3M Infection Prevention

NO MORE WHITE GLOVES
Cleaning Monitoring in Healthcare Today
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• Mario Perella, CBSPD

• Field Technical Service Specialist

• Northeast US Region
  Infection Prevention Division
  3M Healthcare
Upon Completion of this program, the participant will be able to:

- Describe how environmental pathogens are transmitted to patients and healthcare workers.
- Evaluate if an environmental surface is at risk for environmental contamination.
- Describe which MDRO’s are most often found on environmental surfaces.
- Describe the current methods used to monitor environmental cleaning.
- Evaluate if a cleaning monitoring program can be used to support an infection prevention program.
Hospital Acquired Infections (HAI) persist and are costly

- 5%-10% of inpatients acquire infections during their hospital stay*
- 2 million infected per year in the United States
- 90,000 deaths attributed to HAI
- $5 ~ $50 billion additional cost to HC system

Center for Medicaid & Medicare (CMS) is pushing to classify HAI conditions in order to not reimburse for “preventable” hospital charges

New laws (state/federal) are requiring greater reporting of HAI

Research is providing more insight into infections and the role of the environment

*Burke JP. Infection control – a problem for patient safety. NEJM 2003; 348: 651-656
Institute for Healthcare Improvement (IHI) Guidelines for Combating Multi-Drug Resistant Organisms (MDROs)

Recommended interventions useful in reducing transmission of organisms resistant to multiple drugs

- Isolation of Carriers
- Detection of Carriers
- Hand Hygiene
- Disinfection of the Environment

http://www.ihi.org/ihi
Cleaning – Why?

MRSA, VRE, C DIFF, A. bauminii

Break the chain of transmission

Sneezing, coughing, mosquito bite, bodily fluids

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US Historical Perspective on the Role of the Environment in Transmission of HAIs

- Routine culturing of surfaces and air in hospital environment was common prior to 1970’s
- US Center for Disease Control and Prevention (CDC) and American Hospital Assn (AHA) recommended discontinuation of routine environmental culturing.
  - Labor Intensive, Lacked sensitivity
  - Lack of reliable data for horizontal transmission from contaminated surfaces
  - No standards
The Perspective is Changing

- Frequent recovery of emerging MDRO’s from environmental surfaces
  - MRSA, VRE, Clostridium difficile, Acinetobacter baumanii
- Data showing that pathogen strains from patient and the environment are the same
- MDRO’s can survive better in the environment when compared to common bacteria
- Growing evidence for transmission of pathogen
  - Environment to patients
  - Environment to hands of healthcare worker
- Recent studies show that reducing environmental contamination reduces infection in patients
- Focus on “high-touch, high risk areas/objects” in patient rooms.
Where do you find MDRO’s?

**A. baumanii**

- Stretcher
- Sink
- Blood pressure cuffs
- Door handle
- Mattress
- Curtains
- Respiratory care equipment
- Paper towel dispenser
- Shelving

Hayden MK SHEA 2007

**VRE**

- Bedside rails
- Bedside tables
- Blood pressure cuffs
- Toilets, toilet rails
- TV remotes
- Floors
- Intravenous pumps
- Bed control buttons
- Nurse call buttons

Duckro AN Arch Intern Med 2005; 165:304
Where do you find MDRO’s?

**C. difficile**
- Bedside rails
- Beside Tables
- Bed sheets
- Call buttons
- Toilet Seat
- Bathroom Door Handle
- Window sill
- Commodes
- Room Floors
- Toilet Floors

**MRSA**
- Bedside rails
- Bedside tables
- Blood pressure cuffs
- Patient gowns
- Bed linen
- Bathroom Door Handle

McFarland L et al NEJM 1989; 320:204
McFarland LJ ICHE 2002; 23:639
Dubberke ER et al AJIC 2007; 35:315
Verity P et al J Hosp Infect 2001; 49:204

Boyce JM et al ICHE 1997; 18:622
Boyce JM et al ICHE 2007; 28:1142
Bhalla A et al ICHE 2004; 25:164
Dancer SJ Lancet Infect Dis 2008; 8:101
Boyce JM et al J Hosp Infect 2007; 65(S2):50
## Survival of Pathogens in the Environment

