Recent Advances in Environmental Asepsis

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Conflicts of Interest
- The presenter has no conflicts of interest to disclose

Objectives
- After attending this course, participants will be able to:
  - List several recent studies addressing the role that surfaces play in the transmission of healthcare-associated infections
  - Identify trends in environmental asepsis in the hospital environment that are relevant to the dental profession
  - Describe new technologies that can be used to routinely evaluate the quality of environmental hygiene

2014 Updates to the AORN Recommended Practice for Environmental Cleaning

Additions
- Recommendations for cleaning and disinfection in the
  - Pre/Post operative patient care area
  - Operating and Procedure Rooms
  - Sterile Processing areas
- Enhanced cleaning recommendations for multi-drug resistant organisms
- Quality and process improvement recommendations for evaluation of thoroughness in all applicable areas

Multidisciplinary Approach
- Strong recommendation for collaboration between Infection Prevention, Environmental Services, and organizational leadership regarding
  - Selection of cleaning chemicals
  - Selection of cleaning materials, tools, and equipment
  - Establishment of cleaning frequencies
  - When enhanced environmental cleaning procedures should occur
  - Personnel responsible for cleaning patient care areas and equipment

Cleaning Chemicals
- Environmental protection agency (EPA) registered hospital-grade disinfectants should be used on environmental surfaces and equipment
- Surfaces should be cleaned with a detergent prior to disinfection
- Disinfectants should be applied and reapplied as needed to ensure proper dwell time
- Spray and misting methods should not be used to apply cleaning chemicals in procedural areas

Regulations
- Safety data sheets must be available and reviewed
- Follow manufacturer’s instructions for use along with local, state, and federal regulations for the preparation, handling, storage, and disposal of all chemicals
If the cleaning chemical is removed from the original container, ensure the secondary container is labeled with the chemical name, concentration, and expiration date.

**Patient Safety**
- Assess the environment frequently for cleanliness
- Floors should always be considered contaminated
- Protective barrier coverings should be used to cover surfaces if the surface cannot withstand disinfection or is difficult to clean
- Equipment should be cleaned and disinfected before being brought into the patient care area
- All patient positioning equipment should have a moisture-resistant and intact covering

**Patient Safety**
- A clean environment should be reestablished after the patient is transferred from the patient care area
- Procedural areas should be terminally cleaned
- An established schedule should be determined for terminal cleaning

**Staff Safety**
- All personnel should take precautionary measures to limit transmission of microorganisms when performing environmental cleaning and handling of waste materials
  - Appropriate personal protective equipment (PPE) use

**Education Requirements**
- All personnel should receive initial and ongoing education and competency verification on their understanding of the principles and the performance of the processes for environmental cleaning
  - Cleaning / disinfection products available
  - PPE requirements for chemical use
  - Reconstitution ratios (if applicable)
  - Product expiration parameters
  - Storage, handling, and disposal requirements
  - Safety data sheet location

**Cleaning Policies**
- Policies and procedures for environmental cleaning processes and practices should be developed, reviewed periodically, revised as necessary, and readily available in the practice setting

**Quality Assurance**
- Personnel should participate in quality assurance and performance improvement activities consistent with the facility’s plan to improve understanding of and compliance with the principles and processes of environmental cleaning
- Ongoing feedback can show if problems are improving, stabilizing, or worsening
- Obtaining data from quality assurance or performance improvement tools can
  - tell if benchmark goals are met
  - identify areas where additional help is needed

**Process Monitoring**
• Process monitoring is a necessary part of every facility’s environmental cleaning program
• Process monitoring must include
  • compliance with regulatory standards
  • review of products and manufacturers’ instructions for use
  • cleaning procedures
  • monitoring cleaning and disinfection practices
  • reporting and investigation of adverse events
  • outbreaks, product issues, corrective actions, evaluation

**How should cleanliness be measured?**
• Thoroughness of cleaning is the focus of performance improvement
• Measure cleaning practices
  • visual observation of the cleaning process
  • visual inspection of cleanliness
  • fluorescent marking
  • ATP monitoring
  • cultures

**AORN Environmental Cleaning toolkit**

**AORN Environmental Cleaning toolkit**
• Purpose
  • educate all team members about the recommended practices on cleaning the perioperative environment
  • promote patient safety
  • prevent the spread of infection in the perioperative environment
• Available at http://www.aorn.org/Clinical_Practice/ToolKits/Environmental_Cleaning_Tool_Kit/Environmental_Cleaning_Tool_Kit.aspx

