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## Impact of Cohorting for Multidrug-Resistant Organisms with and without Real-Time Feedback

*To the Editor*—Creating a cohorting area is recommended by several guidelines as a strategy to prevent transmission of multidrug-resistant organisms.<sup>1,2</sup> The use of a cohort area, coupled with real-time feedback of compliance with infection prevention measures (eg, hand hygiene and gowning and gloving for isolation patients), has successfully contained multidrug-resistant *Acinetobacter baumannii* transmission in a resource-limited setting.<sup>3</sup> The additive effect of patient cohorting and real-time feedback versus the creation of a defined cohort area alone has not been previously examined. Observation and real-time feedback is a resource-intensive

practice; therefore, understanding its contribution to compliance with infection prevention measures is important. We conducted a study to evaluate the effect of creating a cohort area with and without frequent real-time feedback on compliance with infection prevention practices to prevent transmission of multidrug-resistant organisms (MDROs).

A 2-period observational study to evaluate compliance with infection prevention practices was conducted in a 30-bed open unit at Thammasat University, Pathumthani, Thailand. The unit nurse-to-patient ratio was 1 : 8. We created an 8-bed cohort area in the unit, with 1 nurse per shift being assigned to care for patients in this area. Two 1-hour educational sessions per month were provided to all unit nurses on the importance of adherence to the infection control measures. Observations using a standardized data collection tool were performed by infectious diseases physicians (S.W. and P.L.) on isolation equipment preparation (eg, isolation signs being posted and availability of isolation equipment, such as gloves, gowns, masks, alcohol gel, and stethoscopes), infection control practices (eg, hand hygiene before and after patient contact, appropriate use of gloves and gowns, and environmental cleaning), and time spent with each patient. Hand hygiene compliance was defined as the number of observations for which hand hygiene was performed before and after patient contact divided by the total number of observed hand hygiene opportunities. Monitoring of environmental cleaning was performed as described elsewhere.<sup>3</sup> In period 1 (September 1-30, 2012) no feedback of observations was given to staff, while in period 2 (November 1-30, 2012) real-time feedback on infection control adherence was provided to healthcare workers (HCWs) in the cohort area. Real-time feedback was performed by an infection control nurse when HCWs did not perform hand washing or wear an isolation gown 3 times a week. To avoid an impact of education on infection control practices, we allowed a 1-month washout period (October 1-31, 2012) during which neither cohorting nor education was performed.

During the study, there were 600 observations performed (300 in period 1 and 300 in period 2). In period 1 there was no significant difference in isolation equipment preparation and infection control compliance between the cohort and noncohort areas. In period 2 there was a significantly higher compliance with infection control practices in the cohort versus the noncohort area, and HCWs spent more time caring for patients in the cohort area (Table 1). Notably, compliance with gown use was still low in the cohort area (37.2%). When comparing period 2 with period 1, there was a significant increase in the frequency of environmental cleaning in the cohort and noncohort area, and the proportion of each specific MDRO was different. However, there was no significant change in other isolation precaution practices within the noncohort area (Table 1).

Contact isolation is a key measure to prevent the spread of MDROs by indirect contact in the hospital. Previous data

TABLE 1. Outcome of Cohort Section with and without Real-Time Feedback

Variable	Period 1 (September 1–30, 2012)		Period 2 (November 1–31, 2012)	
	Cohort (n = 150)	Noncohort (n = 150)	Cohort (n = 150)	Noncohort (n = 150)
Nurse-to-patient ratio, mean $\pm$ SD	0.21 $\pm$ 0.02**	0.17 $\pm$ 0.01	0.25 $\pm$ 0.03**	0.16 $\pm$ 0.02
Resource utilization				
Isolation sign posted	150 (100)	149 (99.3)	150 (100)	150 (100)
Isolation equipment provided	150 (100)	150 (100)	150 (100)**	137 (91.3)
Hand hygiene	63 (42.0)	71 (47.3)	99 (66.0)*	81 (54.0)
Contact isolation				
Gloves used	58 (38.7)	45 (30.0)	108 (72.0)**	36 (24.0)
Gown worn	18 (12.0)	20 (13.3)	56 (37.3)*	25 (16.7)
Time spent with patient				
$\leq$ 2 minutes	92 (61.3)	79 (52.7)	43 (28.7)	74 (49.3)
$>$ 2 minutes	58 (38.7)	71 (47.3)	107 (71.3)**	76 (50.7)
Type of MDROs <sup>a</sup>				
ESBL-producing Enterobacteriaceae	12 (8.0)	23 (15.3)	48 (32)	45 (30.0)
<i>Pseudomonas aeruginosa</i>	42 (28.0)	2 (1.3)	54 (36)	53 (35.9)
<i>Acinetobacter baumannii</i>	109 (72.6)	127 (84.6)	77 (51.3)	63 (42.0)
MRSA	46 (30.6)	15 (10.0)	18 (12.0)	40 (26.6)
Environmental cleaning				
$\leq$ 2 times per day	150 (100)	150 (100)	15 (10.0)	15 (10.0)
$>$ 2 times per day	0 (0)	0 (0)	135 (90.0)	135 (90.0)

NOTE. Data are no. (%), unless otherwise indicated. ESBL, extended-spectrum  $\beta$ -lactamase; MDROs, multidrug-resistant microorganisms; MRSA, methicillin-resistant *Staphylococcus aureus*; SD, standard deviation.

