

## Concise Communication

# Transfer of methicillin-resistant *Staphylococcus aureus* by fist bump versus elbow bump

Heba Alhmidi MD<sup>1</sup>, Jennifer L. Cadnum BS<sup>1</sup>, Brigid M. Wilson PhD<sup>2</sup> and Curtis J. Donskey MD<sup>2,3</sup>

<sup>1</sup>Research Service, Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio, <sup>2</sup>Geriatric Research, Education, and Clinical Center, Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio and <sup>3</sup>Case Western Reserve University School of Medicine, Cleveland, Ohio

### Abstract

For 40 patients with methicillin-resistant *Staphylococcus aureus* (MRSA) colonization, fist bump and elbow bump greetings resulted in frequent transfer of MRSA (25% vs 15%, respectively), but significantly fewer colonies were transferred via the elbow bump. Noncontact greetings should be encouraged to reduce the risk of transfer of healthcare-associated pathogens.

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The hands of patients and healthcare personnel are often contaminated with pathogenic microorganisms that can be transferred via hand contact.<sup>1–3</sup> Consequently, some experts have called for a ban on the handshake in healthcare settings.<sup>1,2</sup> Alternative greetings that eliminate or reduce hand contact have also been proposed, including the fist bump which decreases surface area and time of contact.<sup>1,2</sup> However, we found that the burden of methicillin-resistant *Staphylococcus aureus* (MRSA) was similar on the palmar and dorsal surfaces of the hands of MRSA-colonized patients and that fist bump and handshake greetings resulted in similar frequencies of MRSA transfer (16% vs 22% transfer, respectively).<sup>4</sup> Moreover, in simulations involving use of a contaminated keyboard, a benign virus was transferred via fist bump, nearly as often as via handshake.<sup>5</sup>

Given the potential for pathogen transfer via hands, the elbow bump has recently become a commonly used alternative greeting. However, the clothing and skin of patients are often contaminated with pathogens and may serve as a source for transfer to hands or surfaces.<sup>6–8</sup> Thus, it is not clear that the elbow bump is less likely to transfer pathogens than hand contact greetings. Here, we conducted a study with MRSA-colonized patients to test the hypothesis that the elbow bump transfers MRSA less frequently than the fist bump.

### Methods

We conducted a cohort study of a convenience sample of 40 patients in isolation for MRSA colonization with positive anterior nares screening results within 1 month of enrollment. Potential participants were excluded if they had dementia or limited ability to perform the greetings. The facility's institutional review board approved the study protocol.

