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Hand-touch contact assessment of high-touch and mutual-touch surfaces among healthcare workers, patients, and visitors

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SUMMARY

Background: Unlike direct contact with patients' body, hand hygiene practice is often neglected by healthcare workers (HCWs) and visitors after contact with patients' environment. Contact with hospital environmental items may increase risk of pathogen transmission.

Aim: To enumerate the number of hand-touch contacts by patients, HCWs and visitors with any hospital environmental items.

Methods: All contact-episodes between person and item were recorded by direct observation in a six-bed cubicle of acute wards for 33 working days. High-touch and mutual-touch items with high contact frequencies by HCWs, patients, and visitors were analysed.

Findings: In total, 1107 person-episodes with 6144 contact-episodes were observed in 66 observation hours (average: 16.8 person-episodes and 93.1 contact-episodes per hour). Eight of the top 10 high-touch items, including bedside rails, bedside tables, patients' bodies, patients' files, linen, bed curtains, bed frames, and lockers were mutually touched by HCWs, patients, and visitors. Bedside rails topped the list with 13.6 contact-episodes per hour (mean), followed by bedside tables (12.3 contact-episodes per hour). Using patients' body contacts as a reference, it was found that medical staff and nursing staff contacted bedside tables [rate ratio (RR): 1.741, 1.427, respectively] and patients' files (RR: 1.358, 1.324, respectively) more than patients' bodies, and nursing staff also contacted bedside rails (RR: 1.490) more than patients' bodies.

Conclusion: Patients' surroundings may be links in the transmission of nosocomial infections because many are frequently touched and mutually contacted by HCWs, patients, and visitors. Therefore, the focus of hand hygiene education, environmental disinfection, and other system changes should be enhanced with respect to high-touch and mutual-touch items.

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Introduction

Multiple drug-resistant organisms (MDROs) such as vancomycin-resistant enterococci (VRE), carbapenem-resistant *Acinetobacter baumannii* (CRAB), carbapenem-resistant Enterobacteriaceae (CRE) and meticillin-resistant *Staphylococcus aureus* (MRSA) can survive in the hospital environment for a prolonged period and are major players in causing hospital outbreaks, thus requiring infection control attention.^{1–7} Therefore, besides the implementation of active surveillance culture, practice of contact precautions, and of promotion of hand hygiene with alcohol-based hand rub, environmental hygiene is another critical control point in infection control.^{8,9} Unlike practising hand hygiene after direct contact with patients' bodies, hand hygiene after contact with patients' surroundings is often forgotten and missed by healthcare workers (HCWs) and visitors.^{10,11} Therefore, appropriate environmental cleaning and disinfection may improve the control of hospital-acquired infections.¹² A quantitative approach in defining high-touch surfaces in hospitals, by observation of 50 interactions between HCWs and patients during patient care practices, has recently been described.¹³ However, the types of high-touch surfaces touched by patients and visitors have not been addressed. More importantly, the types of surfaces which are mutually touched by both patients and HCWs, thus posing a higher risk for nosocomial transmission, have not been resolved. In this study, we investigated the spectrum of hospital items including patients' bodies touched by HCWs, patients, and visitors by observing 1107 person-episodes of interactions in 6144 contact-episodes in acute medical, surgical, and neurosurgical wards. The aim was to identify high-risk environmental items in the hospital for cleaning and disinfection, and to identify where improvements in hand hygiene education after environmental contact were required.

Methods

This observational study was performed in Queen Mary Hospital, Hong Kong; a university-affiliated hospital of 1600 beds with acute medical, surgical, and neurosurgical services. As part of the infection control measure for hand hygiene monitoring, activities of HCWs (medical staff, nursing staff, supporting staff, and allied health staff), patients, and visitors in three 30-bed wards (one acute medical, acute surgical, and acute neurosurgical ward) were unobtrusively observed by two designated infection control nurses for a period of 33 working days (between 13th January 2014 and 7th March 2014). Each infection control nurse performed a 1 h observation session per working day in a fully occupied six-bedded cubicle to assess the items of contact and frequency of contacts with each observed item.

A contact-episode was defined as one interaction between one person and one item involving any amount of person's hand-touching the item. If one person contacted one item intermittently during the observation, more than one contact-episode was counted. A person-episode was defined as person-time involved in performing one task. If two persons performed one task together, two person-episodes were counted. In each person-episode, there could be more than one contact-

episode. High-touch items were defined as the 10 most frequently touched items in this study. Mutually touched surfaces or items in relation to the activities of HCWs, patients, and visitors were analysed.

Statistical analysis

The mean frequency of contacts per hour in a cubicle was calculated by dividing the number of contact-episodes by the total number of observation hours. The mean frequency for different categories of persons (medical staff, nursing staff, supporting staff, allied health staff, patients, and visitors) was similarly calculated. The proportion of contact-episodes of the top 10 items of each category of persons was calculated by dividing the number of contact-episodes of that item by the total number of contacts made by the corresponding category of persons. For each category of persons, Poisson regression model was used to test whether the frequency of contacts with high-touch items in the hospital environment was different from the frequency of direct contact with patients' bodies. Rate ratio (RR), the ratio of the frequency of contact with an item to the frequency of contact with patients' bodies, was estimated from the Poisson regression model. Ninety-five percent confidence intervals (CIs) were also constructed. Estimated $RR > 1$ indicates higher contact frequency than with patients' body (the reference item); $RR < 1$ indicates lower contact frequency. $RR = 1$ indicates no difference. SPSS version 20 was used to perform the statistical analyses. $P < 0.05$ was considered significant.

Results

During the study period, 1107 person-episodes were observed in 66 observation hours, with an average of 16.8 (1107 person-episodes per 66 h) person-episodes observed per hour in a cubicle. There was an average of 93.1 (6144 contact-episodes per 66 h) contact-episodes per hour in a cubicle, with 41.2 contact-episodes contributed by nursing staff, 26.6 by supporting staff, 10.6 by medical staff, 5.7 by allied health staff, 7.1 by patients, and 1.9 by visitors (Table I).

Bedside rails topped the list of all contacted items with 899 contacts (14.6% of 6144 contacts) during the study period, equivalent to a mean frequency of 13.6 contact-episodes per hour in a cubicle; followed by bedside tables (812 contacts, 13.2%), equivalent to a mean frequency of 12.3 contact-episodes per hour in a cubicle. The top 10 items (including patient's bodies) covered 4143 (67.4%) contacts of all observed contacts (Table II).

The patient management-related activities were analysed as 957 person-episodes of HCWs with 3180 min of patient contacts. The median time per patient contact was 2 min (range: 0.5–38). In all, 5548 contact-episodes were observed. The median number of items touched was 5 per patient contact (range: 1–24).

The RR of frequency of contact with high-touch hospital items by HCWs, patients, and visitors using patients' body contacts as a reference showed that medical staff and nursing staff contacted bedside tables and patients' files more than patients' bodies, and nursing staff also contacted bedside rails more than patients' bodies. However, patients and visitors

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