

Healthcare Worker Hand Contamination at Critical Moments in Outpatient Care Settings



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Abstract

Background: The delivery of healthcare in outpatient settings has steadily risen 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 the need to reexamine the transmission of pathogens in these settings.

Methods: Using an American Society for Testing and Materials (ASTM) hand sampling methodology, healthcare workers from four wound care facilities were sampled during 46 patient care encounters to determine the presence of healthcare-associated pathogens on their hands at key moments of care. Hands were tested for MRSA, VRE, *Acinetobacter*, and *C. difficile*. Glove use was recorded during patient care.

Results: Healthcare workers acquired a pathogen on their hands during 28.3% of all the patient care encounters. Hands sampled before a clean or aseptic procedure and hands sampled after body fluid exposure risk were both contaminated in 17.4% of all instances. Hand contamination occurred in 19.6% of instances where healthcare workers wore gloves during care compared to 14.6% when healthcare workers were ungloved.

Conclusions: The risk of pathogen transmission in outpatient settings must be reconsidered because of the significant contamination found on healthcare workers hands. Attention to hand hygiene compliance at critical moments during patient care is supported by this study. Glove use did not prevent contamination of the hands reaffirming the need for hand hygiene when donning or doffing gloves.

Introduction

- As stated in the Centers for Disease Control and Prevention Guideline for Hand Hygiene in Health-Care Settings, failure to perform appropriate hand hygiene is considered the leading cause of healthcare-associated infections (HAIs) and spread of multidrug-resistant organisms.¹⁻⁴
- Cross-transmission of infection between patients occurs primarily via the contaminated hands of healthcare workers.^{2,3,5-8}
- Over the past several decades, a significant shift in healthcare delivery from the acute, inpatient hospital setting to a variety of ambulatory and community based settings has occurred.⁹
 - Vulnerable patient populations rely on frequent and intensive use of ambulatory care to maintain or improve their health.
- In 2014, the CDC updated the guide to infection prevention in outpatient settings that highlighted the need for dedicated infection prevention staff, training, HAI surveillance, and the use of standard precautions. In addition, the World Health Organization (WHO) adapted their recommendations on hand hygiene best practices for outpatient settings.
- There is a paucity of research on hand hygiene in the ambulatory care practice setting despite its expanding role in healthcare.

Research Objective: The primary research objective was to quantify the presence of healthcare-associated pathogens on the hands of healthcare workers at two of the key moments for hand hygiene in an outpatient care setting and to determine the impact of glove usage. In addition, the study sought to understand the distribution of hand contamination among healthcare workers in outpatient care facilities.

