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Environmental Infection Prevention:

Guidance for Continuously Maintaining a Safe Patient Care and Survey-Ready Environment

A Guide by Joint Commission Resources

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Health care-associated infections (HAIs) remain a major cause of patient morbidity and mortality in the United States, with approximately one out of every 20 hospitalized patients developing an HAI.[1] Although contamination of the patient care environment by microorganisms has long been recognized as a potential contributor to infection transmission, only in recent years has the significance of environmental contamination been fully realized. Environmental surfaces such as countertops, sinks, curtains, bedrails, bedside tables, and nurse call controls can serve as reservoirs for microorganisms that then may be transmitted to patients or health care workers when environmental cleaning and disinfection are inadequate. According to the Centers for Disease Control and Prevention (CDC), effective and consistent cleaning and disinfection of the environment in health care facilities are essential in reducing the incidence of HAIs.[2]

E.H. Spaulding developed a classification scheme in 1968 to classify items to be disinfected or sterilized based on their degrees of risk of infection to patients. Hospitals still use this scheme to guide disinfection and sterilization activities. The Spaulding system categories are as follows[3]:

1. *Critical.* Critical items are objects that enter or come into contact with sterile tissues or the vascular system and that have a high risk of transmitting infection. These include such items as surgical instruments, cardiac and vascular catheters implants, and objects placed into the vascular system, such as needles. Critical patient care items are reprocessed to make them sterile; that is, all microorganisms, including bacterial spores, are killed.

2. *Semi-critical.* Semi-critical items include those that come into contact with nonintact skin or mucous membranes, such as respiratory therapy equipment, anesthesia equipment, and flexible endoscopes. These items are processed with high-level disinfection to eliminate all microorganisms—except for high numbers of bacterial spores.

3. *Noncritical.* Noncritical patient items touch intact skin only. Because the skin acts as an effective barrier to most microorganisms, these items pose a low risk of transmitting infections. Noncritical items include crutches, blood pressure cuffs, stethoscopes, and a variety of other medical accessories as well as nonmedical accessories, such as recreational equipment. Noncritical items are processed with low- or intermediate-level disinfection processes.

See Tool 1 on page 7 for a sample schedule for cleaning and disinfecting various equipment based on Spaulding system categories.

This document provides 1) essential elements for effective environmental infection prevention, and 2) tools for ongoing assessment of environmental infection prevention practices in health care facilities for noncritical items and those surfaces that undergo low-level disinfection by unit/department staff or environmental services staff. Guidance for high-level disinfection and sterilization can be found in the High-Level Disinfection and Sterilization Boosterpak from The Joint Commission, available at https://www.jointcommission.org/assets/1/6/TJC_HLD_BoosterPak.pdf.

Essential Elements for Environmental Infection Prevention

While there are various ways to validate the effectiveness of environmental cleaning and disinfection, all have demonstrated significant deficiencies in routine cleaning and disinfection of patient rooms and medical equipment, with as many as 50% of surfaces still with pathogens present after terminal cleaning.[1]

Environmental contamination prevention strategies primarily fall into four categories:

1. Equipment and disinfectant selection

2. Preventive maintenance and deep cleaning

3. Adherence to proven methods of cleaning and disinfection

4. Automated disinfection technologies

Equipment and Disinfectant Selection

Equipment and disinfectant selection is key to effectively preventing infections in the environment. A multidisciplinary team rather than individual units or departments should do equipment and disinfectant selection. Team members should include infection preventionists, hospital leaders, housekeeping staff, clinical staff, and other environment of care professionals. Review manufacturers' instructions and relevant national guidelines before purchasing equipment so that you are confident that the equipment can be properly disinfected and will not pose a patient or health care worker safety risk. Here are some considerations when purchasing equipment and disinfectants:

- Can the equipment be cleaned and disinfected with a chemical already approved for use in your organization? Or does the equipment require introduction of and education on a new chemical?
- Are all surfaces of the equipment able to be disinfected? For example, are there minimal crevices? And what about upholstery or wood, which are harder to disinfect effectively?
- Does the equipment have components that may rust or deteriorate with repeated cleaning and disinfection?
- For upholstery, can the fabric be disinfected? Maybe consider vinyl instead of cloth. Does furniture have open arms to minimize crevices for bed bugs?
- Can flooring surfaces be routinely and easily cleaned and disinfected? For example, consider a hard surface instead of carpet.
- When selecting disinfectants, consider the following:
  – Equipment compatibility. Try to minimize the number of disinfectants that are needed. Preparing a grid listing all equipment and their disinfectant compatibilities may be helpful in choosing disinfectants to purchase. Ideally, limit number of disinfectants stocked to two or three. (See Tool 2 on page 8 for a sample equipment and disinfectant compatibility grid.)
  – Wet contact time. Try to choose disinfectants with the shortest wet contact time to aid in staff compliance.
  – Antimicrobial activity. Evaluate what organisms against which the disinfectant is effective.
  – Choose disinfectants with the lowest possible risk to staff while still considering the other criteria listed above.

