F with 125ppm chlorine bleach rinse or equivalent detergent
  - Detergents not required to have stated antimicrobial claims
    - Follow manufacturers instructions for use (IFU)

CDC Guidelines for Environmental Infection Control in Health-Care Facilities (PDF)
(www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines.pdf)
Title 22, Division 5, Chapter 1, Article 8 §70825.
Laundry Service
(govt.westlaw.com/calregs/Document)

Bedside Curtains

- Bacteria and fungi can survive on polyester, cotton, wool, and other fabrics
- Privacy curtains are considered high-touch surfaces and can become rapidly contaminated especially when used in transmission-based precautions isolation rooms
- Hands can become contaminated after handling curtains

Fabrics, Floors and Carpets

- Upholstery fabrics – upholstered chairs are difficult to clean, consider reupholstering with wipeable material such as vinyl
- Non-carpeted floors
  - Floor disinfection offers no advantage over regular detergent and water cleaning
  - Soap and water is acceptable for floors and is less expensive
- Carpets
  - Evidence linking carpets to HAI rates is limited
  - Vacuuming and steam cleaning temporarily reduces the number of organisms
  - Difficult to clean with blood/body fluid spills

CDC Infection Control Guidelines
(www.cdc.gov/infectioncontrol/guidelines/)
Dancer, SJ. Clin Microbiol Rev. 2014
(DOI: 10.1128/CMR.00020-14)

Monitoring the Thoroughness of Cleaning

How Do You Know a Patient Room is Clean?

- Appears **visually** clean or finger-swipe clean
  - Fast and inexpensive, but lacks objectivity
- Confirmed via **technology**
  - Increasingly becoming the community standard
    - **Fluorescence:**
      Environmentally stable marker is visible to UV light if still present after cleaning (“Glo-Germ”)
    - **Adenosine Triphosphate** (**ATP**) monitoring:
      Measures residual organic matter left on a surface after cleaning

Lillis. ATP Testing: A Proven Method to Measure Cleanliness 2015
(www.cdc.gov/hai/toolkits/Evaluating-Environmental-Cleaning.html)

Methods to Monitor Cleaning

Comparison of Methods

Method	Visual	Fluorescence	ATP
1. What is measured?	impression of cleanliness	whether fluorescent residual has been removed	biological matter remaining on surface after cleaning
2. Can it be used by persons of differing skill levels?	no technical training required	some technical training needed	some technical training needed
3. How objective is the method? (Can results be changed to appear more positive?)	can be subjective	objective, but marks could have been removed prior to reading	very objective
4. Can the amount of time spent on monitoring be minimized?	yes	room must be pre- marked and read after cleaning	yes

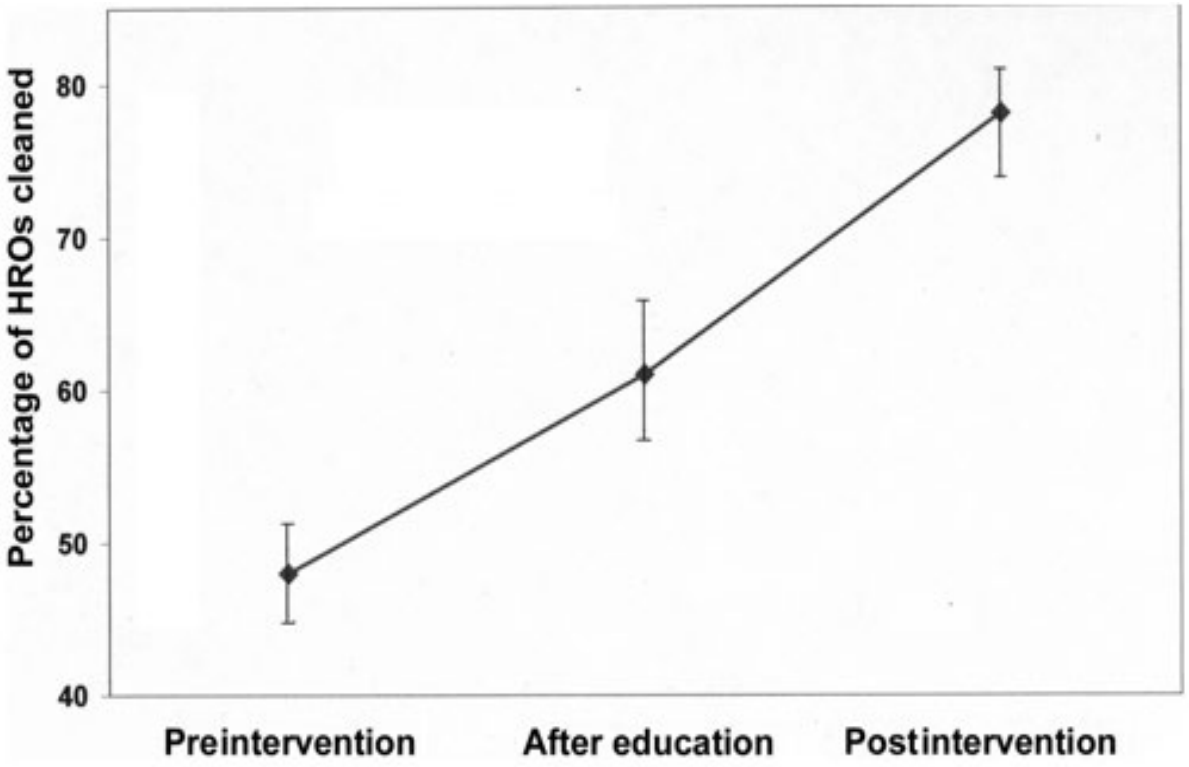
Methods to Monitor Cleaning (continued)