<sup>a</sup> Because 1 person may have more than 1 MDRO, total sums are more than 100%; the pattern of all MDROs was different between periods 1 and 2 ( $P < .05$ ).

\*  $P < .05$  versus noncohort area in the same study period.

\*\*  $P < .001$  versus noncohort area in the same study period.

suggest that contact isolation may be harmful to patients by reducing the frequency and duration of HCW encounters.<sup>4,5</sup> We found that creating a cohort area did not reduce the time spent with patients and actually increased the time spent in patient care during cohorting with feedback. Although the reason why is unclear, we postulate that being an open unit would have an impact on time spent in patient care during cohort. Despite the creation of a cohort area, compliance with some infection control practices (eg, wearing a gown) were still suboptimal.

There are some limitations to this study. This study was performed in an open unit and may not be generalizable to other settings. Since we did not measure the transmission dynamics for MDROs, we cannot conclude that frequent real-time feedback would actually prevent MDRO transmission. We also did not measure other variables, such as frequency of patient contact in the cohort area or attitude of HCWs and patients toward cohorting. Despite these limitations, our study suggests that compliance of contact isolation and hand hygiene is significantly increased only when frequent real-time feedback (3 times per week) is performed and that creating a cohort area alone is insufficient to change HCW behavior. Additional studies are needed to evaluate the impact

of strategies to prevent the transmission of MDROs in resource-limited healthcare settings.

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## Patient Isolation in the High-Prevalence Setting: Challenges with Regard to Multidrug-Resistant Gram-Negative Bacilli

*To the Editor*—Isolation of patients for prevention and control of infections is a standard intervention in infection control practices. Patients infected or colonized with infective agents that are potentially transmissible are physically isolated in a separate room with protective barriers so as to prevent transmission from patients to other patients, staff, or visitors. Examples of infections for which such isolation practices are implemented include tuberculosis, pandemic viral infections, chickenpox, measles, infectious diarrhea or vomiting, and those caused by multidrug-resistant bacteria. Since infections caused by multidrug-resistant organisms (MDROs) have become a major health concern in recent times, these infections are often the most common cause of keeping a patient under barrier precautions and preventive isolation.<sup>1</sup>

The Tata Medical Center is a newly built modern cancer care center in eastern India. The incidence of community-acquired infections, such as tuberculosis, viral gastroenteritis, and viral respiratory infections, is relatively low in this hospital, and most infection control concerns are regarding multidrug-resistant healthcare-associated infections. Our experience for the past 19 months has shown that the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) is low

in this setting (~10%), whereas infections caused by multidrug-resistant gram-negative bacilli, such as those caused by extended-spectrum  $\beta$ -lactamase (ESBL) producers and carbapenem-resistant organisms, comprise the overwhelming majority of infections (ESBL rate, approximately 70%; carbapenem resistance rate, approximately 20%). A significant proportion of patients visiting this tertiary care referral hospital are already colonized with various MDROs. Results from the surveillance cultures of stool samples done near the time of admission or preintervention in hematology and some surgical patients show a high rate of colonization of patients with various MDROs. The surveillance culture antibiogram is similar in pattern to the antibiogram from diagnostic samples. In this context of high prevalence of MDRO colonization or infection, universal isolation of patients on the basis of MDRO status becomes extremely difficult, if not impossible. The hospital has a 47-bed general ward with 1 isolation room, an 11-bed intensive care unit with 5 isolation rooms, and a significant number of single-bed private rooms for patients requiring general or special medical care who are able to afford a higher rate. Emergency ward, day care unit, pediatric, and postoperative patients are managed in open bays that have a bed capacity of 5–6. Patients coming to this hospital are assigned a specific bed location on the basis of clinical need (eg, intensive care/high-dependency support), age group or specialty (eg, pediatrics), and type of intervention (eg, chemotherapy in day care unit, postsurgical intervention cases in surgical bays). For optimal patient placement, it often becomes difficult to achieve a balance among clinical need, available resources, infection control requirements, and patient preferences.

Being a philanthropic initiative, the hospital has invested heavily in optimal bed spacing (space between beds of 1.2–1.5 m against a World Health Organization [WHO]–recommended standard of 1–2 m; area available per patient in a general ward of 7–8.4 m<sup>2</sup>), good housekeeping, staff training and education on infection control, water-quality monitoring, infection prevention bundles, and optimal selection and use of disinfectants and less in expensive and difficult-to-maintain isolation rooms.<sup>2</sup> Daily infection control e-mail messages are sent to concerned department doctors, medical administration, nursing, and housekeeping along with the quality manager to notify them about new MDRO cases. The e-mail contains standard instructions about WHO guidelines related to barrier precautions, hand hygiene, enhanced cleanliness, housekeeping, and use of personal protective equipment (PPE).<sup>2</sup> A biohazard label is electronically flagged in the hospital management system whenever an MDRO is detected in a patient to remind the user through a visual alert about infection control precautions to be taken. In the real world of optimal patient placement and bed management, priority is often given to clinical needs and logistical feasibility, overriding theoretical infection control concerns. In this hospital, universal precautions are emphasized and barrier precautions are followed for patients infected or colonized with MDROs.