Enhanced Environmental Disinfection Strategies Leads to Improved Patient Outcomes

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Over the past decade, there is excellent evidence in the scientific literature that contaminated environmental surfaces in patient rooms and noncritical patient care items play an important role in the transmission of several key healthcare-associated pathogens including MRSA, VRE, *Acinetobacter*, norovirus, and *Clostridium difficile*. All these pathogens have been demonstrated to persist in the environment for days (in some cases months), frequently contaminate the environmental surfaces in rooms of colonized or infected patients, transiently colonize the hands of healthcare personnel, be transmitted by healthcare personnel, and cause outbreaks in which environmental transmission was deemed to play a role. Importantly, studies demonstrated that contact with the environment was just as likely to contaminate the hands of healthcare providers, as was direct contact with the patient. Further, admission to a room in which the previous patient had been colonized or infected with MRSA, VRE, *Acinetobacter* or *C. difficile*, has been shown to be a risk factor for the newly admitted patient to develop colonization or infection.[1,2]

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Since noncritical environmental surfaces and medical equipment surfaces become contaminated with infectious agents and may contribute to cross-transmission by acquisition of transient hand carriage by healthcare personnel (HCP) with subsequent transfer to patients, disinfection is an essential component of infection prevention. Disinfection should render surfaces and equipment free of pathogens in sufficient numbers to prevent disease transmission. Surface disinfection is normally performed by manually applying an EPA-registered hospital disinfectant to the surface with a wipe.[1]

Cleaning/disinfection or environmental cleaning, which refers broadly to an organized process for cleaning, disinfecting and monitoring, is a horizontal control measure. Horizontal controls are broad-based approaches to infection prevention as they attempt reduction to all infections due to all pathogens and include hand hygiene, environmental control, and minimizing unnecessary use of invasive devices. It is important to achieve thorough coverage of a surface in order to result in complete disinfection.

Multiple studies have shown 10-50% of the surfaces in patient rooms colonized or infected with *C. difficile,* MRSA and VRE are contaminated with these pathogens and a lack of thoroughness of cleaning contaminated surfaces in patient rooms (mean 32% of objects cleaned) has been linked to an overall 120% increase risk of infection to the next occupant in that room.[1]

There are two essential components of effective surface disinfection, product (i.e., disinfectant) and practice. Some of the characteristics of the ideal disinfectant are: broad antimicrobial spectrum, fast acting, surface compatible and easy to use. Many studies support the use of disinfection rather than the use of a non-germicidal detergent on environmental surfaces in healthcare. One study showed that daily use of a disinfectant applied to environmental surfaces with an 80% compliance is superior to a non-germicidal detergent because it results in significantly reduced rates of healthcare-associated infections (HAIs) caused by *C. difficile*, MRSA and VRE. Non-germicidal detergents are not recommended for multiple reasons to include detergent wipes transfer significant amounts of epidemiologically important pathogens (e.g., MRSA, *C. difficile*) over surfaces and disinfectants are more effective than detergents in reducing microbial contamination. Similarly, results have demonstrated efficient transfer of *C. difficile* spores from contaminated-to-clean surfaces by non-sporicidal wipes and overused sporicidal wipes.[1]

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The other component of effective surface disinfections is the practice or the thorough application such that the disinfectant contacts all hand-contact or touchable surfaces. It also involves proper training of hospital staff (especially environmental services and nursing) and adherence to the manufacturer's label instructions (except in the cases where an institution may prepare a formal risk assessment to follow alternate contact times such as ≥1 minute for vegetative bacteria). Other factors that affect practice and performance include: sufficient contact time, concentration, surface type, ease of use, organic soil and hard water, porosity of the surface, compatibility of the disinfectant with the wipe used, and sufficient cleaning time. The combination of product and practice results in effective surface disinfection, including the reduction of patient risk via microbial removal and/or inactivation and improved patient outcomes.[1]

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As cleaning and disinfecting of environmental room surfaces is often inadequate, use of no-touch automated methods of disinfection (e.g., UV-C) has been studied using primarily before-and-after design studies. A recent randomized, prospective study evaluated the benefits of enhanced terminal room disinfection (e.g., Quat vs Quat followed by ultraviolet light [UV]) to reduce the level of surface contamination with four epidemiologically-important pathogens (EIP)(i.e., multidrug-resistant *Acinetobacter* [*MDR-Acinetobacter*], *C. difficile*, MRSA, VRE.[2,3] This study demonstrated that an enhanced method of room decontamination (i.e., Quat/UV) was superior in reducing room surface contamination with EIP compared to a standard method (i.e., Quat alone). As reported in this study, comparing the best strategy with the worst strategy for reducing EIP in a patient's room plus bathroom, revealed that a reduction of 94% in EIP (Quat, 60.8 CFU/per room vs Quat/UV, 3.36 CFU/per room) led to a 35% decrease in colonization/infection (Quat, 2.3% vs Quat/UV, 1.5%).[2,3] The key finding of this study was that enhanced environmental disinfection leads to decreased room contamination, which translates to decreases in subsequent patient colonization/infection. Further, this study showed that enhanced methods of room decontamination was significantly superior to a standard cleaning method. Therefore, hospitals should use an enhanced terminal disinfection method for contact precaution patient rooms to reduce risk of HAIs via the environment.[2,3]

References

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