ENVIRONMENTAL HYGIENE

technology review

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“Environmental Services Community of Practice”

IPAC Eastern Ontario
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Kingston, ON
I am not a certified Infection Control Professional
I am not a certified Financial Professional
I am an environmental hygiene Operations Professional

I make my living consulting for healthcare organizations and hygiene technology providers, across North America, to improve patient safety and financial performance through improvements in clinical environmental hygiene.

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Environmental Hygiene Performance Framework℠

CLINICAL = Medical, Clinical, Infection Prevention & Control

TECHNICAL = Hygiene Supply & Technology Industries

OPERATIONAL = Environmental Services, Supply Chain, Finance

Protocol: (the science of cleaning and disinfection) integrated clinical, professional & technical, evidence-based, practice guidance
People: (motivated and independent thinking workforce) competent & engaged human resources, organized and aligned to patient-safety
Process: (scalable & replicable output) consistent execution of standard work, effectively integrated with clinical practice
Product: (products, equipment, systems) strategic & effective utilization of hygiene technology enablers
Performance: (what “good” looks like) continuous improvement informed by measurable key performance indicators

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Environmental Services

where does the money go?

Average Cost Allocation

- Labor: Cleaning Clinical Env.
- Labor: Cleaning Non-Clinical Env.
- Waste Management Services
- Cleaning Supplies
- Other Overhead
Environmental Hygiene Technology Landscape

Secondary Disinfection

Cleaning & Disinfection

TECHNOLOGIES to ensure the pathogenic organism bio-load on patient contact surfaces in the clinical environment are SAFE

Surface Renewal & Regeneration

Environmental Monitoring

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1. **Does It Work?**
   1.1 Objective, Peer-Reviewed, Performance Research (i.e. log reductions)
   1.2 Supported by Protocols, Processes guidance etc.

2. **Will It Make A Difference?**
   2.1 Evidence-Based Clinical and/or Quality (positive) Impact
   2.2 Return on Investment (ROI)

3. **Is It a Solution?**
   3.1 (ES) Management Acceptance
      3.1.1. In-Use Cost (Product / Labor)
      3.1.2. Start Up Costs (Dispensers, Training etc.)
      3.1.3. Ease of Purchase
      3.1.4 Safety/Regulatory Approval
   3.2 Clinical (ICP) Acceptance
      3.2.1. Clear & Compelling Evidence
      3.2.2. Attributable Clinical Benefit
      3.2.3. Consistent & Sustainable Execution
   3.3 Worker Acceptance
      3.3.1. Performance
      3.3.2. Odor / Reactivity / Safety
      3.3.3. Ease of Use
   3.4 Customer (Internal / Patient / Visitor) Acceptance
      3.4.1. Impact on Surfaces / Equipment / Operational & Clinical Processes
      3.4.2. Noticeable Odor / Film / Residue
      3.4.3. Brand or Process Inspire Patient / Visitor Confidence

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Chemical-Based Surface Disinfectants & Disposable Wipes

What:
• Traditional providers changing technology spectrum
• Upstart companies entering the market

So What:
• Increasingly narrow band of differentiating features
• Industry marketing hype & product literature is confusing

The Big Deal:
• ICPs are becoming confused by the (active ingredient) nuances; less inclined to intervene with supply chain & environmental services
• Focus on green products that disinfect – limited choices for registered disinfectants, however this will change

Ones to Watch:
• Stabilized Aqueous Ozone
• Hydrogen Peroxide & Blended Chemistries

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UVD / Fogging / Misting Machines

**What:**
- Use of the “robot-like devices” to reset the microbial load on surfaces at the point of terminal clean

**So What:**
- Strong marketing & technology appeal (the hospital is “seen” to be doing the right thing)
- Positioned as “fool proof” technology, consistent, reliable (vs. human error – 40% surfaces never wiped)

**The Big Deal:**
- Hospital cleaning doesn’t require a premium performing disinfectant; allows Quats to remain
- Not the solution for everyone/everywhere, but is something “innovative” so will get attention (see: the technology hype cycle) $60K - $150K

**Ones to Watch:**
- Portable Disinfection Systems,
- Fixed-Mounted UVD Systems
Coatings, Infusions, Surface Repair and Treatments

What:
• New generation of patient furniture, cubicle drapes, paints, after-market surface treatments, such as: copper, silver, nickel, anti-microbial agents
• Self-disinfecting surfaces can be created by impregnating or coating surfaces with heavy metals (e.g. silver or copper), germicides (e.g., triclosan), or miscellaneous methods (e.g., light-activated antimicrobials).

