



Major Article

Health care worker hand contamination at critical moments in outpatient care settings



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Background: The delivery of health care in outpatient settings has steadily increased over the past 40 years. The risk of infection in these settings is considered to be low. However, the increasing severity of illness and complexity of care in outpatient settings creates a need to reexamine the transmission of pathogens in this setting.

Materials and Methods: Seventeen health care workers from 4 wound care facilities were sampled during 46 patient care encounters to determine the presence of health care-associated pathogens (ie, methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococcus*, multidrug-resistant *Acinetobacter* species, and *Clostridium difficile*) on their hands at key moments of care.

Results: Health care workers acquired at least 1 pathogen on their hands during 28.3% of all patient care encounters. Hands sampled before a clean or aseptic procedure and hands sampled after body fluid exposure risk were each contaminated in 17.4% of instances. Hand contamination occurred in 19.6% of instances where health care workers wore gloves during care compared with 14.6% when health care workers were ungloved.

Conclusions: Contamination of health care workers' hands presents a significant risk of pathogen transmission in outpatient settings. Gloving education, hand hygiene solutions at the point of care, and hand hygiene surveillance are important solutions for reducing transmission of pathogenic organisms.

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BACKGROUND

The delivery of health care has transitioned from centralized, acute care hospitals to community-based outpatient (ambulatory) care settings over the past several decades. Outpatient care settings consist

of physician offices, hospital emergency departments, hospital and nonhospital-based clinics, surgical centers, and many other specialized service centers.^{1,2} During the 10-year period from 1997–2007, outpatient care visits increased by 25% to an estimated 1.2 billion visits with a rate of 4 visits per year per person.³ The rise in utilization of outpatient care centers has been attributed to advancement in medical technology, insurance reimbursement, convenience of care, and efforts to control health care costs.

Infection prevention infrastructure and resources in outpatient settings are often not equivalent to those of acute care hospitals.^{4,5} The lack of infection prevention resources combined with the

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increasing severity of illness, increasingly complicated procedures, and time pressure make infection prevention programs and practices critical to protect patients and health care workers (HCWs) from health care-associated infections (HAIs) in outpatient settings. In 2014, the Centers for Disease Control and Prevention (CDC) updated the guide to infection prevention in outpatient settings to highlight the need for dedicated infection prevention staff, training, HAI surveillance, and the use of standard precautions.¹ In addition, the World Health Organization (WHO) adapted their recommendations on hand hygiene best practices for outpatient settings.²

Hand hygiene is among the most important measures to prevent the transmission and acquisition of HAIs.⁶ The WHO has defined 5 key moments for hand hygiene in outpatient care settings and CDC has suggested 6 key situations when hand hygiene should be performed.^{6,7} Despite the hand hygiene recommendations, the scientific evidence of microbial transmission during critical moments of care in outpatient care settings is limited.² In this study, the primary research objective was to quantify the presence of health care-associated pathogens on the hands of HCWs at 2 of the key moments for hand hygiene in an outpatient care setting and to determine the influence of glove use. In addition, the study sought to clarify the distribution of hand contamination among HCWs in outpatient care facilities.

MATERIALS AND METHODS

Study design

The institutional review board at each facility approved the study. HCWs at 4 wound care facilities in northeastern Ohio were invited to participate on each day of sampling and those who chose to participate signed an informed consent. Sampling took place on 2 separate days at each facility. Participants were asked to perform routine patient care activities, including hand hygiene, with no deviation from their routine practices, except requiring hand hygiene before entering the examination room. Research staff monitored and recorded the application of hand hygiene before entering the examination room. For this study, a patient care encounter was defined as the entire care process for 1 patient, including patient rooming, initial patient contact, wound care, and patient discharge. During the patient care encounter hand samples were taken before performing a clean or aseptic procedure (WHO moment 2) and after gloves were removed following body fluid exposure risk (WHO moment 3). In this study moment 2 corresponded to the moment immediately before wound treatment and moment 3 corresponded

