HOW CLEAN IS CLEAN?

STRATEGIES FOR ENVIRONMENTAL CLEANLINESS IN THE AMBULATORY SETTING

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DISCLOSURES

» Employee of Medline Industries, Inc.

» Opinions expressed are my own and not necessarily representative of Medline Industries, Inc.
TRANSMISSION ACROSS THE CONTINUUM

Source: Intermountain Healthcare
All healthcare settings, regardless of the level of care provided, must make infection prevention a priority.
Foundational Components IP & C

Hand Hygiene

AMS

Environmental Cleaning & Disinfection
CROSS CONTAMINATION

Chain of Infection

- Infectious Agent
- Reservoir
- Susceptible Host
- Portal of Entry
- Portal of Exit
- Mode of Transmission
Common Modes of Transmission

Contaminated inanimate surface → Direct Transmission → Susceptible patient

Hand of healthcare worker

Compliance in had hygiene: ~50%

CROSS CONTAMINATION

» 28-58%: Surface contamination and cross transmission (MRSA and CDI)

» 20-40%: Cross contamination via health care personnel (hands)

» Hospital patients shed pathogens into their surrounding environments

» Organisms persist on environmental surfaces for many days

<table>
<thead>
<tr>
<th>Type of bacterium</th>
<th>Duration of persistence (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acinetobacter spp.</td>
<td>3 days to 5 months</td>
</tr>
<tr>
<td><em>Clostridium difficile</em> (spores)</td>
<td>5 months</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>1.5 hours – 16 months</td>
</tr>
<tr>
<td>Enterococcus spp. including VRE and VSE</td>
<td>5 days – 4 months</td>
</tr>
<tr>
<td>Klebsiella spp.</td>
<td>2 hours to &gt; 30 months</td>
</tr>
<tr>
<td><em>Mycobacterium tuberculosis</em></td>
<td>1 day – 4 months</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>6 hours – 16 months; on dry floor: 5 weeks</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em>, including MRSA</td>
<td>7 days – 7 months</td>
</tr>
<tr>
<td>HBV &amp; HIV</td>
<td>&gt; 1 week</td>
</tr>
<tr>
<td>Influenza virus</td>
<td>1 – 2 days</td>
</tr>
</tbody>
</table>

CROSS CONTAMINATION

» There is a greater risk of infection with various drug-resistant organisms and *C. difficile* for patients who are housed in rooms previously occupied by others with these organisms.

Janet Haas, DNSc, RN, CIC, is an Instructor of Medicine at New York Medical College, and Director of Infection Prevention and Control, Westchester Medical Center, Valhalla, NY. She obtained her DNSc in 2007 at Columbia University, NY.
ENVIRONMENTAL CLEANLINESS & PATIENT SATISFACTION
PATIENT SATISFACTION

SURVEY OF 1000 PATIENTS

- Visible commitment to infection prevention
- Facility accessibility
- Amenities
- Up-to-date medical equipment
- Up-to-date technology
- Compassion / empathy of provider personnel
- Quality of medical products
- Time spent with patient during visit

The 2016 Health Industry Distributors Association (HIDA) Report: Patient Satisfaction. Published by HIDA
REASON PROVIDERS IMPRESS PATIENTS

» 48% - Visible commitment to infection prevention

- Hand sanitizer and other cleaning and sterilization products are plentiful throughout the facility
- Staff is seen frequently washing hands, especially before and after doing procedures or touching patients
- Masks are issued quickly to patients who need them, and made available to anyone who wants them
REASON PROVIDERS IMPRESS PATIENTS

» 48% - Visible commitment to infection prevention
  • Infection control signage and information is present in facility
  • Each area of the building is kept at exceedingly high standards of cleanliness
  • Staff is seen by patients doing cleaning and sterilization tasks
HOW CLEAN IS CLEAN?
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HOW CLEAN IS CLEAN?
CLEANING, STERILIZATION & DISINFECTION

