Methods for Assessing Adequacy of Cleaning Practice and Improving Room Disinfection

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Boston University School of Medicine

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Patent License - Ecolab
Today’s Presentation

A 2014 Perspective
Why patient zone surfaces are important
Addressing suboptimal cleaning practice
Approaches to monitoring hygenic practice in healthcare
Choosing a monitoring system
A 2014 Perspective

Developmental Emphasis

2007 – 2010

Next 5 years

Environmental Disinfection Cleaning

Near-Patient Surface Bio-burden Reduction
## A 2014 Perspective

### Developmental Emphasis

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### Environmental Disinfection Cleaning

- Near-Patient Surface Bio-burden Reduction
A 2014 Perspective

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A 2014 Perspective

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The Environmental Hygiene Equation

Optimized Product + Optimized Practice

* P. Carling 2012
Optimized Product - Healthcare Surface Disinfectants – Update 2014

• For the first time ever (almost), the surface disinfectant landscape is changing.

Good News
More Rapid Sporicides
And
Greener Sporicides

Bad News
Lots of marketing
You need to look for

Clinical Comparisons
Optimized Process
Evaluating Cleaning Practice

Is there a problem ??
DAZO Solution
Target Enhanced
Targeting Patient Rooms

Objects were chosen by considering sites

A. A patient was most likely to contaminate and
B. Care givers may touch with their hands

Up to 14 objects marked in each room after terminal cleaning

Objects were evaluated after one to two patients had cycled through the room to see if targets had been removed by discharge cleaning activities
Areas marked
The big problem
Thoroughness of Environmental Cleaning

Mean = 32%

>110,000 Objects
The good news
Phase I: Covert Baseline Environmental Cleaning Evaluation

Phase II:  
A. Programmatic Analysis  
B. Educational Interventions – ES staff

Phase III: Re-evaluation of Cleaning and Feedback to ES
RESULTS
Hospitals Environmental Hygiene Study Group
36 Hospital Results

% of Objects Cleaned

Resource Neutral

P = <.0001
Is it a surprise that this degree of improvement was resource neutral??

Terminal Cleaning

Rupp ME, Adler A, Schellen M, Abstract 203 Fifth Decennial
The Iowa Project – 56 Hospitals
Improvement Environmental Cleaning According to Policy with DAZO Program

Mean = 32%

Mean = 78%

Health Care Environmental Hygiene Research Group Studies 2004 - 2012
Does Improved thoroughness of disinfection decrease surface contamination?
Improving Disinfection Cleaning to Decrease Environmental Surface Contamination

% Relative Improvement from Baseline

Improvement in Cleaning Practice

Decrease in Environmental Pathogens

80%

64%
Improved Thoroughness of hygienic cleaning is a worthy goal given the billions of dollars involved…but will it impact transmission of HAPs?
Increased risk of prior room occupant transmission
Baseline thoroughness of Cleaning
Thoroughness of cleaning following structured interventions
Programmatic decrease in environmental contamination

- MRSA, VRE, CD, AB: 73% (8 Reports)
- 82% (11 Studies)
This study was the first to programmatically evaluate the actual impact of improving environmental hygiene on transmission of MRSA and VRE.
• Site — 10 ICUs with 100 beds
• Design – Identical to the Healthcare Environmental Hygiene Study Group protocols
• Six week covert analysis followed by a 6mo. Intervention analysis
Brigham & Women’s ICU Study

Goodman R, ICHE 2009
Brigham & Women’s ICU Study

Pre-Intervention

% Thorroughness of Cleaning

44

Post-Intervention

71

% MRSA/VRE Contamination

45

27

Goodman R, ICHE 2009
Brigham & Woman’s ICU Study

Result of the intervention

MRSA Acquisition Decreased 50%  p<0.001)
VRE Acquisition Decreased 28% (p<0.02)
Increased risk of prior room occupant transmission

Baseline thoroughness of Cleaning

Thoroughness of cleaning following structured interventions

Programmatic decrease in environmental contamination

Programmatic decrease in acquisition

- Increased risk of prior room occupant transmission: 74% (11 Studies)
- Baseline thoroughness of Cleaning: 40% (4 Studies)
- Thoroughness of cleaning following structured interventions: 82% (8 Reports)
- Programmatic decrease in environmental contamination: 68% (8 Reports)
- Programmatic decrease in acquisition: 68% (4 Studies)
CDC Recommendations

Acute Care Hospitals should implement a:

Level I Program:

Basic interventions to optimize disinfection cleaning policies, procedures and ES staff education and practice. When completed move to Level II Program

Level II Program:

Adding a structured, objective and ongoing performance improvement program.