to the moment immediately after wound treatment (Fig 1). WHO moments 2 and 3 relate to the moments in the Canadian guidelines 4 moments and are similar to the indications for hand hygiene recommended in the CDC guidelines. Only paired samples taken before moment 2 and after moment 3 from the same patient were included in the results. Participants were allowed to be sampled while giving care to a maximum of 3 patients (ie, 6 total samples) per day to limit workflow disruption. Samples were only taken from HCWs who were providing care during the entire patient encounter of a single patient (ie, rooming to exam conclusion). When multiple patient encounters were sampled from the same HCW during the same clinic day, the encounters sampled were always taken sequentially and never occurred simultaneously. Observation of hand hygiene upon room entry and self-reported glove use were recorded during patient care. Three of the facilities followed CDC hand hygiene guidelines, whereas 1 facility followed the WHO guidelines.

Hand sampling

A hand sampling method described in the American Society for Testing and Materials Standard Test Method E1115-10 was used to recover bacteria from HCWs' hands. Briefly, a sterile, powder-free surgical glove was placed on the dominant hand of the participant, and 50 mL sterile sampling solution (0.075 mol/L phosphate buffer, pH 7.9, containing 0.1% polysorbate 80, 0.1% sodium thio-sulfate, and 0.3% lecithin) was added to the glove. The glove was secured at the wrist with a tourniquet, and the gloved hand was uniformly massaged for 1 minute by the research staff. While the glove remained on the hand, 20 mL sampling solution was aseptically removed from the glove and placed in a sterile sample cup. After sampling, the participants washed hands to remove any residual sampling solution.

Bacteria recovery and identification

The sampled solution was centrifuged at 10,000 g for 10 minutes, and 15 mL supernatant was discarded. The pellet was resuspended in the remaining 5 mL supernatant, and the concentrated sample was plated on various growth media. The limit of detection for the identification of each pathogen was 250 CFU per hand. The identification of methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), multidrug resistant *Acinetobacter* sp, and *Clostridium difficile* are described previously.⁸ Gram stains were performed on all isolates and coagulase tests were used to further confirm MRSA-positive samples.

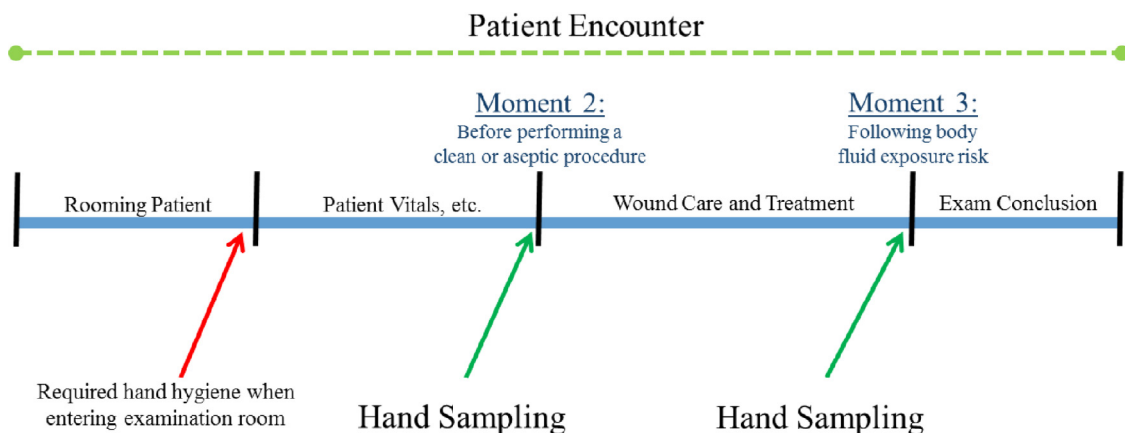


Fig 1. Patient encounter and hand sampling schematic.

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