» Cleaning
  • Removal of visible soil and organic contamination
  • Requires using the physical action of scrubbing with a surfactant or detergent and water
  • Process removes large numbers of microorganisms from surfaces and must always precede disinfection.
CLEANING, STERILIZATION & DISINFECTION
CLEANING, STERILIZATION & DISINFECTION

» **Disinfection** - Process of eliminating or reducing harmful microorganisms from inanimate objects and surfaces

» **Sterilization** - Process of killing all microorganisms
### CMS: IC SURVEYOR WORKSHEET

#### IV. Environmental Infection Control

Observations are to be made of staff performing environmental cleaning (e.g., surgical technicians, cleaning staff, etc.).

*If unable to observe is selected, please clarify in the surveyor notes box why it was not observed and attempt to assess by means of interview or documentation review.*

*Unless otherwise indicated, a “No” response to any question below must be cited as a deficient practice in relation to 42 CFR 416.51(a).*

<table>
<thead>
<tr>
<th>Practices to be Assessed</th>
<th>Was Practice Performed?</th>
<th>Surveyor Notes</th>
</tr>
</thead>
</table>
| A. Operating rooms are cleaned and disinfected after each surgical or invasive procedure with an EPA-registered disinfectant | ○ Yes  
○ No  
○ Unable to observe |                |
| B. Operating rooms are terminally cleaned daily | ○ Yes  
○ No  
○ Unable to observe |                |
| C. Environmental surfaces in patient care areas are cleaned and disinfected, using an EPA-registered disinfectant on a regular basis (e.g., daily), when spills occur and when surfaces are visibly contaminated. | ○ Yes  
○ No  
○ Unable to observe |                |
| D. The ASC has a procedure in place to decontaminate gross spills of blood. | ○ Yes  
○ No |                |
# CDC Checklist for Outpatient Settings

## X.a. Environmental Cleaning

<table>
<thead>
<tr>
<th>Elements to be assessed</th>
<th>Assessment</th>
<th>Notes/Areas for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Facility has written policies and procedures for routine cleaning and disinfection of environmental surfaces, including identification of responsible personnel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Personnel who clean and disinfect patient care areas (e.g., environmental services, technicians, nurses) receive training on cleaning procedures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Upon hire, prior to being allowed to perform environmental cleaning.</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>ii. Annually</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>iii. When new equipment or protocols are introduced</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td><strong>Note:</strong> If environmental cleaning is performed by contract personnel, facility should verify this is provided by contracting company.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. HCP are required to demonstrate competency with environmental cleaning procedures following each training.</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>D. Facility regularly audits (monitors and documents) adherence to cleaning and disinfection procedures, including using products in accordance with manufacturer’s instructions (e.g., dilution, storage, shelf-life, contact time).</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>E. Facility provides feedback from audits to personnel regarding their adherence to cleaning and disinfection procedures.</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>F. Facility has a policy/procedure for decontamination of spills of blood or other body fluids.</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
</tbody>
</table>
**X.a. Environmental Cleaning (continued) – Operating room**

<table>
<thead>
<tr>
<th>Elements to be assessed</th>
<th>Assessment</th>
<th>Notes/Areas for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>G. Operating rooms are terminally cleaned after last procedure of the day.</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>H. Facility regularly audits (monitors and documents) adherence to recommended infection control practices for surgical infection prevention including:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Adherence to preoperative surgical scrub and hand hygiene</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>ii. Appropriate use of surgical attire and drapes</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>iii. Adherence to aseptic technique and sterile field</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>iv. Proper ventilation requirements in surgical suites</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>v. Minimization of traffic in the operating room</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>vi. Adherence to cleaning and disinfection of environmental surfaces</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>I. Facility provides feedback from audits to personnel regarding their adherence to surgical infection prevention practices.</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
</tbody>
</table>
# Direct Observation of Facility Practices

