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Brief report

Multidrug-resistant organisms in a community living facility: Tracking patient interactions and time spent in common areas

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Contact precautions in community living facilities (CLF) are used to reduce the transmission of multidrug-resistant organisms (MDRO). However, this policy does not address the contamination of shared spaces, devices (eg, wheelchairs), and interactions with other patients. Using a real-time surveillance system, this study examines the time MDRO-positive patients spend interacting with others in communal areas. The findings from this study may be used to tailor MDRO policies and practices to the specific needs of CLF.

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Up to 3.8 million infections occur annually in long-term care settings including community living facilities (CLF).¹ Patients who acquire a multidrug-resistant organism (MDRO), such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococci* (VRE), have poorer health outcomes and higher health care costs than their counterparts.² MRSA and VRE are transmitted from a contaminated object or person through direct contact and can colonize on otherwise healthy skin indefinitely.³ Given that MRSA and VRE can live 9 weeks to 6 months on gloves, cotton towels, and medical equipment, these fomites can be reservoirs for MDRO.⁴

To reduce the risk for MRSA and VRE transmission, CLF have instituted contact precautions, requiring staff and visitors to wear a disposable mask, gown, and gloves when entering colonized/infected patient rooms. However, these precautions may not be feasible in a home-like environment⁵ where patients are encouraged leave their room and socialize in common areas. The aim of this study is to use a real-time surveillance system to determine the amount of time MRSA- and VRE-positive patients spend outside of their room in common areas interacting with other patients. These data will be used to discuss potential areas of MDRO transmission in CLF. Interviews with nursing staff are used to supplement these

data, detailing the current practices and procedures for managing MRSA and VRE on the unit.

METHODS

Data and sample

A surveillance system (ultra-wideband [UWB] radio frequency identification device [RFID] [UWB RFID]) was used to objectively record the location of 8 patients (4 MDRO positive, 4 MDRO negative) in a hallway, nursing station, and shower facility in real time. UWB RFID data were collected continuously over the course of 3 weeks with hallway-mounted sensors and patient tags worn on the wrist. The system recorded the (x, y) coordinates of the patient tags with respect to a fixed location in the facility an average accuracy of 50 cm.⁶ These patients were chosen for this study because they were independently mobile (wheelchair/assistive device), had rooms located near each other, and shared a shower facility. This study received approval from the local institutional and VA internal review boards, and all patients in this study granted written consent prior to wearing the tags for surveillance.

Statistical analysis

Descriptive statistics and graphical analyses were conducted using x and y data generated from the UWB RFID sensors and tags. MatLab (Mathworks, Natick, MA) and SPSS version 19.0 (SPSS Inc, Chicago, IL) were used to record time, determine patient movement, and examine patient interactions.

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The views reflected here are the authors and not those of the Veterans Administration.

Conflicts of interest: None to report.

Table 1

Characteristics of patients in the community living facility by multidrug-resistant organism status

Patient	MDRO status	Colonization site	Locomotion method	Incontinent (Y/N)	Invasive device (Y/N)	Broken skin (Y/N)
1	MRSA	Anterior nares	Wheelchair	N	Y	N
2	MRSA	Anterior nares	Wheelchair	N	Y	Y
3	MRSA/VRE	Anterior nares, urine, stool	Wheelchair	Y	N	N
4	MRSA	Anterior nares	Wheelchair	Y	N	N
5	Negative	N/A	Wheelchair	Y	N	N
6	Negative	N/A	Wheelchair	N	N	Y
7	Negative	N/A	Walker/Cane	N	Y	Y
8	Negative	N/A	Wheelchair	Y	Y	Y

Measures

MRSA and VRE status, colonization site, and other descriptive statistics (see Table 1) were determined from patient charts. Two measures were created from the UWB RFID data: patient time per area and patient interactions. Patient interactions were defined as colocation within 2 m (the length of 2 wheelchairs) for at least 60 seconds. In Table 2, this measure includes interactions among all 8 patients in the study because MDRO-positive patients may infect other MDRO-positive patients. Interviews with 2 nursing staff and supporting policy⁷ documentation provided information on the procedures used for cleaning common areas and other objects in the environment (eg, wheelchairs).