Comparison of Methods

Method	Visual	Fluorescence	ATP
5. How are results presented?	pass/fail	pass/fail	numeric value
6. Is software needed for the monitoring process?	no	can be used, but not required	yes
7. How well can it be used for a training tool?	results immediate with visual cues	results immediate with visual cues	results delayed; no visual cues usually available from surface
8. How affordable is the method?	no monetary investment	materials inexpensive; if formal program including staff education purchased, expenses will be higher	cost of machine and swabs is substantial

Does Monitoring Improve Cleaning?

- In 36 hospitals, mean percentage of high-risk objects cleaned was
  - 48% **prior** to intervention
  - 78% **after** intervention



Carling, P. (2016) Optimizing Health Care Environmental Hygiene
Infectious Disease Clinics of North America 30(3)
(dx.doi.org/10.1016/j.idc.2016.04.010)

Monitor Adherence

- Monitoring staff while room cleaning gives feedback to the staff member as soon as breaches are discovered
- Adherence reports improves adherence to standards and helps staff focus on gaps
- CDPH HAI Program developed a tool to monitor adherence of cleaning practices (2016)

CDPH Adherence Monitoring Tools (PDF)
(www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/AdherenceMonitoringEVSApproved101516.pdf)

Adherence Monitoring Tool – Environmental Cleaning

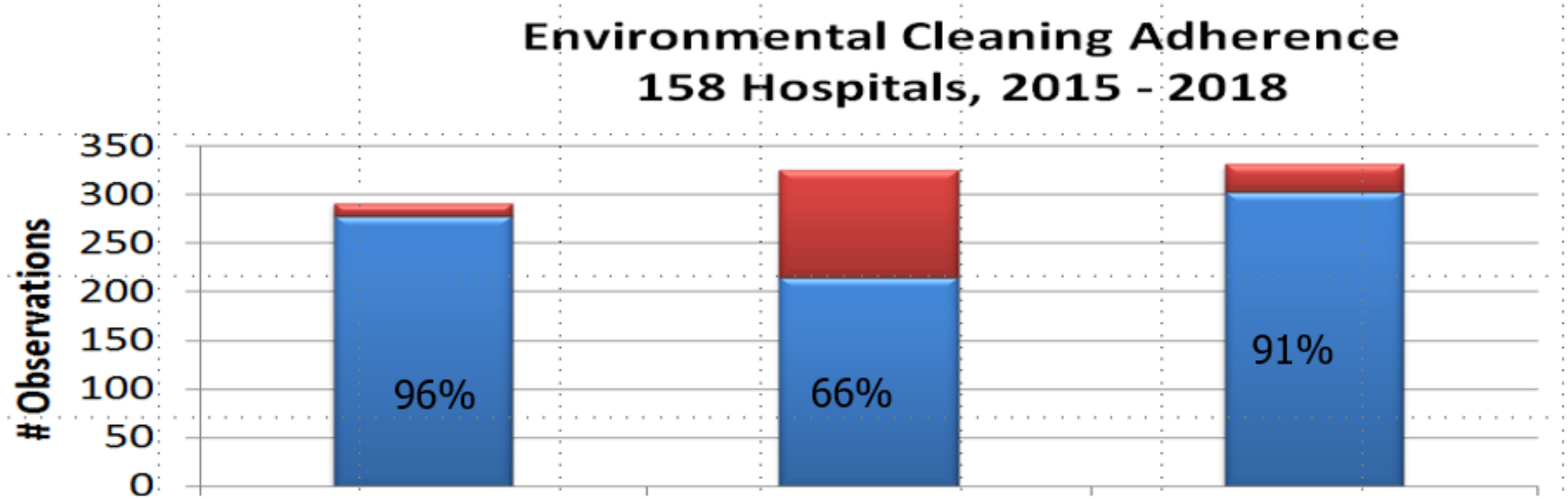
1. Environmental Cleaning Practices	EVS Staff 1		EVS Staff 2		Adherence by Task	
					# Yes	#Obs
2. Detergent/disinfectant solution is mixed according to manufacturer's instructions.	Yes	No	Yes	No	2	2
3. Solution remains in wet contact with surfaces according to manufacturer's instructions.	Yes	No	Yes	No	1	2
4. A new clean, saturated cloth is used in each room. The cloth is also changed when visibly soiled and after cleaning the bathroom.	Yes	No	Yes	No	1	2
5. Environmental Services staff use appropriate personal protective equipment (e.g. Gowns and gloves are use for patients/residents on contact precautions upon entry to the contact precautions room.)	Yes	No	Yes	No	1	2
6. Objects and environmental surfaces in patient care areas that are touched frequently* are cleaned and then disinfected when visibly contaminated or at least daily with an EPA-registered disinfectant.	Yes	No	Yes	No	0	2
# Yes 5	**# Observed 10**		**#Yes/Observed = % Adherence**		**50 %**	