<table>
<thead>
<tr>
<th>MDRO</th>
<th>Duration of Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acinetobacter</td>
<td>Days to 5 months</td>
</tr>
<tr>
<td>Clostridium difficile</td>
<td>Weeks to 5 months</td>
</tr>
<tr>
<td>Enterococcus (VRE)</td>
<td>Days to 4 months</td>
</tr>
<tr>
<td>Staphylococcus aureus (MRSA)</td>
<td>Weeks to months</td>
</tr>
<tr>
<td>Hepatitis B virus</td>
<td>7 days</td>
</tr>
<tr>
<td>Norovirus</td>
<td>12-14 days</td>
</tr>
</tbody>
</table>

Kramer A et al. BMC Infect Dis 2006, 6:130
Hota B Clin Infect Dis 2004; 39:1182
VRE Transmission Reduced by Removing Environmental Contamination

- VRE outbreaks were controlled by removal of contaminated electronic rectal or tympanic thermometers
- VRE transmission was reduced (26 to 34%) by enhanced environmental cleaning over a period
- VRE outbreak in a burn unit was terminated using enhanced environmental cleaning in combination with other control measures

Standards and Guidelines

- A real lack of standards and guidelines for Cleaning Monitoring for Environmental Surfaces
- Environmental cleaning regimens are not standardized or regulated and monitoring of cleaning efficacy is generally based on visual assessment.
- There are Guidelines/Recommendations from Professional Associations on the Verification of Cleaning as part of the Quality Processes.
Recognized Need for Better Monitoring of Environmental Cleaning Practices

• From CDC “Monitor cleaning performance to ensure consistent cleaning and disinfection of surfaces . . . (1)”

• SHEA/IDSA recommends “A system for monitoring adherence to environmental cleaning and disinfection protocols is desirable.”

CDC Toolkit: Options for Environmental Cleaning

The Toolkit offers recommendations on how to implement a program to optimize terminal room cleaning.

- Level I & II programs – implementation & education recommendations
- Review of current monitoring technologies – Visual, Microbial, Fluorescent markers, ATP bioluminescence
- High-Touch point checklist
- Worksheet – Data collection/analysis tool
In view of the evidence that transmission of many healthcare acquired pathogens (HAPs) is related to contamination of near-patient surfaces and equipment, all hospitals are encouraged to develop programs to optimize the thoroughness of high touch surface cleaning as part of terminal room cleaning at the time of discharge or transfer of patients.”

http://www.cdc.gov/HAI/toolkits/Evaluating-Environmental-Cleaning.html
CDC Environmental Checklist for Monitoring Terminal Cleaning

<table>
<thead>
<tr>
<th>Date:</th>
<th>Unit:</th>
<th>Room Number:</th>
<th>Initials of ES staff (optional):</th>
</tr>
</thead>
</table>

Evaluate the following priority sites for each patient room:

<table>
<thead>
<tr>
<th>High-touch Room Surfaces</th>
<th>Cleaned</th>
<th>Not Cleaned</th>
<th>Not Present in Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed rails / controls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tray table</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV pole (grab area)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call box / button</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedside table handle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room sink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room light switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room inner door knob</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom inner door knob / plate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom light switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom handrails by toilet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom sink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet seat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet flush handle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet bedpan cleaner</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluate the following additional sites if these equipment are present in the room:

<table>
<thead>
<tr>
<th>High-touch Room Surfaces</th>
<th>Cleaned</th>
<th>Not Cleaned</th>
<th>Not Present in Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV pump control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-module monitor controls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-module monitor touch screen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-module monitor cables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilator control panel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mark the monitoring method used:

- Direct observation
- Swab cultures
- Fluorescent gel
- ATP system
- Agar slide cultures

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1 Selection of detergents and disinfectants should be according to institutional policies and procedures.
2 Hospitals may choose to include identifiers of individual environmental services staff for feedback purposes.
3 Sites most frequently contaminated and touched by patients and/or healthcare workers.
Healthcare-Associated Infections: Recovery Act

Options for Evaluating Environmental Cleaning

Prepared by:
Alice Guh, MD, MPH¹
Philip Carling, MD²
Environmental Evaluation Workgroup³
December 2010