Preventive Maintenance and Deep Cleaning

Once equipment has been selected, it must be maintained 1) to prevent or reduce the burden of environmental contamination that occurs during use, and 2) to ensure that the surfaces can be properly cleaned and disinfected. Routinely assessing surfaces for the following can help reduce the burden of contamination:

- Remove tape or other adhesive residue.
- Address surface rust.
- Ensure that Velcro®, if present, is in good condition. (Minimize Velcro® whenever possible.)
- Ensure that there are no cracks or chips in laminate on furniture, countertops, and cabinetry.
- Avoid tears or holes in upholstery or mattresses. Patch any holes or tears with an approved product that can be cleaned and disinfected (that is, no tape).
- Maintain casters, wheels, tracks, and so forth on equipment so they function properly and do not build up debris, dust, or other matter.
- Unclog drains, and routinely remove hard water and mineral deposits from ice machines, water dispensers, and any other equipment with water present.
- Ensure that decorative water features, if present, have correct chemical levels to prevent bacterial growth.
- Properly store equipment and supplies in clean locations (for example, cabinets, covered linens, storage rooms, and plastic covers if required by the organizational policy).
- Routinely clean air vents and change filters per manufacturers' instructions.

Cleaning is the removal of foreign material (for example, soil, organic material) from objects and is normally accomplished using water with detergents or enzymatic products. Thorough cleaning is required before high-level disinfection and sterilization because inorganic and organic materials that remain on surfaces interfere

with the effectiveness of disinfection.[2] While most organizations have some sort of routine cleaning schedule for equipment and surfaces, deep cleaning is often not performed due to operational issues, for example, rooms being occupied, lack of back-up equipment, or staffing. Developing and maintaining a deep cleaning process may contribute to more efficient routine cleaning and will result in more effective disinfection processes. Items that may be considered for a deep cleaning schedule include the following[5]:

- Air ducts and grills
- Ice dispensers and storage chests
- Carpeting
- Window blinds and shades
- Privacy curtains
- Clothing washers and dryers
- Mattress and pillow covers
- Beds and bed frames
- Other room furniture and furnishings

Adherence to Proven Methods of Cleaning and Disinfection

Environmental cleaning interventions can improve the thoroughness of cleaning and reduce contamination on surfaces. Interventions have ranged from substituting one disinfectant for another, such as using hypochlorite for disinfecting rooms of patients with *Clostridium difficile* infection, to environmental education programs with feedback and monitoring. While many studies have shown a decrease in environmental contamination, a decrease in HAI rates, and in some cases, an elimination of an outbreak, it is still unclear which interventions were most effective because there are very few well-controlled studies.[4] The organization must maintain a thorough knowledge of and adherence to the manufacturers' instructions for cleaning and disinfecting all equipment. Additional studies are needed to determine optimal frequency of disinfection (terminal, daily, or more frequent), prioritization of special disinfection procedures (high risk units or entire facility), and the role or added benefit for automated devices such as ultraviolet light, particularly when standard cleaning and disinfection methods have been optimized and validated.[4]

Strategies to assist with adherence to proven cleaning and disinfection methods include the following:

- Ensure that staff are educated to their role in cleaning and disinfection, including
  - What cleaner/disinfectant to use on what equipment
  - How to properly apply or use the cleaners/disinfectants provided by the organization (that is, wet contact times)
  - Who is responsible for disinfecting various equipment (for example, environmental services, department/unit staff)
  - Frequency in which to disinfect various types of equipment and surfaces
- Ensure that departments can order only approved cleaners/disinfectants

Automated Disinfection Technologies

Recent technologies for reducing the burden of pathogens on surfaces include antimicrobial surfaces, ultraviolet light disinfection, deep cleaning/disinfection with steam or vaporized hydrogen peroxide, and other technologies. While current studies show reduction in surface contamination, studies demonstrating corresponding reduction in HAIs are limited.[1] Organizations may want to evaluate these technologies for use in addition to existing proven environmental infection prevention strategies. If using these technologies, organizations should do the following:

- Ensure that manual cleaning and disinfection are done prior to use.
- Develop priorities for the use of these technologies (for example, critical care units, operating rooms, oncology wards.
- Determine frequency of use of these technologies that is operationally feasible (for example, at discharge, end of each day in operating rooms, weekly, monthly.

