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BACK TO BASICS: ENVIRONMENTAL CLEANING

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ABSTRACT:

The need for a clean perioperative environment is a basic principle for all perioperative team members. Recent evidence suggests that the environment plays a role in the occurrence of health care–associated infections (HAIs), including surgical site infections. Frequently cleaning high-touch surfaces helps prevent the spread of infections, and routinely cleaning and disinfecting the patient's environment can reduce the level and frequency of contamination and the risk of HAIs. Perioperative personnel should use a bundled approach to perform a standardized cleaning routine and implement a successful monitoring program.

The need for cleanliness of the perioperative environment is a basic principle for all perioperative team members.

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INTRODUCTION:

Perioperative nurses know the importance of providing a safe, clean environment for surgical patients. Healthcare-associated infections (HAIs) are on the rise,[1] and in recent years there has been an increased focus on the role of the physical environment in these infections. In ORs, personnel have frequent contact with environmental surfaces as well as with the patient. In addition, they bring items such as cell phones, tablets, equipment, and personal bags and belongings into the surgical environment, which serve to increase the number of potential pathogens present.[1]

The need for cleanliness of the perioperative environment is a basic principle for all perioperative team members. At times, personnel can overlook this basic principle and fail to effectively clean the OR environment. Environmental cleaning, however, represents the first step in preventing HAIs and surgical site infections. Every day and during every procedure, some type of cleaning should be performed. Cleaning practices are not always standardized or monitored across practice settings,[1] so the question is whether cleaning is being performed in an effective manner. Areas that are frequently touched by health care providers or patients are called "high-touch" surfaces, and it is important for perioperative team members to understand that frequent cleaning of these surfaces is essential to prevent the spread of potentially infectious organisms.[2]

HOW-TO GUIDE:

Health care personnel can use the following strategies to reduce the risk of HAIs.

- Do not sweep the OR with a broom; use other methods (eg, wet mop, wet vacuuming, don gloves to manually remove, use an instrument to remove sharp debris) to pick up debris.

Figure 1: Example of cleaning frequencies in the OR and other procedure rooms.

