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ORIGINAL ARTICLE

The Effect of Contact Precautions on Healthcare Worker Activity in Acute Care Hospitals

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BACKGROUND AND OBJECTIVE. Contact precautions are a cornerstone of infection prevention but have also been associated with less healthcare worker (HCW) contact and adverse events. We studied how contact precautions modified HCW behavior in 4 acute care facilities.

DESIGN. Prospective cohort study.

PARTICIPANTS AND SETTING. Four acute care facilities in the United States performing active surveillance for methicillin-resistant *Staphylococcus aureus*.

METHODS. Trained observers performed “secret shopper” monitoring of HCW activities during routine care, using a standardized collection tool and fixed 1-hour observation periods.

RESULTS. A total of 7,743 HCW visits were observed over 1,989 hours. Patients on contact precautions had 36.4% fewer hourly HCW visits than patients not on contact precautions (2.78 vs 4.37 visits per hour; $P < .001$) as well as 17.7% less direct patient contact time with HCWs (13.98 vs 16.98 minutes per hour; $P = .02$). Patients on contact precautions tended to have fewer visitors (23.6% fewer; $P = .08$). HCWs were more likely to perform hand hygiene on exiting the room of a patient on contact precautions (63.2% vs 47.4% in rooms of patients not on contact precautions; $P < .001$).

CONCLUSION. Contact precautions were found to be associated with activities likely to reduce transmission of resistant pathogens, such as fewer visits and better hand hygiene at exit, while exposing patients on contact precautions to less HCW contact, less visitor contact, and potentially other unintended outcomes.

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Healthcare-associated infections are a major cause of morbidity and mortality.¹ Declining rates of healthcare-associated infections have been reported in the United States, potentially as a result of increased infection prevention efforts in hospitals.^{2,3} Hand hygiene and contact precautions are central to infection prevention efforts targeting the transmission of multidrug-resistant bacterial infections and other pathogens.⁴

Contact precautions involve the use of gown and gloves for patient contact as well as a private or cohorted room.⁴ They are routinely used for patients colonized or infected with multidrug-resistant organisms (MDROs), including methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile*.⁴ Recent approaches to infection prevention include active surveillance for MRSA.² Active surveillance for MRSA identifies not only patients with infections but also all patients colonized with MRSA, and it is associated with a 3-fold increase in patients being placed on contact precautions.²

Previous studies have highlighted unintended consequences associated with the use of contact precautions.⁵ These include more adverse events,⁶ depression,⁷ delirium,⁷ and possibly worse patient satisfaction and quality of care.^{5,6,8,9} These outcomes are thought to stem from less healthcare worker (HCW) contact and stigmatization. Frequency of HCW contact has been reported to be approximately 50% less frequent in a range of acute care settings.^{5,10,11} Although visits are less frequent in patients on contact precautions, 1 study found only 22% less HCW contact time, suggesting that activities may be “bunched” into longer but less frequent visits.¹⁰ Furthermore, authors have suggested that compliance with hand hygiene may be better¹² or worse^{13,14} with use of contact precautions or glove use. Previous studies have been limited to single centers or a limited sampling of patients.

To determine whether contact precautions modify HCW activity in acute care settings, we conducted a prospective

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cohort study observing HCW activity at 4 acute care hospitals across the United States.

METHODS

The study took place from April 29, 2010, to December 5, 2011. The study was conducted in 3 Department of Veterans Affairs (VA) Hospitals (Baltimore VA Medical Center, Iowa City Medical Center, and Portland VA Medical Center) as well as the University of Maryland Medical Center. The study was conducted in 7 intensive care units (ICUs) as well as 6 medical/surgical wards. Observations were performed in ICUs as well as medical/surgical wards in all VA hospitals. Observations were only performed in ICUs in the university hospital as part of existing protocols.^{15,16} This study was approved by participating institutional review board and VA research and development committees.