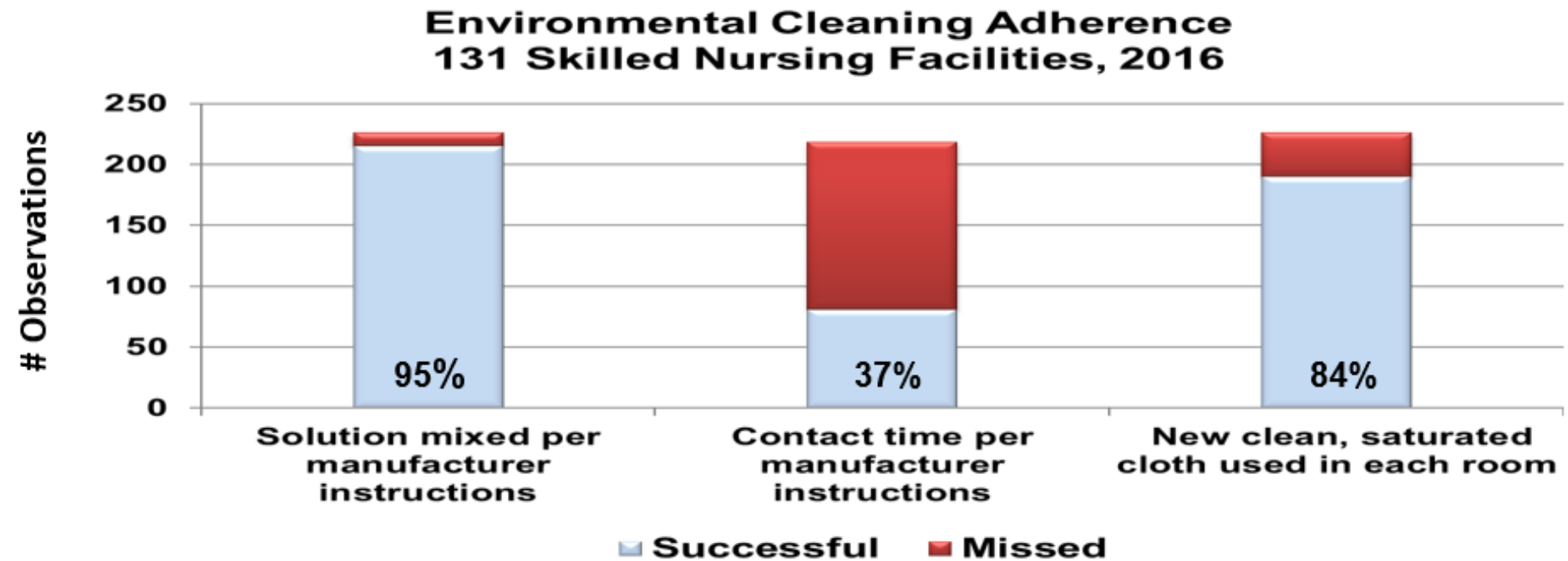
CDPH Adherence Monitoring Tools (PDF)
(www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/AdherenceMonitoringEVSApproved101516.pdf

