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.

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. 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. 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. 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 vs 17.30 minutes per hour for isolated patients vs 11.58 minutes per hour for other patients; \( P = .001 \)).

Table 1 lists the most frequent HCWs visited and their associated contact times. The most visited type of HCW was physician, with a median contact time of 8 minutes per hour. The second most frequently visited HCW was nurse, with a median contact time of 4 minutes per hour. Provider visits were significantly less frequent than other visits (3 minutes per hour). The median contact times for each category of HCW are listed in Table 1.

\[ \text{Table 1: Median Contact Times for Various Categories of HCW} \]

<table>
<thead>
<tr>
<th>Category</th>
<th>Median Contact Time (Minutes/Per Hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physician</td>
<td>3</td>
</tr>
<tr>
<td>Nurse</td>
<td>4</td>
</tr>
<tr>
<td>Provider</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>

CONCLUSION

This study observed that HCW contact times were significantly shorter than those observed in previous studies. 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 vs 17.30 minutes per hour for isolated patients vs 11.58 minutes per hour for other patients; \( P = .001 \)).
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 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)

<table>
<thead>
<tr>
<th></th>
<th>CP</th>
<th>Non-CP</th>
<th>P</th>
<th>CP</th>
<th>Non-CP</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>All HCWs</td>
<td>2.78 (1,663/598)</td>
<td>4.37 (6,080/1,391)</td>
<td>&lt;.001</td>
<td>13.98 (8,177/585)</td>
<td>16.98 (23,121/1,362)</td>
<td>.02</td>
</tr>
<tr>
<td>HCW type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provider</td>
<td>0.61 (367/598)</td>
<td>0.95 (1,328/1,391)</td>
<td>&lt;.001</td>
<td>8.59 (2,028/236)</td>
<td>10.44 (6,151/589)</td>
<td>.006</td>
</tr>
<tr>
<td>ICU status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU</td>
<td>3.00 (897/299)</td>
<td>4.25 (3,191/751)</td>
<td>.02</td>
<td>16.39 (4,785/292)</td>
<td>16.70 (12,325/738)</td>
<td>.51</td>
</tr>
<tr>
<td>Non-ICU</td>
<td>2.56 (766/299)</td>
<td>4.51 (2,889/640)</td>
<td>.01</td>
<td>11.58 (3,392/293)</td>
<td>17.30 (10,796/624)</td>
<td>.01</td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2.32 (608/262)</td>
<td>3.88 (2,081/536)</td>
<td>.08</td>
<td>11.23 (2,898/258)</td>
<td>15.16 (8,037/530)</td>
<td>.18</td>
</tr>
<tr>
<td>B</td>
<td>3.25 (500/154)</td>
<td>4.09 (2,009/491)</td>
<td>.02</td>
<td>14.06 (2,081/148)</td>
<td>14.57 (6,848/470)</td>
<td>.63</td>
</tr>
<tr>
<td>C</td>
<td>2.89 (272/94)</td>
<td>5.05 (773/153)</td>
<td>.10</td>
<td>18.35 (1,725/94)</td>
<td>26.17 (4,004/153)</td>
<td>.22</td>
</tr>
<tr>
<td>D</td>
<td>3.22 (283/88)</td>
<td>5.77 (1,217/211)</td>
<td>.15</td>
<td>17.33 (1,473/85)</td>
<td>20.25 (4,232/209)</td>
<td>.07</td>
</tr>
</tbody>
</table>

Note. For HCW type, provider is defined as physician, nurse practitioner, physician assistant, or medical student. ICU, intensive care unit.
patient contact is likely inconvenience related to donning gowns and gloves. 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.18

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 gowned and gloved, 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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REFERENCE


