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Post-Discharge Surveillance to Identify Subsequent Methicillin-Resistant *Staphylococcus aureus* Infections in Colonized Children

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Abstract

Some hospitals screen and identify high risk patients for methicillin-resistant *Staphylococcus aureus* (MRSA) colonization. We performed post-discharge surveillance, including phone survey, and estimated a 9.5% incidence of infection in MRSA colonized children in the year following discharge. Interventions are needed to reduce MRSA infections in colonized children after hospital discharge.

Colonization with methicillin-resistant *Staphylococcus aureus* (MRSA) poses risks to an individual and to the population, such that a child colonized with MRSA has an increased likelihood of developing a subsequent MRSA infection, and serves as a reservoir for MRSA transmission to other people.^{1, 2} In attempt to reduce MRSA transmission and subsequent infections, some hospital surveillance programs screen and identify high risk children for MRSA colonization. These screening programs successfully identify MRSA colonized children that were previously unrecognized by families or healthcare workers.³ However, counseling families of children newly identified as MRSA carriers has been difficult given the limited data on the long-term risk of infection associated with MRSA colonization.⁴

Adult patients with newly detected MRSA colonization have a significant risk of MRSA infection during their hospitalization and after discharge.^{5, 6} Similarly, we recently found that children identified as colonized at time of ICU admission had an 8.5% chance of subsequent MRSA infection, with a much higher risk in those that newly acquired MRSA colonization in the ICU.² This study used hospital-based laboratory surveillance and determined that 80% of subsequent MRSA infections occur after hospital discharge. Using hospital-based laboratory data fails to identify patients who seek care from other institutions and providers in our community. Therefore, our objective was to determine whether follow-up phone survey can enhance laboratory surveillance to assess the incidence of infection after hospital discharge in MRSA colonized children. We performed laboratory surveillance as previously described by querying institutional laboratory databases, reviewing medical records, and applying National Healthcare Safety Network (NHSN) infection surveillance criteria.^{2, 7} We conducted a 12 month follow-up survey by contacting parents or guardians (caregivers) of children admitted to the pediatric intensive care unit (PICU) between July 1st,

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2008 and May 31st, 2010 who were either colonized or infected with MRSA during their PICU admission or who had a prior history of MRSA colonization or infection at our institution. All eligible children were considered MRSA colonized for purpose of this study. This study was approved by The Johns Hopkins University Institutional Review Board.

One hundred and sixty-eight children were MRSA colonized of which 128 (76%) were newly identified as colonized during their PICU admission. Caregivers of all children were mailed letters and called, but despite repeated attempts only 76 (45%) were administered the questionnaire. Ten (13.2%) of these 76 caregivers reported that their child had an infection due to MRSA after hospital discharge that was confirmed by a healthcare professional in a clinic or hospital setting. Post discharge laboratory review of our institution's database identified only 4 of the 10 patients with caregiver reported MRSA infections (5.3%). Six of the 10 MRSA infections were not detected by laboratory surveillance or review of our institution's medical records. All laboratory identified cases were confirmed by caregiver report, but laboratory identified cases underestimated reported infections by 150%.

Of the 76 children whose families were contacted, 56 had been newly identified as MRSA colonized during their ICU admission, including 6 children that acquired MRSA in the ICU. In those with newly identified MRSA, 7 caregivers (12.5%) reported a MRSA infection after discharge, 3 of which were confirmed by laboratory surveillance. In those with known MRSA colonization (n=20), 3 infections were captured by follow up survey. Children with newly identified MRSA had similar rates of subsequent infection as those with known MRSA colonization (12.5% vs 15 % $p=0.77$)

Post-discharge review of institutional laboratory databases and medical records from 168 colonized patients identified 10 patients with a MRSA infection that met NHSN criteria after hospital discharge. An additional 6 MRSA infections were identified by follow up phone survey in children whose caregivers responded to the survey. Including laboratory surveillance and follow up phone survey, a total of 16 post-discharge infections were identified during the 12 month follow up period (Table 1). In the 76 patients that responded to our follow-up phone survey, we identified 6 MRSA infections by survey alone. In the group of non responders(n=92), only 6 (6.5%) infections were identified using laboratory surveillance which likely underestimated infections in this group due to inability to contact caregivers. Despite only reaching 45% of caregivers, supplementing laboratory surveillance with phone survey increased our post-discharge capture of subsequent MRSA infections from 10 (6.0%) to 16 (9.5%).

Our data suggest that approximately one in ten MRSA colonized children may develop an MRSA infection in the year following discharge. As has been shown in adults, our data demonstrate that post-discharge surveillance may improve detection of subsequent infection in MRSA colonized children.⁵ Despite all contacted caregivers agreeing to participate in the survey, the study was limited by our inability to contact 55% of caregivers. However, children whose caregivers responded were similar to those who did not respond with respect to demographic characteristics (data not shown) and incidence of laboratory confirmed MRSA infections in the year following discharge. Larger post-discharge surveillance studies may better estimate the incidence of infection in MRSA colonized children. However, these data offer improved estimates of the incidence of future infection that can be offered to families whose children are being labeled as "MRSA positive" as a result of hospital-based MRSA screening programs. Given the incidence of infection after discharge, additional studies are needed to assess preventative measures to reduce infection in this high risk group.

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Figure 1.
Flow chart of MRSA colonized children

Table 1

Post-discharge MRSA infections in children identified by laboratory surveillance and follow-up phone survey

	Patients who responded to follow-up phone survey (n=76) n (%)	Patients who did not respond to follow-up phone survey (n=92) n (%)	All patients (n=168) n (%)
Laboratory confirmed MRSA ^I infections	4 (5.3)	6 (6.5)	10 (6)
Additional MRSA ^I infections reported by caregiver	6 (7.9)	-	6 (3.6)
Total number of MRSA ^I infections	10 (13.2)	6 (6.5)	16 (9.5)

^IMRSA - methicillin resistant *Staphylococcus aureus*