Managing MRSA Skin and Soft Tissue Infections

Methicillin-resistant *Staphylococcus aureus* (MRSA) is causing skin and soft tissue infections (SSTIs) among otherwise healthy adults and children in the community. Less frequently, MRSA is responsible for invasive infections such as necrotizing pneumonia and empyema, bacteremia/sepsis syndrome, as well as bone and joint infections.

MRSA first emerged as a pathogen in hospital settings in the 1970s. Since that time, MRSA has spread to hospitals throughout the country and has become the most common pathogen causing healthcare-associated infections in the United States and throughout the world. It accounts for as many as 50-70 percent of the *Staphylococcus aureus* infections acquired in health care facilities.

Hospital-associated (HA) infections have been associated with older age and underlying conditions. Respiratory infections, especially ventilator-associated pneumonia, are more common in HA infections than in community-associated (CA) infections. In contrast, skin and soft tissue infections are more common in CA infections where patients are younger and not as likely to have an underlying disease. However, with growing frequency, community-associated strains of MRSA are causing post-surgical and nosocomial infections in hospital settings.

**Prevalence**
A national prevalence survey of MRSA in U.S. healthcare facilities was conducted in October/November 2006 by the Association for Professionals in Infection Control & Epidemiology (APIC). Data were submitted from 1,237 healthcare facilities located in every state, representing approximately 21% of all U.S. healthcare facilities. Data from the APIC study show that 46 out of every 1,000 patients in this study were either infected or colonized with MRSA. This rate of infection is between eight and eleven times greater than previous estimates.

**Risk Factors/Transmission**
Risk factors for MRSA infection include frequent skin to skin contact, having abraded or injured skin, sharing personal hygiene items or sports equipment, injection drug use (IDU), and overusing or taking antibiotics incorrectly. People who live in crowded conditions, have little or no access to health care, and/or have challenges maintaining cleanliness and personal hygiene are also at greater risk. MRSA is transmitted by close skin-to-skin contact with an infected person, or by contact with a fomite or surface contaminated with the bacteria.

**Clinical Presentation**
Pierce County data for 2006 shows that 78% of all reported MRSA infections were skin and soft tissue infections. Often MRSA skin infections look like spider bites to both patients and providers. Skin and soft tissue infections may also present as furuncles, boils, abscesses, or impetigo. MRSA infections can be confined to a small area or they can be extensive, requiring hospitalization for debridement and IV antibiotics.

**Epidemiology**
In 2006 in Pierce County, 54% of reported *S aureus* isolates were MRSA. These data show only a 0.5 percentage point increase over 2005, the smallest increase we have seen in ten years. Between 2004 and 2005, there was a 9.1% increase in *S. aureus* isolates reported as MRSA. In 2006, 4,012 cases of MRSA (1st isolate per patient per year) were reported to Tacoma-Pierce County Health Department. When incidence data (2001-2006) is disaggregated by age group, children under five show the greatest increase in cases from 2004 through 2006. Anecdotally, health care providers in Pierce County continue to report that many of the patients they see do not have traditional risk factors for MRSA.

**Genetic Characteristics**
Resistance to the anti-staphylococcal penicillins, including methicillin, oxacillin and nafcillin, is the result of an altered protein (PBP 2a) on the cell wall coded for by the mecA gene. Organisms with this altered protein are resistant to all of the penicillins and cephalosporins since this protein will not allow for efficient binding of either class of antibiotics. This resistance gene is found in several species of *Staphylococcus*, not just *S. aureus*. As a result of this intra-species distribution of the mecA gene, a different gene sequence must be used as a target for molecular detection of MRSA. This target in *S. aureus* is leading gene sequence that is adjacent to the mecA gene called the Staphylococcal Chromosomal Cassette (SCCmec).

Molecular detection of SCCmec, using a real-time PCR assay, allows for identification of patients who are nasal carriers of MRSA in a few hours, rather than one to two days required by culture methods.
Managing MRSA SSTIs (cont.)

Diagnosis & Treatment

It is very important to obtain specimens for culture and antimicrobial susceptibility testing. Open skin lesions or incised abscesses should be cultured. Wounds should be cleaned with normal saline prior to culture, and superficial culture of open wounds should be avoided.

Incision and drainage of abscesses and fluctuant lesions is first-line treatment, and should be done whenever possible. For uncomplicated abscesses less than 5 cm diameter, incision and drainage alone without antibiotic treatment is a reasonable option. (See Interim Guidelines for Management of Suspected Staphylococcus aureus Skin and Soft Tissue Infections for detailed clinical management, next page.)

