Infection Control & Hospital Epidemiology (2024), **45**, 788–789
doi:10.1017/ice.2024.24

SHEA

Concise Communication

Contact precautions as a barrier to hand hygiene: The Plan–Do–Study–Act (PDSA) framework to improve compliance with gloved hand hygiene

Pamela Bailey DO, MPH[1], Kaila Cooper RN, MSN[2], Michael P. Stevens MD, MPH[3], Gonzalo Bearman MD, MPH[2] and Michelle Doll MD, MPH[2]

[1]Prisma Health Midlands, Columbia, South Carolina, [2]Virginia Commonwealth University Healthcare System, Richmond, Virginia and [3]West Virginia University Healthcare System, Morgantown, West Virginia

Abstract

In an identified quality improvement effort, nurses were observed regarding their workflow while in contact precaution rooms. Multiple opportunities for hand hygiene were missed while nurses were in gloves, predominantly while moving between "dirty" and "clean" tasks. An education initiative afterward did not show improvement in hand hygiene rates.

(Received 26 October 2023; accepted 5 January 2024; electronically published 29 February 2024)

Full compliance with personal protective equipment (PPE) is challenging, with multiple barriers noted: adherence to indicated and appropriate PPE, lack of knowledge of appropriate PPE, added time to nursing workflow, and appropriate donning and doffing techniques of PPE.[1–4] Additionally, nurses tend to batch care to achieve more while in the room when wearing contact isolation PPE.[3,5] Implementation of an electronic hand hygiene technology system alerted medical/respiratory intensive care unit (MRICU) nurses to inadequacies of performing the World Health Organization (WHO) Five Moments of Hand Hygiene when in contact isolation PPE with gowns and gloves.

Methods

Infection preventionists implemented the 'Plan–Do–Study–Act' (PDSA) framework to address the MRICU team concerns. As suggested in systems engineering, an accurate understanding of the independent and interdependent relationships is critical for effective process improvement.[6] A trained hand hygiene observer spent time at the bedside observing minute-to-minute nursing workflows in contact isolation rooms to inform the infection prevention and MRICU regarding the nature of missed opportunities for hand hygiene to inform next PDSA steps. Hand hygiene adherence rates in the unit were compared using a 2-sample *t* test in Microsoft Excel (Redmond, WA).

Results

In total, 6 nurses were directly observed on separate occasions while providing bedside care to understand nursing workflow and barriers to hand hygiene while in contact isolation PPE. The trained observer noted all activities undertaken by nursing staff in each individual patient room. All 6 nurses performed hand hygiene prior to entering the room and when exiting the room. Once donning PPE, they had variable but low compliance with any additional hand hygiene opportunities (Table 1). The average missed opportunities per encounter was 5.2 (range, 2–11). These primarily were moments that would require hand washing or sanitizer if the nurse were not gloved. Changing of gloves occurred in 3 instances, but none of these were accompanied by hand hygiene. Nurses frequently moved between "clean" and "dirty" tasks without changing gloves or performing hand hygiene. Most missed opportunities were hand hygiene prior to an aseptic task such as accessing the clean supply drawer or manipulating vascular access devices. An average of 9.8 tasks were achieved in each room (range, 3–18). On average, each visit was 16 minutes long (range, 4–30).

The next step of the PDSA cycle involved education of the MRICU team, promoting hand hygiene on gloved hands to address the perception that hand hygiene was not feasible while wearing PPE in contact isolation rooms. This education was delivered by the IP team directly to MRICU leadership and then disseminated in shift huddles. MRICU hand hygiene adherence was calculated before and after the educational intervention. From October 2019 to January 2020 (4 months), there were 122,973 complaint opportunities and 131,447 total opportunities, with overall adherence of 93.6%. From February 2020 through December 2020 (11 months), there were 77,358 compliant opportunities and 84,390 total opportunities, with overall adherence of 91.6%. The hand hygiene decrease after the intervention was statistically significant ($P = .009$) and coincided with a marked decrease in overall observations and usership of the hand hygiene monitoring system after March 2020.

Corresponding author: Pamela Bailey; Email: pamela.bailey@uscmed.sc.edu

Cite this article: Bailey P., Cooper K., Stevens M. P., Bearman G., Doll M. Contact precautions as a barrier to hand hygiene: The Plan–Do–Study–Act (PDSA) framework to improve compliance with gloved hand hygiene. *Infect Control Hosp Epidemiol* 2024. 45: 788–789, doi: 10.1017/ice.2024.24

© The Author(s), 2024. Published by Cambridge University Press on behalf of The Society for Healthcare Epidemiology of America.

https://doi.org/10.1017/ice.2024.24 Published online by Cambridge University Press

Check for updates

Table 1. Missed Opportunities by WHO Hand Hygiene Indication

Moment	Missed Opportunities, N/Total Opportunities (%)
1. Before touching a patient	4/10 (40)[a]
2. Before clean/aseptic procedures	12/12 (100)[a]
3. After body fluid exposure risk	5/5 (100)
4. After touching a patient	7/13 (54)[a]
5. After touching patient surroundings	4/4 (100)

[a]Glove change occurred once for each moment type; however, none of the glove changes were accompanied by hand hygiene so were considered to be missed opportunities.