## X.b. Environmental Cleaning

<table>
<thead>
<tr>
<th>Elements to be assessed</th>
<th>Assessment</th>
<th>Notes/Areas for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Supplies necessary for appropriate cleaning and disinfection procedures (e.g., EPA-registered disinfectants) are available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: If environmental services are performed by contract personnel, facility should verify that appropriate EPA-registered products are provided by contracting company</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>B. High-touch surfaces in rooms where surgical or other invasive procedures (e.g., endoscopy, spinal injections) are performed are cleaned and then disinfected with an EPA-registered disinfectant after each procedure.</td>
<td>○ Yes ○ No ○ Not applicable</td>
<td></td>
</tr>
<tr>
<td>C. Cleaners and disinfectants are used in accordance with manufacturer’s instructions (e.g., dilution, storage, shelf-life, contact time).</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
<tr>
<td>D. HCP engaged in environmental cleaning wear appropriate PPE to prevent exposure to infectious agents or chemicals (PPE can include gloves, gowns, masks, and eye protection).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: The exact type of correct PPE depends on infectious or chemical agent and anticipated type of exposure.</td>
<td>○ Yes ○ No</td>
<td></td>
</tr>
</tbody>
</table>
ENVIRONMENTAL CONTROL

» OR / Procedure rooms cleaned/disinfected after each case
» OR Procedure rooms terminally cleaned daily
» High touch surfaces in patient care areas
  • Pre-op
  • Post-op
  • Exam rooms
» When surfaces are contaminated
» Procedure for gross spills of blood and body fluids
Tools of the Trade
DISINFECTANT CLAIMS

» Disinfectant must be EPA registered.

Microorganisms in Descending Order of Resistance\(^1\) and Corresponding Micro-Kill Product Solution:

- **BACTERIAL ENDOSPORE**
  - C. diff spores

- **MYCOBACTERIA**
  - Tuberculosis

- **SMALL NON-ENVELOPED VIRUSES**
  - Norovirus, rhinovirus, poliovirus

- ** FUNGI**
  - Tricophyton mentagrophytes (athlete’s foot), Candida albicans

- **LARGE NON-ENVELOPED VIRUSES**
  - Rotavirus, adenovirus type 5

- **GRAM & VEGETATIVE BACTERIA**
  - Staph, MRSA, VRE

- **ENVELOPED VIRUSES (BLOODBORNE)**
  - HIV, HBV, HCV

\(^1\) Based on APIC Guideline for Selection and Use of Disinfectants.
DISINFECTANTS

» Disinfectant should be used in the manner recommended by the manufacturer

  • Contact time
  • Dilution
  • How to use

» Disinfectants that are “ready to use, or dispensed in pre-measured amounts, are preferred over those that require mixing
FACTORS IN DISINFECTANT EFFICACY

- Nature of object to be cleaned/disinfected
- Temperature and relative humidity

EQUIPMENT DISINFECTION

» Anesthesia machine
» Stethoscopes
» IV Equipment
» Monitors
» Blood pressure cuffs
» Blood Glucose Monitors
MEDICAL DEVICES CLEANING & DISINFECTION

» Follow your manufacturer’s instruction to the letter!
» During vendor training, make sure they are following the IFU
  • If instructions other than in the IFU are given – Ask for documentation!!!!
» Education
  • Instrument or device specific!
  • Competency should be demonstrate more than during initial training
  • Train to the IFU – Not how Susie does it
WHO’S RESPONSIBLE??

EVS or Nursing?

Someone else?
EDUCATION & TRAINING

» All responsible staff - EVS & Nursing
  • Provide job- or task-specific infection prevention education and training.
    > This includes those employed by outside agencies and available by contract or on a volunteer basis to the facility.

» Training should be provided upon hire and repeated annually and when policies or procedures are updated/revised.