See Tool 3 on page 9 for an Environmental Infection Prevention Assessment that you can use to assess your organization's practices against Joint Commission standards for infection prevention and control as they relate to the environment of care.

REFERENCES

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Tool 1. Equipment Cleaning and Disinfection Schedule

- All equipment and furniture should be routinely evaluated for intact surfaces that can be appropriately disinfected.
- Any damaged surfaces should either be repaired or replaced (for example, patch mattresses; repair chipped laminate; replace equipment with cracked plastic; remove rust).
- Equipment should be kept in good working order, with preventive maintenance performed on a routine basis and per manufacturers' instructions.

Department: _____

Date last reviewed/updated: _____

Equipment	Spaulding Classification	Clearning/ Disinfection Frequency	Person/ Department responsible	Approved Disinfectant/ Cleaner
Example: Intravenous pump	Non-critical	Daily, when visibly soiled and between patients	Environmental Services	Facility-approved disinfectant (list brand name of disinfectant)
Example: Microwave oven	Non-critical	Daily	Food and Nutrition Services	Facility-approved bleach disinfectant
Example: Wheelchair	Non-critical	Daily and when visibly soiled	Unit staff	Facility-approved disinfectant
Example: Ice and water dispenser	Non-critical	Daily and when visibly soiled	Food and Nutrition Services	Facility-approved bleach disinfectant
Example: Thermometer	Non-critical	Between each patient use	Unit staff	Facility-approved disinfectant
Example: Glucometer	Non-critical	Between each patient use	Unit staff	Facility-approved disinfectant
Example: Bronchoscope	Semi-critical	Between each patient use	Pre-clean at point of use by unit staff, high-level disinfection by facility-determined department (for example, Sterile Processing)	Facility- and manufacturer-approved high-level disinfectant or sterilant
Example: Mattress	Non-critical	Between each patient, when visibly soiled	Environmental Services, unit staff	Facility-approved disinfectant

Tool 2. Equipment-Disinfectant Compatibility Assessment Tool

- Identify the equipment located in your unit/department that you are responsible for disinfecting.
- Determine the disinfectants approved for use in the instructions for use (IFUs) that your organization has approved/provides, and list them across the top of this tool with the contact time.
- Identify the equipment manufacturer and obtain the manufacturer's IFUs.
- Place a check mark in the corresponding box under each approved disinfectant for each piece of equipment.
- Once completed, determine the disinfectant that is compatible with the majority of your equipment, with the goal of stocking and using as few different disinfectants as possible (ideally, bleach plus one additional disinfectant) and with the shortest contact time.

Assessment Date: _____

Participants: _____

Equipment/Surface	Manufacturer	Disinfectant #1 (e.g. quaternary ammonia)	Disinfectant #2 (e.g. quaternary ammonia)	Disinfectant #3 (e.g. alcohol-free quat)	Bleach	Hydrogen peroxide	Comments
Contact Time (minutes)		3	2	10	1	1	
Example: Vitals machine		✔	✔		✔		
Example: Blood pressure cuff		✔	✔	✔	✔	✔	
Example: Intravenous (IV) pump			✔	✔	✔	✔	
Example: Cardiac monitor				✔	✔		

Tool 3. Environmental Infection Prevention Assessment Tool

Department: _____

Assessment Date: _____

Reviewer: _____

General Environment	Joint Commission Standard(s)	Yes	No	N/A	Comments/ Actions
Floors and walls are clean and free of spills, dust, stains, tape, and adhesive residue.	IC.02.02.01				
Furnishings (for example, mattresses, chairs, beds, tables) are free of holes, tears, tape, adhesive residue, stains, and rust.	IC.02.02.01				
Curtains, window blinds, vents, sinks and all horizontal surfaces are clean and dust free.	IC.02.02.01				
Ceiling tiles are free of stains, leaks, and holes.	IC.02.02.01				
All drinks are covered in patient care areas. No food is in patient care areas.	IC.02.02.01				
Supply and Medication Storage Areas					
Clean supplies and equipment are clean and free of spills, dust, stains, tape, and adhesive residue and are kept separate from dirty supplies and equipment. If required by facility policy, clean equipment is labeled or bagged as clean.	IC.01.04.01				
No patient care supplies are stored underneath sinks or draining pipes.	IC.02.02.01				
Items used to prepare medications are clean. If single patient use, these are labeled (for example, pill cutters and crushers).	IC.02.02.01				
Sterile supplies are stored in a clean, dry enclosed area.	IC.02.02.01				
Supplies are stored 8 to 10 inches above the floor. All bottom wire racks in clean supply rooms have a plastic cover or solid bottom shelf.	IC.02.02.01				
No expired supplies (for example, hand sanitizer, soap, disinfectant wipes, disinfectant solutions)	IC.02.02.01				
Corrugated shipping boxes are not stored in clean and sterile storage locations in clinical areas.	IC.02.02.01				
Nourishment Areas					
Refrigerators are clean, and freezers are defrosted.	IC.02.01.01				
Only patient food is stored in refrigerators and freezers found in patient rooms.	IC.02.01.01				

