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Brief Report

An in-room observation study of hand hygiene and contact precaution compliance for *Clostridioides difficile* patients

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Using an innovative, covert, in-room observer method to evaluate infection control practices for patients with *Clostridioides difficile* infection, we found no difference between physician and nursing hand hygiene compliance and contact precaution usage. There was also no diurnal variation in hand hygiene practices, but decreased contact precaution usage at night. Conversely, hospital-wide data from overt observations collected over the same time period showed significantly higher hand hygiene compliance among nurses than physicians.

Clostridioides difficile is a major cause of hospital-acquired infection in the United States.[1] Its prevention requires compliance with hand hygiene, particularly soap and water, and contact precautions. Despite numerous prior studies of hand hygiene and contact precautions, few focus on patients with *C difficile* infection (CDI). Furthermore, most rely on overt observations or self-reported data, as opposed to covert observations.[2] Overt reporters consistently overestimate covertly measured hand hygiene rates by 20%-60%, making it difficult to accurately track compliance and intervention effectiveness.[3-5]

Given *C difficile's* unique infection control considerations and the urgency of reducing infection, novel approaches to measuring compliance are needed. Electronic monitoring systems recently became available to automate tracking. However, their use is limited by high upfront cost and unclear accuracy.[6,7] Covert observation remains the gold-standard method, yet is typically also costly and labor intensive.[6] Therefore, we conducted an innovative, in-room observation study using volunteers and light-duty staff to assess hand hygiene and contact precaution practices of hospital employees and visitors interacting with CDI patients.

METHODS

The study was conducted from December 2015 to June 2018, at a 565-bed tertiary-care hospital in Madison, Wisconsin. We employed an in-room methodology to evaluate hand hygiene and contact precaution compliance using volunteer and light-duty staff as covert observers. Observers spent at least 15 minutes inside each CDI patient room, collecting data on entering hospital employees and visitors. Hand hygiene compliance at entry was defined as using alcohol handrub or soap and water. Rubbing hands together on room approach was allowed, as people were presumed to have applied handrub immediately prior. At study inception, our facility had sustained hyperendemic rates of CDI. Therefore, compliance at exit was defined as soap and water use at an inside or outside room sink. Contact precaution compliance was defined as wearing gown and gloves at room entry. Data were categorized into day (7 AM to 3 PM) and night (3 PM to 7 AM) shifts.

All observers completed one-on-one training with a single infection preventionist prior to data collection. They wore identification badges and red polo volunteer shirts, neither of which were visible through the opaque isolation gowns donned on room entry. In an

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Script for introducing self to patient:

Good morning/afternoon/evening Mr. / Mrs. _____. My name is _____. As part of our regular work here at UW Hospital, we like to make sure we are providing the safest care possible. We make sure we are doing this by watching how we care for our patients. If it is alright with you, I would like to sit here in your room for a few minutes and observe anyone who might come in to visit or take care of you. Would that be ok with you? [...] Thank you.

When asked by staff what you are doing there:

My name is _____, and I am working with the department of Infection Control and Nursing Quality looking at patients on enhanced contact isolation precautions. I'm looking at both individual practice and room setup. If you have any questions, you can contact ***** in Infectious Diseases (*****) or ****** in Infection Control (*****).

Once we start. *After an observation of non-compliance:*

For staff: "I am conducting observations for enhanced contact precautions and observed that you did not follow the guidelines (before you entered the patient's room / during patient care / after leaving the patient's room). Please be sure to do this to prevent the spread of infections."

When told "but I didn't touch the patient:"

"Often times, we go into a room without the intention of touching anything, but end up touching a countertop, a monitor, a remote control, a pump, something...it is UW policy and best to adhere to isolation precautions to ensure that we are not putting our patients or ourselves at risk--regardless of whether or not we plan to touch anything in the room."

If you receive a negative response from someone who was non-compliant please contact: ***, MD (for physicians), ****** (for nursing and nursing assistants) or ****** (for any others).***

Fig 1. Script provided to observers to address issues related to patient involvement and staff concerns.

effort to maintain covert observations, we trained and used 195 different observers, to date. Each typically conducted observations once weekly over the course of a college semester. Observations were recorded on OpenText Teleform (OpenText Corp, Waterloo, ON) scannable forms and scanned into a Microsoft Access (Microsoft Corp, Redmond, WA) database. If questioned by staff, covert observers used a standard script to discuss the project (Fig 1).

