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CONCISE COMMUNICATION

A Quantitative Approach to Defining "High-Touch" Surfaces in Hospitals

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Fifty interactions between healthcare workers and patients were observed to obtain a quantifiable definition of "high-touch" (ie, frequently touched) surfaces based on frequency of contact. Five surfaces were defined as high-touch surfaces: the bed rails, the bed surface, the supply cart, the over-bed table, and the intravenous pump.

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In the global infection control community, it is widely accepted that contaminated environmental surfaces, contaminated equipment, and contaminated hands of healthcare workers all have been linked to the transmission of several pathogens, which has led to individual cases and multiple outbreaks of healthcare-acquired infection. Recently, the infection control community has focused attention on the role that inanimate objects in the immediate vicinity of a patient play in the transmission of nosocomial pathogens. The findings suggest that "high-touch" (ie, frequently touched) surfaces in the immediate vicinity of a patient may be a reservoir for nosocomial pathogens and that these pathogens are transmitted directly or indirectly by the hands of healthcare workers.[1-3]

One of the most recent recommendations from the Healthcare Infection Control Practices Advisory Committee and the Centers for Disease Control and Prevention regarding environmental infection control in healthcare facilities[4] was a category II recommendation to clean and disinfect high-touch surfaces (eg, doorknobs, bed rails, light switches, and surfaces in and around toilets in patients' rooms) on a more frequent basis than minimal-touch surfaces. However, no one has quantitatively assessed the frequency of healthcare worker contact with different room surfaces. Similarly, the types of pathogens found on different room surfaces and their microbial load have also not been systematically evaluated. We do know that important nosocomial pathogens—including vancomycin-resistant enterococci (VRE), methicillin-resistant *Staphylococcus aureus* (MRSA), *Acinetobacter baumannii, Clostridium difficile, Escherichia coli,* and *Pseudomonas aeruginosa*—have been shown to persist in the environment for several days to several months.[5] In light of the recommendations from the Healthcare Infection Control Practices Advisory Committee and the Centers for Disease Control and Prevention and in light of evidence confirming the potential for purported high-touch surfaces to harbor pathogens, the aim of our study was to obtain a quantifiable definition of these frequently touched surfaces based on observations assessing the frequency of healthcare worker contact with surfaces in a patient's immediate environment.

METHODS

During an 18-month period in 2008–2009, healthcare workers (ie, registered nurses, physicians, nursing aides, and other allied direct-care providers) were observed providing routine patient care, to ascertain the frequency of contact with surfaces in the immediate vicinity of the patient. Bathrooms were not included in the observations. A total of 50 interactions were observed in 5 intensive care units (ICUs) and on 7 general medical-surgical floors at the University of North Carolina hospitals in Chapel Hill, North Carolina. UNC Health Care is a 780-bed, tertiary care academic facility.

Common surfaces in each of the ICUs (28 surfaces) and on each of the medical-surgical floors (24 surfaces) were identified and included on the observational tool. An effort was made to include an equal amount of rooms with ($n = 21$) and without Contact Precautions ($n = 29$) within each type of setting. All observations were conducted by a single observer to maintain consistency and avoid the need to assess interobserver variability.

Observations for each surface were tallied and divided by the total number of observations (25 observations in the ICUs and 25 observations on the medical-surgical floors) to determine the mean frequency of contact per surface per interaction observed. These data were aggregated by use of SAS, version 9.1 (SAS Institute), and a 95% confidence interval (CI) was determined for each mean frequency (by use of the Poisson distribution) and plotted graphically to define high-touch, medium-touch, and low-touch surfaces on the basis of the average frequency of contact for each type of setting.

RESULTS

A total of 1,490 surface contacts were recorded during the observation period. The ICUs accounted for 1,109 (74.4%) surface contacts (Figure 1), and the medical-surgical floors (Figure 2) accounted for 381 (25.6%). There were 3 surfaces (ie, the bed rail, the bed surface, and the supply cart) in the ICUs that were considered high-touch surfaces (defined as sustaining more than 3 contacts per interaction [95% CI, 2.17–13 contacts per interaction]), and these 3 surfaces accounted for 40.2% of the contacts recorded in the ICUs (Figure 1). Similarly, there were 4 surfaces (ie, the bed rail, the over-bed table, the intravenous pump, and the bed surface) on the medical-surgical floors that were considered high-