Direct Observation

Trained research staff members who did not have clinical responsibilities on the units randomly selected 1 or 2 rooms in each unit and observed these rooms at least 3 times per week for a minimum of 1 hour at random times. Randomization of rooms and times occurred with a preset table of patient rooms. All observers completed training with the data collection tool and performed supervised observation periods with a primary investigator (D.J.M., E.N.P., or G.F.). The data collection tool included start/stop time for the observation and documentation of time of room entry/exit for HCWs and whether they were compliant with hand hygiene and, as appropriate, gowns and gloves. The tool had a checkbox for presence of any visitors during the observation period. "Secret shopper" observers recorded time of room entry and exit over defined 1-hour observation periods as well as hand hygiene behavior on room entry and exit. Observers maintained their presence as "secret shoppers" by bringing other reading material and having a prepared story that they were observing human factors related to HCW movement, if asked (which happened rarely after the first few weeks of study). HCWs were considered compliant with contact precautions if they donned gloves and gowns at time of room entry. Any use of gowns was considered compliant (tied or not). HCWs were considered compliant with hand hygiene if HCWs performed hand hygiene inside the patient room or in the hallway immediately before entering or after exiting the room. Hand hygiene dispensers and sinks were near the exit to patient rooms, and hand hygiene inside the room was often apparent. If a curtain was closed, drying hands or rubbing hands together was considered evidence of hand hygiene. We did not observe all World Health Organization 5 moments for hand hygiene (before touching a patient, before clean/septic procedures, after body fluid exposures/risk, after touching a patient, and after touching patient surroundings), since in-room observation of hand hygiene would not be possible without being conspicuous.⁵ We did not inform HCWs of observation.

Patients on airborne or droplet precautions were excluded. If an aspect of observation could not be observed, that aspect was not recorded and was indicated as nonobservable on the data collection tool.

Types of HCW were divided into 3 groups: provider (physician, nurse practitioner, physician assistant, or medical student), nurse, or other (eg, patient care technicians, respiratory technicians, physical therapy, nutrition, social work).

Contact Precautions

Patients were placed on contact precautions for colonization or infection with MRSA, vancomycin-resistant *Enterococcus*, gram-negative bacteria susceptible to 2 or fewer classes of antibiotics not including tigecycline or polymyxin, or *C. difficile* with active diarrhea. Contact precautions included gown and gloves for all patient contact. Active surveillance for MRSA was performed on all study units.

Statistical Analysis

HCW visit rates (counts and minutes per hour of observation) and hand hygiene compliance proportions were compared by isolation status by first calculating unit-specific rates and proportions (to account for unit-level clustering) and then tested using the paired *t* test or Wilcoxon signed-rank test at the unit level. HCW compliance proportion with contact precautions was compared between ICU units and non-ICU units by calculating unit-specific proportions and tested using the Wilcoxon rank-sum test at the unit level.¹⁷ Statistical analysis was performed using R software.

RESULTS

During the ~19-month study period, 7,743 HCW visits were observed over 1,989 hours of observation. Hours of observation per hospital were as follows: hospital A, 798 hours; hospital B, 645 hours; hospital C, 247 hours; hospital D, 299 hours.

Frequency and Duration of HCW Visits

Frequency of HCW visits differed by contact precautions status. Patients on contact precautions were visited 36.4% less frequently than those not on precautions (2.78 visits per hour [1,663/598] vs 4.37 visits per hour [6,080/1,391]; $P < .001$). This difference was seen among all types of HCWs. Duration of time with patients also differed by use of contact precautions. Patients on contact precautions were visited for 17.7% less time than other patients (13.98 minutes per hour [8,177/585] vs 16.98 minutes per hour [223,121/1,362]; $P = .02$; see Figure 1) This difference was most evident among physicians and providers (8.59 vs 10.44 minutes per hour; $P < .01$; see Table 1). Duration of HCW contact differed among non-ICU, medical/surgical ward patients on contact precautions (11.58 minutes per hour for isolated patients vs 17.30 minutes per hour for other patients [30.1% less contact time]; $P = .01$) but not among ICU patients on contact precautions

(16.39 minutes per hour for isolated patients vs 16.70 minutes per hour for other patients; $P = .51$; see Table 1). These effects were similarly present across all hospitals.

Frequency of Visitors

Patients on contact precautions in this study had fewer outside visitors. Specifically, patients on contact precautions had 23% fewer visitors (18.9% of observation periods [113 of 598 hours of observation] vs 24.4% for nonisolated patients [340 of 1,391 hours of observation]; $P = .08$). Proportion of patients observed on contact precautions versus those not on contact precautions did not vary by shift (68%–73% non-contact precaution observations for day, evening, and night shifts).

Compliance

Overall compliance with gowns and gloves among patients on contact precautions was 66.2% (1,003/1,514). Compliance was greater in ICUs (69.9% [592/847]) than in non-ICU wards (61.6% [411/667]; $P = .18$).