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²Carney Hospital and Boston University School of Medicine, Boston, MA; Dr. Philip Carling has been compensated as a consultant of Ecolab and Steris. He owns a patent for the fluorescent targeting evaluation system described in this document (DAZO Fluorescent Marking Gel).
³Brian Koll, Beth Israel Medical Center, New York, NY; Marion Kainer and Ellen Borchers, Tennessee Department of Health, Nashville, TN; and Brandi Jordan, Illinois Department of Public Health, Chicago, IL

Introduction

In view of the evidence that transmission of many healthcare-acquired pathogens (HAPs) is related to contamination of near-patient surfaces and equipment, all hospitals are encouraged to develop programs to optimize the thoroughness of high-touch surface cleaning as part of terminal room cleaning at the time of discharge or transfer of patients. Since dedicated resources to implement objective monitoring programs may need to be developed, hospitals can initially implement a basic or Level I program, the elements of which are outlined below. Some hospitals should consider implementing the advanced or Level II program from the start, particularly those with increased rates of infection caused by healthcare-acquired pathogens (e.g., high *Clostridium difficile* infection rate). All hospitals that have successfully achieved a Level I program should advance to Level II...
Monitoring means:
Check, supervise, watch, keep track of….

How do we monitor environmental cleaning?

- Visual Inspection
- Aerobic Colony Counts (ACC)
- Fluorescent Dyes/Powders/Gel
- ATP Bioluminescence
Current Standard Practice: Visual Examination

• Visual assessment is not an accurate measure of surface cleanliness nor of microbial contamination. It can be a misleading measure of cleaning efficacy.

Just because it looks clean…. does not mean it *is* clean.

• You can’t see biofilm or microbes
• You can’t see biological residues
Fluorescent Powders/Lotions/Gels

• UV fluorescent molecules are incorporated into water soluble gels, powders or lotions and used to mark an environmental surface.

• The surface is cleaned and then re-inspected by using a UVA light. The removal or partial removal of the fluorescent marker indicates if a surface has been wiped.

• Generate Qualitative Results: Has the surface been wiped? Yes/No
Aerobic Colony Counts (ACC)

- Environmental surfaces are cultured for the presence of aerobic bacteria.
  - Swab surface and culture on nutrient media
  - Dip slides or RODAC plates – nutrient agar is pressed directly onto the environmental surface
- Results are quantitative: CFU/ area tested
- Pathogens are identified in some cases.
You make me SICK!

When germ relationships go bad
Adenosine Tri-phosphate (ATP) Bioluminescence

- ATP is present in all living organisms – animal, plant, microorganisms, human secretions and excretions.
- Contaminated surfaces show high levels of ATP, clean surfaces show low ATP levels.
- The surface is swabbed and the ATP levels measured in a luminometer.
- Results are quantitative: ATP bioluminescence is measured in Relative Light Units.
- Benchmark RLU levels used to define “clean”.
Detecting ATP

In cells, ATP loses one or more phosphates to release energy

Fire-fly Luciferase harnesses this energy to produce Light
Simple Relationship

increase in light (RLU)

increase in ATP levels

increase in organisms or organic residues
ATP Testing Attributes

ATP is present in every living cell; every microbe, human cell and plant cell contributes to the signal

• Tests are simple to perform
• Poor cleaning leaves sufficient ATP to register a clear signal
• Results are quantitative and linear with respect to ATP
• Results are immediately available – no days long wait for results
• The fact that ATP is present in every living organism makes it a great marker for cleanliness.
Please keep this in mind.....

• RLU does not equal CFU
  • In pure lab cultures, correlations are beautiful!
  • In the “real world” it’s a mixed culture
    • Bigger cells have more ATP’
    • ATP levels vary with the metabolic state of the cell
      • Spores do not have ATP as they are not metabolically active
    • Many environmental bacteria do not grow under “normal” culture conditions.
    • Flocculent groups/bio-film chunks = 1 CFU
  • Contributions to ATP readings come from non-bacterial sources (skin cells, blood, food residue, plants)
Most ATP monitoring devices have software

- Data from luminometer is transferred to the computer
- Ability to monitor trends
# Rolling-Month Hygiene Map for Hospital Name