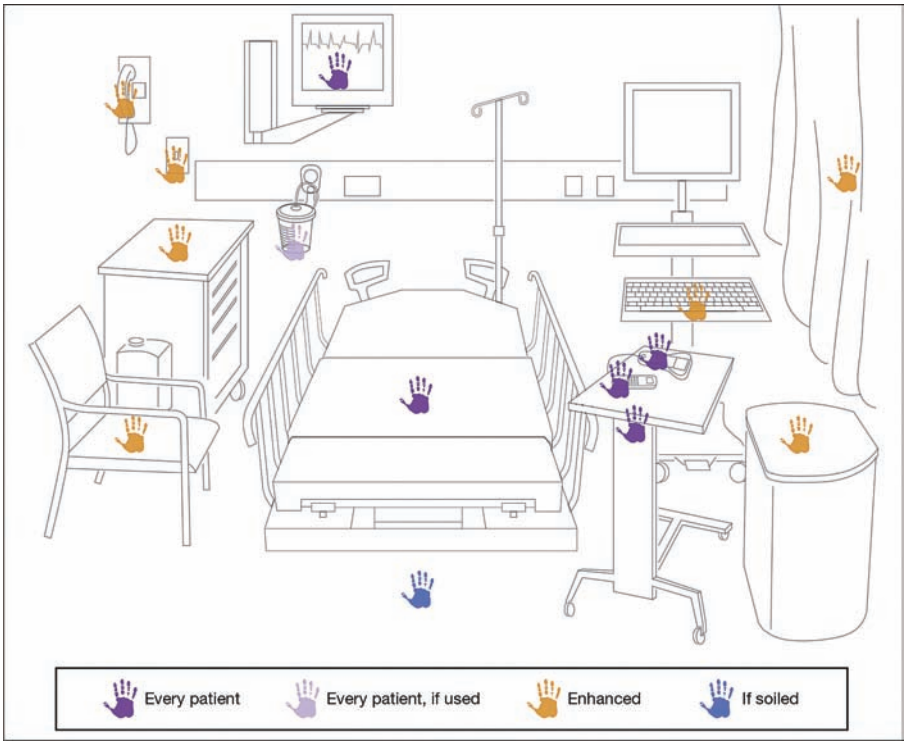

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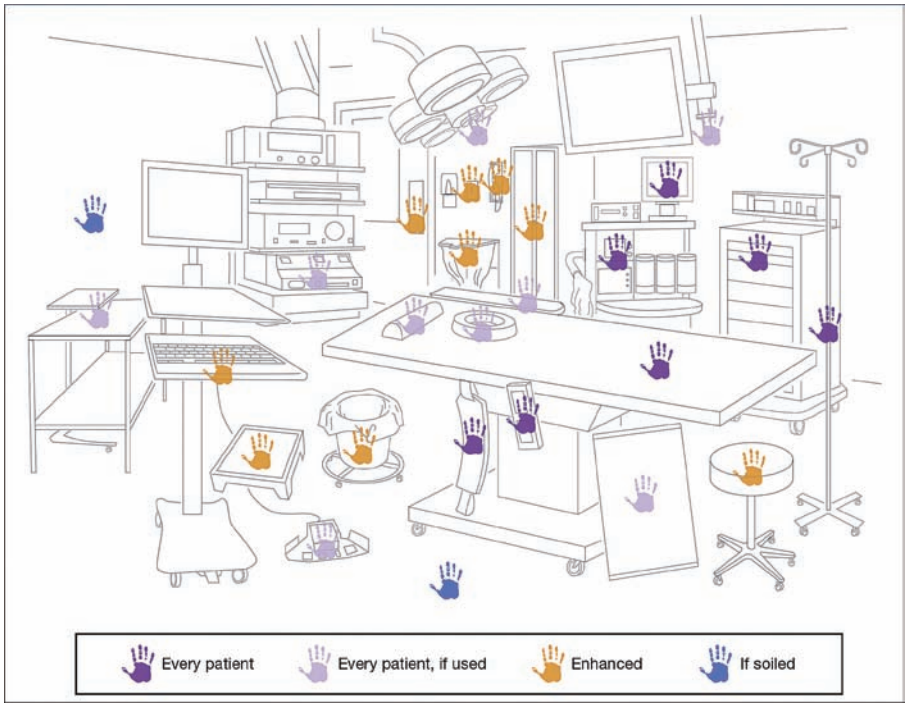
Figure 2: Example of cleaning frequencies in preoperative and postoperative patient care areas.



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- At a minimum, mop the OR floor between procedures if it is visibly soiled.
- Move the OR bed during room turnover to check for debris under the bed and when mopping to help ensure a clean floor.
- Mop or wet vacuum the entire floor during terminal OR cleaning.
- Wait to clean the OR until after the surgical team has taken the patient from the room.
- Pour cleaning chemicals rather than spraying them.
- Remember that
  - people generate dust;
  - the floor is dirty, even if it is not visibly soiled; and
  - common sense should be used when deciding what to clean.
- Concentrate cleaning on high-touch objects (**Figure 1, Figure 2**).
- When in doubt about cleaning methods or a new process or product, perform a risk-benefit cost analysis.

BENEFITS:

Pathogens can live on environmental surfaces for days, weeks, and even months, causing risk of transmission to patients and health care providers.[3] Health care providers touch environmental surfaces and patients often, and even with the use of gloves, personnel can transfer pathogens from surface to surface and then to patients, increasing patients' risk of HAIs. Health care providers are also at risk for acquiring potentially pathogenic organisms from the patient care environment and transferring these pathogens to themselves, their homes, and their communities. Routine cleaning and disinfecting of the patient's environment has been shown to reduce the level and frequency of contamination and the risk of HAIs.[1]

TIPS & TRICKS:

A bundled approach (ie, using an interdisciplinary team, using appropriate disinfecting and cleaning agents, creating checklists and educational presentations, using innovative and emerging technology) is essential to performing a

standardized cleaning routine and implementing a successful monitoring program.[4] To accomplish this bundled approach, personnel should use the following strategies.

