



INTERNATIONAL
SOCIETY
FOR INFECTIOUS
DISEASES

GUIDE TO INFECTION CONTROL IN THE HOSPITAL

CHAPTER 10

Disinfection in the Hospital Environment

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KEY ISSUE

Disinfection of the inanimate environment decreases bioburden and limits cross transmission of pathogens in the hospital.

KNOWN FACTS

- **Definitions:**

1. Cleaning is the removal of visible foreign material including biofilm on objects or surfaces and is normally performed either manually or mechanically. It is the first step in environmental sanitation.
2. If disinfection is recommended, it must follow cleaning and be applied to a clean surface.
3. Touchless cleaning technologies (UV-light and hydrogen peroxide (H₂O₂) emitting robots) may provide an incremental benefit to standard practices by limiting cross-transmission of pathogens via environmental surfaces and may impact rates of *Clostridium difficile* and vancomycin resistant enterococcal infections in the hospital. However, these technologies are mainly available in high-income countries.

SUGGESTED PRACTICE IN ALL SETTINGS

Recommended Procedures for Disinfection of Environmental Surfaces – Minimal Standard

- Clean all surfaces in a patient care area, including beds when visibly soiled or after patient discharge.
- Clean floors, tabletops, and other surfaces regularly (daily or three times per week), when the surface is visibly soiled and as soon as spillage occurs.

- Replace disinfectant detergents regularly (e.g., mopping solution every three patient rooms and/or every hour).
- Use a hospital detergent (with or without a disinfectant) for non-critical surfaces.
- If disinfectants are used to clean infant bassinets in between patients, the surface must be thoroughly cleaned, rinsed, and dried prior to reuse.
- In the case of a blood spill, use protective gloves prior to discarding any sharps and cleaning visible blood with absorbent material. Following cleaning, disinfect the area with an EPA-registered biocide that is labeled for use with human immunodeficiency virus (HIV) or hepatitis B virus (HBV), or freshly diluted sodium hypochlorite solution.

Assessment of Environmental Surface Disinfection

- Several potential strategies exist for monitoring compliance and assessing environmental hygiene. No single strategy is considered the gold standard.
 1. Visual assessment of cleaning is not reliable since it is open to individual interpretation. If carried out, the process must be validated by an independent evaluation.
 2. Adenosine triphosphate (ATP) bioluminescence is a fast and sensitive way to monitor effectiveness of cleaning and/or to implement a modified cleaning regimen. Less than 500 relative light units (RLU) suggest that a surface is clean. Some studies advocate that a more stringent cutoff of 250 RLU should be used. This method is reliable but expensive.
 3. Fluorescent markers (UV light) are a useful means of assessing and providing feedback about the frequency that high-touch surfaces are wiped by housekeeping. Complete or partial removal of fluorescent markers during terminal cleaning is correlated with less surface contamination. This method is useful for demonstrating appropriate cleaning of surfaces by detecting the remains of the fluorescent dye.

Self-Cleaning Surfaces

- Hard surface disinfection techniques include, but are not limited to:
 1. Copper and copper alloy cladding, silver, and triclosan products incorporated into hard surfaces. Copper technology has potent antimicrobial activity and has shown promise in the reduction of hospital-acquired infections. Silver is known to have intrinsic antimicrobial activity. No evidence of benefit from silver-based products has yet been published. Triclosan has limited spectrum of antimicrobial activity and induces resistance over the long term, making this product of limited use in the clinical setting.
 2. Quaternary ammonium salt surfactant coating. This may be another promising technology, but its utility has yet to be proven.

Touchless Technologies for Enhanced Terminal Room Disinfection

- UV light emitting robots reduce bioburden of a wide spectrum of organisms, including *C. difficile* spores. Published reports suggest that this may reduce both vancomycin-resistant enterococci (VRE) and *C. difficile* infections.
- Hydrogen peroxide vapor emitting robots also result in enhanced terminal room disinfection. Published reports suggest that this may impact VRE infections in the hospital.
- All touchless technology is employed for terminal room disinfection following mechanical (hand) cleaning of the environment.

SUMMARY

Daily and terminal room disinfection reduces bioburden on the inanimate environment. This decreases the risk of cross transmission in the hospital. Daily and terminal cleaning with sporicidal agents is preferred. Several mechanisms exist for assessing the adequacy of room disinfection, however no gold standard is referenced. Self-cleaning surfaces, such as copper impregnated textiles, may play a role in infection prevention through further bioburden reduction. Touchless cleaning devices, such as UVC (ultraviolet C radiation) emitting robots or H₂O₂ emitting robots, may further impact terminal disinfection and reduce *C. difficile* and VRE hospital-acquired infections.

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