LETTERS TO THE EDITOR

Association of Length of Stay With Contamination of Multidrug-Resistant Organisms in the Environment and Colonization in the Rectum of Intensive Care Unit Patients in China

To the Editor—Multidrug-resistant organisms (MDROs) have recently caused infection outbreaks with increased morbidity and mortality.[1,2] Colonization of the inanimate hospital environment and intestines may contribute to the increased prevalence of MDROs.[3,4] To prevent the spread of MDROs in the intensive care unit (ICU), the correlation between colonization of MDROs and the length of patient hospitalization is important to consider. However, there are few reports in the literature on the epidemiology of MDROs in China that highlight the change in trends of their colonization rate.

Here, we studied the contamination of the surrounding environment (eg, telemetry units, blood pressure cuffs, flashlights, stethoscopes, bedside tables, and bed frames, controllers, and mattresses) and rectal colonization of ICU patients at a tertiary teaching hospital in China with 5 types of MDROs (ie, multidrug-resistant [MDR] *Acinetobacter baumannii* [AB], methicillin-resistant *Staphylococcus aureus*, MDR-*Pseudomonas aeruginosa*, MDR-*Escherichia coli*, and MDR-*Klebsiella pneumoniae*). Samples were collected using cotton swabs. Methicillin-resistant *S. aureus* was isolated by CHROMagar MRSA plates (CHROMagar) and identified using Staphytect Plus kits (Oxoid). Gram-negative MDROs were isolated by ChromID Extended-Spectrum Beta-Lactamase plates (bioMeriéux) and identified using the analytical profile index system (bioMeriéux). AB and *P. aeruginosa* isolates that were resistant to ceftazidime were considered MDROs.

The overall MDRO contamination rate of ICU patients' surrounding environment was 26.4%. The MDR-AB contamination rate was 18.9%, and its proportion versus all MDROs was 71.6%. The contamination rates of methicillin-resistant *S. aureus*, MDR-*K. pneumonia*, MDR-*E. coli*, and MDR-*P. aeruginosa* were 3.4%, 3.0%, 1.6%, and 1.1%, respectively. Furthermore, the MDRO contamination rate was 10.0% on day 1, and it increased to 35.4% by day 3, 35.8% by day 7, and 46.6% by day 14 or longer. The MDR-AB contamination rate and the proportion of MDR-AB versus all MDROs increased with the length of stay in ICU (Table 1).

TABLE 1. Rates of Multidrug-Resistant Organisms (MDROs) Contaminating the Surrounding Environment or Colonizing the Rectum of Intensive Care Unit (ICU) Patients

	Rate, %				
	Length of stay in ICU				
Organism	Day 1	Day 3	Day 7	Day ≥14	Subtotal
Environmental samples					
Before interventions					
MDROs[a]	10.0 (19/190)	35.4 (34/96)	35.8 (29/81)	46.6 (34/73)	26.4 (116/440)[G]
MDR-AB[b]	5.8 (11/190)	22.9 (22/96)	28.4 (23/81)	37.0 (27/73)	18.9 (83/440)[H]
Proportion (MD-AB/MDROs)[c]	57.9 (11/19)	64.7 (22/34)	79.3 (23/29)	79.4 (27/34)	71.6 (83/116)[I]
After interventions					
MDROs	7.5 (13/174)	16.1 (9/56)	11.4 (8/70)	12.0 (20/167)	10.7 (50/467)[g]
MDR-AB	5.8 (10/174)	7.1 (4/56)	10.0 (7/70)	7.2 (12/167)	7.1 (33/467)[h]
Proportion (MD-AB/MDROs)	76.9 (10/13)	44.4 (4/9)	87.5 (7/8)	60.0 (12/20)	66.0 (33/50)[i]
Rectal samples					
Before interventions					
MDROs[d]	56.1 (46/82)	73.5 (36/49)	77.8 (28/36)	81.8 (18/22)	67.7 (128/189)[K]
MDR-AB[e]	9.8 (8/82)	24.5 (12/49)	22.2 (8/36)	45.5 (10/22)	20.1 (38/189)[M]
Proportion (MD-AB/MDROs)[f]	17.4 (8/46)	33.3 (12/36)	28.6 (8/28)	55.6 (10/18)	29.7 (38/128)[N]
After interventions					
MDROs	58.2 (46/79)	72.9 (43/59)	77.1 (27/35)	82.1 (32/39)	69.8 (148/212)[k]
MDR-AB	5.1 (4/79)	27.1 (16/59)	31.4 (11/35)	17.9 (7/39)	17.9 (38/212)[m]
Proportion (MD-AB/MDROs)	8.7 (4/46)	37.2 (16/43)	40.7 (11/27)	21.9 (7/32)	25.7 (38/148)[n]

NOTE. χ^2 test for trend (day 1, day 3, day 7, day ≥14): a, $P < .001$; b, $P < .001$, c, $P = .05$, d, $P = .004$, e, $P < .001$, f, $P = .008$. χ^2 test: G vs g, $P < .001$; H vs h, $P < .001$; I vs i, $P = .474$; K vs k, $P = .653$; M vs m, $P = .578$; N vs n, $P = .457$. MDR-AB, multidrug-resistant *Acinetobacter baumannii*.

https://doi.org/10.1017/ice.2015.282 Published online by Cambridge University Press

The overall MDRO rectal colonization rate was 67.7%, with MDR-*E. coli* at 49.2%, MDR-AB at 20.1%, MDR-*K. pneumoniae* at 18.0%, and MDR-*P. aeruginosa* at 2.7%. The colonization rate for MDROs was 56.1% on day 1, and it was 73.5% by day 3, 71.4% by day 7, and 81.8% by day 14 or longer. In addition, the MDR-AB colonization rate and proportion of MDR-AB versus all MDROs isolated from the rectums of ICU patients were also positively associated with the length of stay in ICU (Table 1).