**Author for correspondence:** Curtis J. Donskey, E-mail: [Curtis.Donskey@va.gov](mailto:Curtis.Donskey@va.gov)

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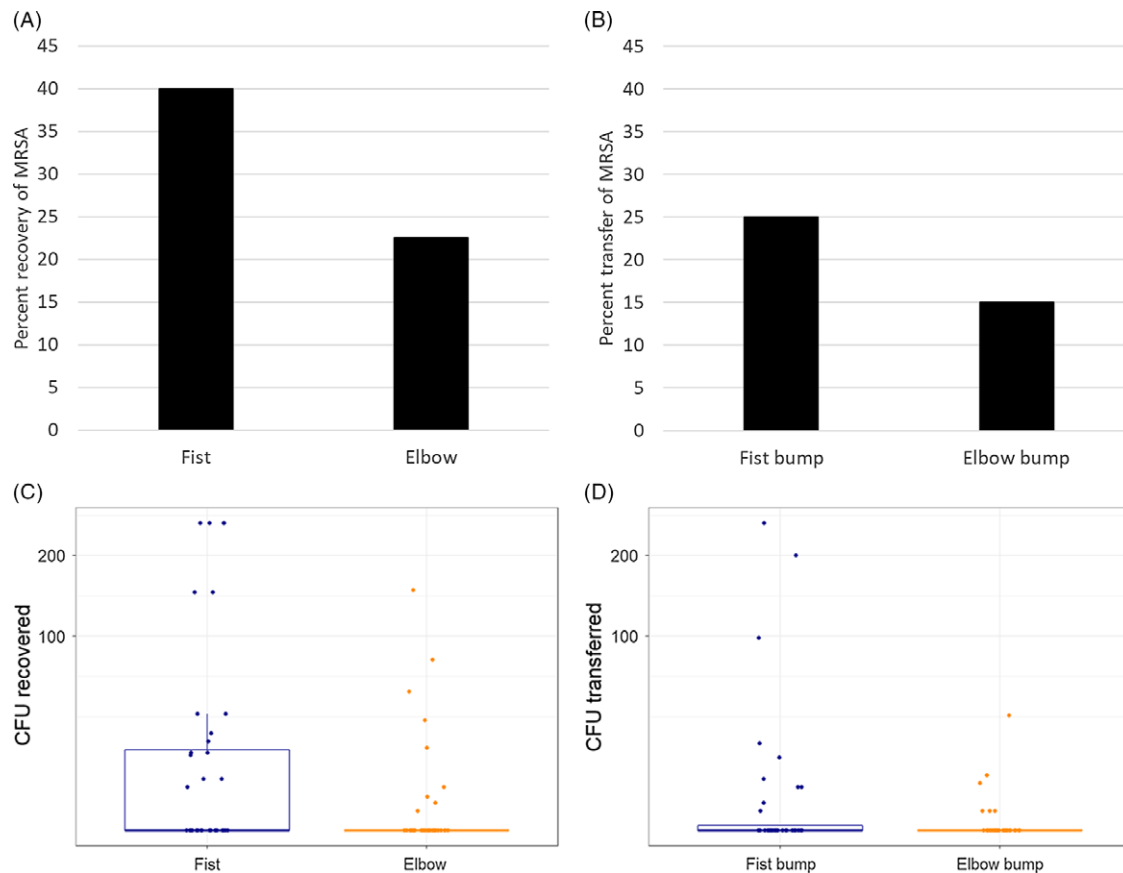
Each participant served as an internal control and performed 1 greeting using their right fist or elbow and 1 with their left fist or elbow; the order of the greetings alternated among consecutive participants. The recipient for the greetings was a research staff member. The recipient wore a sterile glove on the hand that received the fist bump. A 10 × 10-cm section of cotton cloth cut from hospital scrubs was attached over the elbow of the recipient to receive the elbow bump. After the greeting, the contacted portions of the sterile glove and cotton cloth were imprinted directly onto BBL CHROMagar RODAC (replicate organism detection and counting) plates containing cefoxitin 6 µg/mL. The fist of the hand used by the patient for the fist bump and the elbow used for the elbow bump were imprinted onto additional RODAC plates to assess the burden of MRSA. For participants with long-sleeved shirts, clothing was not removed for the greetings or the imprint cultures. For a subset of the participants, an anterior nares swab was collected to determine whether MRSA colonization was detectable at the time of enrollment. Plates were processed for recovery of MRSA as previously described.<sup>4</sup> The number of MRSA colony-forming units (CFUs) recovered was counted.

Analyses were exploratory because the study was not powered to detect significant differences between the greetings. The McNemar test was used to compare the frequency of contamination of fists versus elbows and the frequency of transfer for fist bump versus elbow bump paired within subject. The Wilcoxon signed rank test was used to compare the paired differences per participant in numbers of MRSA colonies recovered from fists versus elbows and the numbers transferred via fist bump versus elbow bump. Data were analyzed using R version 3.5.0 software (R Foundation for Statistical Computing, Vienna, Austria).

