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## Outbreak of Methicillin-resistant *Staphylococcus aureus* in a Newborn Intensive Care Unit

### Background

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a Gram-positive bacterium that is resistant to several types of beta-lactam antibiotics (e.g., penicillin, amoxicillin, nafcillin) and is sometimes associated with severe health consequences. In April 2011, an Anchorage hospital (Hospital A) asked the Alaska Section of Epidemiology (SOE) to assist with an investigation of a MRSA outbreak in Hospital A's newborn intensive care unit (NICU). The purpose of this *Bulletin* is to report the results of the collaborative investigation.

### Methods

Since April 2011, the Hospital A and SOE investigative team performed the following tasks:

- Assessed the NICU's environment in April and again in July to review cleaning and disinfection practices for patient care equipment and the general environment;
- Performed observations of health care workers and parents using iScrub to assess hand hygiene and compliance with isolation precautions;<sup>1-3</sup>
- Assessed spacing between infants;
- Monitored patient culture screening results (nasal swabs were obtained from all infants on admission and every week that they were in the NICU);
- Collected nasal swabs from health care workers (HCWs) in June and August; and
- Provided specific intervention recommendations to the Hospital A Infection Prevention Program and leadership.

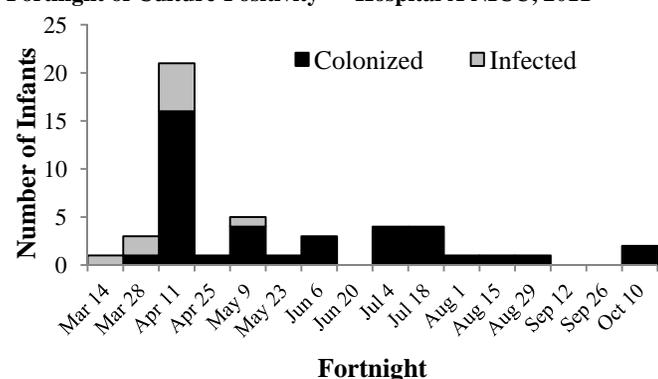
The following laboratory testing was performed on MRSA-positive isolates:

- The Alaska State Public Health Laboratory performed pulsed-field gel electrophoresis (PFGE) analysis;
- The U.S. Centers for Disease Control and Prevention (CDC) performed clonal pattern typing; and
- The Hospital A Laboratory performed antimicrobial susceptibility pattern characterization.

### Results

From March 23, 2011 through November 1, 2011, 48 NICU infants were identified as being either colonized (i.e., when a person carries the bacteria but shows no clinical signs or symptoms of infection [n=34]) or infected (n=14) with MRSA. The last infected infant was identified on May 12 and the last two colonized infants were identified on October 18 (Figure). All infections were described as "mild" (e.g., eye, upper respiratory, and gastrointestinal). Forty-four isolates were identical by PFGE analysis (PFGE results are pending for two isolates), and the 10 isolates tested by CDC were all USA 500/Iberian clonal types. The MRSA outbreak strain was resistant to the following antibiotics: cefazolin, clindamycin, erythromycin, mupirocin, oxacillin, penicillin G, ticarcillin/clavulanic acid, and trimethoprim/sulfamethoxazole.

**Figure 1. MRSA Colonized and Infected Infants (n=48), by First Fortnight of Culture-Positivity — Hospital A NICU, 2011**



Approximately 165 HCWs provided medical care to infants in the NICU; 139 were screened for MRSA, and none were positive for the outbreak strain. A total of 196 observations were conducted to assess for adherence to established hand hygiene and isolation precaution guidelines;<sup>2,3</sup> the guidelines were met 136 (69%) times. Of the 60 times that the guidelines were not met, 32 (53%) were due to inadequate hand hygiene, 4 (7%) were due to inadequate use of a gown, and 24 (40%) were due to both inadequate hand hygiene and use of a gown. Spacing between infants was substantially less than the recommended standard.<sup>4</sup>

### Discussion

Transmission of MRSA during this outbreak was likely facilitated by multiple factors including NICU crowding and breakdowns in infection control practices. The observed 69% adherence to selected infection control guidelines in the NICU demonstrates that improvement is needed in this area; however, this problem is not uncommon in intensive care units.<sup>5</sup> This investigation did not identify a colonized HCW who might have facilitated transmission; however, this cannot be ruled out as screening is not 100% sensitive and some HCWs were not screened. It is unclear how the outbreak strain was introduced into the NICU.

In addition to the work performed by the investigative team, Hospital A implemented numerous control measures. For example, they required contact and droplet precautions for all NICU infants, increased NICU tidiness, enhanced environmental cleaning efforts, enhanced hand hygiene efforts, held regular multidisciplinary response group meetings, and distributed timely information to hospital staff.

MRSA outbreaks in intensive care units are notoriously difficult to control and can continue for months to years. In this outbreak, the incidence of newly colonized or infected infants has decreased considerably and no infections have occurred since May 12; however, newly colonized infants continue to be identified, so ongoing vigilance is needed.

To control MRSA outbreaks in neonatal intensive care units, the following mitigation strategies should be considered:

- Cohort infected and colonized infants in designated beds and with specified staff;<sup>3</sup>
- Screen infants for MRSA on admission and weekly until evidence suggests a halt in transmission;
- Space infants and their medical equipment as per the American Academy of Pediatrics and the Association for Professionals in Infection Control recommendations;<sup>4</sup>
- Ensure that appropriate isolation precautions (i.e., gowns and gloves with all interactions) are followed for MRSA colonized and infected infants;<sup>3</sup>
- Observe hand hygiene regularly to ensure that staff are adhering to the recommended guidelines;<sup>2</sup>
- Follow the Health Care Infection Control Practices Advisory Committee recommendations for cleaning;<sup>3</sup> and
- Follow the National Association of Neonatal Nurses recommendations regarding appropriate staffing.<sup>6</sup>

### References

- iScrub info available at: <https://compepi.cs.uiowa.edu/iscrib/home/>
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