Vancomycin has been the gold standard for invasive MRSA infections, but most community acquired infections do not require hospitalization or vancomycin therapy. Local susceptibility patterns for CA-MRSA indicate use of trimethoprim-sulfamethoxazole, doxycycline, or clindamycin for empiric treatment while awaiting results of culture and susceptibility testing. Isolates sensitive to clindamycin and resistant to erythromycin should be evaluated for inducible clindamycin resistance by using the "D test." Pierce County hospital laboratories report that they are seeing inducible resistance in approximately 30% of isolates sensitive to clindamycin. Clindamycin susceptibility seems to be higher in persons 29 years old and younger.

Colonization

Nasal colonization with methicillin-sensitive Staph aureus (MSSA) has been identified as a risk factor for infection in various healthcare settings. Little data are available on the association between MRSA colonization and infection in the community. MRSA colonization occurs in sites other than the nose (i.e. pharynx, axilla, rectum, perineum) and may be important in the transmission of infection.

In a nationally representative U.S. survey of non-institutionalized individuals ≥ one year old, the prevalence of S. aureus nasal colonization was 32.4% in 2001/2002; only 0.8% of these S. aureus-positive cultures were reported as MRSA.

Eradication of MRSA colonization with antibiotics is usually not recommended. Data from healthcare settings indicate that decolonization can be effective in the short term, but re-colonization is common.

There are few data on the effectiveness of decolonization regimens to eliminate colonization or prevent infections in families or in the community. Development of resistance to systemic and topical antimicrobials during decolonization has been reported, causing concern about widespread use of these interventions. If decolonization treatment is being considered, consultation with an infectious disease specialist is recommended.

Infection Control

Use contact precautions for patients with MRSA. Wear a gown or a fluid-resistant apron as well as gloves when doing wound care. Protect your eyes and face if splashing from the site is likely.

Hand washing is the most important thing we can do to stop the spread of MRSA

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Source: Tacoma-Pierce County Health Department Surveillance Data 2006

MRSA Educational Material: Specific for clinics (including patients and healthcare providers), childcare centers, schools, workplaces, and police are available at www.tpchd.org/page.php?id=12.
Interim Guidelines for Management of Suspected *Staphylococcus aureus* Skin and Soft Tissue Infections*

**Clinical presentation**
- Looks like insect or spider bite
- Folliculitis, pustular lesions
- Furuncle, carbuncle (boils)
- Abscess (esp. w/ tissue necrosis)
- Cellulitis
- Impetigo
- Infected wound

**Risk factors associated with MRSA**
- History of MRSA infection, colonization
- History (within past 12 months) of: hospitalization, surgery, long term care residence, indwelling catheter or medical device; dialysis, renal failure, diabetes, or other co-morbidities
- Injection drug use, incarceration
- Close contact with someone known to be infected or colonized with MRSA
- High prevalence of MRSA in community or population
- Local risk factors: consult local public health department

**Incision & drainage (I & D) of abscesses**
- If I & D not performed, consider culture of draining wounds, or aspirate or biopsy of central area of inflammation

**Culture & antimicrobial susceptibility testing**
- Include "D-test" for clindamycin resistance if MRSA

**Patient education**
- To decrease spread of infection, provide education on infection control measures and wound care to all patients and/or caregivers of patients with *S. aureus* infections, esp. those with MRSA per WAC 246.101.105(7)

**Mild**
- Afebrile, healthy other than SSTI

**Moderate**
- Febrile, appears ill, but no unstable co-morbidities

**Severe/Critically Ill**
- Appears toxic, unstable co-morbidity, sepsis syndrome, or limb-or life threatening infection, e.g., necrotizing fasciitis

**Outpatient management**
- Local care, I & D, +/- topical antibiotics may be sufficient
- If oral antibiotics used – β-lactam preferred for MSSA
- If increased suspicion for MRSA based on presence of ≥ 1 risk factor: Consider empiric therapy active against MRSA
- Adjust antibiotics based on results of culture & susceptibility testing
- Monitor response to therapy

**Outpatient management**
- Low suspicion for MRSA:
  - β-lactam antibiotics effective against *S. aureus* preferred for MSSA
  - If increased suspicion for MRSA based on presence of ≥ 1 risk factor: Empiric therapy active against MRSA
  - Adjust antibiotics based on results of culture & susceptibility testing
  - Monitor response to therapy