Material and Methods

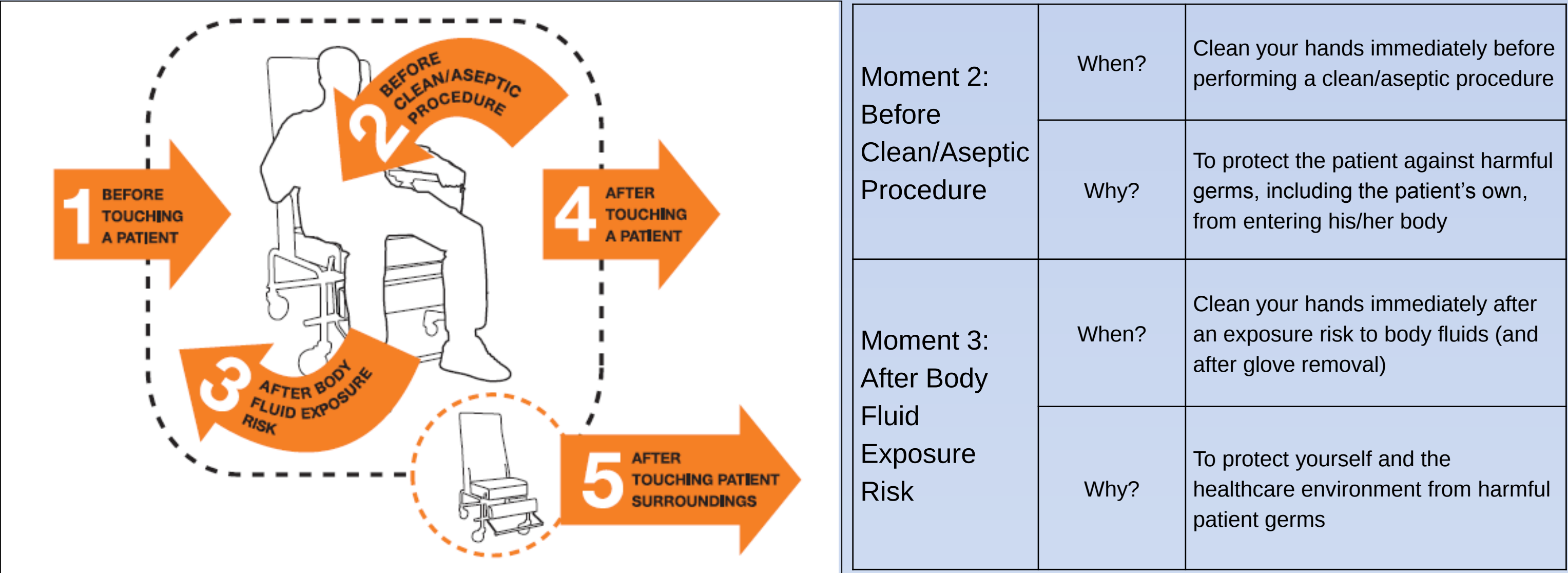
Study Design: Healthcare workers (HCWs) at four wound care facilities in Northeast Ohio were invited to participate each day of sampling and those who chose to participate signed an informed consent. Participants were asked to perform routine patient care activities with no deviation from their routine practices, except requiring hand hygiene before entering the examination room. For this study, a patient care encounter was defined as the entire care process 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 (Moment 2, WHO) and after gloves were removed following body fluid exposure risk (Moment 3, WHO). In this study Moment 2 corresponded to the moment immediately before wound treatment and Moment 3 corresponded to the moment immediately after wound treatment (Figure 1). Only paired samples taken prior to Moment 2 and after Moment 3 from the same patient were included in the results. Observation of hand hygiene upon room entry and self-reported glove use were recorded during patient care.

Hand Sampling: A hand sampling method described in the ASTM Standard Tests Method E 1115-10 was used to recover bacteria from HCW's hands. Briefly, a sterile, powder-free surgical glove was placed on the dominant hand of the participant, and 50 mL of sterile sampling solution 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. The sampling solution was aseptically removed from the glove and enumerated for the presence of pathogens.

Bacterial Recovery and Identification: The sampled solution was plated on various growth media for the identification of Methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin-resistant *Enterococcus* (VRE), multi-drug resistant *Acinetobacter* species and *C. difficile*. The limit of detection for the identification of each pathogen was 250 colony-forming units/hand. Gram stains were performed on all isolates and coagulase tests were used to further confirm MRSA positive samples. Growth of any single organism was recorded as a positive for hand contamination.

Statistical Analysis: The odds of hand contamination was assessed by a mixed effects logistic regression model with random effects for date crossed with facility, and HCW nested in facility. The random effects accounted for the repeated measures taken from each HCW, date, and facility. Individual value plots and residual plots, and Hosmer and Lemeshow goodness of fit tests, were used to assess the fit of the logistic regression model to the data. All analyses were performed using package lme4 and R. All statements of statistical significance are based on Wald tests with a significance level of 5%.