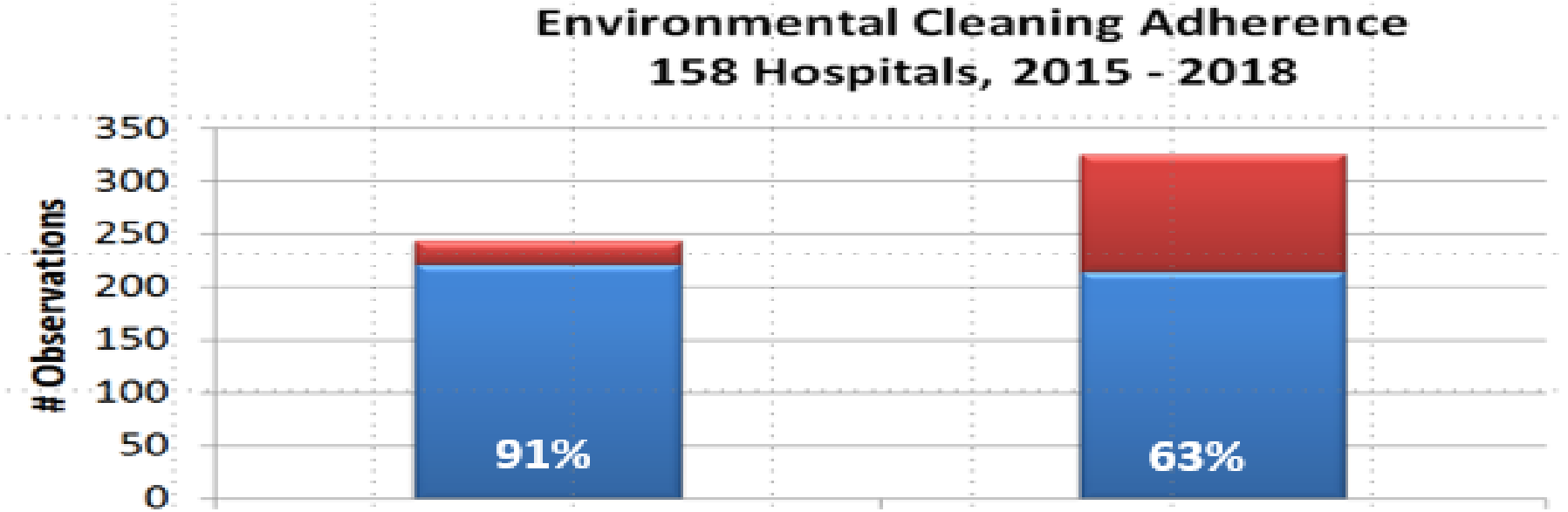
California Department of PublicHealth

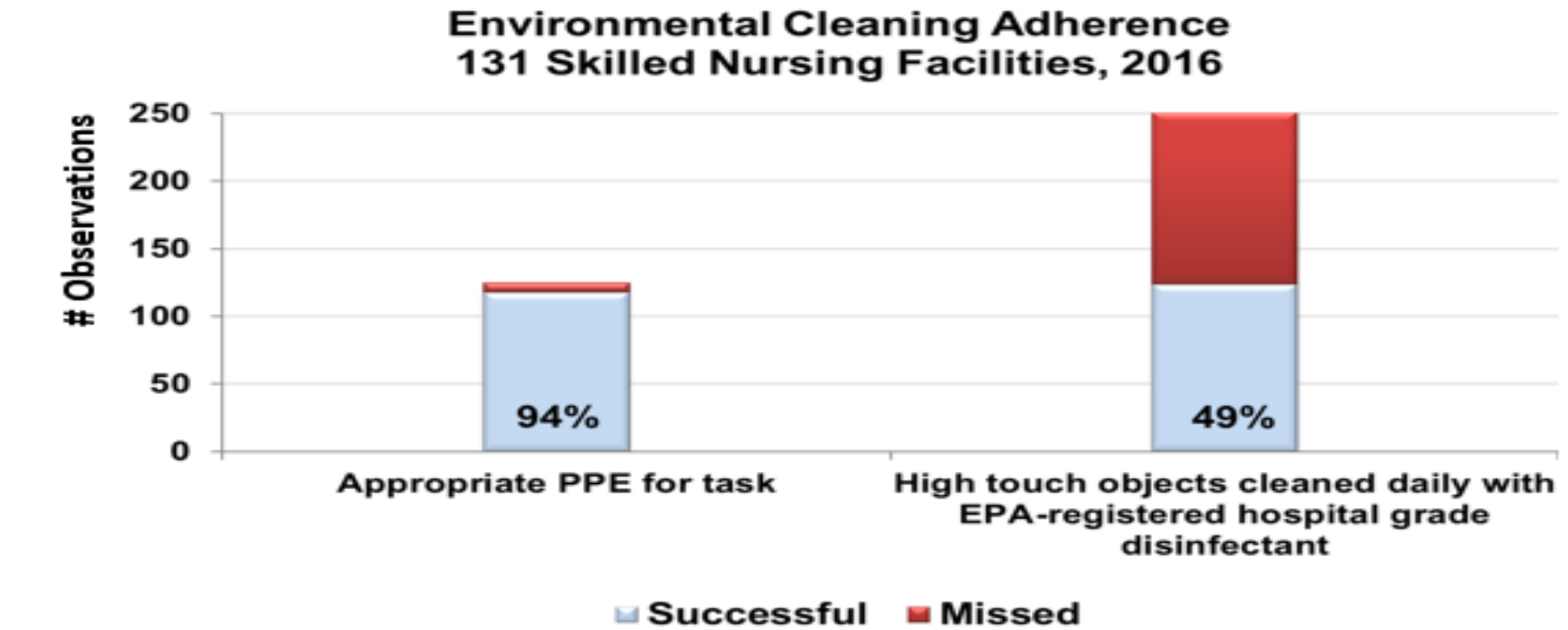
Adherence monitoring and reporting in EVS

