



Major Article

Reduction of methicillin-resistant *Staphylococcus aureus* infection in long-term care is possible while maintaining patient socialization: A prospective randomized clinical trial



Lance R. Peterson MD ^{a,b,c,d,e,*}, Susan Boehm RN ^d, Jennifer L. Beaumont MS ^f, Parul A. Patel MT ^d, Donna M. Schora MT ^d, Kari E. Peterson MPH ^d, Deborah Burdsall RN ^g, Carolyn Hines RN ^e, Maureen Fausone BA ^d, Ari Robicsek MD ^{a,c,e}, Becky A. Smith MD ^{a,c,e}

^a Department of Medicine, University of Chicago Pritzker School of Medicine, Chicago, IL

^b Department of Pathology, University of Chicago Pritzker School of Medicine, Chicago, IL

^c Division of Infectious Diseases, Department of Medicine, NorthShore University HealthSystem, Evanston, IL

^d Division of Microbiology, Department of Pathology and Laboratory Medicine, NorthShore University HealthSystem, Evanston, IL

^e Department of Infection Control, NorthShore University HealthSystem, Evanston, IL

^f Department of Medical Social Sciences, Northwestern University Feinberg School of Medicine, Chicago, IL

^g Lutheran Life Communities, Arlington Heights, IL

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methicillin-resistant *Staphylococcus aureus* (MRSA)
real-time PCR
health care-associated infection
decolonization therapy
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Background: Antibiotic resistance is a challenge in long-term care facilities (LTCFs). The objective of this study was to demonstrate that a novel, minimally invasive program not interfering with activities of daily living or socialization could lower methicillin-resistant *Staphylococcus aureus* (MRSA) disease.

Methods: This was a prospective, cluster-randomized, nonblinded trial initiated at 3 LTCFs. During year 1, units were stratified by type of care and randomized to intervention or control. In year 2, all units were converted to intervention consisting of universal decolonization using intranasal mupirocin and a chlorhexidine bath performed twice (2 decolonization-bathing cycles 1 month apart) at the start of the intervention period. Subsequently, after initial decolonization, all admissions were screened on site using real-time polymerase chain reaction, and those MRSA positive were decolonized, but not isolated. Units received annual instruction on hand hygiene. Enhanced bleach wipe cleaning of flat surfaces was done every 4 months.

Results: There were 16,773 tests performed. The MRSA infection rate decreased 65% between baseline (44 infections during 365,809 patient days) and year 2 (12 infections during 287,847 patient days; $P < .001$); a significant reduction was observed at each of the LTCFs ($P < .03$).

Conclusions: On-site MRSA surveillance with targeted decolonization resulted in a significant decrease in clinical MRSA infection among LTCF residents.

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* Address correspondence to Lance R. Peterson, MD, Department of Pathology and Laboratory Medicine, NorthShore University HealthSystem, 2650 Ridge Ave, Evanston, IL 60201.

E-mail address: lance1@uchicago.edu (L.R. Peterson).

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Additional Information: This study is registered with ClinicalTrials.gov (trial no. NCT01302210).

Infections in long-term care facilities (LTCFs) are frequent and result in morbidity, mortality, hospital readmission, and substantial cost to the health care system.¹ There are approximately 16,000 LTCFs, or nursing homes, in the United States that are the residence for 1.5 million persons. In this population of older and generally frailer individuals, some 2 million infections occur each year, often from antibiotic-resistant bacteria.¹ By 2030 it is estimated the LTCF population will grow to 5.3 million people, indicating the urgent need for addressing this health care-associated infection problem.² Common bacterial infections in LTCFs are methicillin-resistant *Staphylococcus aureus* (MRSA), antibiotic resistant gram-negative bacilli, and vancomycin-resistant enterococci that cause urinary, respiratory, and skin-soft tissue infection.¹ A recent critical review investigating prevention of MRSA clinical disease in LTCFs found only a single published controlled trial as of August 2013, which included 32 nursing homes and evaluated the effect of infection control education and training on MRSA prevalence.³ There was no impact on MRSA prevalence as part of the intervention.

We undertook the Detection, Education, Research and Decolonization without Isolation in Long-term care program with a focus on MRSA. Our goal of this demonstration project was to reduce the MRSA clinical disease rate in LTCF residents (eg, patients), as has successfully been done in acute care.^{4,5} Our hypothesis was that this could be done using a novel approach tailored to the LTCF setting without negatively impacting socialization needs and activities of daily living (eating, bathing, dressing, toileting, transferring [walking] and continence) in these patients (residents) who have the LTCF as their home and often permanent residence.

METHODS

Trial design and participants

The overall methods to the Detection, Education, Research and Decolonization without Isolation in Long-term care program pragmatic intervention design were straightforward. We first removed the target pathogen (MRSA) from the population by decolonizing all the intervention unit residents and then tested (using a rapid method) all new admissions on-site followed by decolonization of those positive going to the intervention units. All nursing unit personnel received education on the nature of pathogen transmission, the need for effective cleaning and disinfection of health care facility surfaces and equipment, and the importance of hand hygiene, which are considered standard practices for adequate MRSA control.^{3,6}

The original design was an institutional review board-approved, prospective, cluster randomized, clinical trial performed in 12 nursing units (between 850-900 beds in total) at 3 separate LTCFs, with an approximate total of 4,200 annual admissions. Nursing units for the 3 facilities each belonged to 1 of 3 categories (skilled nursing, rehabilitation, or dementia care) that were included in the cluster randomization. These 12 units were randomly assigned to intervention or control. All persons residing (cared for) in those units were eligible for participation—there were no exclusions. Isolation, or contact precautions, was not part of this trial; therefore, the intervention did not interfere with any movement or daily activities of the residents. A systematic review of the program and outcome measures was done at the end of year 1, before year 2 began.

A point prevalence survey for MRSA nasal colonization was performed at the beginning of the study (March 2011) and then repeated 5 additional times (Table 1). At each of these times, environmental decontamination of flat surfaces in all rooms, common areas, and equipment with bleach was conducted over a 1-week period. Beginning in April 2011 all admissions were tested for MRSA nasal colonization. Discharge testing for MRSA colonization was

Table 1
Project timeline and number of patients (residents) tested during each project event

Event	PP 1 and Decol. of intervention unit residents	All admit testing for MRSA	1420	Apr through Jun	PP 2 and all admit testing for MRSA	1178	Jul	PP 3 and all admit testing for MRSA	1209	Nov	PP 4 and Decol. of all unit residents; all admit and discharge testing for MRSA	1413	Mar	All admit and discharge testing for MRSA	1320	Jan and Feb 2012	PP 5 and all admit testing for MRSA	1209	Sep	All admit testing for MRSA	1355	Oct through Dec	All admit and discharge testing for MRSA	1475	Jan and Feb 2013	PP 6 and all admit and discharge testing for MRSA	1385	Mar
No. included	675																											
Date	Mar 2011																											

Apr, April; Aug, August; Dec, December; Decol, decolonization; Feb, February; Jan, January; Jul, July; Jun, June; Mar, March; MRSA, methicillin-resistant *Staphylococcus aureus*; Nov, November; Oct, October; PP, point prevalence; Sep, September.

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