Study Design



Patient Encounter

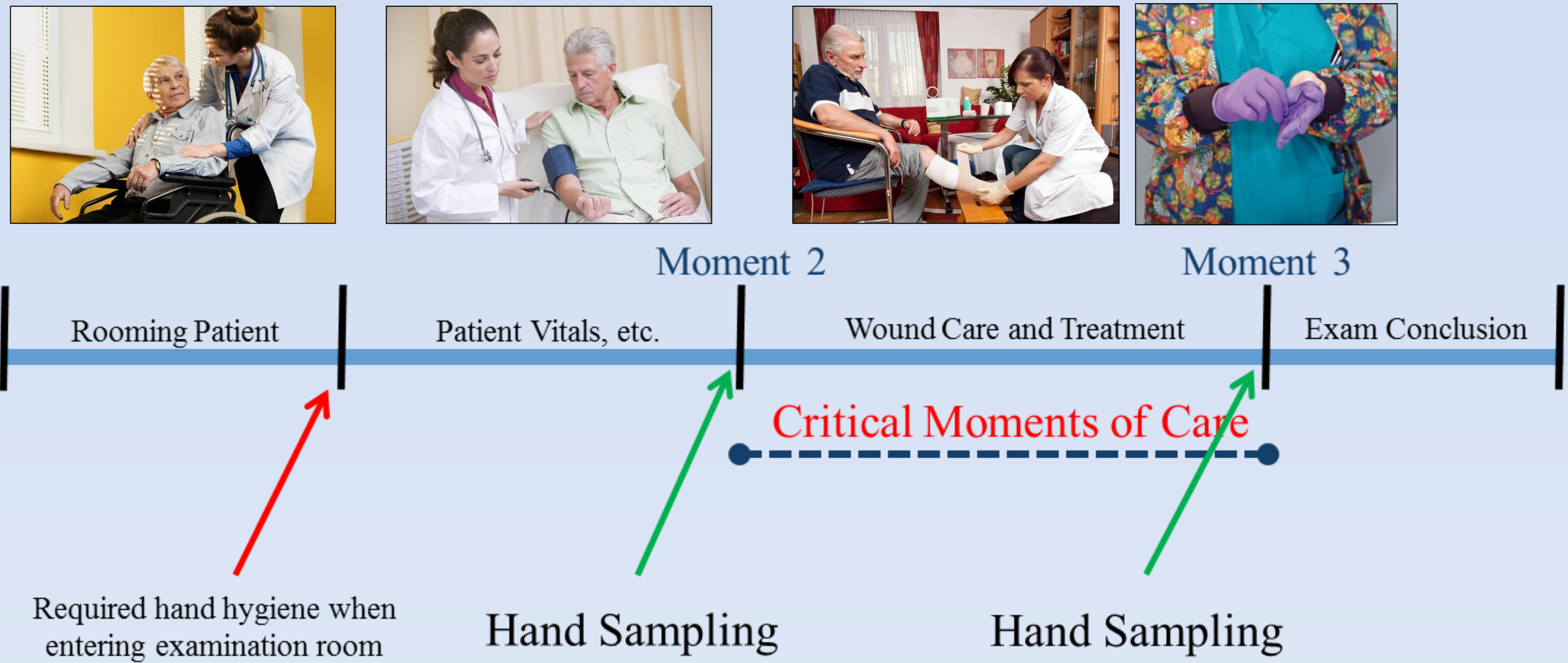


Figure 1: Schematic of a typical patient encounter beginning with the initial patient contact and ending after wound care and treatment. The two moments of hand sampling are shown (before clean/aseptic technique and after body fluid exposure risk).

Results

Table 1: Breakdown of healthcare workers hand contamination during patient care encounters, % (n)			
Pathogens	Moment 2 Events (n = 46)	Moment 3 Events (n = 46)	Patient Care Encounters (n = 46)
MRSA	4.4% (2)	10.9% (5)	13.0% (6)
VRE	2.2% (1)	0.00% (0)	2.2% (1)
<i>Acinetobacter</i>	0.0% (0)	2.2% (1)	2.2% (1)
<i>C. difficile</i>	10.9% (5)	4.4% (2)	15.2% (7)
Any Pathogen	17.4% (8)	17.4% (8)	28.3% (13)

Results (Continued)

Table 2: Incidence of hand contamination based on glove usage, positive samples/total samples (%)		
Time of Care	Positive Samples (n = 16)	
	Gloved	Ungloved
Prior to Moment 2	2/5 (40.0)	6/41 (14.6)
Between Moments 2 & 3	8/46 (17.4)	0/0 (N/A)
Combined	10/51 (19.6)	6/41 (14.6)

Table 3: Analysis of hand contamination by healthcare worker, % (n)			
Hand Contamination Events	Percentage of Contaminated Healthcare Workers		
	Moment 2	Moment 3	Patient Care Encounters
Once	47.1% (8)	35.3% (6)	64.2% (11)
Twice	0.0% (0)	16.7% (2)	16.7% (2)

Conclusions

- Healthcare worker hands are contaminated during critical moments of care (i.e. before a clean/aseptic procedure (Moment 2) and after body fluid exposure risk (Moment 3))
 - Hand hygiene solutions are needed at the point-of-care to enable timely and efficient
- Glove use did not prevent or reduce hand contamination in this study
 - Existing paradigms that hands are clean post doffing gloves could compromise patient, environmental, and healthcare worker safety
 - Hand hygiene education (including when donning and doffing gloves) must be part of an Outpatient Infection Control Program
- The majority of healthcare workers’ hands (64.2%) become contaminated during patient care demonstrating that contamination is not concentrated between a subset of healthcare workers
 - Moment 2 & Moment 3 are critical moments to monitor hand hygiene compliance in a Outpatient

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