



How-to-guide Pediatric supplement

Reduce Methicillin-Resistant Staphylococcus Aureus (MRSA) Infection

Pediatric Affinity Group



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Outline for Pediatric Supplement to Reduce Methicillin-Resistant Staphylococcus Aureus (MRSA) Infection

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I. Scope of Problem and Description of Need in Pediatrics

Infections caused by Methicillin-Resistant *S. aureus* (MRSA) are problematic among neonatal, pediatric, and adolescent patients, as well as adults. The incidence of MRSA infections has increased over the past decade, and, compared to Methicillin-Susceptible staphylococcal infections, they are more lethal. According to the Centers for Disease Control and Prevention (CDC), MRSA now accounts for greater than 50% of hospital-acquired *S. aureus* infections and 63% of *S. aureus* infections acquired in intensive care units (ICUs) in the United States in 2004.

Hospital Associated MRSA (HA-MRSA) emerged first (1980) and Community-acquired MRSA (CA-MRSA) followed (2000). Hospital Associated MRSA isolates are often multi-drug resistant while community-acquired MRSA isolates are generally multi-drug susceptible (except to beta-lactams) and have distinctive molecular characteristics. Pediatric patients colonized or infected with MRSA of both types are being identified in increasing numbers. In-hospital spread may occur with either type and serious infections may be due to either Hospital Associated MRSA or Community Associated MRSA. Either type may be encountered among patients irrespective of their prior exposure to health care.

The anterior nares are the most common site of colonization by HA-MRSA *S. aureus*. The most common site for colonization by CA-MRSA remains to be defined. Other sites that can become colonized include the throat, rectum, tracheotomy site, and the neonatal umbilicus. Colonization generally proceeds, and is a risk factor for, symptomatic *S. aureus* infection. Colonization can occur without immediate sepsis or infection, and for this reason may not be recognized.

The prevalence of colonization and the risk of serious infection tend to be highest in ICUs, and most MRSA outbreaks occur in this setting. The vulnerability of ICU patients is multifactorial. Identified risk factors include the presence of invasive devices (i.e. central venous catheters), and patients who are mechanically ventilated. Patients who undergo surgery while colonized with MRSA also are at risk.

MRSA is an especially challenging nosocomial pathogen in neonatal intensive care units (NICUs). Neonates are especially vulnerable to severe disease caused by MRSA. Outbreaks of MRSA infection in NICUs can be prolonged and difficult to control. Once an outbreak has developed, routine infection control measures may not be sufficient to halt transmission, and strict cohorting of infants and personnel with or without the use of mupirocin may be needed to contain these outbreaks.

Nosocomial outbreaks of staphylococcal infections are common because of the ease of transmission of the organism by direct contact or indirect contact through health-care workers' hands.

Control measures outlined within the IHI MRSA bundle collectively reinforce the strategies of:

Prevention:

Hand Hygiene

Decontamination of the environment and equipment

Adherence to Central Venous Catheter Bundle

See Pediatric Supplement:

Please visit: <http://www.nichq.org/NICHQ/Topics/PurgingHarm/>

Adherence to Ventilator Associated Prevention Bundle

See Pediatric Supplement:

Please visit: <http://www.nichq.org/NICHQ/Topics/PurgingHarm/>

Detection of infection/colonization:

Active Surveillance Culturing

Mitigation:

Contact Precautions for Infected and/or Colonized Patients.

All of the control measures outlined within the IHI MRSA bundle are applicable to the care of pediatric patients.

The benefits derived from the rigorous adherence to, and simultaneous use of these control measures extends beyond MRSA infections, and support infection control strategies to prevent infectious disease transmission of other pathogens that are spread principally from person to person on the hands of health care providers and inanimate objects.

II. Pediatric Considerations

a. Hand hygiene

1. A waterless, alcohol-based hand hygiene product should be made available and easily accessible; soap and water should be used if hands are visibly soiled.
2. Monitoring of hand hygiene is a key component in preventing MRSA transmission in the NICU. Direct observations of hand hygiene practices on a regular basis, or consistent enforcement of proper hand hygiene (e.g., use of a unit guard, providing feedback), contribute to increased rates of compliance.)

b. Neonatal surveillance cultures

1. Although cultures of swab specimens from multiple body sites, including nares, throat, rectum, and umbilicus, have been used to detect MRSA colonization, culture of nasal or nasopharyngeal specimens alone is generally sufficiently sensitive to detect MRSA colonization in neonates. On occasion, some newborns are colonized in the rectum exclusively.
2. Infants in the NICU should be screened periodically to detect MRSA colonization. The frequency of screening should increase (e.g., to once per week) when clusters of colonization are detected; after evidence suggests a halt in transmission, it may decrease to a lower frequency (eg, to once per month) until the investigation is over.

c. Communication

1. A receiving facility should consider isolating and screening of any infant transferred from another NICU, regardless of the transferring institution's MRSA status.
2. Standardized instruction sheets describing methods to prevent the transmission of MRSA should be developed as a resource for parents and visitors of infants in NICUs in which MRSA has been detected.

d. Screening of HCWs

1. Screening of HCWs in response to a cluster of MRSA colonization or infection in the NICU should be performed **only** to corroborate or refute epidemiological data that link an HCW to transmission.

e. Decolonization

1. In addition to the control measures outlined in the IHI MRSA Prevention bundle, attempts have also been made to **decolonize** MRSA from patients. Mupirocin may be used for decolonization of neonates and/or HCWs if deemed necessary by the affected institution (off-label use). Unfortunately, many patients who have receive decolonization treatment and who initially have a negative nares culture for S aureus, will have the organism reappear weeks or months later. It remains unclear whether the recurrent colonization is due to the fact that the

MRSA organism was suppressed but not eradicated or because it was reacquired.

2. A cautionary note on the widespread use of mupirocin has been the emergence of mupirocin resistant MRSA strains. At the present time mupirocin is the only agent available for decolonization. For this reason decolonization attempts may be most appropriate for patients at highest risk for MRSA infection such as MRSA colonized patients undergoing cardiovascular, neurosurgical, or implant procedures.

f. Environmental cultures

- 1 Environmental cultures should be performed in response to a cluster of MRSA colonization or infection in the NICU **only** to corroborate or refute epidemiological data that link an environmental source to transmission

g. Molecular analysis

1. When investigating an outbreak, molecular analysis with pulsed-field gel electrophoresis or a comparable molecular epidemiological tool should be performed to assess the relatedness of strains found in NICU patients, HCWs, and the environment. This analysis is useful so long as there are differences between the dominant HA-MRSA and CA-MRSA genotypes. If one genotype begins to predominate in both environments, the value of the analysis is diminished as a tool to identify the source of an outbreak.
2. If the hospital cannot perform genotyping in-house, then the isolates should be sent to a suitable laboratory for molecular analysis.

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