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Value of Methicillin-resistant *Staphylococcus aureus* Nasal Swab Screening for Predicting Invasive Methicillin-resistant *Staphylococcus aureus* Respiratory Infection in Pediatric Patients with Artificial Airways

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ABSTRACT

Background: In our 180-bed, free-standing children's hospital, all patients admitted to intensive care units or from a nursing facility have a GenXpert MRSA nasal screen. This information is routinely used for isolation purposes, but it has increasingly been used to guide antibiotic usage when patients have a suspected infection. Previous studies have demonstrated that patients with positive MRSA screens are at higher risk for MRSA infection. The objective of this study was to evaluate the predictive value of the MRSA screen result for MRSA infection in patients with suspected respiratory infection as tested by bronchoalveolar lavage (BAL) or tracheal aspirate.
Methods: All patients admitted from 1/27/09 to 9/17/13 who had both MRSA screening and BAL or tracheal aspirate performed were retrospectively studied. A total of 1336 pairs of screens and cultures were analyzed for correlation of results using descriptive statistics.
Results: There were 196 positive MRSA screens (14.7%). Forty-five respiratory cultures were positive for MRSA. Of these 45 positive cultures, 13 had negative MRSA screens, while 32 had positive screens. Statistical analyses demonstrated a positive predictive value for the screen of 16.3% and a negative predictive value of 98.9%. Sensitivity of the screen for a positive respiratory culture was 71%, and specificity was 87.3%. Relative risk of culture-positive MRSA respiratory infection with respect to positive screen result was 14.8.
Conclusion: Our study demonstrates that the MRSA nasal screen has a high negative predictive value for MRSA infection in pediatric patients with artificial airways. While patients with a positive screen are at significantly higher risk for culture positive infection, the sensitivity and positive predictive value of a positive screen are relatively low. Since patients with a negative MRSA screen have a lower risk of MRSA respiratory infection, these data could help guide clinicians toward earlier narrowing of empiric antibiotic choices in patients with MRSA screen results and pending respiratory cultures. However, clinical judgment should be used, as 29% of patients in our cohort with a culture positive MRSA respiratory infection had a negative screen. Further study is warranted to clarify the implications of these results.

INTRODUCTION

MRSA infections remain a significant concern for critically ill patients. Many patients are colonized with MRSA, but there is conflicting research regarding whether this increases the risk of invasive infection. In our hospital, all patients admitted to critical care units have a MRSA nasal screen on admission. The result is sometimes used to guide empiric antibiotic selection, but it is unclear if this practice has validity. We sought to examine the correlation between MRSA nasal screen results and MRSA respiratory infections in patients with artificial airways. We hypothesized that patients with a negative MRSA screen were less likely to have an invasive MRSA infection.

METHODS

All patients admitted from 1/27/09 to 9/17/13 were considered for inclusion in this retrospective study. Those that had both a nasal MRSA screen PCR and a tracheal aspirate or BAL during their admission were included in the study. A total of 1336 pairs of screens and cultures were analyzed for correlation.

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RESULTS

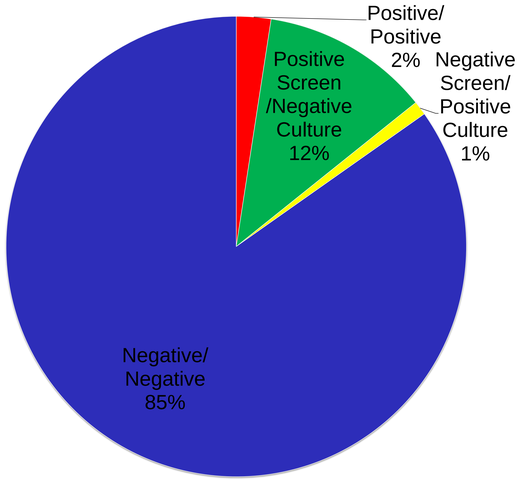
- 1336 screen/culture pairs analyzed, 16 eliminated due to discordant results
- 188 (14%) MRSA screen positive
- 45 (3.4%) MRSA positive cultures
- Relative risk for MRSA infection with respect to positive screen 14.8

MRSA Swab and Culture Results

	Culture Positive	Culture Negative	Total
Screen Positive	32	156	188
Screen Negative	13	1119	1132
Total	45	1275	1320

Predictive Value of Nasal Swab for Respiratory Infection

Sensitivity	Specificity	NPV	PPV
74%	87.3%	98.9%	16.3%



DISCUSSION

- Culture-positive MRSA respiratory infection was rare in our population
- Patients with positive MRSA screen had higher likelihood of culture-positive infection, but positive predictive value and sensitivity of screen were low
- Positive MRSA screen should not alone necessitate antibiotic coverage for MRSA
- High negative predictive value makes screen a potentially useful tool for narrowing empiric antibiotic choices
- Clinical judgment is required, as 29% of patients in our cohort with culture-positive MRSA respiratory infection had a negative screen result
- Further study is warranted for broader populations and other types of infections

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