Original Article

The prevalence of methicillin-resistant *Staphylococcus aureus* colonization in emergency department fast track patients

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BACKGROUND: Over the past two decades, methicillin-resistant *Staphylococcus aureus* (MRSA) has evolved from a hospital-associated infection to a significant public health threat in the community, causing outbreaks of soft tissue infections in otherwise healthy individuals. The goal of this study was to determine the prevalence of nasal MRSA colonization in low acuity Emergency Department (ED) Fast Track patients in order to better characterize the epidemiology of this pathogen.

METHODS: We conducted a cross-sectional study of a convenience sample of adult patients from our ED Fast Track. Nasal swabs were analyzed for MRSA using a polymerase chain reaction assay. Study participants completed a survey assessing traditional risk factors for CA-MRSA colonization.

RESULTS: A total of 106 ED Fast Track patients were tested. Four (3.8%, 95% *CI* 1.5%–9.3%) were MRSA positive. Three traditional CA-MRSA risk factors (personal history of abscess, family history of abscess, and participation in contact sports) were examined. In patients with a positive MRSA nasal swab, only a personal prior history of abscess retained significance (*OR* 33, 95% *CI* 1.7–676, *P*=0.02).

CONCLUSION: This study found a higher prevalence of nasal MRSA colonization in low acuity ED Fast Track patients compared with historical community surveillance studies. A personal history of prior abscess was a significant risk for CA-MRSA carriage.

KEY WORDS: Methicillin-resistant *Staphylococcus aureus*; Emergency department

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INTRODUCTION

Methicillin-resistant *Staphylococcus aureus* (MRSA), first identified in 1961,[1] was primarily a concern for hospitalized patients until the past two decades when new strains of MRSA emerged in the community.[2] Community-associated MRSA (CA-MRSA) is linked to aggressive virulence factors and displays distinctive antibiotic resistance traits, and has become a significant public health threat causing outbreaks of soft tissue infections in otherwise healthy individuals.[3]

While health-care exposure is a reported risk factor for MRSA colonization, prior studies evaluating the baseline rate of MRSA colonization in the general population have reported an extremely low carriage rate in these individuals.[4,5] Due to the growing incidence of CA-MRSA clinical infections, we expected to discover an increased level of nasal MRSA colonization in community members. This cycle of colonization and subsequent infection has a significant impact on health care utilization and resources. Identifying colonization patterns in the community adds to the understanding of this public health challenge and may aid in the development of infection control strategies.

The goal of this study was to determine the prevalence of nasal MRSA colonization in low acuity Emergency Department (ED) Fast Track patients in order to better characterize the epidemiology of this pathogen in our community.

METHODS

Study design and setting

We conducted a cross-sectional study of a convenience sample of low-acuity adult patients from our ED Fast Track treatment area in order to determine the MRSA colonization rate. This was part of a larger study investigating factors associated with MRSA colonization in our ED.[6] Our study setting was a tertiary care community teaching hospital with approximately 82 000 ED patient visits per year. The Fast Track is designed to be a rapid throughput treatment area, and triage criteria include an emergency severity index (ESI) of 4 or 5, representing the lowest acuity patients.

The study period was between May 2006 and September 2006. The hospital institutional review board approved the study, and all study participants provided informed consent.

Selection of participants

Study participants consisted of a convenience sample of low acuity ED Fast Track patients who were willing to undergo nasal swab testing. Exclusion criteria for the study population were age less than 18, pregnancy, hospitalization within the prior 60 days, known prior CA-MRSA infection or history of known CA-MRSA colonization, immunocompromise (diabetes mellitus, malignancy, current chemotherapy, chronic oral steroid use), residency or employment in a long-term care facility, employment as a health care worker, or recent incarceration. These exclusion criteria were chosen to emphasize the likelihood that the colonization prevalence in this study would reflect community exposure to MRSA.

All study participants also answered a set of demographic questions and completed a survey assessing traditional risk factors for CA-MRSA colonization, including a personal or family history of abscess or a family member with an abscess in the prior year, as well as participation in contact sports.

Methods of measurement

We obtained nasal swabs from all study participants and analyzed samples with the Cepheid IDI MRSA polymerase chain reaction assay (Cepheid, Sunnyvale, CA), which has a sensitivity of 94% and a specificity of 95% to 99% for nasal specimens compared with standard culture. Nasal samples were collected by inserting a single-headed synthetic swab (CultureSwab, BBL; Becton, Dickinson and Co) into both the left and right nostrils of each study subject. Samples were obtained during each subject's visit to the ED.