- Findings from adherence monitoring should be reported to EVS department supervisor/director, presented to committees that oversee
  - Quality, patient safety, regulatory
  - Infection control committee
  - Internal EVS department
- Feedback should be provided to EVS staff


Environmental Cleaning Adherence
158 Hospitals, 2015 - 2018
Observations
350
300
250
200
150
100
50
0
96%
66%
91%


Environmental Cleaning Adherence
131 Skilled Nursing Facilities, 2016
Observations
250
200
150
100
50
0
95%
37%
84%
Solution mixed per manufacturer instructions
Contact time per manufacturer instructions
New clean, saturated cloth used in each room
Successful
Missed


Environmental Cleaning Adherence
158 Hospitals, 2015 - 2018
Observations
350
300
250
200
150
100
50
0
91%
63%


Environmental Cleaning Adherence
131 Skilled Nursing Facilities, 2016
Observations
250
200
150
100
50
0
94%
49%
Appropriate PPE for task
High touch objects cleaned daily with EPA-registered hospital grade disinfectant
Successful
Missed

Effective Cleaning and Disinfection Programs – Policy

Cleaning Policy Considerations

A healthcare facility's cleaning policy should include

- The surfaces and equipment that can reasonably be expected to be contaminated by bacteria (high touch surfaces)
  - Bedrail
  - Call light
  - Light switches
  - Doorknobs
  - TV remote
  - IV pump
  - IV poles
  - Computer keyboard
  - Telephone
  - Over bed table
  - Respiratory and other bedside equipment
  - Chairs
  - Toilet, commode chair
- Responsibility and frequency for cleaning and disinfecting patient care equipment and surfaces

Cleaning Responsibility

- **All personnel are responsible** for cleaning the environment
  - Environmental services staff
  - Nursing service staff – CNAs, LVNs, RNs, dietary aides
  - Physical, occupational, and speech therapists
  - Respiratory therapists
  - Radiology technicians, facilities/maintenance
- **All personnel must be oriented** to proper cleaning methods
  - Safety is a must! Accidental slips, needlesticks, and exposure to chemicals are a few of many safety concerns

OSHA: Housekeeping
(www.osha.gov/SLTC/etools/hospital/housekeeping/housekeeping.html)

Cleaning Responsibility (continued)

- Put individual responsibilities into **policy**
- Assign responsibilities with **checklist**

Healthcare-Associated Infections Program

Environmental Cleaning and Disinfection – Responsibility Assessment

Who is responsible for cleaning:	Respondent #1 Title:	Respondent #2 Title:	Respondent #3 Title:
ABHR dispenser			
Bathroom			
Bedrail			
Blood pressure machine			
Call button			
Charting area			
Floor			
Floor, with large spill			

[Responsibility checklist from CDPH](www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/AdherenceMonitoringEVS_ResponsibilityAssessment.pdf)
(www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/AdherenceMonitoringEVS_ResponsibilityAssessment.pdf)

Allotted Cleaning Times

- **Proper cleaning requires adequate time**
  - **Daily** cleaning can take **20-25 minutes** per room
  - **Terminal** cleaning will take **40-45** minutes

Association for the Health Care Environment
(www.ahe.org/ahe/learn/press_releases/2009/20090924_minimal_time_guidelines.html)

How Much Time Should it Take to Clean?

- **Create an individualized benchmark time** for the facility based on time needed to complete a checklist of items to be cleaned and disinfected
  - Input from front line staff is essential
  - Consider room size, amount of equipment, furniture and clutter that need to be cleaned or cleaned around
- **Disseminate information to all nursing units**
  - General understanding of how important room cleaning is, and how taking shortcuts may harm patients

Environmental cleaning and disinfection of patient areas
(www.ijidonline.com/article/S1201-9712(17)30270-9/fulltext)
Doll, M., Stevens, M., & Bearman, 2017. IJID,67(2018)