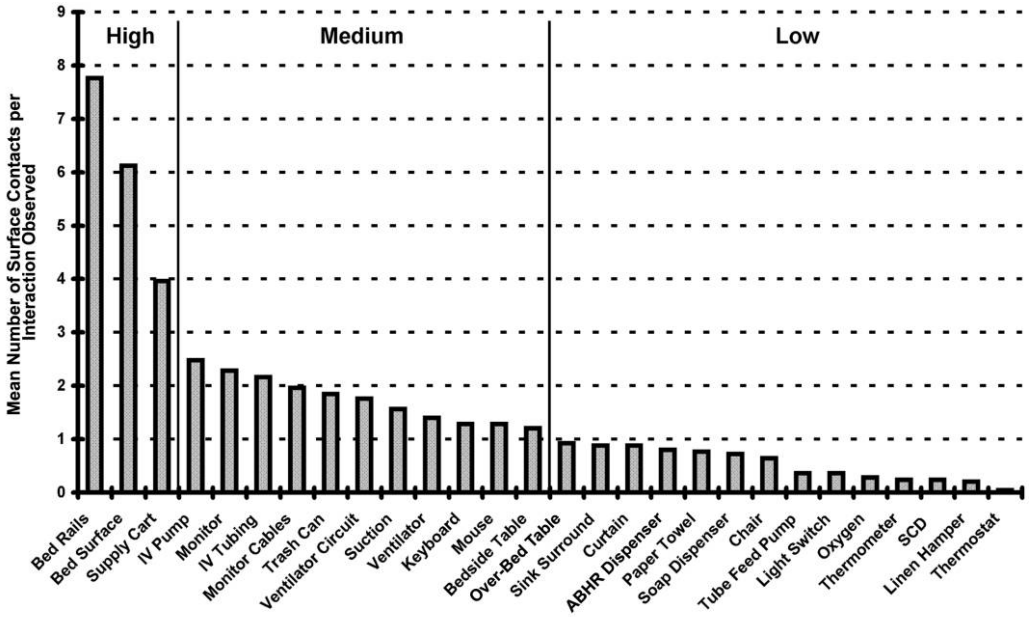

FIGURE 1. Mean frequency of healthcare worker contact for 28 surfaces in an intensive care unit. ABHR, alcohol-based hand rub; IV, intravenous; SCD, sequential compression device.

touch surfaces (defined as sustaining more than 1 contact per interaction [95% CI, 0.2–6.99 contacts per interaction]), and these 4 surfaces accounted for 48.6% of the contacts recorded on the medical-surgical floors (Figure 2). Bed rails had the highest frequency of contact in both types of healthcare settings, accounting for 7.76 contacts per interaction (95% CI, 3.30–15.44 contacts per interaction) in the ICUs and 3.12 contacts per interaction (95% CI, 0.67–8.95 contacts per interaction) on the medical-surgical floors.