RESULTS

Most of the MRSA- and VRE-positive patients were colonized in the anterior nares; 2 were incontinent of urine and/or bowel (see Table 1). All patients used assistive devices for mobility. Half of the patients in this study had an invasive device and broken skin. Nursing staff reported that patients shared assistive devices and that these devices were cleaned monthly.⁷

MRSA- and VRE-positive patients were much less likely than their counterparts to shower; total time in the shower each week was less than 10 minutes (see Table 2). Although showers should be disinfected after each patient,³ patient preferences for specific shower times can alter this schedule, and showers may not be cleaned until the end of the day. UWB RFID data show that MDRO-positive patients were also less likely than MDRO-negative patients to spend time in the hallway and the nursing station areas (see Table 2). This may be because all of the MDRO-positive patients frequented the unmonitored smoking area outside of the facility (MDRO-negative patients were nonsmokers).

The number of social interactions per week among MRSA- and VRE-positive patients is shown in Table 2. MDRO-positive patients interacted with each other and MDRO-negative patients about 10 times/week. MDRO-negative patients interacted with each other about 3 times/week.

DISCUSSION

This study found that MRSA- and VRE-positive patients interacted with each other and other patients regularly in a communal setting. This is of concern given that the MRSA- and VRE-positive patients showered infrequently and these MDRO can colonize on skin indefinitely. Ensuring that MDRO-positive patients receive daily showers and practice good hand hygiene when out of their room may reduce MRSA and VRE transmission risk. Consistent with VA policy,⁷ the wheelchairs in this study were cleaned monthly; more frequent cleanings may be necessary to reduce the risk of MDRO transmission, especially because 2 of the positive MDRO patients were incontinent of urine and/or bowel.⁸ Finally, the

Table 2

The number of minutes spent in common areas and the number of patient interactions by multidrug-resistant organism status

Patient groups	Shower	Hallway	Nursing station	Patient interactions ^a
MDRO-positive patients				
Week 1	<10	390	241	17 [†]
Week 2	<10	150	132	10
Week 3	<10	144	145	4
3-Week mean	<10	228	173	10
MDRO-negative patients				
Week 1	118	1,215	578	1 [‡]
Week 2	134	1,156	390	2
Week 3	132	1,128	435	6
3-Week mean	128	1,166	468	3

^aDefined as colocation within 2 m (the length of 2 wheelchairs) for at least 60 seconds.

[†]MDRO-positive interactions include interactions with MDRO-positive and -negative patients.

[‡]MDRO-negative interactions capture only those among MDRO-negative patients.

MRSA- and VRE-positive patients in this study were located outside of their room, touching other common objects in the environment. Because MRSA and VRE can live for long periods of time on objects in the environment, it is likely that these shared spaces are also contaminated.³

There are several limitations to consider before interpreting results. First, staff may also transmit MDRO, but we were unable to examine this in this study. Second, we were unable to monitor all of the patients on the unit, and we were unable to determine the nature of each interaction (eg, a hallway conversation vs a hug). Third, MDRO-positive patients spent time in the smoking area outside of the facility, and this activity was not monitored. Finally, this study's findings are not generalizable to other patient populations or facilities given the study's small sample size.

Despite these limitations, this study's findings add to the ongoing debate in the literature on the feasibility of contact precautions to reduce MDRO transmission. Some studies show that good hand hygiene and standard precautions reduce the risk for MDRO transmission,⁹ whereas others argue that contact precautions are most effective.¹⁰ These findings may be mixed because studies have largely focused on acute care settings. In a communal environment where less intensive treatment is provided over a longer period of time and patients are frequently located outside of their rooms, a more tailored approach may be needed. For example, to supplement contact precautions, patient education to encourage handwashing before and after contact with other patients and before communal activities¹¹ may reduce the risk for MDRO transmission.

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