### Results

For the 40 MRSA-colonized patients, the mean age was 69.4 (range, 51–79), 40 (100%) were men, 6 (15%) were long-term care facility (LTCF) residents, 8 (20%) had limited mobility, and 34 (85%) had received antibiotic therapy within the previous month. Also, 12 patients (30%) reported regular use of hand





**Fig. 1.** Percent recovery of methicillin-resistant *Staphylococcus aureus* (MRSA) from fists versus elbows (A) and transfer by fist bump versus elbow bump (B) and boxplots showing the colony-forming units (CFU) recovered from fists versus elbows (C) and transferred via fist bump versus elbow bump (D). The top and bottom of the boxes in the boxplots indicate the interquartile range (IQR) and the horizontal line the median which was 0 for each variable on the x axis. Whisker endpoints extend to last value within 1.5 times the IQR above the third quartile or below the first quartile.

sanitizer or soap and water handwashing while in the hospital or LTCF. For the subset of 32 participants with anterior nares cultures, 18 (56.3%) had positive cultures for MRSA; the average  $\log_{10}$  CFU recovered from nares was 3.0 (range, 0–4  $\log_{10}$ ).

Furthermore, 21 (52.5%) participants wore long-sleeved shirts and 19 wore short-sleeved shirts. As shown in Figure 1, MRSA was recovered more frequently from the fist versus elbow of the MRSA-colonized patients [16 of 40 (40%) vs 9 of 40 (22.5%);  $P = .02$ ], but there was no significant difference in the frequency of MRSA transfer for the fist bump versus the elbow bump [10 of 40 (25%) vs 6 of 40 (15%);  $P = .13$ ]. Significantly more MRSA colonies were recovered from fists versus elbows (Fig. 1C), and more MRSA colonies were transferred by fists versus elbows (Fig. 1D) ( $P < .01$  for each comparison). All transfer of MRSA occurred in the 18 patients with confirmed positive nares cultures for MRSA on enrollment.

## Discussion

The handshake is a deeply ingrained social custom and a public health hazard. Alternative greetings such as the fist bump and elbow bump are increasingly used with the goal of reducing pathogen transfer.<sup>1,2</sup> However, both handshake and fist bump greetings have been associated with frequent transfer of MRSA and a benign virus.<sup>4,5</sup> In the current study, fist bump and elbow bump greetings from MRSA-colonized patients were associated with frequent transfer of MRSA (25% vs 15%, respectively),

although significantly fewer colonies were transferred via elbow bump. Our results suggest that noncontact greetings should be encouraged to reduce the risk for pathogen transfer.

Given that greetings involving contact are strongly established as a social custom, efforts to minimize hand and clothing contamination may be helpful in reducing the risk for pathogen transfer by fist bump and elbow bump greetings. Personnel and patients should be aware of the need to perform hand hygiene after fist bump greetings. Educational interventions have been shown to increase patient hand hygiene.<sup>9</sup> Ensuring that MRSA patients change clothing daily might reduce the burden of contamination on clothing.<sup>6</sup> Improved bathing practices might reduce the burden of MRSA on skin, with subsequent reductions in clothing contamination. Antimicrobial-impregnated clothing has reduced contamination in some studies in healthcare personnel,<sup>6</sup> and silver-based laundry treatment reduced bacterial contamination on patient gowns and bed sheets.<sup>10</sup> Additional studies of antimicrobial-impregnated clothing are needed in patients.

Our study has some limitations. We only studied 1 pathogen in a single facility with predominantly male patients. The number of participants was relatively low. The failure to detect a significant difference in the frequency of transfer may have been due to insufficient power. Only 30% of participants reported regular hand hygiene while in the hospital or LTCF. Additional studies are needed with other pathogens and in settings with higher frequency of patient hand hygiene. Only 56% of the participants in isolation for previous MRSA colonization had positive nares cultures on

enrollment, and all transfer was from these individuals. Thus, our results may underestimate the true frequency of transfer from colonized patients. Finally, transfer of MRSA via fist bump to a gloved hand may differ from transfer to a bare hand.

In summary, fist bump and elbow bump greetings both resulted in frequent transfer of MRSA from colonized patients. In addition to promoting noncontact greetings, there is a need to improve patient hand hygiene and to identify other strategies to reduce transfer of pathogens by hands and clothing. There is also a need to assess the risk for transmission of severe acute respiratory syndrome coronavirus 2 or surrogate viruses with different types of greetings.

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