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Short report

Value of an active surveillance policy to document clearance of meticillin-resistant *Staphylococcus aureus* and vancomycin-resistant enterococci amongst inpatients with prolonged admissions

A. Ghosh [a], L. Jiao [b], F. Al-Mutawa [b], C. O'Neill [c], D. Mertz [a,c,d,e,*]; Hamilton Health Sciences Infection Prevention and Control Team [c]

[a] *Department of Medicine, McMaster University, Hamilton, Ontario, Canada*
[b] *Department of Pathology and Molecular Medicine, McMaster University, Hamilton, Ontario, Canada*
[c] *Hamilton Health Sciences, Hamilton, Ontario, Canada*
[d] *Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada*
[e] *Michael G. DeGroote Institute for Infectious Diseases Research, McMaster University, Hamilton, Ontario, Canada*

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SUMMARY

This article reports the impact of an active surveillance policy to identify clearance of meticillin-resistant *Staphylococcus aureus* (MRSA) or vancomycin-resistant enterococci (VRE) in known colonized inpatients with prolonged admissions in order to discontinue isolation precautions. Amongst 365 colonized patients with hospital admissions exceeding 30 days, clearance rates of 11% for MRSA and 18% for VRE were found after a median of 23 days and 26.5 days, respectively, resulting in a saving of 2152 patient-days of contact precautions over one year. This has proven to be a cost-beneficial policy.

Introduction

Preventing the spread of epidemiologically important antimicrobial-resistant organisms, such as meticillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococci (VRE), within healthcare facilities requires,

* Corresponding author. Address: Hamilton Health Sciences, Juravinski Hospital and Cancer Centre, 711 Concession Street, Section M, Level 1, Room 3, Hamilton, ON L8V 1C3, Canada. Tel.: +1 905 527 4322x43952; fax: +1 905 577 1415.
E-mail address: mertzd@mcmaster.ca (D. Mertz).

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amongst a variety of interventions, the use of contact precautions for known carriers.[1,2] However, contact precautions, involving the use of gowns/gloves and single rooms (when possible), are associated with lower patient satisfaction, fewer interactions with healthcare providers, and delays in care and time-to-bed assignment,[2,3] making it expedient to discontinue contact precautions when it is safe to do so. Carriage may either be persistent, with the antimicrobial-resistant organisms adopted as part of their normal flora, or transient.[4] It is common practice to discontinue contact precautions once a known carrier has had three negative surveillance cultures, collected at least seven days apart while off antimicrobial therapy.[1,2] While outpatient studies suggest clearance of MRSA in the majority of carriers over months to years,[5,6] and clearance of VRE over weeks to months,[7] few data have been published regarding the duration of MRSA or VRE carriage amongst inpatients. A recent study involving new admissions of patients with a history of MRSA carriage favoured an active strategy of screening for clearance over a passive strategy.[8] However, the authors are not aware of published evidence about optimal inpatient surveillance for the clearance of MRSA or VRE.

As such, the authors employed an active surveillance policy to identify inpatients who spontaneously decolonized MRSA or VRE carriage, and were eligible for discontinuation of contact precautions. This article reports the impact of this policy over a one-year period.

Methods

All inpatient admissions exceeding 30 days were reviewed to identify carriers of MRSA or VRE at one paediatric and two adult tertiary acute care teaching hospitals with associated acute long-term and rehabilitation wards in Hamilton, Ontario, Canada from January to December 2012. As a quality assurance project, this study was exempt from approval by the research ethics board.

All three hospitals employed the same active surveillance protocol for known MRSA or VRE carriers to identify clearance. Surveillance samples for MRSA were swabs of anterior nares, rectum, and wound or exit sites (if present), and surveillance samples for VRE were rectal swabs, anal swabs with faecal contamination or stool samples. The policy requires more frequent screening earlier in admission for rapid detection of transient carriers. Surveillance samples were sent weekly for the first two months. If patients remained positive after two months, repeat samples were sent monthly for the next three months, and thereafter every six months if persistently positive. If a surveillance culture was negative, two more samples, taken one week apart, were performed. A patient was considered to be cleared of MRSA or VRE and eligible for discontinuation of contact precautions after three consecutive negative samples (for VRE, the latter two had to be stool samples). Surveillance samples were only taken into account if the carriers were not taking any disqualifying antibacterial agents [any systemic antibiotics for MRSA and VRE-active antibiotics on formulary for VRE (i.e. linezolid, daptomycin, doxycycline, rifampin, fusidic acid, tigecycline, aminoglycosides)]. No attempts to decolonize MRSA carriers with mupirocin and/or chlorhexidine were performed routinely.

The microbiology laboratory processed the samples following the guidelines of the Clinical and Laboratory Standards Institute. Bio Rad Chromogenic MRSA Select medium was used for MRSA samples, and confirmatory Alere PBP2a testing was performed for the first isolate from each patient. Discordant results were resolved with polymerase chain reaction (PCR) testing for *mecA* and *nuc* genes. Dalynn Colorex VRE medium was used for VRE samples, and confirmatory PCR testing for *vanA* and *vanB* genes was performed for the first isolate from each patient.

All data were input into Excel 2007 (Microsoft Corp., Redmond, WA) and PASW 18 (SPSS Inc., Chicago, IL, USA) for analysis. Numbers of samples taken, with and without antimicrobial therapy, were counted to assess adherence to the protocol. Culture results and concurrent antibacterial therapy were reviewed to determine when carriers met the criteria for discontinuation of contact precautions. Time to clearance was calculated from the date of the first positive sample, or admission date if there was a prior history of colonization and colonization had been confirmed at admission, until the date of the first of three negative samples indicating clearance. The number of days of contact precautions saved was calculated from the date of the third negative sample indicating clearance until the date of documented recolonization or discharge. In patients co-colonized with MRSA and VRE, days of contact precautions saved were only counted if there was clearance of both MRSA and VRE. Economic calculations were made using cost estimates, published previously by a similar institution,[9] of $8.50 to process each sample, including nursing and laboratory technician time as well as materials, and $140.00 for each patient-day in contact precautions, including costs of single rooms, gowns and gloves, and additional nursing time per patient encounter.

Results

In total, 365 patients were included in the analysis. Of these, 132 (36%) were colonized with MRSA alone, 196 (54%) were colonized with VRE alone, and 37 (10%) were colonized with both MRSA and VRE (Table I and Figure 1). The majority of patients were admitted to adult acute care sites ($N = 348$, 95%). The average hospital admission was 83 days [median 60, interquartile range (IQR) 41–99].

With regards to adherence to the surveillance protocol, 53% of patients had the expected number of samples taken within a margin of error of one sample, while 28% had two or more

Table I
Clearance and impact of clearance on isolation days

	MRSA	VRE
No. of patients[a]	169	233
No. of patients cleared (%)	19 (11.2)	42 (18.0)
Median time to clearance (IQR), days	23 (14–39)	26.5 (13–45.5)
No. of cleared patients recolonized (%)	4 (20.0)	3 (7.0)
No. of isolation-days saved	961	1190
No. of screenings conducted	538	877

MRSA, meticillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant enterococci; IQR, interquartile range.
[a] Includes 37 patients colonized with both MRSA and VRE.