In conclusion, significant opportunity exists for improved hand hygiene while in PPE for contact precautions. Transmission of organisms is reduced by working from "clean" to dirty," with frequent hand hygiene with or without glove changes while providing patient care and touching equipment.[1] When nurses perform care in contact isolation rooms, they may move between "clean" and "dirty" tasks without performing glove changes as recommended, as demonstrated here and elsewhere.[5] There is concern for cognitive overload between the tasks required in nursing care and tasks necessitated by infection prevention practices.[5] Nurses may be more aware of the WHO Five Moments when not wearing gloves in contact precaution rooms, but they may lose the trigger once the gloves are on in the contact isolation rooms. Glove use is also significantly associated with desire for personal safety and could have been learned in lieu of hand hygiene during their professional training.[7,8] Our findings support that providers wearing gowns and gloves need explicit guidance for hand hygiene performance on gloved hands for hand hygiene to occur at all during a patient care encounter.

Our low rates of hand hygiene while in the patient room providing care to complex patients has been reported in previous studies. In a trauma ICU with video review of hand hygiene opportunities, only 3% were compliant with prior to patient contact, 0% were compliant before a clean procedure, 15% were compliant after patient contact, and 2% were compliant after contact with the environment. Glove use was more common, occurring 69% of the time before patient contact, and 47% after patient contact. HCP donned new gloves 75% of the time before bedside procedures. If glove use was incorporated into "appropriate" hand hygiene, compliance increased to 57%.[9] In the 2009 guidance from the WHO, guidelines clearly stated "in no way does glove use modify hand hygiene indications or replace hand hygiene."[10] For this reason, we focused on incorporation of any hand hygiene (regardless of whether glove changes occurred or not) into the bundled care episodes taking place in our ICU isolation rooms.

Unfortunately, we did not see improvement in overall hand hygiene adherence during the follow up period to our PDSA cycle. These data were confounded by the onset of the COVID-19 pandemic, which reached our facility in March 2020. We saw a sharp decline in hand hygiene observations from our monitoring system because providers were afraid to wear the badge inside isolation rooms for fear of COVID-19 contamination of the badges. Other limitations of this study include the Hawthorne effect of the nurses knowing they were observed and potentially changing their workflow during our observations. A convenience sample was used, and the results may not be broadly applicable due to the small sample size and workflows at one institution.

Our study highlights a gap between recommended hand hygiene practices and the realities observed in the care of complex, critically ill patients in contact isolation rooms. As these patients represent our most susceptible to healthcare-associated infections, it is imperative that we seek and offer novel ways to achieve more frequent hand hygiene within these critical care episodes.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/ice.2024.24

Acknowledgments.

Financial support. No financial support was provided relevant to this article.

Competing interests. All authors report no conflicts of interest relevant to this article. P.B. and M.S. performed this work while affiliated with Virginia Commonwealth University Healthcare System.

References

1. Siegel JD, Rhinehart E, Jackson M, Chiarello L. 2007 Guideline for isolation precautions: preventing transmission of infectious agents in health care settings. *Am J Infect Control* 2007;35:S65–S164.
2. Ellingson K, Haas JP, Aiello AE, *et al.* Strategies to prevent healthcare-associated infections through hand hygiene. *Infect Control Hosp Epidemiol* 2014;35 suppl 2:S155–S178.
3. Barker AK, Codella J, Ewers T, Dundon A, Alagoz O, Safdar N. Changes to physician and nurse time burdens when caring for patients under contact precautions. *Am J Infect Control* 2017;45:542–543.
4. Glowicz JB, Landon E, Sickbert-Bennett EE, *et al.* SHEA/IDSA/APIC practice recommendation: strategies to prevent healthcare-associated infections through hand hygiene: 2022 update. *Infect Control Hosp Epidemiol* 2023;44:355–376.
5. Gregory L, Weston LE, Harrod M, Meddings J, Krein SL. Understanding nurses' workflow: batching care and potential opportunities for transmission of infectious organisms, a pilot study. *Am J Infect Control* 2019;47:1213–1218.
6. Yanke E, Carayon P, Safdar N. Translating evidence into practice using a systems engineering framework for infection prevention. *Infect Control Hosp Epidemiol* 2014;35:1176–1182.
7. Acquarulo BA, Sullivan L, Gentile AL, Boyce JM, Martinello RA. Mixed-methods analysis of glove use as a barrier to hand hygiene. *Infect Control Hosp Epidemiol* 2019;40:103–105.
8. Baloh J, Thom KA, Perencevich E, *et al.* Hand hygiene before donning nonsterile gloves: healthcare workers' beliefs and practices. *Am J Infect Control* 2019;47:492–497.
9. Haac B, Rock C, Harris AD, *et al.* Hand hygiene compliance in the setting of trauma resuscitation. *Injury* 2017;48:165–170.
10. WHO guidelines on hand hygiene in health care. World Health Organization website. https://www.who.int/publications-detail-redirect/9789241597906. Accessed February 16, 2023.