So What:
• Positioned as “added assurance” technology, consistent, reliable (vs. human error – 40% surfaces never wiped)
• Innovative “ecologically sustainable” approach to environmental hygiene vs. (harmful) chemicals

The Big Deal:
• Will be marketed as a strong (premium) differentiator at the time of purchase; off-set by reduced need/cost for cleaning
• Analogy: no-finish flooring substrates

Ones to Watch:
• Nickel-Copper blend surface treatments
• After-market surface regenerators
Environmental Monitoring

**What:**
- Environmental Sampling, ATP, Microbial Simulations, Visual Monitoring systems and technologies
- Performed post-cleaning (with lag time) by someone other than environmental services

**So What:**
- Lagging, non-standard indicators, with no correlation to clinical outcomes
- Inconsistent with LEAN (stop-the-line?), Positive Deviance (outcomes?)
- ATP is seen as innovative and is being hyped and touted as “best-of-the-lot” solution, however is fallible & costly, therefore adoption will not become mainstream

**The Big Deal:**
- ICP community requires a mechanism to ensure cleaning and disinfection is working that is objective, empirical, standardized and informed by evidence
- No ability to separate product efficacy from human performance
- Product satisfaction is tied to a weak evaluation process (with compatibility challenges)

**Ones to Watch:**
- Nano-based continuous assessment technology
- New generation florescent marking agents
- Integrated, WEB, technology platforms

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Important Trends & Implications

**Trends**

- Increased HAI Public Awareness & Provider Urgency to Act
- Financial Reform, Revenue & Cost Containment Challenges
- Proliferation of Environmental Hygiene Technology Options
- Acceptance that Human Processes are Fallible
- Increased involvement by Infection Preventionist in the management of Environmental Services

**Implications**

- More public HAI disclosure; stronger financial pressure to improve performance; increased hunt for the IPAC magic-bullet; Snr. leaders will seize control of the HAI agenda
- Hospital utilization rates will increase, as will use of out-patient clinical facilities; outsourcing of ES will remain a viable option, although product control will not shift; patient throughput and satisfaction will remain priorities
- Innovations will proliferate; major players will compete with upstarts; having a product in multiple locations on the hype-cycle will matter
- Interest in technology solutions or workarounds will grow; risk that healthcare leaders will "give-up" on traditional human-based solutions; patient attitudes will be critical
- ICPs will assume a greater role in oversight of the EH program; evidence-based practice will be a priority; focus on stronger front-line hourly ES worker education and individual accountability

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Menu of Potential Environmental Hygiene Performance Improvement Solutions

1. Launch a microfibre cleaning system
2. Change disinfectant or disposable wipes product
3. Clarify cleaning & disinfections responsibilities
4. Enhance training for ES/Clinical employees
5. Add more staff to increase cleaning frequencies

Restorative Interventions

1. Purchase/resource a UV-C based portable room disinfecting system
2. Purchase/resource an Ozone-based portable room disinfecting system
3. Purchase/resource a Hydrogen-peroxide vapor based portable room disinfecting system

Surface Renewals & Regeneration

1. Repair, replace or treat existing surfaces to make them respond better to cleaning and disinfection
2. Replace privacy drapes or upholstered fabrics with silver infused products
3. Upgrade patient bed-rails or bedside furniture to nickel-copper coated products

Environmental Monitoring

1. Implement a visual cleanliness monitoring system
2. Implement a florescent marking system
3. Add more supervision to better monitor staff
Environmental Infection Prevention

Reality Check

Clinical
• Ever-changing biological conditions
• Contradictory technical advice
• Cause of HAI's are multi-factorial
• ICP knowledge and interest in environmental hygiene is highly variable

Operational
• ES & ICP band width for assessment is low
• Both ES & ICP suffer from a lack of resources
• Lack of financial resources; yet poor ability to calculate a return-on-investment
• Variation in environments
• Disruptive impact of supply chain channels

Variables and Constraints for INFECTION PREVENTION STRATEGY

CLINICAL
epidemiology medical clinical

OPERATIONAL
physical financial human
The emerging Value Proposition of Environmental Hygiene, represents a paradigm shift for everyone...Are you ready?