For comparison, monthly historical hand hygiene compliance data were also obtained from the hospital's infection control database for this time period. These data are routinely collected by trained overt observers on all patients, not just those with CDI. Hand hygiene at entry and exit were reported as a composite measure. Compliance was defined as described earlier, with exit practices liberalized to also include alcohol handrub.

Analyses were performed in R software (R Foundation for Statistical Computing, Vienna, Austria), using the χ^2 test or the t test. This was a quality-improvement study, deemed exempt from review by the University of Wisconsin Health Sciences institutional review board.

RESULTS

A total of 2,889 covert observations were collected from CDI rooms. Among these, visitors had the lowest rates of compliance for all 3 measures: hand hygiene at entry, hand hygiene at exit, and contact precautions (Table 1). Overall hand hygiene compliance among health care workers was 71.6% and 73.7% at entry and exit, respectively. Hand hygiene compliance was comparable between nurses and physicians at entry (70.9% vs 75.0%; $P = .37$) and exit (75.7% vs 71.4%; $P = .17$). Contact precautions compliance was also the same at 80.4% for nurses and 83.7% for physicians ($P = .21$). Overall health care worker compliance with contact precautions was 80.6%.

Table 1
Hand hygiene and contact precautions practices, evaluated by population type and time of observation

	Hand hygiene at entry; n (%)				Hand hygiene at exit; n (%)					Contact precautions; n (%)						
	Compliant		Non-compliant		Compliant		Non-compliant			Compliant		Non-compliant				
	Alcohol rub	S/W	Neither	*P*-value*	S/W in room	S/W outside room	Alcohol rub	Neither	*P*-value*	Gown tied, gloves	Gown untied, gloves	Gown only, tied	Gown only, untied	Gloves only	None	*P*-value*
Population type				<.001					<.001							<.001
Physician	108 (73.0)	3 (2.0)	37 (25.0)		115 (43.9)	72 (27.5)	24 (9.2)	51 (19.5)		170 (55.6)	86 (28.1)	10 (3.3)	11 (3.6)	11 (3.6)	18 (5.9)	
Nurse	497 (67.8)	23 (3.1)	213 (29.1)		665 (52.5)	293 (23.1)	97 (7.7)	211 (16.7)		1061 (68.6)	182 (11.8)	75 (4.9)	29 (1.9)	93 (6.0)	106 (6.9)	
Visitor	24 (27.9)	10 (11.6)	52 (60.5)		39 (32.0)	8 (6.6)	9 (7.4)	66 (54.1)		143 (21.8)	32 (6.3)	111 (21.8)	40 (7.9)	2 (0.4)	181 (35.6)	
Other healthcare†	94 (69.6)	2 (1.5)	39 (28.9)		108 (46.4)	45 (19.3)	19 (8.2)	61 (26.2)		209 (66.1)	39 (12.3)	16 (5.1)	13 (4.1)	16 (5.1)	23 (7.3)	
Other‡	44 (59.5)	3 (4.1)	27 (36.5)		41 (30.6	17 (12.7)	13 (9.7)	63 (47.0)		102 (57.3)	46 (25.8)	5 (2.8)	9 (5.1)	8 (4.5)	8 (4.5)	
Time of observation				.17					.87							<.001
Day	295 (57.5)	11 (2.1)	207 (40.4)		601 (50.7)	221 (18.6)	60 (5.1)	303 (25.6)		941 (60.2)	242 (15.5)	80 (5.1)	50 (3.2)	67 (4.3)	183 (11.7)	
Night	85 (60.7)	8 (5.7)	47 (33.6)		113 (49.6)	47 (20.6)	24 (10.5)	44 (19.3)		187 (56.3)	32 (10.6)	33 (9.6)	14 (4.2)	20 (6.0)	46 (13.9)	

S/W, soap and water.
*Compliant versus non-compliant across all 5 population types.
†Includes pharmacy, physical therapy, occupational therapy, respiratory therapy, phlebotomy, radiology technicians, and other health care workers.
‡Includes environmental cleaning, transport, food services, and other non-health care workers.

There was no difference in hand hygiene compliance for CDI patients at entry or exit between day and night shifts. However, there was a decrease in contact precaution use at night that remained significant among employee-only data, when visitors were excluded (83.3% vs 74.6%; $P = .001$).

A total of 101,833 hand hygiene observations were obtained by infection control. Compliance from these hospital-wide, overt observations was significantly higher for nurses than physicians (97.2% vs 90.5%; $P < .001$). Similar rates were reported for other health care providers (97.1%) and non-health care provider employees (93.0%).