Compliance with hand hygiene was 32.9% (2,539/7,716 opportunities) on room entry and 50.8% (3,919/7,715) on room exit (see Table 2). HCWs were not significantly more likely to perform hand hygiene on room entry for patients on contact precautions (42.5% [706/1,660]) compared with other patients (30.3% [1,833/6,056]; $P = .14$). Hand hygiene compliance at room entry varied from 18.4% to 67.1% for isolated patients and from 17.5% to 45.5% for nonisolated patients. HCWs were more likely to perform hand hygiene on exiting the room of a patient on contact precautions (63.2% [1,044/1,651]) compared with nonisolated patients (47.4% [2,875/6,064]; $P < .001$). This result was consistent across hospitals. These results were not different by VA status

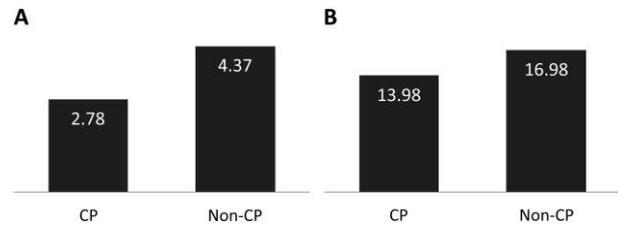


FIGURE 1. Frequency (A) and hourly total duration (B) of health-care worker visits in patients on contact precautions (CP) compared with patients not on contact precautions.

and were more pronounced in ICUs than in non-ICUs (see Table 2).

DISCUSSION

We found that HCWs behaved differently when caring for patients on contact precautions. HCWs were less likely to visit patients on contact precautions and spent less overall time with these patients. This was observed for ward care but not ICU care and was most evident among physicians and other providers but less so in nurses. Hand hygiene was performed more often after leaving the rooms of patients on contact precautions. Patients on contact precautions also tended to have fewer visitors.

From 1999 to 2003, 3 articles reported decreased frequency of HCW visits to patients on contact precautions. These were consistent in finding approximately half as many visits and 20% less contact time with patients.^{10,11,18} Despite newer guidelines cautioning against changes in care associated with contact precautions⁴ and recent patient safety initiatives, we found remarkably similar effects of contact precautions on HCW visits a decade later. The reason for decreased HCW-

TABLE 1. Healthcare Worker (HCW) Contact Time with All Patients and Those on Contact Precautions (CP), Expressed as Both Number of Hourly HCW Visits and Total Amount of HCW Contact (Minutes/Hour)

	No. of HCW visits/person-hour of observation			Visit minutes/person-hour of observation		
	CP	Non-CP	<i>P</i>	CP	Non-CP	<i>P</i>
All HCWs	2.78 (1,663/598)	4.37 (6,080/1,391)	<.001	13.98 (8,177/585)	16.98 (23,121/1,362)	.02
HCW type						
Provider	0.61 (367/598)	0.95 (1,328/1,391)	<.001	8.59 (2,028/236)	10.44 (6,151/589)	.006
Nurse	1.49 (890/598)	2.34 (3,261/1,391)	<.001	9.02 (4,232/469)	9.79 (11,242/1,148)	.43
Other	0.68 (406/598)	1.07 (1,491/1,391)	<.001	6.26 (1,917/306)	7.37 (5,728/777)	.11
ICU status						
ICU	3.00 (897/299)	4.25 (3,191/751)	.02	16.39 (4,785/292)	16.70 (12,325/738)	.51
Non-ICU	2.56 (766/299)	4.51 (2,889/640)	.01	11.58 (3,392/293)	17.30 (10,796/624)	.01
Hospital						
A	2.32 (608/262)	3.88 (2,081/536)	.08	11.23 (2,898/258)	15.16 (8,037/530)	.18
B	3.25 (500/154)	4.09 (2,009/491)	.02	14.06 (2,081/148)	14.57 (6,848/470)	.63
C	2.89 (272/94)	5.05 (773/153)	.10	18.35 (1,725/94)	26.17 (4,004/153)	.22
D	3.22 (283/88)	5.77 (1,217/211)	.15	17.33 (1,473/85)	20.25 (4,232/209)	.07

NOTE. For HCW type, provider is defined as physician, nurse practitioner, physician assistant, or medical student. ICU, intensive care unit.

