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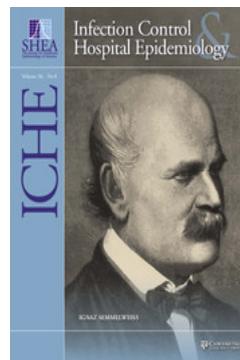
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## Microbial Assessment of High-, Medium-, and Low-Touch Hospital Room Surfaces

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Infection Control & Hospital Epidemiology / Volume 34 / Issue 02 / February 2013, pp 211 - 212  
DOI: 10.1086/669092, Published online: 02 January 2015

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### How to cite this article:

Kirk Huslage, William A. Rutala, Maria F. Gergen, Emily E. Sickbert-Bennett and David J. Weber (2013). Microbial Assessment of High-, Medium-, and Low-Touch Hospital Room Surfaces. *Infection Control & Hospital Epidemiology*, 34, pp 211-212 doi:10.1086/669092

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## RESEARCH BRIEF

## Microbial Assessment of High-, Medium-, and Low-Touch Hospital Room Surfaces

Hospital-acquired infections (HAIs) cause substantial morbidity and mortality. A majority of HAIs are known to result from patients' own endogenous flora, but an estimated 20%–40% of HAIs have been attributed to cross infection via the hands of healthcare personnel (HCP).<sup>1</sup> Hand contamination can occur with equal frequency when HCP contact the patient or through only touching contaminated environmental surfaces.<sup>2</sup> Furthermore, the most significant risk factor for hand and glove contamination of HCP with multidrug-resistant pathogens has been demonstrated to be positive environmental cultures.<sup>3</sup> Numerous studies have demonstrated that environmental contamination with several epidemiologically important pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), *Acinetobacter* species, norovirus, and *Clostridium difficile*, can persist for several days to months<sup>4</sup> and contributes to transmission of these pathogens.<sup>5</sup> Moreover, numerous studies have demonstrated that these epidemiologically important pathogens can be transferred from contaminated surfaces to the hands of HCP, that there is lower compliance with hand hygiene by HCP following contact with the patient's environment,<sup>6</sup> and that HCP frequently contact numerous surfaces during interaction with a patient.<sup>7</sup>

We previously reported the results of an observational study that defined high-, medium-, and low-touch surfaces on the basis of the frequency of HCP contact with room surfaces.<sup>7</sup> This is a follow-up study designed to assess the level of total microbial contamination on our previously defined high-, medium-, and low-touch surfaces in intensive care units and general medical-surgical floors. Two sites for each touch classification were assessed for aerobic colony counts before and after terminal cleaning using replicate sampling with RODAC plates with D/E neutralizing agar (BD). Postcultures were obtained immediately following completion of room cleaning. Efforts were made to obtain the pre- and postcultures without knowledge of the environmental service worker to avoid observed worker bias (the Hawthorne effect). The mean number of colony-forming units (CFUs) per RODAC for high-, medium-, and low-touch surfaces was calculated (Table 1). No additional assessment of cultures for epidemiologically important pathogens (VRE, MRSA, etc) was done as part of this study. The mean bacterial loads and 95% confidence intervals (CIs) for the various surfaces were as follows: high-touch surfaces had a mean of 71.9 CFUs/RODAC (95% CI, 46.5–97.3), medium-touch surfaces had a mean of 44.2 CFUs/RODAC (95% CI, 28.1–60.2), and low-touch surfaces had a mean of 56.7 CFUs/RODAC (95% CI,

34.2–79.2). The means for each of the surfaces were not statistically different, demonstrating no correlation between the frequency of touch by HCP and microbial contamination (Table 1). All surfaces had their microbial burden reduced to low (<10 CFUs/RODAC) numbers following terminal cleaning, regardless of frequency of touch. There was no significant difference in the bacterial burden on each of the 3 types of surfaces after cleaning.

Ample evidence exists that environmental contamination with important healthcare-associated pathogens (MRSA, VRE, *Acinetobacter*, norovirus, *C. difficile*) poses a risk for patient-to-patient transmission of these organisms.<sup>4</sup> Multiple studies have demonstrated that environmental service workers frequently fail to decontaminate high-risk objects.<sup>8</sup> Moreover, a recent study by Stiefel et al<sup>2</sup> demonstrated that contact with the environment was just as likely to contaminate the hands of HCP as was direct patient contact. Smith et al<sup>9</sup> demonstrated that, during care episodes, HCP touched the patient directly (58%) in addition to clinical equipment (52%). During covert observations, hand hygiene compliance before and after room entry was only 25%, providing frequent opportunities for pathogen transfer.

Current guidelines in the United States recommend that environmental surfaces in patient rooms be cleaned and disinfected on a routine basis (eg, daily or 3 times per week) and when the patient is moved or discharged from the room (ie, terminal cleaning).<sup>10</sup> Past research has demonstrated that high-risk surfaces are not associated with an increased risk of contamination of HCP hands and gloves or patient-to-patient transmission of pathogens, while this study found that high-touch surfaces have levels of microbial contamination similar to those of less-frequently contacted surfaces; therefore, the goal of room disinfection efforts should be general, thorough cleaning and disinfection. More emphasis should be placed on adequately training environmental service workers and providing timely feedback on the thoroughness of cleaning by using fluorescent marking or adenosine triphosphate-based methods. These efforts have been demonstrated to improve the thoroughness of cleaning from 40% to 80%.<sup>8</sup> The addition of no-touch room decontamination systems (ie, UV-C light or hydrogen peroxide) should also be considered

TABLE 1. Precleaning and Postcleaning Bacterial Load Measurements for High-, Medium-, and Low-Touch Surfaces

Surface (no. of samples)	Mean CFUs/RODAC (95% CI)	
	Precleaning	Postcleaning
High ( <i>n</i> = 40)	71.9 (46.5–97.3)	9.6 (3.8–15.4)
Medium ( <i>n</i> = 42)	44.2 (28.1–60.2)	9.3 (1.2–17.5)
Low ( <i>n</i> = 37)	56.7 (34.2–79.2)	5.7 (2.01–9.4)

NOTE. CFU, colony-forming unit; CI, confidence interval.

to aid in further reduction or elimination of environmental contamination following terminal cleaning, specifically in rooms of patients with epidemiologically important pathogens (eg, *C. difficile*), especially if studies continue to demonstrate a benefit in reduction of HAI.

Further research should be focused on identifying methods for achieving and maintaining clean hospitals. These studies should include cost-effectiveness analyses of these interventions and their impact on reducing the spread of healthcare-associated infections. Efforts to improve room cleaning should be focused on all surfaces, not just high-touch, high-risk objects, as well as on continuous performance improvement efforts aimed at increasing the thoroughness of cleaning.

#### ACKNOWLEDGMENTS

We thank the University of North Carolina Health Care Environmental Services for assistance in locating rooms for this study.

*Potential conflicts of interest.* All authors report no conflicts of interest relevant to this article. All authors submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest, and the conflicts that the editors consider relevant to this article are disclosed here.

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Received July 20, 2012; accepted September 24, 2012; electronically published December 18, 2012.

*Infect Control Hosp Epidemiol* 2013;34(2):211-212

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