- Gather a team of professionals, including the facility infection preventionist, to establish a detailed environmental cleaning policy.[1] Other team members should include administrators, nurses, and environmental services, material management, biomedical engineering, pharmacy, and laboratory personnel.[4]
  - Include the use of an Environmental Protection Agency–registered, hospital-approved disinfectant in the policy.[1] When identifying disinfectants to use, perioperative team members should remember that Clostridium difficile is a spore, and it is necessary to use a sporicidal germicide to inactivate it.
- Define cleaning tasks, specify who is responsible for performing the tasks, establish cleaning frequency, and specify hospital-approved cleaning products to be used in the policy.[4] Categorize levels of disinfection based on the Spaulding criteria (ie, a classification system for the disinfection and sterilization of patient care items and equipment).[4]
  - Noncritical surfaces (ie, those that only touch intact skin) require low-level disinfection. Examples of noncritical surfaces include bedside rails, toilets, sinks, over-bed tables, ceilings, walls, windowsills, blood pressure cuffs, and monitors.[4] These surfaces should be cleaned and disinfected daily or more frequently if needed depending on frequency of use and at terminal cleaning.
- Determine the method of application and whether products can be applied by pouring, as opposed to spraying, and wiped with cotton, microfiber, or disposable wipes. Disinfectants should be applied liberally to achieve sufficient saturation and contact time according to the manufacturer's instructions for use.[4]
- Provide detailed education and periodic reeducation of all environmental services and perioperative team members.[1,4] Education should include the
  - items that require cleaning;
  - frequency of cleaning;
  - products to be used, their concentration, and correct contact time;
  - method and time of the required cleaning process, the order in which items should be cleaned, and the use of disposable wipes;
  - required personal protective equipment;
  - importance of the role of the environment and environmental services personnel in the transmission of potentially pathogenic organisms; and
  - required observation or monitoring process.
- Establish a cleaning process for cell phones and other personal items being brought into the perioperative setting and assign responsibility for monitoring this process.[1]
- Monitor compliance and create a system for ongoing monitoring of cleaning practices and for identifying improvement strategies when needed.[1,4] This includes the following:
  - Visual inspection.
  - Aerobic colony counts from surfaces—this culturing takes 48 to 72 hours to obtain results and identifies the level of contamination and pathogens present on surfaces.
  - Fluorescent marker systems that monitor whether certain surfaces have been cleaned—this requires marking surfaces before cleaning and ultraviolet (UV) light inspection after cleaning.
  - Bioluminescence-based adenosine triphosphate (ATP) assays to

Resources for Environmental Cleaning:

- AORN Video Library: *Environmental Sanitation, Terminal Cleaning, and Disinfection*. Ciné-Med®. https://cine-med.com/index.php?nav=aorn&cat=all&id=1960.
- Environment cleaning tool kit. AORN, Inc. http://www.aorn.org/Clinical_Practice/ToolKits/Environmental_Cleaning_Tool_Kit/Environmental_Cleaning_Tool_Kit.aspx.
- Environmental cleaning toolkit: cleaning practices and tools. Public Health Ontario. http://www.publichealthontario.ca/en/ServicesAndTools/Tools/Pages/Cleaning-Practices-and-Tools.aspx.
- Environmental infection prevention toolkit. ASC Quality Collaboration. http://www.ascquality.org/EnvironmentalInfectionPreventionToolkit.cfm
- Health care–associated infections (HAIs): prevention toolkits. Centers for Disease Control and Prevention. http://www.cdc.gov/HAI/prevent/prevention_tools.html.
- *Perioperative Competency Verification Tools and Job Descriptions* [CD-ROM]. Denver, CO: AORN, Inc; 2013. http://www.aorn.org/CompetencyTools.
- *Policy and Procedure Templates* [CD-ROM]. 3rd ed. Denver, CO: AORN, Inc; 2013. http://www.aorn.org/Books_and_Publications/AORN_Publications/Policy_and_Procedure_Templates.aspx.
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quantify the presence of organic substances—this monitoring requires the purchase of a luminometer and swabs; however, results are available within seconds and provide immediate feedback.
- Create an environmental cleaning checklist for individual facilities to help ensure that environmental cleaning team members are following policy and procedure. Checklists can be invaluable to help personnel clean appropriately (**Figure 3**).

