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Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Brief Report

Clothing and shoes of personnel as potential vectors for transfer of health care–associated pathogens to the community



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Key Words:

Clothing
Shoes
Dissemination
Healthcare-associated pathogens

In an acute care hospital, we demonstrated that the clothing and shoes that physicians and nurses wear home from health care facilities can be contaminated with health care–associated pathogens, particularly methicillin-resistant *Staphylococcus aureus*. These findings suggest that the clothing and shoes of personnel have the potential to serve as vectors for the transfer of health care–associated pathogens to the community. © 2019 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

INTRODUCTION

The clothing of health care personnel often becomes contaminated with health care–associated pathogens during patient care activities.^{1–6} The risk for contamination increases when providing care for patients with wounds and during certain types of care activities, such as assistance with bathing.⁴ The use of universal gowning and gloving has been associated with reduced risk for the acquisition of pathogens on clothing.³ In addition, caring for patients on contact precautions has been associated with a reduction in the burden of organisms acquired on clothing.⁴ Although the role of personnel attire in pathogen transmission is not well defined, there is concern that contaminated clothing could contribute to pathogen transmission in health care facilities and place personnel at risk for infection.^{1–4}

Most studies of clothing contamination have focused on uniforms intended to be worn in health care facilities, including surgical scrubs and physicians' white coats; however, it is plausible that personal clothing might also become contaminated. Contamination

of clothing occurs frequently during personal protective equipment removal.⁷ It has been observed that personnel frequently touch their clothing after performing hand hygiene and prior to contact with patients.³ Moreover, a recent observational study identified several failures in transmission-based precautions that could result in self-contamination of personnel.⁸ In addition to serving as a source of transmission in health care facilities, contaminated clothing that is worn home from health care facilities could serve as a vector for the transfer of pathogens to the community. Here, we tested the hypothesis that personal clothing or scrubs that are worn home from the hospital may be contaminated with health care–associated pathogens.

METHODS

We cultured the hands, clothing, and shoes of a convenience sample of physicians and nurses at an acute care hospital between January 2018 and May 2018. All cultures were collected at the end of the work day, as the objective was to culture clothing that would be worn home from the hospital. Premoistened BD CultureSwabs (Becton Dickinson; Franklin Lakes, NJ) were used to sample the entire surface of both hands and the entire surface area of the sole of 1 shoe. To sample clothing, participants used alcohol hand sanitizer and then applied 4 cm × 4 cm cotton gauze pads premoistened with phosphate-buffered saline to their sleeve cuffs, external pockets, and shirt collars, as well as to the waistline and external pockets of pants. Gauze pads were used for these samples because we found that it was easier for personnel to collect the samples with gauze

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Funding/support: This work was supported by a Merit Review grant (1 I01 BX002944-01A1) from the Department of Veterans Affairs to C.J.D.

Conflicts of interest: C.J.D. has received research grants from GOJO, Pfizer, Clorox, Avery Dennison, and Boehringer Laboratories. All other authors report no conflicts of interest relevant to this article.

pads vs swabs. Cultures were processed for methicillin-resistant *Staphylococcus aureus* (MRSA), *Clostridium difficile*, vancomycin-resistant *Enterococcus*, and carbapenem-resistant Gram-negative bacilli.⁷ The nares of physicians with MRSA contamination of their clothing were cultured for MRSA. To investigate potential routes of clothing contamination, we observed physicians during work rounds to identify activities that might result in pathogen transfer to clothing. The facility's institutional review board approved the study protocol.

RESULTS

Of the 41 participants, 25 (61%) were nurses and 16 (39%) were physicians. All 25 nurses were wearing scrubs that they intended to wear home. None of the physicians wore scrubs. Of the 41 participants, 18 (44%) were contaminated with 1 or more pathogens, with nearly all of that contamination occurring on clothing (8/41, 20%) and shoes (12/41, 29%) (Figure). There was no significant difference in the frequency of contamination with 1 or more pathogens for physicians (8 of 16, 50%) vs nurses (10 of 25, 40%) ($P = .53$). Of the 6 physicians with MRSA on their clothing, 2 (33%) demonstrated nasal carriage of MRSA. The carbapenem-resistant Gram-negative bacilli included *Pseudomonas aeruginosa* ($n = 2$) and *Stenotrophomonas* spp ($n = 1$).

Of 100 observations of physician interactions with patients, 60 (60%) involved 1 or more direct or indirect contacts between the physicians' personal clothing and a patient or the environment. All indirect contacts ($n = 35$) occurred when personal clothing was touched with a contaminated hand or glove followed by contact with a patient. Such contact often involved reaching under a white coat or personal protective equipment for phones, notes, or pagers. All direct contacts ($n = 25$) occurred when sleeve cuffs of long-sleeved shirts touched a patient or the environment.

DISCUSSION

In an acute care hospital, we demonstrated that the clothing and shoes that physicians and nurses wear home from health care facilities can be contaminated with health care–associated pathogens, particularly MRSA. These findings have several implications for the prevention of pathogen transmission by clothing. First, in addition to physicians' white coats and surgical scrubs, personal clothing could be a source of pathogen transmission in health care facilities. As has been reported by others,^{3,8} we observed frequent direct and indirect contacts between physician's personal clothing and patients or the environment. Education of personnel might be beneficial in reducing such contacts.