**From: 05/04/2009 To: 05/05/2009**

| NEONATAL UNIT                  | 06/04/2009-14:16 | 07/04/2009-15:16 | 08/04/2009-16:16 | 09/04/2009-17:16 | 10/04/2009-18:16 | 11/04/2009-19:16 | 12/04/2009-20:16 | 01/05/2009-00:00 | 02/05/2009-01:00 | 03/05/2009-02:00 | 04/05/2009-03:00 | 05/05/2009-04:00 | 11/05/2009-08:00 | 12/05/2009-09:00 | 13/05/2009-10:00 |
|-------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Alarm Mute Bn Ventilator      | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              | 206              |
| Bedside monitor screen        | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              | 171              |
| Clinical Bin Lid              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              | 245              |
| Cot Area Work Top Surface     | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              | 461              |
| Drug Fridge handle            | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              | 300              |
| Floor Under Incubr Cot        | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              | 571              |
| Keyboard                      | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             | 3.4k             |
| Nurse Station                 | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              | 216              |
| On Off Switch Enteral Feed    | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              | 376              |
| OnOffSwitch infusion pump     | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              | 519              |
| OnOffSwitch suction Jar       | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              | 567              |
| OnOffSwitchSyringe driver     | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              | 508              |
| Shaft of drip stand           | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             | 2.1k             |
| Staff Rm Dr Handl Outside     | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              | 867              |
| Staff Rm Dr Handle Inside     | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             | 1.4k             |
| Storage Cupbird Handle        | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              | 856              |
| TapHandle wash hand basin     | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              | 175              |
| Top Intubation trolley        | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              | 666              |
| Top of Incubator              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              | 123              |
### TEST PLAN LOCATION: Operating Room 2 - Post Terminal Cleaning 4/28/2011

<table>
<thead>
<tr>
<th>TEST POINT</th>
<th>OR #1</th>
<th>OR #2</th>
<th>OR #3</th>
<th>OR #4</th>
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<tbody>
<tr>
<td>Main Light Handle</td>
<td>1324</td>
<td>71</td>
<td>271</td>
<td>404</td>
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<tr>
<td>Smaller Light Handle</td>
<td>1246</td>
<td>118</td>
<td>90</td>
<td>320</td>
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<tr>
<td>Leads</td>
<td>2822</td>
<td>223</td>
<td>840</td>
<td>973</td>
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<tr>
<td>Pulse Ox</td>
<td>1088</td>
<td>1324</td>
<td>513</td>
<td>####</td>
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<tr>
<td>Door Handles</td>
<td>2152</td>
<td>1759</td>
<td>307</td>
<td>1131</td>
</tr>
<tr>
<td>Telephone</td>
<td>1417</td>
<td>717</td>
<td>1456</td>
<td>223</td>
</tr>
<tr>
<td>Anesthesia Machine</td>
<td>64</td>
<td>139</td>
<td>75</td>
<td>22</td>
</tr>
<tr>
<td>Bovie Buttons</td>
<td>3434</td>
<td>287</td>
<td>173</td>
<td>475</td>
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<tr>
<td>Anesthesia Monitor</td>
<td>4299</td>
<td>1396</td>
<td>990</td>
<td>1016</td>
</tr>
<tr>
<td>Storage Cabinets</td>
<td>1450</td>
<td>534</td>
<td>743</td>
<td>460</td>
</tr>
<tr>
<td>Table Controls</td>
<td>858</td>
<td>612</td>
<td>1549</td>
<td>####</td>
</tr>
<tr>
<td>Side rail clamps</td>
<td>347</td>
<td>299</td>
<td>427</td>
<td>665</td>
</tr>
<tr>
<td>Light switches</td>
<td>797</td>
<td>528</td>
<td>178</td>
<td>199</td>
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<tr>
<td>Tourniquets</td>
<td>N/A</td>
<td>436</td>
<td>N/A</td>
<td>1985</td>
</tr>
<tr>
<td>Computer Keyboards</td>
<td>1800</td>
<td>1136</td>
<td>772</td>
<td>1464</td>
</tr>
<tr>
<td>Metal parts of Seat Belts</td>
<td>1087</td>
<td>507</td>
<td>1173</td>
<td>1965</td>
</tr>
<tr>
<td>Sterilizers</td>
<td>N/A</td>
<td>125</td>
<td>N/A</td>
<td>82</td>
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<tr>
<td>Warming Cabinets</td>
<td>N/A</td>
<td>1265</td>
<td>N/A</td>
<td>984</td>
</tr>
<tr>
<td>Pyxis Keyboard/Monitor</td>
<td>6340</td>
<td>1453</td>
<td>776</td>
<td>N/A</td>
</tr>
<tr>
<td>Fracture Table Handles</td>
<td>N/A</td>
<td>320</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Fracture Table Post Hole</td>
<td>N/A</td>
<td>597</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**EXAMPLE "RLU" LEVELS - PASS/CAUTION/FAIL**