TABLE 2. Compliance with Hand Hygiene with All Patients and Those on Contact Precautions (CP)

	Hand hygiene entry compliance, %			Hand hygiene exit compliance, %		
	CP	Non-CP	<i>P</i>	CP	Non-CP	<i>P</i>
All HCWs	42.5 (706/1,660)	30.3 (1,833/6,056)	.14	63.2 (1,044/1,651)	47.4 (2,875/6,064)	<.001
ICU status						
ICU	49.0 (439/896)	27.1 (863/3,181)	.07	66.2 (589/889)	48.4 (1,540/3,185)	<.001
Non-ICU	34.9 (267/764)	33.7 (970/2,875)	.97	59.7 (455/762)	46.4 (1,335/2,879)	.02

NOTE. HCW, healthcare worker; ICU, intensive care unit.

patient contact is likely inconvenience related to donning gowns and gloves.⁵ It is unclear why HCW contact was not different in the ICU setting while it was lower in the ward setting. This could relate to single-patient rooms for all ICU patients, higher proportion of patients on contact precautions in the ICU, or higher acuity of care in the ICU. Another possibility is the higher nurse-to-patient ratio in ICUs, so that changing gowns/gloves may be less frequent.¹⁹

Less contact with HCWs suggests that other unintended consequences of contact precautions still exist. This is of particular concern, given that contact precautions are more widely used now than 10 years ago as a result of the Department of Veterans Affairs MRSA Prevention Initiative as well as other active surveillance programs.² The resulting decrease in HCW contact may lead to increased adverse events and a lower quality of patient care due to less consistent patient monitoring and poorer adherence to standard adverse event prevention methods (such as fall or pressure ulcer prevention protocols).⁶ Evidence has continued to accumulate that patients on contact precautions may experience worse outcomes, including more delirium,⁷ more depression,⁷ worse discharge instructions, and less smoking cessation counseling.⁹

We found variability in how contact precautions affected hand hygiene compliance on room entry, with some hospitals in our study observing increased compliance and others observing decreased compliance. This difference was not statistically significant, potentially because of the variability in observed hand hygiene compliance on entry between hospitals. In 1 other study that used a similar approach, no difference was found in hand hygiene compliance rates between patients with contact precautions and those without precautions.²⁰ However, in our study, as in others, there was a consistent increase in compliance after removal of gowns and gloves.

Past studies examining the effects of glove use on hand hygiene have reached differing conclusions. These studies have assessed multiple reasons for glove use, including as part of universal gowning and gloving, contact precautions, standard precautions, or for low-risk care.¹²⁻¹⁴ Fuller et al¹³ reported on 249 hours of observation over 15 hospitals. They found that use of gloves was associated with worse hand hygiene compliance. This was a study of standard precautions or low-risk gloving, since these patients were not on contact precautions.¹³ In our study, there was a clear increase in hand hygiene after caring for patients on contact precautions. This

association between contact precautions and hand hygiene at room exit would be expected to increase the ability of contact precautions to prevent transmission of MDROs.

Limitations of the study include the following: (1) non-ICU units were observed in only the VA hospitals in this study, making the findings less generalizable to non-VA settings; and (2) patient-level factors, such as severity of illness or other methods of case-mix adjustment, were not available (if patients on contact precautions were less acutely ill than other patients, less frequent visits could be appropriate). However, the opposite effect is more likely since colonization or infection with MDROs is typically associated with higher baseline illness severity.

Limitations notwithstanding, this study has strengths, including nearly 2,000 hours of observations at 4 different US hospitals in geographically distinct areas using a standard observation tool. Because of the nearly 2,000 hours of observation, we were able to perform subanalyses based on type of HCW and visitors.

In summary, we found that patients on contact precautions had less HCW contact and visitor contact. Contact precautions had other effects, including increasing compliance with hand hygiene on room exit. Contact precautions were found to be associated with activities likely to reduce transmission of pathogens, such as fewer visits and better hand hygiene, while exposing patients on contact precautions to less HCW contact and potentially more adverse events. Clinicians and healthcare epidemiologists should be aware of the way contact precautions modify care delivery. Researchers need to consider both the positive and negative aspects of interventions using gowns, gloves, and other aspects of patient isolation.

