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A Call for Universal Disinfection

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ABSTRACT

The concept of universal disinfection as put forward in this manuscript is important for the infection control community to consider. We have entered a new age in infection control in which serious pathogens are no longer limited to occasional patients who can be isolated. Instead, we face a situation in which high percentages of patients are likely colonized with one or more MDRO. Additionally, in some settings the isolation capacity of facilities is overloaded. Meanwhile, the disinfection protocols are complex and lead to low compliance. We need to be considering new approaches to infection control and environmental hygiene.

Keywords: Disinfection, New technologies

INTRODUCTION

Pathogens in the healthcare environment are increasingly resistant to antibiotics and pose a significant threat to the safety of patients, visitors and healthcare workers. Infections that could previously be treated with a dose of antibiotics may now result in life-threatening infections. As pathogens have evolved to become resistant to more antibiotics, the way we clean and disinfect hospitals, by and large, has become more complex.

Currently, the removal of pathogens from the healthcare environment is shared between nursing and environmental services or housekeeping department. Nursing is usually in charge of cleaning medical devices in close proximity to the patient. The cleaning teams are faced with a daunting task – not only to make the environment pleasant for patients, but also to make it safe and pathogen free. The cleaning teams are given inadequate time and rudimentary tools such as buckets, mops, rags, wipes and chemicals to disinfect the environment. They receive limited training and there are often high amounts of turnover in cleaning staff, leading to new hires that are not fully trained. Cleaning teams often receive less support to do their job within the culture of the healthcare facility, compared to other departments [1]. This results in two fundamental problems: disinfection errors and inadequate disinfection.

Problem 1: Disinfection errors

Current disinfection protocols are not designed for compliance, ease of implementation or the reality of the healthcare environment. Hospital cleaning and disinfection protocols are complex and varied. The type and level of disinfectant varies by pathogen identified, surface location, outbreak status, equipment type and other factors [2,3]. For example, hypochlorite dilution can vary from 250 ppm for floors, 500 ppm for beds and walls, 1000 ppm if a *C. auris* or a carbapenem-resistant Enterobacteriaceae has been identified up to 2000 ppm in outbreak context [2,3]. Alcohol based disinfectants are used routinely, however, they are inactive on spores and sporicidal agents will be needed.

Room or bed status impacts protocols, with isolation rooms requiring different daily and terminal disinfection. Unit status could also impact the protocol, with clusters and outbreaks altering disinfection practice [2]. Special pathogen-specific protocols also exist, for example, if *C. auris* or *C. difficile* is present [4]. Each piece of medical equipment may also have its own protocol, with some being disinfected by nursing and others by environmental services. Certain medical equipment and healthcare areas may be specified as disinfected by nursing, technicians or

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environmental service personnel leading to confusion and disinfection failure [3,4]. Equipment manufacturers may specify certain disinfection methods and forbid others. Failure to comply may result in loss of warranty.

The complexity of these processes results in errors, non-compliance and confusion.

Problem 2: Inadequate disinfection

Most protocols specify disinfection for spaces occupied by isolated or infected patients [2]. This practice assumes that infection control measures have adequately contained the contamination of surfaces, equipment and hands during that patient's hospitalization. Cleaners may not be informed of the diagnosis of the prior patient and may use chemical disinfectants that do not have efficacy against the pathogen [3]. In settings with multi-occupancy rooms and shared bathrooms, it is unlikely that infection control measures are able to contain the contamination. Furthermore, undetected colonized individuals can shed contaminate the environment. It is estimated that 30% of *C. auris* contact become colonized by *C. auris* and one out of 10 contacts will be contaminated [4]. The contamination will not be limited to the patient bed space and may include all areas where the patient was, including the nurse's stations and the sluices.

Finally, dry biofilms, patinas and abraded surfaces, reduce the effectiveness of disinfectants in the healthcare environment. When a biofilm forms on a surface, bacteria attaches and creates a protective layer of proteins and sugars that prevent chemicals from penetrating into the film. This protective layer also helps the biofilm adhere to surfaces, which makes removal by manual cleaning ("scrubbing") almost impossible [5]. Further complications arise when pathogens become less sensitive to chemical disinfectants.

The above results in inadequate disinfection of the healthcare environment.

UNIVERSAL PRECAUTIONS: AN ANALOGY

The fundamental problems outlined above, combined with the increasing prevalence of MDROs diagnosed and undiagnosed both in the healthcare environment and the community pose challenges to providing all patients with a safe environment of care. At the early stages of the HIV epidemic, precautions for medical procedures were applied to patients at AIDS stage only. As an HIV test became available, it became evident that anyone could be positive for HIV and, there was a shift to universal precautions – with healthcare workers using full infection control protocols for every procedure [6]. Something similar needs to happen in environment cleaning. We need a simple approach that is done for all patients to fulfill our obligation to provide a safe and healing healthcare environment. This approach should be easy to implement, have high compliance, and have the capability to be widely used throughout the healthcare environment. Disinfection technologies are emerging that meet the criteria outline in **Table 1** [7].

Table 1. Criteria for universal disinfection technology.

Pathogen independent protocol	The disinfection technology should not change whether a pathogen was identified or not. And the chemical used should be active on all pathogens.
Multi-modal mechanism	More than one pathway of disinfection to reduce the probability of resistance developing.
Operational efficiency	The ability to be used in a variety of settings, including multi-occupancy spaces as well as sufficient speed to be used for all discharges on targeted units to provide disinfection for non-isolation rooms.
Materials compatibility	Disinfection should not damage surfaces or equipment.
Resistance testing	Evidence should be available that the disinfection pathway will not cause resistance selection.
Limit human error	Disinfection processes should be as simple as possible to minimize the input ad reliance on human to reduce human error in disinfection.
Effectiveness in real world	Disinfection evidence should be presented from the actual patient care environment to demonstrate the reduction in contamination in the presence of dry biofilms and on real-life surfaces.

CONCLUSION

Infection control practices need to be elevated to meet the rising multi-drug resistance of pathogens. Disinfection technology can provide assurance and consistency in disinfection protocols. Making the healthcare environment clean and pathogen free is a necessary component to achieve the goal of zero hospital-acquired infections.

REFERENCES

1. Bernstein DA, Salsgiver E, Simon MS, Greendyke W, Eiras DP, et al. (2016) Understanding barriers to optimal cleaning and disinfection in hospitals: Knowledge, attitudes and practices survey of environmental services workers. Infect Control Hosp Epidemiol 37: 1492-1495.
2. Ling ML, Apisarnthanarak A, Villanueva V, Pandjaitan C, Yusof MY (2015) APSIC Guidelines for environmental cleaning and decontamination. Antimicrob Resistance Infect Control 4: 58.
3. Smith R, Martinelli J, Derman S (2017) AIHA Guidelines for selection and use of environmental surface disinfectants in healthcare. Am J Infect Control 45: S2.
4. Jeffery-Smith A, Taori SK, Schelenz S, Jeffery K, Johnson EM, et al. (2018) *Candida auris*: A review of the literature. Clin Microbiol Rev 31: e00029-17.
5. Otter JA, Vickery K, Walker JD, Pulcini ED, Stoodley P, et al. (2015) Surface-attached cells, biofilms and biocide susceptibility: Implications for hospital cleaning and disinfection. J Hosp Infect 89: 16-27.
6. Sinha D (2016) Importance of universal precautions in HIV, HBV, HCV positive patients. J Renal Nutr Metab 2: 5.
7. Doll M, Stevens MP, Bearman G (2018) New technologies for infection prevention. Infect Prev, pp: 55-66.