New Technologies: Whole-Room Disinfection

- "Touchless" or non-manual techniques
- Types include
  - Hydrogen peroxide fogging (dry mist or vapor)
  - Ultraviolet light (continuous emitting or pulsed xenon-UV)
- Not enough studies to support their use
- VERY expensive
- Require thorough manual cleaning before use – may add to room turnover time

Canadian Agency for Drugs and Technologies in Health. Room Disinfection in Healthcare Facilities (PDF)
(www.cadth.ca/sites/default/files/pdf/htis/nov2014/RC0545%20Room%20Disinfection%20Final.pdf)

Caveats to Whole-Room Disinfection Technologies

- Whole room disinfection technologies cannot substitute for
  - good physical cleaning practices
  - high level compliance to hand hygiene
  - avoidance of cross-contamination
  - staff education and competencies
- Temporary relocation of patients may be needed when disinfecting rooms
  - Need to assess cleaning procedures, chemicals used, safety issues

HEALTHCARE-ASSOCIATED INFECTIONS (HAI) PROGRAM

Environmental Cleaning

Welcome to the California Department of Public Health (CDPH) Healthcare-Associated Infections (HAI) Program environmental cleaning in healthcare facilities web page. The purpose of this page is to answer questions and provide information on maintaining a clean and sanitary environment in healthcare facilities for patients, visitors and staff. Reducing bioburden in the environment decreases potential for transmission of harmful organisms. Information is presented as frequently asked questions (FAQ) with references and links to additional information. The initial content on this page will emphasize the importance of environmental cleaning for stopping the spread of *C. difficile* diarrheal infections (CDI).

Additional content will be added in the coming months. For questions, suggestions, or more information, please email HAIProgram@cdph.ca.gov.

Role of Environmental Surfaces in Disease Transmission

Effective Cleaning Strategies

Monitoring Cleaning

CDPH Adherence Monitoring Tools (PDF)
(www.cdph.ca.gov/Programs/CHCQ/HAI/CDPH%20Document%20Library/AdherenceMonitoringEVSApproved101516.pdf)

CDC Cleaning Programs
(cdc.gov/hai/prevent/resource-limited/cleaning-programs.html)

California Department of PublicHealth

Reprocessing Reusable Medical Devices

Cleaning Medical Instruments and Devices

- Disinfection or sterilization cannot be achieved without cleaning first
  - Organic material dilutes or inactivates disinfectants
  - Bioburden must be reduced for processes to be effective
- Clean all medical equipment, instruments and devices by
  - Removing visible soil at point of use
  - Disconnecting or separating instrument parts
  - Checking the IFU for specific instruments to avoid damage
  - Avoid organic material drying on equipment, by rinsing or soaking in an enzymatic solution per IFU
  - Guidance on reuse of single use items, link below

CDC Oral Health
(www.cdc.gov/oralhealth/infectioncontrol/faqs/single-use-devices.html)

FDA Reprocessing and Reuse of Single Use Devices
(www.fda.gov/regulatory-information/search-fda-guidance-documents/reprocessing-medical-devices-health-care-settings-validation-methods-and-labeling)

Reprocessing Terminology

- Health care devices and equipment are designated (Spaulding's Classification System)
  - Non-critical: touches intact skin
  - Semi-critical: touches mucous membranes - except dental
  - Critical: enters sterile tissue or vascular system
- Categories determine level of reprocessing required

CDC: Spaulding's classification system
(www.cdc.gov/infectioncontrol/guidelines/disinfection/rational-approach.html)

Spaulding's Classifications and Levels of Disinfection or Sterilization

Reprocessing Classification
• Non-Critical • Semi-critical • Critical

Levels of Disinfection
• Low-level • Intermediate-level • High-level
Sterilization

Non-Critical Medical Devices

- In contact only with intact skin
- Require low-level or intermediate-level disinfection
- Include
  - Blood pressure cuffs
  - Stethoscopes
  - Durable mobile medical equipment

Semi-Critical Devices

- In contact non-intact skin or mucous membranes (except dental)
- Examples
  - Bronch**oscopes**
  - GI endo**scopes**
  - Vaginal ultrasonic probes
  - Respiratory therapy equipment
  - Anesthesia equipment

Critical Medical Devices

- Enter sterile tissue or the vascular system
  - Requires sterilization
  - Includes some dental or podiatry instruments
- Includes:
  - Surgical instruments and accessories
  - Biopsy forceps
  - Cardiac and urinary catheters
  - Implants

Disinfecting Medical Devices

- Disinfection eliminates or kills most bacteria, many virus types, some fungi (not prions)
- Cannot be accomplished without first cleaning
- Time-dependent process
- High, intermediate, and low levels of disinfection
- Must use EPA-approved disinfectant products
  - Product must have a tuberculocidal label claim to be used as a disinfectant for medical devices