Nourishment Areas	Joint Commission Standard(s)	Yes	No	N/A	Comments
Refrigerated patient food brought from home is labeled with the patient's name and date made or obtained. No food items greater than 3 days from the date made or obtained are found.	IC.02.01.01				
Refrigerator logs are complete and accurate.	IC.02.01.01				
Refrigerator temperatures are appropriate. Corrective actions are documented for temperatures falling out of range.	IC.02.01.01				
Microwaves, ice machines and other appliances are clean.	IC.02.02.01				
Linen and Waste					
Clean linen is stored on clean, covered shelves or in enclosed cabinets separate from dirty linen.	IC.02.02.01				
Soiled linen is stored in appropriate plastic bags, in a covered hamper, or in the soiled utility room.	IC.02.02.01				
Sharps containers are not overfilled (that is, less than 3/4 full).	IC.02.01.01				
Trash is disposed of appropriately. Trash in soiled utility rooms is contained, not overflowing or lying on the floor.	IC.02.01.01				
Soiled utility room has at least one red receptacle for potentially infectious medical waste labeled with BIOHAZARD signage.	IC.02.01.01				
Soiled reusable instruments that require high-level disinfection or sterilization are pre-cleaned and stored and transported in a covered biohazard marked container (for example, endoscopes, surgical instruments). Soiled instruments are not on countertops or lying in sinks.	IC.02.02.01				
Environmental Services, Hand Hygiene, and Supplies					
There is an adequate supply of liquid soap, alcohol-based hand sanitizer, and paper towels. No expired soap or gel is found.	IC.01.04.01				
Dispensers are functional.	IC.01.04.01				
Staff with direct patient contact do not have artificial or long natural nails.	IC.01.04.01				
Staff can verbalize how they know what equipment is clean or dirty and who is responsible for cleaning and disinfecting it.	IC.02.02.01				
Staff can verbalize correct wet contact times for facility-approved disinfectants and when to use each disinfectant (for example, bleach versus quaternary ammonia).	IC.02.02.01				
Staff can verbalize frequency of cleaning and disinfection of various pieces of equipment.	IC.02.02.01				
Environmental services staff can verbalize correct order if cleaning and disinfecting a patient room.	IC.02.02.01				
Staff use personal protective equipment correctly for cleaning and disinfection (for example, gloves are not worn in hallways or room to room).	EC.02.02.01 IC.02.01.01				

Environmental Services, Hand Hygiene, and Supplies	Joint Commission Standard(s)	Yes	No	N/A	Comments
Environmental services staff can verbalize correct use of cleaning and disinfection solutions (for example, no double-dipping rags, frequency of mop head changes).	IC.02.02.01				
Environmental services carts are secured.	EC.02.02.01				
Environmental services closets do not contain patient care supplies or supplies that may be compromised by moisture (for example, toilet paper). These items should be stored in a dedicated clean storage room or cabinet.	IC.02.02.01				
If cleaning and disinfection solutions are not ready to use, staff can verbalize correct dilution per manufacturer's instructions. Measuring containers and required personal protective equipment are available and used.	EC.02.02.01 IC.02.02.01				
Secondary containers for cleaners and disinfectants are labeled per facility policy and in compliance with OSHA requirements. Per OSHA 29 CFR 1910.1200(f), *the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged, or marked with the following information:* *Identity of the hazardous chemical(s) contained therein; and* *Appropriate hazard warnings, or alternatively, words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide employees with the specific information regarding the physical and health hazards of the hazardous chemical.*	EC.02.02.01 IC.02.01.01				
Deep Cleaning and Preventive Maintenance	**Joint Commission Standard(s)**	**Yes**	**No**	**N/A**	**Comments**
Mattresses, pillows, and covers are in good repair, without holes, tears, or staining.					
Bed frames are clean and in good repair (including side rails, hinges, casters or wheels, and bases).					
Carpet, if present, is clean, without stains, and on a routine extraction schedule.					
Ice machines and storage bins are clean and maintained.					
Privacy curtains are visibly clean and on a routine cleaning/ laundering schedule.					