We implemented a series of interventions, including enhancing the adherence to hand hygiene, disinfecting the environment using Metrex CaviWipes (Metrex) immediately after MDROs detection, and contact isolation. After interventions, the overall MDRO and MDR-AB contamination rates in the surrounding environment decreased to 10.7% and 7.1%, respectively (Table 1). Nevertheless, the overall MDRO and MDR-AB rectal colonization rates showed no significant differences (69.8% and 17.9%, respectively).

These results show that contamination and colonization with MDROs, particularly MDR-AB, in the surrounding environment and rectums of ICU patients, are augmented with increasing of length of stay in ICU. The phenomenon could be explained by the spread of organisms from contaminated sites to other surfaces, the contamination of the environment by sputum, feces, blood, and body fluids from patients, and the selective pressure exerted by antibiotic use. Furthermore, *Acinetobacter* spp. are able to survive on inanimate surfaces for a long time,[3] thus the proportion of MDR-AB versus all MDROs on the surrounding environmental surfaces increased with length of stay in ICU. Therefore, more efforts should be put towards the cleaning and disinfection of the surrounding environment of patients, particularly those who stay in ICU for an extended time. Conventional interventions could lead to the decontamination of MDROs on the surrounding environmental surfaces; however, these procedures will not reduce rectal colonization of gram-negative MDROs. Additional measures, including decreasing unnecessary antibiotic exposure, decontamination of the digestive tract, and chlorhexidine bathing,[5] are needed for the decolonization of endosomatic MDROs.

ACKNOWLEDGMENTS

Financial support. Specialty Fund of Chinese Ministry of Health (No. 201002021); Hunan Provincial Science Fund (No. 2012SK3200).

Potential conflicts of interest. All authors report no conflicts of interest relevant to this article.

Pengcheng Zhou, MD;
Xinrui Xiong, MD;
Chunhui Li, MD;
Anhua Wu, MD

Affiliation: Infection Control Center, Xiangya Hospital, Central South University, Changsha, China.

Address correspondence to Anhua Wu, MD, Infection Control Center, Xiangya Hospital, Central South University, Changsha 410008, China (xywuanhua@csu.edu.cn).

Infect. Control Hosp. Epidemiol. 2016;37(1):120–121
 0899-823X/2016/3701-0022. DOI: 10.1017/ice.2015.282

REFERENCES

1. Furuya EY, Larson E, Landers T, et al. Challenges of applying the SHEA/HICPAC metrics for multidrug-resistant organisms to a real-world setting. *Infect Control Hosp Epidemiol* 2011;32:323–332.
2. Ma X, Wu Y, Li L, et al. First multicenter study on multidrug resistant bacteria carriage in Chinese ICUs. *BMC Infect Dis* 2015;15:358.
3. Karageorgopoulos DE, Falagas ME. Current control and treatment of multidrug-resistant *Acinetobacter baumannii* infections. *Lancet Infect Dis* 2008;8:751–762.
4. Bernard MC, Lanotte P, Lawrence C, et al. Air contamination around patients colonized with multidrug-resistant organisms. *Infect Control Hosp Epidemiol* 2012;33:949–951.
5. Climo MW, Yokoe DS, Warren DK, et al. Effect of daily chlorhexidine bathing on hospital-acquired infection. *N Engl J Med* 2013;368:533–542.

Seasonal Variation of Surgical Site Infections: Why Does It Occur, Why Does It Matter?

To the Editor—I read the article by Durkin et al[1] on the seasonal variation of common surgical site infections (SSIs) with great interest and would like to commend the authors for performing this multicenter study. As stated by the authors, the finding of higher rates of SSIs during warmer months had been previously reported,[2–5] and the current work further corroborates such observation. As a result, the most important question is perhaps no longer whether seasonal variation in SSIs can occur, but rather, what is the basis for this observation? Although Durkin et al primarily invoke an increase in skin and soft-tissue infections during warm and humid months in the general population as an explanation for their findings, a question remains regarding why an excess number of SSIs is occurring despite standard perioperative practices, to which participating hospitals routinely are assumedly adhering irrespective of the month of the year. To explore this question further, I would like to propose a more systematic examination of pre-, intra-, and postoperative factors that may be subject to seasonal change, some of which might have been considered but were not discussed by the authors.

Concerning preoperative variables, factors that may be associated with higher bacterial burden on the patient's skin during warm and humid months,[1] such as excessive perspiration,[6] should be considered in more detail. To this