Primary data analysis

We measured the proportion of ED Fast Track patients testing positive for nasal MRSA colonization and calculated 95% confidence intervals (CIs) with the Wilson score method. A sample size of 97 patients with an expected colonization rate of 2% provides a 95% *CI* width of less than 5%. We also performed a multivariate forward stepwise logistic regression model of traditional risk factors for CA-MRSA using a significance of P=0.05 for entry and P=0.10 for removal of variables.

RESULTS

A total of 106 ED Fast-Track patients were tested. Of these patients, 4 (3.8%, 95% *CI* 1.5%–9.3%) were MRSA positive.

Three traditional CA-MRSA risk factors (personal history of abscess, family history of abscess, and participation in contact sports) were examined. In patients with a positive MRSA nasal swab, only a personal prior history of abscess retained significance (*OR* 33, 95% *CI* 1.7–676, P=0.02).

DISCUSSION

The 3.8% MRSA colonization rate in our general community sample reflects higher carriage rates than those published in recent years. Although approximately 30% of the healthy population carries *S. aureus* in the nose, community prevalence estimates of MRSA colonization between 2001 and 2002 were 0.8%.[4] Gorwitz et al[5] reported that the prevalence of colonization with MRSA increased from 0.8% to 1.5% from 2001 to 2004. We believe that the higher rate of MRSA colonization found in our study population is consistent with the ongoing national increased incidence of CA-MRSA soft tissue infections.

Our rate of colonization is concerning. Nasal colonization with MRSA has been shown to place individuals at risk to develop MRSA infections[7] as well as to transmit MRSA to others.[8] Patients colonized with MRSA at the time of hospital admission have a significantly increased risk of developing clinical MRSA infection compared with those colonized with methicillin-sensitive *S. Aureus* (MSSA) or those patients without any staphylococcal colonization.[9] The same pattern was reported in a cohort of healthy US Army soldiers: those colonized with CA-MRSA had a significantly higher incidence of soft-tissue infection compared with soldiers colonized with MSSA.[10] While CA-MRSA is most often associated with skin and soft tissue infections, it also has the capacity to cause invasive disease.[13]

Traditionally reported risk factors for CA-MRSA infection share the element of close personal contact, either through incarceration, sports activities, day care centers, or from family members. By multivariate analysis in our study, however, the only statistically significant risk factor for MRSA colonization was shown to have a personal prior history of an abscess. Obtaining a history of prior abscesses may indicate a higher likelihood of colonization and thereby have implications when choosing antibiotics for skin infections in these patients.

LIMITATIONS

Our study was conducted at a single Chicago area hospital on a convenience sample of otherwise low acuity ED Fast Track patients. Colonization rates may vary in other populations.

We tested colonization of the anterior nares, as this site is considered the most frequent reservoir for *S. aureus*.[11] There are, however, other potential sites of colonization including the pharynx, skin, rectal mucosa, axilla, and inguinal area.

We chose to use the Centers for Disease Control and Prevention (CDC-P) working definition of CA-MRSA rather than a genotypic definition. The CDC-P presumes a MRSA infection to be community-associated if it occurs less than 48 hours after hospital admission and in a patient without a history of hospitalization or surgery within the past year, residency in a long-term care facility, dialysis, and if on admission the patient has no indwelling percutaneous devices or catheters.[12] Since our subjects were low acuity ED Fast Track patients with the previously described exclusion criteria, we viewed positive nasal swabs as representing colonization with CA-MRSA. Since these data were collected, the CDC-P updated its classification of MRSA infections, and used the timing of positive cultures after hospital admission to further stratify health care-associated MRSA infections into community-onset or hospital-onset. Community-associated MRSA cases have no documented health care risk factors.[13]

In conclusion, we demonstrated a higher prevalence of nasal MRSA colonization in our low acuity ED Fast Track patients compared with historical community surveillance studies. A personal history of prior abscess was a significant risk for CA-MRSA carriage in our study population, while other commonly cited risk factors did not affect colonization rates. We anticipate continued escalation in community MRSA colonization and clinical infection rates. Improving our knowledge of MRSA colonization patterns will add to the understanding of MRSA epidemiology.

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Conflicts of interest: We have no conflicts of interest to report.
Contributors: Williamson K proposed the study and wrote the paper. All authors contributed to the design and interpretation of the study and to further drafts.

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