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REFERENCES

1. Klevens RM, Edwards JR, Richards CL, et al. Estimating health care–associated infections and deaths in US hospitals, 2002. *Public Health Rep* 2007;122:160.
2. Jain R, Kralovic SM, Evans ME, et al. Veterans affairs initiative to prevent methicillin-resistant *Staphylococcus aureus* infections. *N Engl J Med* 2011;364:1419–1430, doi:10.1056/NEJMoa1007474.
3. Centers for Disease Control and Prevention. Vital signs: central line–associated blood stream infections—United States, 2001, 2008, and 2009. *MMWR Morb Mortal Wkly Rep* 2011;60:243–248.
4. Siegel JD, Rhinehart E, Jackson M, Chiarello L; Health Care Infection Control Practices Advisory Committee. 2007 guideline for isolation precautions: preventing transmission of infectious agents in health care settings. *Am J Infect Control* 2007;35(Suppl 2):S65–S164, doi:10.1016/j.ajic.2007.10.007.
5. Morgan DJ, Diekema DJ, Sepkowitz K, Perencevich EN. Adverse outcomes associated with contact precautions: a review of the literature. *Am J Infect Control* 2009;37:85–93, doi:10.1016/j.ajic.2008.04.257.
6. Stelfox HT, Bates DW, Redelmeier DA. Safety of patients isolated for infection control. *JAMA* 2003;290:1899–1905, doi:10.1001/jama.290.14.1899.
7. Day HR, Perencevich EN, Harris AD, et al. Association between contact precautions and delirium at a tertiary care center. *Infect Control Hosp Epidemiol* 2012;33:34–39, doi:10.1086/663340.
8. Gasink LB, Singer K, Fishman NO, et al. Contact isolation for infection control in hospitalized patients: is patient satisfaction affected? *Infect Control Hosp Epidemiol* 2008;29:275–278, doi:10.1086/527508.
9. Morgan DJ, Day HR, Harris AD, Furuno JP, Perencevich EN. The impact of contact isolation on the quality of inpatient hospital care. *PLoS One* 2011;6:e22190, doi:10.1371/journal.pone.0022190.
10. Evans HL, Shaffer MM, Hughes MG, et al. Contact isolation in surgical patients: a barrier to care? *Surgery* 2003;134:180–188, doi:10.1067/msy.2003.222.
11. Kirkland KB, Weinstein JM. Adverse effects of contact isolation. *Lancet* 1999;354:1177–1178, doi:10.1016/S0140-6736(99)04196-3.
12. Trick WE, Vernon MO, Welbel SF, et al. Multicenter intervention program to increase adherence to hand hygiene recommendations and glove use and to reduce the incidence of antimicrobial resistance. *Infect Control Hosp Epidemiol* 2007;28:42–49, doi:10.1086/510809.
13. Fuller C, Savage J, Besser S, et al. “The dirty hand in the latex glove”: a study of hand hygiene compliance when gloves are worn. *Infect Control Hosp Epidemiol* 2011;32:1194–1199, doi:10.1086/662619.
14. Bearman GM, Marra AR, Sessler CN, et al. A controlled trial of universal gloving versus contact precautions for preventing the transmission of multidrug-resistant organisms. *Am J Infect Control* 2007;35:650–655, doi:10.1016/j.ajic.2007.02.011.
15. Reisinger HS, Vander Weg M, Morgan D, Forrest G, Shardell M, Perencevich E. Improving hand-hygiene compliance with point-of-use reminder signs designed using theoretical grounded messages. In: *IDWeek 2012*. San Diego, CA: IDWeek, October 18, 2012.
16. Morgan DJ, Pineles L, Shardell M, et al. Automated hand hygiene count devices may better measure compliance than human observation. *Am J Infect Control* 2012, <http://www.ncbi.nlm.nih.gov/pubmed/19249637>.
17. Donner A, Klar N. Design and analysis of cluster randomization trials in health research. *Int J Epidemiol* 2001;30:407–408.
18. Saint S, Higgins LA, Nallamothu BK, Chenoweth C. Do physicians examine patients in contact isolation less frequently? a brief report. *Am J Infect Control* 2003;31:354–356.
19. Sales A, Sharp N, Li YF, et al. The association between nursing factors and patient mortality in the Veterans Health Administration: the view from the nursing unit level. *Med Care* 2008;46:938–945, doi:10.1097/MLR.0b013e3181791a0a.
20. Gilbert K, Stafford C, Crosby K, Fleming E, Gaynes R. Does hand hygiene compliance among health care workers change when patients are in contact precaution rooms in ICUs? *Am J Infect Control* 2010;38:515–517, doi:10.1016/j.ajic.2009.11.005.