"I realize you had an appointment, however the housekeeper has been detained on patient rounds. You'll just have to wait."
Environmental Hygiene Technology Assessment Framework

• Principles
  – Objective
  – Measurable
  – Comparative Benefit
• Components
  – Assessment Pre-conditions
    • People, Process, Environment (Who / How / Where)
    • Specific Objective (Why / What)
    • Clinical Activity (When)
  – Research
    • Vendor Provided Evidence
    • Peer Referrals
    • Professional Research
  – Structured Methodology
    • Process: Time Frame / Comparative
    • Without Internal / External Influences
    • Mitigating Complexities
    • Criteria For Attributable Benefit (Clinical, Financial, Operational)
    • Peer Advisor
  – Analysis
    • Direct & In-Direct Interventions & Support
    • Sustainable Benefit
    • Full Cost / Benefit Disclosure
Industry Literature & Expert Guidance

(Snap Shot Overview)
Review of VHP, UVD, HPM

RESEARCH QUESTIONS
1. What is the clinical effectiveness and safety of non-manual techniques utilizing UV light or hydrogen peroxide for room disinfection in healthcare facilities?
2. What are the evidence-based guidelines for the use of non-manual techniques utilizing UV light or hydrogen peroxide for room disinfection in healthcare facilities?

KEY FINDINGS
Low quality evidence from one systematic review and three cohort studies suggests that VHP is effective in reducing the incidence of nosocomial infections due to a number of different pathogens in hospital settings. In three low quality case studies, VHP decontamination successfully terminated Acinetobacter baumannii outbreaks. Low quality evidence from one cohort study suggests that UV light reduces the incidence of hospital-associated C. difficile infections. Two evidence-based guidelines included VHP and UV light decontamination in their scope and found that there was insufficient evidence to make recommendations about the use of these methods.

METHODS
Literature Search Strategy
A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2014, Issue 3), University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to documents published between January 1, 2009 and March 31, 2014.

Rapid Response reports are organized so that the evidence for each research question is presented separately.
No Touch Room
Disinfection Systems

Review of No-Touch Room Disinfection Systems

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AD Russell Memorial Teleclass

Does Improving Surface Cleaning and Disinfection Reduce Healthcare-Associated Infections?

William A. Rutala, PhD, MPH
Director, Hospital Epidemiology, Occupational Health and Safety; Professor of Medicine and Director, Statewide Program for Infection Control and Epidemiology
University of North Carolina at Chapel Hill and UNC Health Care, Chapel Hill, NC

Hosted by Prof. Jean-Yves Maillard
Cardiff University, Wales

www.webbertraining.com

April 25, 2013
ALL “TOUCHABLE” (HAND CONTACT) SURFACES SHOULD BE WIPED WITH DISINFECTANT

“High touch” objects only recently defined (no significant differences in microbial contamination of different surfaces) and “high risk” objects not epidemiologically defined.
Touch (manual disinfection not thorough) vs No-Touch (mechanical)

No Touch

(supplements but do not replace surface cleaning/disinfection; avoids the need for “touch” and the problems associated with manual disinfection)
Assessing UVC Disinfection: Microbiological Efficacy and Integration into Hospital Workflow

Elizabeth Bryce, Titus Wong, Tracey Woznow, Elena Murzello, Mike Petrie, Amin Kadora

Presentation to the Environmental Hygiene Interest Group 2014 Infection Prevention & Control Conference - Halifax
Conclusion

• Both machines are microbiologically effective
• Functionality and integration into workflow became the primary determinants
• Cycle time becomes paramount in our institution

Carefully consider how your facility operates when selecting UVC machines
Environmental Cleaning in Healthcare: Is Monitoring of Cleaning Compliance Really Needed?

