RESEARCH BRIEFS

A Randomized Trial to Determine Whether Wearing Short-Sleeved White Coats Reduces the Risk for Pathogen Transmission

Long-sleeved white coats are a traditional part of the attire of physicians. However, several studies have demonstrated that white coats are often contaminated with healthcare-associated pathogens, raising concern that they could serve as a source of transmission.[1,2] Currently, no evidence shows that wearing short sleeves reduces the risk of pathogen transmission, but it is plausible that contaminated sleeves could transmit pathogens. Thus, the United Kingdom implemented a "bare below the elbows" dress code policy in 2007 recommending that personnel wear short-sleeved clothing with no wristwatch or jewelry.[3] Although similar policies have not been widely implemented in the United States, expert guidance recommendations from the Society for Healthcare Epidemiology of America has suggested that healthcare facilities consider adopting the "bare below the elbows" policy based on biological plausibility and the low likelihood of harm.[1]

We conducted a randomized, crossover trial involving simulated patient care interactions to test the hypothesis that transmission of pathogens occurs less frequently when personnel wear short- versus long-sleeved coats. Cauliflower mosaic virus DNA was generated and detected as described previously.[4–6] A group of 34 healthcare personnel were randomized to wear either a long- or short-sleeved clean white coat and gloves while conducting a standardized examination of mannequin in a hospital bed with an adjacent bedside table. The chest and back of the mannequin was contaminated with 1 μg cauliflower mosaic virus DNA. The examination included palpation and percussion of first the chest and abdomen and then the back and required approximately 2 minutes. After the first examination, participants washed their hands with soap and water for 30 seconds and put on clean gloves prior to conducting a similar examination of an uncontaminated mannequin; hand washing and changing gloves were included to eliminate hand contamination as a source of transmission. Participants wore the same coats during the examinations of both mannequins. After the examination of the second mannequin, sterile Fisherbrand Polyester-Tipped Applicators (Fisher, Waltham, MA) premoistened with phosphate-buffered saline were used to sample the wrists and coat sleeves of personnel and the second mannequin as well as surfaces adjacent to the second mannequin (ie, bed rail and bedside table). An identical simulation was conducted while the participant was wearing a white coat with the alternative sleeve design. Fisher's exact test was used to compare the frequency of transfer of the DNA marker to the sleeves and/or wrists of personnel and to the uncontaminated mannequin for the long- versus short-sleeved coat simulations.

To assess the potential for transfer of pathogens by the sleeves of white coats in a real-world setting, we conducted anonymous observations of groups of physicians during morning work rounds. We assessed the frequency of contact between the sleeves of white coats and patients or environmental surfaces in patient rooms during interactions in which patients were examined.

During simulated examinations, the cuffs of long-sleeved white coats frequently contacted both the first and the second mannequins (26 of 34, 77% and 23 of 34, 68% of simulations, respectively). As shown in Figure 1, contamination with the DNA marker was detected significantly more often on the sleeves and/or wrists of personnel and on environmental surfaces adjacent to the second mannequin when long- versus short-sleeved coats were worn.

The sleeve cuffs of 1 or more physicians' white coats contacted patients and/or environmental surfaces during 31 of 71 (44%) interactions that included physical examination of patients. The environmental surfaces most frequently contacted by sleeve cuffs included bed rails, bedding, and privacy curtains.

Although the hands of personnel are considered the major source of pathogen transmission, fomites such as shared portable equipment also frequently come in direct or indirect contact with patients and may contribute to pathogen transmission.[6–9] For example, a DNA marker inoculated onto portable equipment disseminated widely in an intensive care setting.[6] In the current study, we provide experimental evidence that the cuffs of long-sleeved white coats may similarly serve as a vector for pathogen transmission. Transfer of a viral DNA marker occurred significantly more often when long- versus short-sleeved white coats were

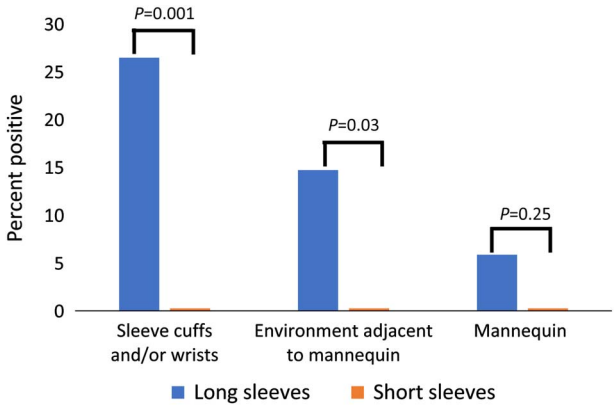

FIGURE 1. Frequency of transfer of a viral DNA surrogate marker to clean sites during simulated physical examinations when wearing long- versus short-sleeved white coats.

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worn. Moreover, during work rounds, the cuffs of physician's long-sleeved white coats frequently contacted patients or environmental surfaces.

Our study has some limitations. We studied the transmission of a DNA marker rather than a pathogen. However, in simulated examinations, dissemination of the DNA marker was analogous to dissemination of the live virus bacteriophage MS2 and nontoxigenic *C. difficile* spores.[4] We did not assess whether wearing uniforms with short sleeves reduces the risk for the transfer of pathogens in clinical settings. Thus, additional studies are needed in healthcare facilities.

In summary, our results provide support for the recommendation that healthcare personnel should wear short-sleeved uniforms to reduce the risk for pathogen transmission.[1–3] There is a need to test other approaches to reduce the potential for transfer from the cuffs of long-sleeved coats. For example, some studies suggest that antimicrobial-impregnated clothing might reduce microbial contamination of uniforms.[10] Simple approaches such as rolling up the sleeves of white coats when examining patients might also be effective.

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A Successful Strategy to Decrease Hospital-Onset *Clostridium difficile*

Cambridge Health Alliance adopted polymerase chain reaction testing (PCR; Cepheid, Sunnyvale CA) for *Clostridium difficile* (CD) in 2011. Like many facilities, we realized an increase in our CD rate soon thereafter. This increase occurred despite excellent hand hygiene, private room with contact precautions, daily bleach disinfection of high-touch surfaces, ultraviolet disinfection after terminal clean, and an antimicrobial stewardship program.

In 2013, the National Healthcare Safety Network (NHSN) implemented surveillance for CD based on a positive laboratory test (Lab ID),[1] a proxy measure for infection. Providers had been educated that a clinical diagnosis of CD should be based on symptoms and that indiscriminate use of PCR for diarrhea from any cause could inflate our rate because PCR cannot differentiate colonization from infection. Providers were encouraged to only test patients with clinically significant diarrhea (>2 episodes in 24 hours).

In 2015, related to an incentive program, our organization sought to drive our CD standardized infection ratio (SIR) to <1.

METHODS

A multidisciplinary team implemented a performance improvement project. To optimally identify patients with