For the remaining surfaces observed in the ICUs, there

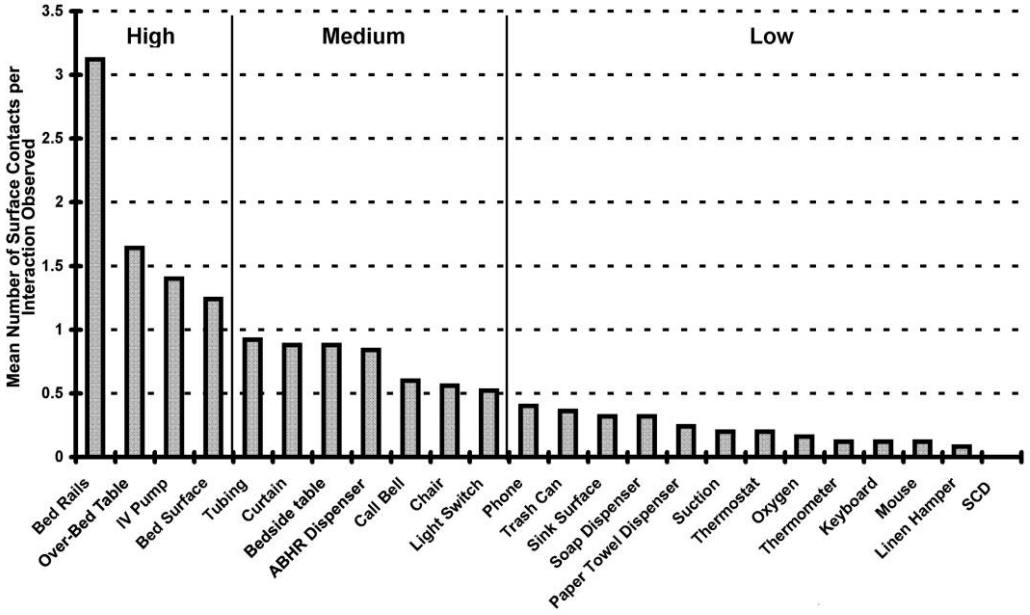

FIGURE 2. Mean frequency of healthcare worker contact for 24 surfaces on a general medical-surgical floor. ABHR, alcohol-based hand rub; IV, intravenous; SCD, sequential compression device.

were 11 surfaces that were considered medium-touch surfaces (a mean of 1.75 contacts per interaction [95% CI, 0.17–6.82 contacts per interaction]) and 14 surfaces that were considered low-touch surfaces (a mean of 0.52 contacts per interaction [95% CI, 0–4.71 contacts per interaction]). For the remaining surfaces observed on the medical-surgical floors, there were 7 surfaces that were considered medium-touch surfaces (a mean of 0.74 contacts per interaction [95% CI, 0.01–5.11 contacts per interaction]) and 13 surfaces that were considered low-touch surfaces (a mean of 0.20 contacts per interaction [95% CI, 0–4.10 contacts per interaction]).

DISCUSSION

Contaminated surfaces in patient rooms have been linked to patient-to-patient transmission of several important nosocomial pathogens, including MRSA, VRE, *C. difficile,* and multidrug-resistant gram-negative bacilli (such as *Acinetobacter* species). Epidemiologic studies have shown that patients admitted to rooms previously occupied by individuals infected or colonized with MRSA,[6] VRE,[7] or *C. difficile*[8] are at significantly higher risk of acquiring these organisms from contaminated environmental surfaces.

Because contaminated environmental surfaces may play a role in hospital acquisition of nosocomial pathogens, surface disinfection is recommended on a routine basis or when a patient is moved or discharged from the room (ie, terminal cleaning). Recent studies have identified significant opportunities in hospitals to improve the cleaning of frequently touched objects in the patient's immediate environment.[9,10] For example, one study showed that of 20,646 standardized environmental surfaces (14 types of objects), only 9,910 (47.9%) were cleaned during terminal room cleaning.[10] These findings have stimulated the development of programs to improve cleaning practices as well as the implementation of room decontamination units to decrease the risk of environmental transmission of pathogens to patients.

Studies of the effectiveness of room disinfection and protocols for cleaning and/or disinfecting rooms have focused on high-touch objects (eg, sink, bedside table, side rail, call box, and telephone) rather than on all possible environmental surfaces (on medical-surgical floors). However, no operational definition of "high-touch" surfaces is available in the literature. In fact, the frequency of healthcare worker contact with different environmental surfaces has never been evaluated at all. To our knowledge, the present study is the first to provide data on the frequency of contact between healthcare workers' hands and specific environmental surfaces in a patient room.

Our data demonstrated that, in the ICU and on the medical-surgical floor, high-touch and medium-touch surfaces were in the immediate vicinity of the patient. This finding becomes a primary concern when considering how to target room disinfection practices. Ideally, all surfaces should be disinfected regardless of the frequency of contact, but fewer than 50% of surfaces are cleaned during a terminal cleaning.[10] Hospital protocols for room cleaning and disinfection should focus on environmental service personnel training, use of checklists, and/or monitoring of those surfaces that have the highest frequency of contact with healthcare workers' hands, to minimize the potential for hand contamination, as well as direct transmission to patients. Thus, in the ICU, it is critical that bed rails, bed surfaces, and supply carts be adequately cleaned and disinfected. Furthermore, studies of the effectiveness of room disinfection should focus on evaluating disinfection of these surfaces. Room decontamination protocols used in hospitals should take into account both our data on the frequency with which healthcare workers touch certain surfaces and data on the concentration and type of microbial pathogens found on specific environmental surfaces. Although it is desirable that all environmental surfaces be routinely disinfected, other surfaces that are likely not heavily contaminated or frequently touched, such as thermostats, may not warrant as much concern. However, at terminal cleaning, all environmental surfaces should be disinfected.

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