Second, our results highlight the potential for clothing and shoes of personnel to serve as vectors for the transfer of health care–associated pathogens to the community. Such contamination is unlikely to pose a risk for healthy individuals; however, personnel living with immunocompromised individuals should be aware of the potential to carry pathogens such as *Clostridium difficile* and MRSA home on their clothing or shoes. Finally, it is notable that all nurses participating in the study wore surgical scrubs that they intended to wear until they arrived home. Others have noted that personnel often wear surgical scrubs home and launder them there.³ Avoiding wearing surgical scrubs home from work would be a simple approach to reducing the risk for dissemination of pathogens to the community.

Our study has some limitations. Only a small cohort of personnel was studied, and the participants were not randomly selected. Although contamination was demonstrated, our study was not designed to evaluate the transmission of contaminating organisms. Thus, the significance of clothing and shoe contamination is uncertain. Previous studies have demonstrated the potential for organisms to be transferred from the floors to high-touch surfaces in hospitals.^{9,10} Finally, the number of organisms recovered was not

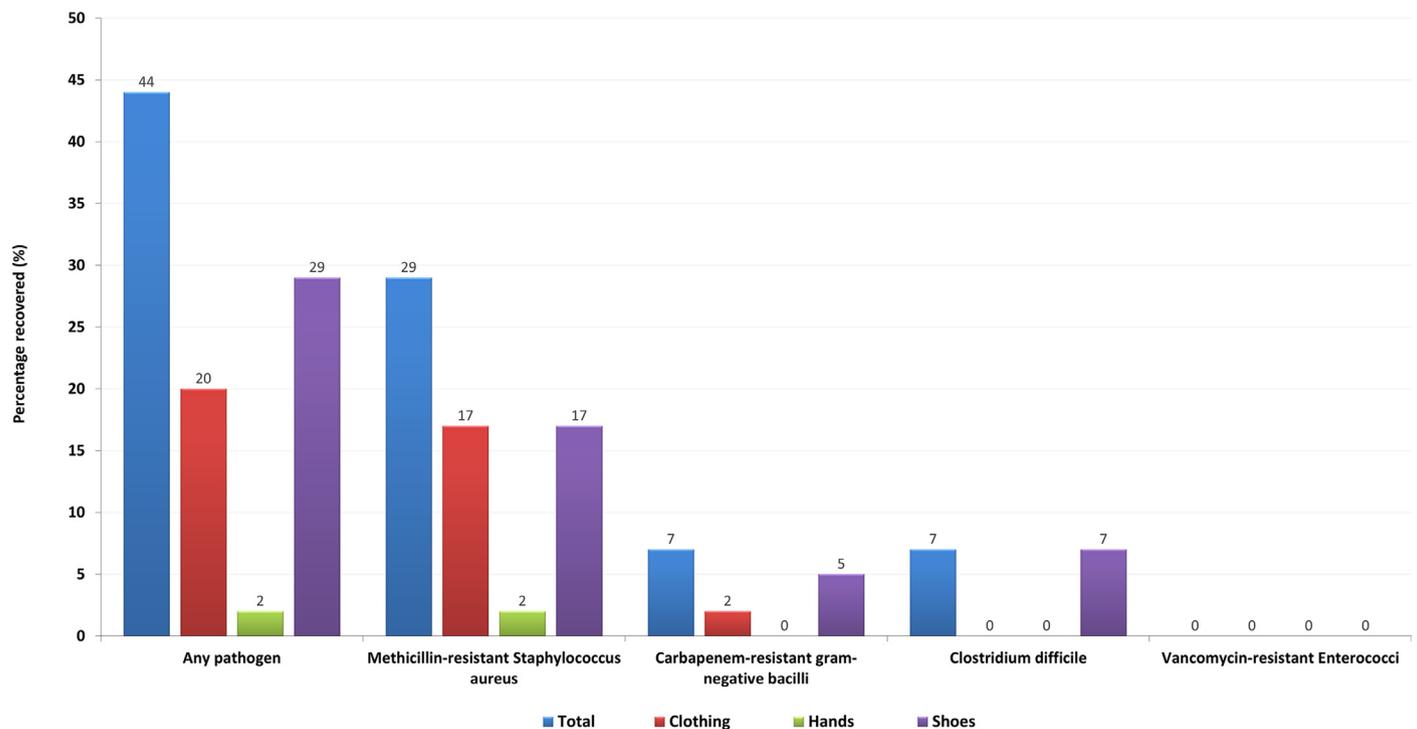


Figure. Frequency of contamination of the hands, shoes, and clothing of hospital personnel with health care–associated pathogens.

recorded, so it is not possible to provide a quantitative microbial risk assessment.

CONCLUSIONS

Our results suggest that the clothing and shoes that physicians and nurses wear home from health care facilities can be contaminated with health care–associated pathogens. Further studies are needed to examine the potential for such contamination to contribute to the transmission of pathogens in health care facilities and in the community.

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