**AORN Environmental Cleaning toolkit**
• Resources
  • Modules – Power Point presentations used for orientation, review, annual competencies
  • Checklists – Specific for each practice setting, the cleaning checklists can be used for documentation and education
  • Posters – Helpful tools for quick reminders when providing targeted education for staff

**Toolkit Modules**
• Module 1 - Environmental Cleaning: Basics
• Module 2 - Environmental Cleaning: Preoperative and Postoperative Areas
• Module 3 - Environmental Cleaning: OR and Procedure Rooms
• Module 4 - Environmental Cleaning: Sterile Processing Areas
• Module 5 - Special Cleaning Procedures
• Module 6 - Quality and Process Improvement

**End of Procedure Cleaning in the OR or Procedural Room**
Terminal Cleaning in the Preoperative and Postoperative Care Area

What should be cleaned first?

- Clean from
  - top to bottom
  - clean to dirty areas

- Clockwise or counter-clockwise cleaning may be performed when used along with clean-to-dirty and top-to-bottom cleaning methods

Cleaning

Sample Cleaning Checklist
Pre/Post Procedural Areas

Chain of Infection

Hand Hygiene

- Hand hygiene must always be performed
  - when you remove PPE
  - as soon as possible after hands are soiled

Current Discussions in Healthcare Environmental Asepsis

Hot Topics

- One-step vs. Two-step cleaning / disinfecting
- ATP testing / Fluorescent marking
- Ultraviolet / Solar disinfection
- Copper / Silver containing disinfectants

One-step verses Two-step

Cleaning / Disinfection

- Clean
  - The absence of visible dust, soil, debris, blood, or other potentially infectious material
  - The “first step”
- Disinfection
  - A process that kills most forms of microorganisms on inanimate surfaces
  - The “second step”

One-step verses Two-step

- One-step product – combines detergent and disinfectant, typically packaged as single-use wipes
- Two-step products – separate detergent and disinfectant, requires user to perform cleaning and disinfection in two separate steps
  
  - 
  - 
  -
One-step Wipes

- Various terminology used by wipe manufacturers make it difficult to choose which wipe will best fit the organizations needs
  - Sanitizing
  - Disinfectant
  - Germicidal
  - Sporicidal
  - Virucidal
  - Antibacterial

Disinfectant Wipes

- While wipes have gained tremendous popularity, there is poor evidence to support efficacy at the point of care
  - Effectiveness of the wipe depends on...
    - Detergency – ability to remove dirt on a visibly soiled surface
    - Wetness – ability to leave a layer of disinfectant on the surface of objects / equipment
    - Disinfectant efficacy – once the surface is dry disinfection stops, if residue is left behind there is no further antimicrobial effect

Wipe it Out

- Royal College of Nursing produced “The Selection and Use of Disinfectant Wipes”
- Ultimate resource for thorough understanding of benefits and limitations of one-step wipe products

Infection Control Resources

- “Proper Use of Healthcare Disinfectants: The Implications Associated with Off-Label Use of Disinfectants”
- “Infection Control Facts: How to Select an Ideal Disinfectant”

ATP testing

verses

Fluorescent marking

ATP testing vs. Fluorescent marking

- CDC recommends all facilities develop programs to evaluate the thoroughness of high-touch object cleaning
- Emerging technologies take evaluation of cleaning and disinfecting beyond direct observation and checklists
Subjective evidence verses objective evidence

**Objective Methods for Evaluation**
- Direct practice observation
- Swab cultures or agar slide cultures
- ATP bioluminescence
- Fluorescent markers

**ATP Testing**
- Measurement of adenosine triphosphate (ATP) on surfaces using a luciferase assay and luminometer
  - Method
    - Before room cleaning / disinfection occurs, a specialized swab obtains a sample from the surface area or object
    - The swab is placed in the portable hand-held luminometer which identifies the amount of ATP in the sample
    - After cleaning / disinfection has occurred, the items are swabbed and analyzed again