Low-Level Disinfection

- For non-critical devices and equipment that contact intact skin
- EPA-approved products for low-level disinfection include:
  - Quaternary ammonium compounds (QUATS)
  - Phenolic compounds
  - Iodophors
- Ensure achievement of dilution and contact or “wet” time requirements

CDC Guideline for Disinfection and Sterilization in Healthcare Facilities, 2017
(www.cdc.gov/infectioncontrol/guidelines/disinfection/updates.html)

Intermediate-Level Disinfection

- For non-critical devices and equipment that may come in contact with nonintact skin or mucous membranes for a brief period of time, such as
  - Examples: respiratory therapy and anesthesia equipment, some endoscopes, laryngoscope blades, esophageal manometer probes
- EPA-approved products for intermediate-level disinfection include
  - Alcohols
  - Aldehydes
  - Chlorine compounds
  - Hydrogen Peroxide
  - Phenolics
  - Iodophors
- Ensure achievement of dilution and contact or “wet” time requirements

CDC Disinfection and Sterilization (www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html)

High-Level Disinfection

- For semi-critical devices and equipment
- EPA-approved products for high-level disinfection include
  - Gluteraldehyde
  - Ortho-phthaldehyde (OPA)
  - Peracetic acid
  - Peracetic acid/hydrogen peroxide
  - Hydrogen peroxide
- Test disinfectant product prior to each use
  - Change product as indicated by test, per manufacturer IFU
  - Maintain test log
- Ensure competency of staff

CDC Guideline for Disinfection and Sterilization in Healthcare Facilities (Feb 2017)
(www.cdc.gov/infectioncontrol/guidelines/disinfection/updates.html)

Glutaraldehyde (NIOSH)
(www.cdc.gov/niosh/topics/glutaraldehyde/default.html)

Scope-Associated Infections

- More healthcare-associated outbreaks are associated with **endoscopes** than any other medical device
  - Outbreaks often associated with disinfection process failures
  - 14.4 million gastrointestinal endoscopic procedures are performed annually in the U.S.

- Evidence of transmission of resistant organisms from inadequately processed bronchoscopes including:
  - Mycobacteria resistant to many disinfectants
  - Multidrug resistant Pseudomonas aeruginosa

Factors Leading to Outbreaks from Endoscope and Bronchoscope Contamination

- Contaminated water supply
- Contaminated brushes for cleaning scope lumens
- Improper manual cleaning prior to disinfection
- Biofilm inside automatic washer
- Improper use of automatic washer
- Contaminated or expired disinfection reagent
- Inability or neglect to clean the suction channel
- Mechanical or design issues related to the endoscope/bronchoscope

Endoscope Reprocessing

7 steps that must be performed in order, following manufacturer's instructions for use (IFU)

1. **Pre-clean**
   - Removes organic materials immediately following the procedure
2. **Leak Testing**
   - Detects damage to external surfaces and internal channels
3. **Manual Cleaning**
   - Includes brushing and flushing channels and ports
   - Most crucial step in the reprocessing process!

Essential Elements of a Reprocessing Program for Flexible Endoscopes
(www.cdc.gov/hicpac/pdf/flexible-endoscope-reprocessing.pdf)

Endoscope Reprocessing (continued)

4. **Visual Inspection – scope and accessories**
   - Provides additional assurance that scope is clean and free of defects
5. **Disinfection or Sterilization**
   - Review and follow scope manufacturer's IFU
   - Follow chemical or sterilant manufacturer's IFU
   - Follow automated reprocessor manufacturer's IFU
6. **Storage**
   - Hang vertically in a closed cabinet to promote drying and avoid recontamination
7. **Documentation**
   - Maintain documentation of adherence to these steps

Special Considerations for Reprocessing Duodenoscopes

- Duodenoscopes are used for endoscopic retrograde cholangiopancreatography (ERCP) procedures

To reprocess

- Inspect and manually clean the elevator mechanism
    - Perform in open/raised and closed/lowered positions
- Ensure that all channels of the scope and elevator mechanism are thoroughly dried before storage

Duodenoscope Surveillance Sampling & Culturing Reducing the risks of Infection
(www.cdc.gov/hai/organisms/cre/cre-duodenoscope-surveillance-protocol.html)
Essential Elements of a Reprocessing Program for Flexible Endoscopes (PDF)
(www.cdc.gov/hicpac/pdf/flexible-endoscope-reprocessing.pdf)

Special Considerations for Reprocessing Duodenoscopes - continued

- Culture ERCP scopes to ensure effectiveness of reprocessing
  - See CDC suggested algorithm
  - Take remedial action if a scope is culture-positive for high concern organisms or if unacceptable colony counts of low-concern organisms

Duodenoscope Surveillance Sampling & Culturing Reducing the risks of Infection
(www.cdc.gov/hai/organisms/cre/cre-duodenoscope-surveillance-protocol.html)
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Sterilization

- Used for critical medical devices
- Kills all organisms
- 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)

Reprocessing Surgical Instruments

- Sterilize all surgical instruments according to published guidelines and manufacturer's recommendations
- Refer to CDC HICPAC 2008 Guideline for Disinfection and Sterilization in Healthcare Facilities for additional recommendations.