Evidence shows that visual inspection is insufficient to ensure adequate pathogen removal.[1] Research suggests that UV light or bioluminescence-based ATP assays combined with risk-based audit checklists should be instituted to help ensure adequate cleaning.[1] Placing UV markers on high-touch surfaces before cleaning gives immediate feedback as to how well the cleaning was performed and helps demonstrate to environmental services team members whether they are adequately cleaning and where they need to improve.[1]

Cleaning Methods

Evidence shows that visual inspection is insufficient to ensure adequate pathogen removal.[1] Research suggests that UV light or bioluminescence-based ATP assays combined with risk-based audit checklists should be instituted to help ensure adequate cleaning.[1] Placing UV markers on high-touch surfaces before cleaning gives immediate feedback as to how well the cleaning was performed and helps demonstrate to environmental services team members whether they are adequately cleaning and where they need to improve.[1]

Munoz-Price et al[5] conducted a study that used UV markers and environmental cultures to improve OR cleaning practices after an outbreak of endemic Acinetobacter baumannii infection. The researchers used an adjunct educational intervention and evaluated subsequent cleaning practices with UV markers and found that there was significant and striking improvement in the cleanliness of the anesthesia machine as well as an improvement in cleaning bed control panels, Mayo stands, and overhead lamps after the intervention. There was no improvement in cleaning the floor, IV poles, or room door handles.[5] As a result, the facility infection preventionist:
- assigned anesthesia technologists the responsibility of cleaning the anesthesia machines, electrocardiogram lead wires, blood pressure cuffs, IV pumps and poles, and oxygen equipment and
- changed the cleaning product from 17.2% isopropanol to a 1:10 sodium hypochlorite solution.[5]

A study by Andersen et al[6] evaluated four mopping methods (ie, dry mopping, spray mopping, moist mopping, wet mopping) for effectiveness by measuring residual organic soil after each mopping method was used. The cleaning agent used contained two propranolol 1% to 5% and detergents 1% to 5%. Dry, moist, and wet mopping reduced bacterial floor counts better than spray mopping. All four methods increased bacterial counts in the air, although wet mopping produced fewer aerosols than dry mopping. Wet mopping was the most effective for removing organic materials from the floor.[6]

Emerging Technology:

Researchers are studying new methods that have the potential to improve the cleaning and disinfection of environmental surfaces. Although these new and evolving methods are not widely used currently, facilities should be aware of them. If a facility is experiencing an increase in HAIs or surgical site infections, it may be time to evaluate current practices and institute a new cleaning technology. According to Carling and Huang,[1] the following methods are being researched today and should be considered.

Standards related to this article subject can be found in the *Operating Room Nurses Association of Canada (ORNAC) Standards for Perioperative Registered Nursing Practice* (12th edition, October 2015) Section 2, Standards 2.34 to 2.39, pages 164 - 170. The full version, reprinted from the Standards, appears on page 64 of this Journal.

Figure 3: Example of a cleaning checklist.