- **PASS** LESS THAN 500 RLU
- **CAUTION** 501 - 999 RLU
- **FAIL** GREATER THAN 1000 RLU
Which monitoring method is best? Depends on the question asked.

- Have important surfaces been wiped?
  - Visual Inspection/Checklist
  - Fluorescent powder/lotion/gel

- Is the surface “clean”?
  - Aerobic colony counts
  - Adenosine triphosphate (ATP) bioluminescence assay

Malik et al Am J Inf Cont 2003;31:181
Sherlock et al J Hosp Inf 2009
## Advantages and Disadvantages of Methods for Assessing Cleaning Practices

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection</td>
<td>• Simple</td>
<td>• Not reliable measure of cleanliness</td>
</tr>
<tr>
<td>Fluorescent marker system</td>
<td>• Inexpensive</td>
<td>• Must mark surfaces before cleaning, and check them after cleaning</td>
</tr>
<tr>
<td></td>
<td>• Minimal equipment needed</td>
<td>• Does not provide quantitative measures</td>
</tr>
<tr>
<td></td>
<td>• Can improve practices</td>
<td></td>
</tr>
<tr>
<td>Aerobic colony counts</td>
<td>• Relatively simple</td>
<td>• More expensive</td>
</tr>
<tr>
<td></td>
<td>• Detects presence of pathogens</td>
<td>• Results not available for 48 hrs later</td>
</tr>
<tr>
<td>ATP bioluminescence assay</td>
<td>• Provides quantitative measure of cleanliness</td>
<td>• More expensive</td>
</tr>
<tr>
<td>systems</td>
<td>• Quick results</td>
<td>• Requires special equipment</td>
</tr>
<tr>
<td></td>
<td>• Can improve practices</td>
<td></td>
</tr>
</tbody>
</table>
Where do you start?
What is a high risk - high touch surface?

A Quantitative Approach to Defining “High-Touch” Surfaces in Hospitals

Kirk Huslage, RN, BSN, MSPH;
William A. Rutala, PhD, MPH;
Emily Sickbert-Bennett, PhD; David J. Weber, MD, MPH

Fifty interactions between healthcare workers and patients were observed to obtain a quantifiable definition of “high-touch” (ie, frequently touched) surfaces based on frequency of contact.

Five surfaces were defined as high-touch surfaces: the bed rails, the bed surface, the supply cart, the over-bed table, and the intravenous pump.

Infect Control Hosp Epidemiol 2010; 31(8):850-853
V.B.8 Enhanced environmental measures
V.B.8.c. **Monitor** (i.e., supervise and inspect) **cleaning performance** to ensure consistent cleaning and disinfection of surfaces in close proximity to the patient and those likely to be touched by the patient and HCP (e.g. bedrails, carts, bedside commodes, doorknobs, faucet handles.) **Category 1B**

*Strongly recommended for implementation and supported by some experimental, clinical or epidemiologic studies and strong theoretical rationale.*

www.cdc.gov/ncidod/dhqp/gl_environinfection.html
Monitoring the efficacy of environmental cleaning in healthcare facilities: A review of three studies.
Improving Cleaning Practices by Using Fluorescent Marker System

Carling PC et al. ICHE 2008;29:1035

- Study performed in 36 acute-care hospitals
- Fluorescent markers covertly applied to environmental surfaces before terminal room disinfection
- Surfaces checked with UVA light after terminal cleaning
- Intervention included providing housekeepers with performance feedback