Steam Sterilization by Autoclave

- Most common sterilization method
- 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 or other organic material
  - Packaged so that the steam can penetrate
- Autoclave must be loaded correctly

Rapid Cycle or Flash Sterilization

- Should be **reserved for** patient care **items that will be used immediately** in emergency situations when no other options are available
- **Should not** be used for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time.
- Unwrapped items only
- **Do not flash whole trays of instruments**
- Maintain records of items flash sterilized, including implants

Monitoring Sterilization

- **Mechanical** indicators
  - Gauges, displays, printouts on the machine
  - Indicates if device is working properly
- **Chemical** indicators
  - Change color with timed exposure to heat, steam
  - Show items have gone through sterilization process
  - Does not indicate sterility
- **Biological** indicators
  - Demonstrates bacterial spores on test strips or in vials/containers have all been killed
  - Indicator of sterility

Storage of Sterile Items

- Protect sterility of stored instruments until ready to use
  - Store to protect packages from dust, moisture, falling
  - Handle to protect package integrity
    - Do not stack, crush packaging or rubber-band sterile packages together
    - Wrap sharp points with tip protectors before packaging and sterilizing
- Rotate sterile items: first in, first out (FIFO)

Are Reusable Medical Devices and Equipment Reprocessed Appropriately in a Facility?

Requires

- Educated, competent reprocessing staff
- Devices properly cleaned before disinfection/sterilization
- Use of appropriate PPE
- Low, intermediate, and high-level disinfectants used according to manufacturers instructions
- Sterility being monitoring and sterile packages stored appropriately

Facility won't know if they don't monitor!

Adherence Monitoring Tools- Device Reprocessing

HEALTHCARE-ASSOCIATED INFECTIONS (HAI) PROGRAM

Monitoring Adherence to Health Care Practices that Prevent Infection

Device Reprocessing

Many areas of the healthcare facility may be performing device reprocessing.

- Device Reprocessing Adherence Monitoring Tool (PDF)
  Use this tool in any area where device reprocessing is performed.
- High-Level Disinfection of Reusable Devices Adherence Monitoring Tool (PDF)
  Use this tool in any area where high-level disinfection of reusable devices is performed
- Sterilization of Reusable Devices Adherence Monitoring Tool (PDF)
  Use this tool in any area where sterilization of reusable devices is performed.

Additional resources:

- CDC Guideline for Disinfection and Sterilization in Healthcare Facilities (PDF)
- FDA regulations on reprocessing of single-use devices

CDPH Adherence Monitoring Tools

(www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/MonitoringAdherenceToHCPracticesThatPreventInfection.aspx)

California Department of PublicHealth

Summary

- A properly cleaned care environment is essential to prevent or contain HAIs
- Surfaces must be physically cleaned before they can be disinfected
- Environmental services staff must be competent to ensure infection prevention and patient safety
- Engage with directors of environmental services, sterile processing, operating room, endoscope services, facilities management
- Adherence to policies and procedures for cleaning, disinfection, sterilization, and instrument handling, should be part of a facility's Infection Prevention Program
- Use a standardized tool to monitor environmental cleaning and device reprocessing using CDPH adherence monitoring tools or others

Resources

- Environmental Protection Agency Guide to Registered Disinfectants
  (Pesticide Registration)
  (www.epa.gov/pesticide-registration/selected-epa-registered-disinfectants)
- CDC Guideline for Disinfection and Sterilization in Health Care Facilities (PDF)
  (Disinfectants Cleaning, Sterilization)
  (www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf)
- CDC Guidelines for Environmental Infection Control in Healthcare Facilities (PDF)
  (Water, Air, Medical Waste, Pet Therapy, Construction)
  (www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines.pdf)
- CDC Tool kit: Developing a Water Management Program to Reduce Legionella Growth and Spread in Buildings (PDF) (www.cdc.gov/legionella/downloads/toolkit.pdf)
- California Medical Waste Management Act (PDF)
  (cchealth.org/eh/solid-waste/pdf/medical_waste_management_act.pdf)

Questions?

For more information,

please contact

HAIProgram@cdph.ca.gov

Include “ACH IP Training Course” in the subject line

Post Test

Now that you have completed this module,

Click on the “Post Test” link when it pops up

To Return to

Learning Stream

and take the post test

If the Post Test link does not pop up, you will be sent a link via e-mail