Operating or procedure room cleaning checklist – before first procedure of the day	Completed
1. Remove unnecessary equipment	
2. Damp dust from top to bottom:	
a. Overhead lights	
b. All reachable flat surfaces	
i. Furniture	
ii. Booms	
iii. Equipment	
iv. Countertops	

Operating or procedure room cleaning checklist – end of procedure (after the patient has left the area)	Completed
1. Perform hand hygiene	
2. Don personal protective equipment (PPE)	
3. Collect linen	
4. Remove gross soil	
5. Remove large debris from floor	
6. Remove trash	
7. Clean and disinfect:	
a. Anaesthesia cart and equipment (IV poles and pumps)	
b. Anaesthesia machine	
c. Patient monitors	
d. OR beds	
e. Reusable table straps	
f. Bed attachments	
g. Positioning devices	
h. Patient transfer devices	
i. Overhead procedure lights	
j. Tables	
k. Mayo stands	
l. Mobile and fixed equipment	
i. Suction regulators	
ii. Medical gas regulators	
iii. Imaging monitors	
iv. Radiology equipment	
v. Electrosurgical units	
vi. Microscopes	
vii. Robots	
viii. Lasers	
8. Floors and walls if soiled or potentially soiled (splash, splatter, or spray)	
9. Remove PPE	
10. Perform hand hygiene	

Operating or procedure room cleaning checklist – terminal cleaning	Completed
1. All floors: wet vacuum or a single-use mop	
2. Anaesthesia carts and equipment	
3. Anaesthesia machines	
4. Patient monitors	
5. OR beds	
6. Reusable table straps	
7. OR bed attachments	
8. Positioning devices	
9. Patient transfer devices	
10. Overhead procedure lights	
11. Tables and Mayo stands	
12. Mobile and fixed equipment	
13. Storage cabinets, supply carts, and furniture	
14. Light switches	
15. Door handles and push plates	
16. Telephones and mobile communication devices	
17. Computer accessories	
18. Chairs, stools, and step stools	
19. Trash and linen receptacles	

Preoperative and postoperative areas cleaning checklist – patient discharge	Completed
1. Patient monitors	
2. Patient beds	
3. Over-bed tables	
4. Television remote	
5. Call lights	
6. Mobile and fixed equipment	
a. Suction equipment	
b. Medical gas regulators	
c. Imagine monitors	
d. Radiology equipment	
e. Warming equipment	
7. Floors and wall if soiled or potentially soiled (splash, splatter, or spray)	
8. Patient transport vehicles including the straps, handles, side rails, and attachments	

Preoperative and postoperative areas cleaning checklist – terminal cleaning	Completed
1. All floors: wet vacuum or a single-use mop	
2. Patient monitors	
3. Patient beds	
4. Over-bed table	
5. Television remote controls	
6. Call lights	
7. Mobile and fixed equipment	
8. Storage cabinets, supply carts, and furniture	
9. Light switches	
10. Door handles and push plates	
11. Telephones and mobile communication devices	
12. Computer accessories	
13. Chairs and stools	
14. Trash and linen receptacles	

- Hydrogen peroxide has a high safety and low irritation profile among Environmental Protection Agency–approved agents. Evidence is beginning to emerge regarding its effectiveness for microbe disinfection.[1]
- Ultraviolet light is being evaluated as a postdischarge terminal disinfection method.[1] The advantages of this method are automation (ie, it does not require personnel to operate it) and that it enhances human cleaning. Manual cleaning of rooms should still be required, but this technology can be used as an adjunct to routine cleaning procedures.
- Hydrogen vapor and peracetic acid cleaning agents, while possible for other patient care areas, have long application times ranging from 30 minutes to 1 hour, which would be impractical for OR cleaning between procedures.[1]

WRAP-UP:

Healthcare-associated infections are a significant problem worldwide and not only put patients and health care providers at risk but also have a significant effect on health care costs. Focused attention must be paid to the prevention of these potentially deadly infections. One of the basics of prevention is regular and thorough cleaning of the health care environment. Taking a bundled approach as described in this "Back to Basics" article is the first step in preventing HAIs and surgical site infections.

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