DISCUSSION

There was no difference in hand hygiene or contact precaution compliance between covertly observed physicians and nurses working with CDI patients. However, hospital-wide overt observation data over the same time period showed significantly higher nursing compliance. Although hospital-wide and CDI-specific rates are not directly comparable, hand hygiene compliance at exit is typically higher for patients under contact precautions than the general hospital population.[8,9] Therefore, our CDI-specific hand hygiene rates likely overestimate hospital-wide compliance and underestimate differences between overt and covertly observed measurements at our institution.

The conflicting nature of our in-room and overt observation findings are directly in line with recent systematic reviews of hand hygiene practices, which illustrate a lack of clarity regarding the effect of provider type on compliance.[2] Studies reporting higher nursing compliance typically used overt observations or self-report methodology. However, overt observers overestimate compliance twice as much when evaluating nurses as physicians.[3,4] Therefore, it is not surprising that our institution's nursing and physician hand hygiene rates were more similar among covert than overt observations.

In addition to using distinct CDI-specific and hospital-wide populations for in-room and overt observations, we were also limited by the inability of in-room observers to record outside-room hand hygiene that was not visible from inside. Observers could not doff gown and gloves and exit the patient's room between observations, which resulted in a disproportionate amount of missing data regarding hand hygiene at entry. Considering that all subjects had access to the same outside-room sink and alcohol dispensers, differential rates of visibility are not expected to have biased this assessment of hand hygiene compliance.

Finally, to our knowledge, this is the first study to evaluate diurnal effects of contact precaution usage. Notably, the decrease in compliance overnight cannot be fully explained by low adherence among visitors, as the association remained significant when visitors were excluded. It is possible that fewer providers working overnight results in increased clinical burdens and perceived lack of time, both of which contribute to low compliance with contact precautions.[10]

CONCLUSIONS

Covert observations do not simply replicate the findings of routine, overt observations, but provide a more realistic estimate of compliance with infection control practices. The added burden of covert observation is warranted for CDI patients, given the importance of accurate hand hygiene measurements for this population.[1] The cost of conducting covert observations can be minimized by relying on hospital volunteers and light-duty staff trained in infection control monitoring.

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References

1. McDonald LC, Gerding DN, Johnson S, Bakken JS, Carroll KC, Coffin SE, et al. Clinical practice guidelines for *Clostridium difficile* infection in adults and children: 2017 update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clin Infect Dis 2018;66:e1-48.
2. Erasmus V, Daha TJ, Brug H, Richardus JH, Behrendt MD, Vos MC, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital care. Infect Control Hosp Epidemiol 2010;31:283-94.
3. Wu K-S, Lee SS-J, Chen J-K, Chen YS, Tsai HC, Chen YJ, et al. Identifying heterogeneity in the Hawthorne effect on hand hygiene observation: a cohort study of overtly and covertly observed results. BMC Infect Dis 2018;18:369.

4. Kovacs-Litman A, Wong K, Shojania KG, Callery S, Vearncombe M, Leis JA. Do physicians clean their hands? Insights from a covert observational study. J Hosp Med 2016;11:862-4.
5. Kwok YLA, Juergens CP, McLaws M-L. Automated hand hygiene auditing with and without an intervention. Am J Infect Control 2016;44:1475-80.
6. Ward MA, Schweizer ML, Polgreen PM, Gupta K, Reisinger HS, Perencevich EN. Automated and electronically assisted hand hygiene monitoring systems: a systematic review. Am J Infect Control 2014;42:472-8.
7. Boyce JM. Hand hygiene compliance monitoring: current perspectives from the USA. J Hosp Infect 2008;70:S2-7.
8. Morgan DJ, Pineles L, Shardell M, Graham MM, Mohammadi S, Forrest GN, et al. The effect of contact precautions on healthcare worker activity in acute care hospitals. Infect Control Hosp Epidemiol 2013;34:69-73.
9. Swoboda SM, Earsing K, Strauss K, Lane S, Lipsett PA. Isolation status and voice prompts improve hand hygiene. Am J Infect Control 2007;35:470-6.
10. Efstathiou G, Papastavrou E, Raftopoulos V, Merkouris A. Factors influencing nurses' compliance with standard precautions in order to avoid occupational exposure to microorganisms: a focus group study. BMC Nursing 2011;10:1.