» Competencies should be documented following each training.
**EVS EDUCATION & TRAINING**

» Provide Feedback and Information

- **People:** Focus on Turnover, Attendance, Morale, **Employee of the Month**
- **Service:** Focus on Inpatient and Outpatients Scores (PRC or Press Ganey, HCAPS)
- **Financial:** Focus on Supplies cost, Linen cost, equipment repair (Whatever you want to share that have financial impact on the organization and department)
- **Operational Quality:** Focus on TAT, Black light/ATP results

![Good Job! Well Done! Good Job!]

HOW DO YOU MONITOR CLEANLINESS?
Measure For Cleanliness

» There is no standard method for measuring
  • Actual cleanliness of surfaces
  • Achievement of certain cleaning parameters (e.g.,
    adequate contact time of disinfectant)
  • Defining the level of microbial contamination that
    correlates with good or poor environmental hygienic practices.
Cleaning Verification Systems

Swab cultures

Fluorescent Markers

ATP
FLUORESCENT MARKERS
THE SCIENCE BEHIND ATP SYSTEMS

» ATP systems measure light output
» Uses a reaction that produces light
» Bioluminescence - The Firefly Reaction
» Combination of Luciferin & Luciferase with ATP produces light
THE SCIENCE BEHIND ATP SYSTEMS

» ATP is present in blood, skin cells, other bodily fluids and microbes

» As organic material comes into contact with surfaces, it leaves ATP

» After cleaning, amount of ATP that remains is a direct indication of how much organic matter is still on the surface
ATP SYSTEMS

Step 1
Use special swab to sample surface

Step 2
Place swab in reaction tube

Step 3
Place tube in luminometer
Results: Relative Light Units
**NO-TOUCH ROOM DISINFECTION (NTD) SYSTEMS**

- **Hydrogen peroxide vapour (HPV)**
- **Aerosolised hydrogen peroxide (AHP)**
- **Ultraviolet radiation (UVC)**
- **Pulsed-xenon UV (PX-UV)**
## KEY DIFFERENCES BETWEEN HPV & UV

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Hydrogen Peroxide Vapor</th>
<th>UV Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle time (For single room)</td>
<td>90 minutes</td>
<td>15min to &gt;1hr</td>
</tr>
<tr>
<td>Ease of Use</td>
<td>Door &amp; air vent sealing &amp; leak detection required. Need specific training</td>
<td>No door &amp; air vent sealing &amp; leak detection required Relatively easy to use</td>
</tr>
<tr>
<td>Distribution</td>
<td>Homogenous</td>
<td>Affected by line of sight</td>
</tr>
<tr>
<td>Microbiological Efficacy</td>
<td>Elimination of pathogens from surfaces; 6-log sporicidal reduction</td>
<td>Does not eliminate pathogens from surfaces; 1-3 log sporicidal reduction</td>
</tr>
<tr>
<td>US EPA registration for use against spores</td>
<td>Sterilant</td>
<td>None</td>
</tr>
<tr>
<td>Evidence of clinical impact</td>
<td>Published evidence</td>
<td>Published evidence</td>
</tr>
</tbody>
</table>

Modern technologies for improving cleaning and disinfection of environmental surfaces in hospitals

John M. Boyce
SUMMARY

» Cross transmission of organisms from environmental surfaces has been well documented in the literature

» Patient Satisfaction is Impacted by a Clean Environment

» Patient Safety is Impacted by Environmental Cleaning and Disinfection
SUMMARY

» Education, Training and Competency are Key
  • What tools to use when
  • How to use your tools
  • Who is responsible for cleaning what

» Monitor for Cleanliness
RESOURCES


» CDC/HICPAC Guidelines and recommendations: http://www.cdc.gov/HAI/prevent/prevent_pubs.html
RESOURCES


» Occupational Safety & Health Administration (OSHA) Bloodborne Pathogens and Needlestick Prevention Standard: http://www.osha.gov/SLTC/bloodbornepathogens/index.html