RESULT:
- Percent of objects cleaned
  - Before intervention: 47%
  - After interventions: 76 - 92%
Is it really clean? An Evaluation of the Efficacy of Four Methods for Determining Hospital Cleanliness.
Sherlock et al.  Journal of Hospital Infection 2009. 72:140-146

- Objective – Answer the following question: Is visual assessment a sufficient means of monitoring cleaning efficacy? Four methods were used to monitor cleaning:
  - Visual assessment, Aerobic colony counts, presence of MRSA and ATP
- Study design – Using each of the four assessment methods, the surface cleanliness of 10 environmental surfaces was compared before and after cleaning in two wards (medical and surgical).
Visual assessments alone did not always provide a meaningful measure of surface cleanliness or cleaning efficacy.

The use of ATP to monitor cleaning efficacy is a sensitive test that reports not just the presence of microbiological, but also any organic, contamination.

ACCs are a good indicator of general bioburden in an environment, but they are slow to process.
Sherlock et al. Summary

• “Visual methods to evaluate cleanliness are subjective and inadequate.”

• “As standard methods for the isolation of micro-organisms from the hospital, environment have not been established, and as organism recovery is often low or absent, the use of rapid methods such as ATP bioluminescence monitoring in a hospital setting should be considered in conjunction with visual methods.”
Monitoring Daily Cleaning Practices Using an ATP Bioluminescence Assay

Boyce JM et al. ICHE 2009;30:678

- **Objective** - To evaluate the usefulness of an adenosine triphosphate (ATP) bioluminescence assay for assessing the efficacy of daily hospital cleaning practices.

- **Study design** - A 2-phase prospective intervention study at a university-affiliated community teaching hospital.

- **Conclusions** - Suboptimal cleaning practices were documented by determining aerobic colony counts and by use of an ATP bioluminescence assay. **ATP readings provided quantitative evidence of improved cleanliness of high-touch surfaces after the implementation of an intervention program.**
Study Design

• **Phase 1 Goals**
  • Assess the thoroughness of daily cleaning procedures by determining aerobic colony counts and by use of an ATP bioluminescence assay

• **Intervention**
  • In-service educational sessions for housekeeping. Data from Phase 1 reviewed to stress importance of cleaning procedures and performance feedback.

• **Phase 2 Goals**
  • Establish with greater certainty the range of ATP readings to be expected on high-touch surfaces in patient rooms before and after daily cleaning.
  • Determine whether alerting housekeepers that cleaning procedures were being monitored would result in improved cleaning practices, as reflected in the ATP readings.
Median Relative Light Unit Readings, After Daily Cleaning, Phases I and II

<table>
<thead>
<tr>
<th>Relative Light Units</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedrail</td>
<td>600</td>
<td>100</td>
</tr>
<tr>
<td>Overbed Table</td>
<td>200</td>
<td>100</td>
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<tr>
<td>TV Remote</td>
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<td>100</td>
</tr>
<tr>
<td>Grab bar</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Toilet Seat</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

P < .001  < 0.001  .02  .002  .87
Monitoring Cleaning Effectiveness
How can this be used in your hospital?

- To Improve cleaning/disinfection practices in hospitals
  - You need a plan that includes:
  - Developing detailed protocols, educating housekeepers, monitoring cleaning and providing feedback to housekeepers.

You need to decide which method best answers your most important questions:

- Has a surface been wiped? Visual assessment, fluorescent markers
- Is the surface clean? ATP bioluminescence assay systems, aerobic colony counts,
  Quantitative Monitoring cleaning practices can help establish the effectiveness of new technologies for “area decontamination”
Summary

• MDRO pathogens survive in the environment leading to increased environmental contamination
• Environmental contamination may lead to direct transmission of MDRO to patients and HCWs
• Transmission of pathogens can be reduced by increased cleaning.
• Current recommended practices describe cleaning monitoring as part of a quality control program
• The standard practice of visual assessment is no longer adequate for the monitoring of cleaning efficacy
• Visual assessment, fluorescent powders/lotions/gels, aerobic colony counts and ATP bioluminescence are all currently used to monitor cleaning protocols.
• Together with educational interventions, monitoring technologies can be used to increase the efficacy of and compliance with cleaning protocols.
Thank You