



Environmental Surfaces and Disease Transmission

“In the 1970s and 1980s the transmission of pathogens from healthcare surfaces to susceptible patients was thought to be insignificant” (CDC). However more recent studies show surfaces in patient’s rooms play a pivotal role in the transmission of disease to other patients in healthcare environments.

Understanding how transmission events contribute, and are related to patient room surfaces, can be used as a tool for preventing infection, which allows for facilities to optimize cleaning and disinfection of surfaces.

In any environment, pathogens can survive for extended amounts of time and continue to be viable over time. In a healthcare environment pathogen survival on hospital surfaces can result in hand contamination by healthcare workers, patients, or visitors. The most difficult of pathogens to kill or acquire 100% disinfection rates tend to have the longest survival times, ranging from 3 days to 46 months (see image 1) (Rutala).

The primary spread of infection is through indirect contact that occurs when an infected patient or individual touches, and contaminates, an object or surface. When subsequent contact between that item and another patient or individual occurs infection spreads. According to John Boyce, MD, Yale University, the “frequency of hand or glove contamination is related to the frequency with which surfaces in patient rooms are contaminated” (Boyce). Multiple studies back up this claim and have shown an increased risk from prior infected room occupants due to suboptimal terminal cleaning and disinfection of rooms.



In one study it was proven that patients with diarrhea, caused by *C difficile*, contaminate environmental surfaces in their vicinity. Three types of rooms were cultured for *C difficile*. Rooms with no recent *C difficile* patient had 2.6 % - 8.0 % of positive environmental cultures, whereas rooms previously occupied by patients with *C difficile* in their bowel but do not have diarrhea, had 7.0 – 29.0 % of positive environmental cultures. In rooms of patients previously occupied by *C difficile* who had diarrhea had 20.0 – 90.0 % positive cultures.

In another a study of room admission previously occupied by *C difficile* patients showed an increased risk of acquiring infection by 235%. The study showed that only 40-60% of surfaces were cleaned between patients and this resulted in the transfer of pathogens by healthcare workers. This is also true for other pathogens, such as MRSA, VRE, and MDR Acinetobacter (see image 2). According to William Rutala, MS, MPH, PhD, and Director of a Statewide Program for Infection Control in North Carolina, “healthcare workers contaminate their hands as much from touching the environment as touching the patients. According to [this] study, there is no significant difference on contamination rates of gloved hands after contact with skin [versus] environmental surfaces” (Rutala).

These studies show there are greater risks of acquiring pathogens for patients in a room where prior occupants had been colonized or infected. Patients represent the major reservoir of healthcare associated pathogens (Boyce). The highest risk areas in a patient’s room occur in “patient zones”, a term coined by Nancy L Havill, MT, CIC. Highest risk areas and the percentage of contamination before cleaning while patients occupy the rooms are (Havill):



Environmental Surface	Percent Contamination
IV Pump	96%
Bedside Table	93%
BP Cuff	86%
Bedrail	85%
Door Handle	59%
Monitor	58%

By developing policies and procedures for what to clean, when to clean, and who is to clean allows for monitoring of performances and the ability to provide feedback and education to staff. According to Centers for Medicare Medicaid (CMS), having an active program for prevention, control, and investigations of infections and diseases are the most successful elements of creating performance standards to provide a sanitary environment and avoid sources of transmission (Havill).

In many facilities housekeepers wipe less than 50% of high touch surfaces during cleaning. However, today there are more supplemental tools, such as no-touch technologies, to assist cleaning and infection control. “Even if we have good surface disinfection there is data to suggest microorganisms survive on environmental surfaces in patient rooms and put the next patients at risk for the previous patients pathogens. We should be considering no touch technologies to be used at discharge for contact precaution patients” (Rutala).

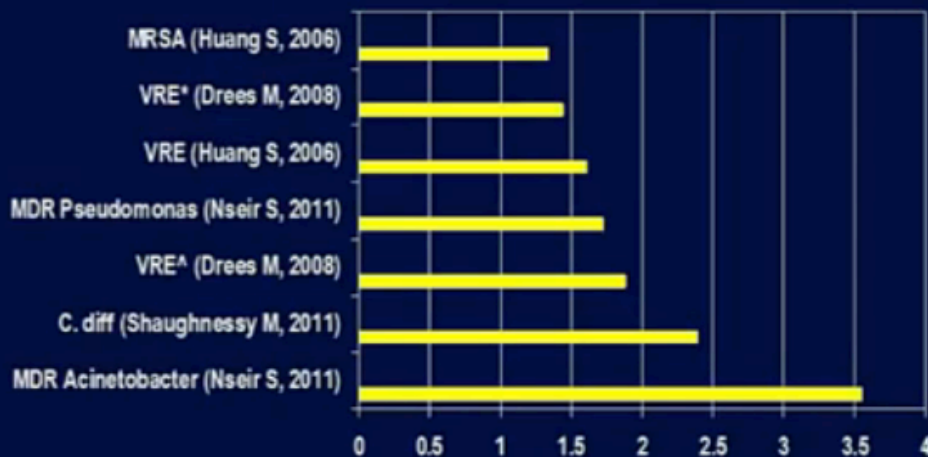
ENVIRONMENTAL SURVIVAL OF KEY PATHOGENS ON HOSPITAL SURFACES

Pathogen	Survival Time
<i>S. aureus</i> (including MRSA)	7 days to >12 months
<i>Enterococcus</i> spp. (including VRE)	5 days to >46 months
<i>Acinetobacter</i> spp.	3 days to 11 months
<i>Clostridium difficile</i> (spores)	>5 months
Norovirus (and feline calicivirus)	8 hours to >2 weeks
<i>Pseudomonas aeruginosa</i>	6 hours to 16 months
<i>Klebsiella</i> spp.	2 hours to >30 months

Image 1 (Rutala)

RISK OF ACQUIRING PATHOGEN FROM PRIOR ROOM OCCUPANT ~120%

JA Otter et al. Am J Infect Control 2013;41:S6-S11



* Prior room occupant infected; ^ Any room occupant in prior 2 weeks infected

Image 2: Horizontal axis scaled by 100% (Rutala)



References

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