Michelle J. Alfa, Ph.D., FCCM
Principal Investigator, St. Boniface Research Centre
Winnipeg, MB, Canada

Hosted by Paul Webber
paul@webbertraining.com

www.webbertraining.com December 11, 2014
Hospital-approved Liquid Disinfectants for Environmental Cleaning  
[PIDAC 2012]

- Alcohols: 70-90%
- Chlorines: sodium hypochlorite or bleach
- Hydrogen peroxides: (enhanced action formulations)
- Quaternary ammonium compounds: QUATS [limited bacterial killing ability]
- Phenolics: not to be used in nurseries
- Iodophors: non-antiseptic formulations

Be sure to ensure microbial killing claims are effective in ≤ 3 minutes
Environmental Cleaning Monitoring

**PIDAC Recommendations:**
- Process in place to assess quality of cleaning
- In addition to visual inspection use of an Audit tool
- Regular feedback to housekeeping staff
- Action plans when inadequate compliance detected

**Audit Tools:**
- UV-visible Marker
- ATP
- Culture
Novel Methods for Environment Disinfection:

- Fogging:
  - VHP,
  - Ozone gas,
  - super-oxidized water,
- UV irradiation:
- Steam:

Regardless of Disinfection method used, monitoring cleaning compliance is still needed.
<table>
<thead>
<tr>
<th>Cleaning criteria:</th>
<th>Compliance of Monitoring Method with cleaning criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UV-Marker</td>
</tr>
<tr>
<td>Surface was wiped</td>
<td>+</td>
</tr>
<tr>
<td>Low Organic residuals</td>
<td>-</td>
</tr>
<tr>
<td>Low Microbial residuals</td>
<td>-</td>
</tr>
<tr>
<td>No residual AROs</td>
<td>-</td>
</tr>
<tr>
<td>Low labour</td>
<td>+</td>
</tr>
<tr>
<td>Results available for immediate feedback</td>
<td>+</td>
</tr>
</tbody>
</table>

* Cutoff for adequate cleaning not yet defined (250 RLUs/site suggested)
** ATP lacks sensitivity to detect < 100 cfu/test

ATP levels (RLUs) do NOT correlate with viable count


Key Study Conclusions:

HAI rates reduced for VRE, MRSA & *C. difficile*

**Three key components:**

- **Training of Housekeepers:**
  - required to demonstrate competency

- **Monitoring cleaning compliance:**
  - minimal acceptable compliance of 80%
  - same-day feedback (re-clean required)

- **Effective disinfectant agent:**
  - wide range of kill in $\leq 1$min
  - container-wipe application system
Environmental Disinfection in 2014: New Technologies, Old Dilemmas

Curtis Donskey, M.D.

Louis Stokes VA Medical Center
Cleveland, Ohio
UV Advantages and Disadvantages

Advantages
- Rapid (15 min; 45 min for C diff)
- Room does not need to be sealed
- Minimal health and safety concerns
- Low operating costs (+/-)

Disadvantages
- No controlled studies showing reduced infections
- Inadequate methods to monitor UV delivery and effectiveness
Improved hydrogen peroxide disinfectants

Advantages

- Fast: 30 sec - 1 min bactericidal and virucidal claim
- Safe (EPA toxicity category, III - Caution)
- Noncorrosive
- Effective on soft surfaces (EPA soft surface claim)
  - Reduced MRSA and VRE on privacy curtains

Disadvantages

- More expensive than Quats
- Not effective against *C. difficile* spores

Summary

The environment plays an important role in transmission of healthcare-associated pathogens. Environmental interventions can reduce transmission, but the quality of the evidence is low. Environmental disinfection can be improved using automated devices or through standard cleaning interventions. Multiple challenges remain.
The Big Picture of Environmental Hygiene

Imperatives

Philip Carling, MD
Single intervention clinical studies of environmental hygiene

Enhanced Cleaning
New Disinfectant
HPV
UV

Studies = 57
Single intervention clinical studies of environmental hygiene

Non-outbreak Studies = 32
Single intervention clinical studies of environmental hygiene

Non-outbreak studies in which TDC was objectively monitored during the intervention = 10
Conclusions

• None of the technologies replace disinfection cleaning

• No-touch technologies have potential value in defined applications

• Studies to assess their possible added benefit in terminal cleaning are in progress
Thank You

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