Options for Evaluating Environmental Cleaning

October 2010

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion
New CDC Recommendations

Web Link:

http://www.cdc.gov/HAI/toolkits/Evaluating-Environmental-Cleaning.html

Options for Evaluating Environmental Cleaning

October 2010
Options for Evaluating Surface Cleaning in Healthcare
### Defining the Difference Between Cleaning and Cleanliness

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<th></th>
<th><strong>CLEANLINESS</strong></th>
<th><strong>CLEANING</strong></th>
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<tr>
<td><strong>Definition</strong></td>
<td>A Measure of bacteria on a surface</td>
<td>Measured by evaluating process</td>
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<tr>
<td><strong>Defined Criteria</strong></td>
<td>No (less vs. more bacteria)</td>
<td>Yes – DAZO removal</td>
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<tr>
<td><strong>Methods to Study</strong></td>
<td>Culture/ATP</td>
<td>DAZO</td>
</tr>
<tr>
<td><strong>Improvement shown to decrease bacterial transmission (published)</strong></td>
<td>None</td>
<td>Two</td>
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<tr>
<td><strong>Impacted by</strong></td>
<td>Bioburden, thoroughness of recent cleaning, effectiveness of disinfectant used, recent contamination or lack of</td>
<td>Thoroughness of the evaluated cleaning practice</td>
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<td><strong>CDC endorsed to improve patient safety</strong></td>
<td>No</td>
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Evaluating healthcare environmental hygiene practice
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Use of Cultures to Evaluate Cleaning Performance

**Advantages**
- Can be pathogen specific
- Touch slide procedure can easily confirm heavy contamination or sterility

**Disadvantages**
- Pathogen Specific:
  - Very costly
  - Several research methodologies used
- Touch Slides:
  - “Hygienic Standards” suggested but not validated
  - Logistical issues – Timing of monitoring
    - Labor intensive
    - Does light growth mean low contamination or relatively good cleaning?
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Using tools that measure cleanliness to systematically evaluate cleaning process
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Surface evaluation using ATP bioluminescence

Swab surface → luciferase tagging of ATP → Hand held luminometer
The ATP tool in context

Industrial Use
- Developed in the 1970s for commercial food preparation
- Used when very clean surfaces are important
- High-grade disinfectants + Rinsing
- Testing immediately after cleaning and just before use is the standard

Healthcare Use
- Griffiths – JHI studies – Effectively used cultures and ATP to debunk the “visibly clean ” standard
- He and later Dancer showed that most surfaces had both high bacterial and ATP counts (89% of surfaces “Failed”) (many appeared dirty!)
- The Hygienic standard is proposed
Limitations of ATP evaluation of cleanliness in healthcare settings

Three studies of ATP sensitivity and specificity clarify the limits of the ATP “Cleanliness Standard” as it was proposed several years ago.
Study # 1.

Evaluation of ATP bioluminescence swabbing as a monitoring and training tool for effective hospital cleaning 2007
Correlation between ATP bioluminescence (RLU/Swab) and aerobic colony count (cfu/swab)
Correlation between ATP bioluminescence (RLU/Swab) and aerobic colony count (cfu/swab)

Satisfactory by RLUs but Unsatisfactory by # CFU

Bioluminescence
PPV = 63%  NPV = 71%
"Routine cleaning with detergent can reduce concentration of microbes & organic matter by RLU. The effect is not large, with many sites exhibiting similar values after cleaning as they did before. …Further work is required to refine practical sampling strategy and choice of benchmarks."
Despite their limitations, can dip slide cultures or ATP be theoretically used to evaluate cleaning practice?

The CDC Guidance says yes......But
But then you will need to deal with the other implication of ATP or touch slide monitoring.
Most surfaces have too low a bioburden to evaluate… you need to mark two to three times the number of surfaces you planned to get an appropriately sized sample to detect a 20% change in process

* No aerobic growth or < 2.5 CFU/cm²
Programmatically Improving Environmental Hygiene in Healthcare Settings
Opportunities to Reduce Transmission

• The most objectively evaluable intervention to decrease HAP transmission

• Opportunities for improvement have been found in all venues within hospital and non-hospital settings in the US and abroad

• Implementation Science is well established (CDC 2010)

• Complements Hand Hygiene – “If a surface is not contaminated with CD spores touching it will not lead to transmission, regardless of HH thoroughness.”
Thanks for Inviting me !!

Questions – Comments?