**ATP Testing**
- Advantages
  - Easy to use
  - Immediate teaching and feedback
- Disadvantages
  - Results vary between systems
  - A threshold value has not been determined in the healthcare setting for determining clean / contaminated
  - Significant amount of ATP in the environment is non-microbiological
  - Bleach based disinfectants alter the bioluminescence reaction
  - Viruses and bacterial spores do not contain ATP

**Fluorescent Marking**
- Fluorescent powder, gel, or lotion can be used to mark objects prior to cleaning
  - Method
    - Objects are marked before cleaning occurs
    - Evaluation occurs by shining a UV (black) light over the object to see if the product has been removed

**Fluorescent Marking**
- Advantages
  - Ease of use
  - Immediate teaching and feedback
- Disadvantages
  - Some markers can be seen after the mark is applied, alerting the individual to clean the tagged object more thoroughly
  - Some marking products can be difficult to remove from surfaces and equipment, leaving permanent stains

**Comparison**

**Comparing ATP Monitoring Units**
- Article on ISSA Web site “Using an ATP Monitoring System in Healthcare Settings”
• Representatives from each major industry provider of ATP monitoring systems in healthcare contributed their perspective of ATP integration into practice
• Available at http://www.fmlink.com/article.cgi?type=Magazine&title=Using+an+ATP+Monitoring+Syste m+in+Health+Care+Settings&pub=ISSA+Today&id=41190&mode=source

Current Research - ATP
• Validation occurred for all three meters tested, but only one could be verified due to variations in system performance between units
• Recommends careful consideration of technologic application in the healthcare environment

Current Research – Marking
• With the use of fluorescent marking, 10 high-touch surfaces were evaluated for cleaning efficacy
• 74% of high-touch surfaces were adequately cleaned

• Several studies have shown us two certainties...
  • Cleaning practices are often subpar
  • Improvements made through education and feedback do not last
• This leads us to reach out for new technologies that can be applied to the healthcare environment

Ultraviolet verses Hydrogen peroxide

Ultraviolet vs. Hydrogen peroxide
• Manual cleaning / disinfection relies on the individual to follow manufacturer’s stated contact time and appropriate distribution of the chemical across surfaces
• Even with vigorous cleaning, multidrug resistant organisms (MDROs) can remain in the environment for months
• Both methods have published evidence of reduction of contamination in the healthcare setting

Ultraviolet Light
• Acts by breaking down the molecular bonds of DNA, causing cell destruction
• Requires appropriate intensity, exposure time, air movement, and bulb strength
• Can be used as an adjunct to manual cleaning / disinfecting practices

Hydrogen peroxide
• Acts by releasing the oxygen (oxidizing) from within the cell membrane of organisms,
leading to cell death
• Available as a vapor, aerosolized dry mist, and vaporized hydrogen peroxide
• Active against bacteria, fungus, viruses, and spores
• Numerous systems available in various price ranges
• Can be used as an adjunct to manual cleaning / disinfecting practices

Comparison

Current Research – UV light
• Both studies showed significant reduction of organisms despite high levels of contamination, including *C diff* spores

Current Research – Hydrogen peroxide
• Study shows vapor or dry mist distribution of hydrogen peroxide can effectively disinfect the hospital environment

Copper versus Silver-containing Disinfectants

Copper
• Acts by altering the structure of proteins, leaving them unable to perform their natural functions (inactive)
• Used in self-disinfecting surfaces
• Not a cleaning / disinfection strategy, rather this is a proactive approach to decreasing microbial load

Silver Containing Disinfectants
• Action is not entirely understood, but believed to have a germicidal effect on some bacteria, viruses, algae, and fungi
• Not toxic to humans
• Testing and standardization is difficult in the healthcare setting
• Used in self-disinfecting surfaces
• Not a cleaning / disinfection strategy, rather this is a proactive approach to decreasing microbial load

Comparison

Current Research – Copper
• Study found a reduction in organisms in the healthcare environment with the use of copper
alloy materials

- However, the items must contain greater than 58% copper

What is on the horizon for cleaning and disinfecting in healthcare?

Healthcare Cleaning “Bundles”
- Steps include
  - Creating policies and procedures
  - Selection of cleaning products
  - Determining method of application
  - Education
  - Monitoring
  - Providing feedback

References
- AORN Environmental Cleaning toolkit (2014).
- Royal College of Nursing. (2011) Wipe it out; One chance to get it right.

Questions?

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