**Hospital management**
- Empiric broad-spectrum IV antibiotics including vancomycin for activity against *S. aureus*, including MRSA
- Adjust antibiotics based on results of culture & susceptibility testing
- Monitor response to therapy
- Consult ID specialist if no improvement or considering alternative agents (e.g., linezolid, daptomycin)
- Switch to oral therapy based on susceptibility testing if:
  - Afebrile for 24 hours
  - Clinically improved
  - Able to take oral therapy
  - Close follow-up possible

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*MSSA: Methicillin susceptible S. aureus
MRSA: S. aureus resistant to all penicillins & cephalosporins
β-lactam antibiotics: Includes all penicillins & cephalosporins

*For details, see full text of Interim Guidelines for Evaluation & Management of Community-Associated Methicillin Resistant *Staphylococcus aureus* Skin and Soft Tissue Infections in Outpatient Settings*
Table 1. Interim Guidelines for Empiric Oral Antimicrobial Treatment of Outpatients with Suspected MRSA Skin and Soft Tissue Infections (SSTI)

Selection of empiric therapy should be guided by local S. aureus susceptibility and modified based on results of culture and susceptibility testing. The duration of therapy for most SSTI is 7-10 days, but may vary depending on severity of infection and clinical response. **NOTE: Before treating, clinicians should consult complete drug prescribing information in the manufacturer’s package insert or the PDR.**

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>Adult Dose</th>
<th>Pediatric Dose</th>
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<tbody>
<tr>
<td>Trimethoprim-sulfamethoxazole (TMP-SMX) DS</td>
<td>1 tablet (160 mg TMP/800 mg SMX) PO bid</td>
<td>Base dose on TMP: 8-12 mg TMP &amp; 40-60 mg SMX per kg/day in 2 doses; not to exceed adult dose</td>
</tr>
<tr>
<td>Minocycline or doxycycline</td>
<td>100 mg PO bid</td>
<td><strong>Not recommended for pediatric use – suggest consultation with infectious disease specialist before use</strong></td>
</tr>
<tr>
<td>Clindamycin</td>
<td>300-450 mg PO qid</td>
<td>10-20 mg/kg/day in 3-4 doses; not to exceed adult dose</td>
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*If considering clindamycin, isolates resistant to erythromycin and sensitive to clindamycin should be evaluated for inducible clindamycin resistance (MLS<sub>B</sub> phenotype) using the “D test.” Consult with your reference laboratory to determine if “D testing” is routine or must be specifically requested. If inducible resistance is present, an alternative agent to clindamycin should be considered. NSF

- If Group A streptococcal infection is suspected, oral therapy should include an agent active against this organism (β-lactam, macrolide, clindamycin). Tetracyclines and Trimethoprim-sulfamethoxazole, although active against many MRSA, are not recommended treatments for suspected GAS infections.
- Outpatient use of quinolones or macrolides: Fluoroquinolones (e.g., ciprofloxin, levofloxacin, moxifloxacin, gatifloxacin) and macrolides (e.g., erythromycin, clarithromycin, azithromycin) are NOT recommended for treatment of MRSA because of high resistance rates. If fluoroquinolones are being considered, consult with infectious disease specialist before use.
- Outpatient use of linezolid in SSTI: Linezolid is costly and has great potential for inappropriate use, inducing antimicrobial resistance, and toxicity. Although it is 100% bioavailable and effective in SSTI, it is not recommended for empiric treatment or routine use because of these concerns. It is strongly recommended that linezolid only be used after consultation with an infectious disease specialist to determine if alternative antimicrobials would be more appropriate.

Table 2. Eradication of MRSA Colonization

Efficacy of decolonization in preventing re-infection or transmission in the outpatient setting is not documented, and is NOT routinely recommended. Consultation with an infectious disease specialist is recommended before eradication of colonization is initiated.

**Possible eradication regimens include:**

- **Rifampin** (Adult dose: 300mg PO bid x 5 days; pediatric dose: 10-12 mg/kg/day in 2 doses not to exceed 600 mg/d x 5 days) may be used in combination with TMP-SMX, OR rifampin with doxycycline, OR rifampin with minocycline, for recurrent MRSA infection despite appropriate therapy. **Never use rifampin monotherapy, due to the rapid emergence of resistance. Rifampin interacts with methadone, oral hypoglycemics, hormonal contraceptives, anticoagulants, protease inhibitors, phenytoin, theophylline, cardiac glycosides and other drugs.**
- **Topical intranasal mupirocin** may be used bid for 5 days with or without systemic antimicrobial therapy.
- **Skin antisepsis** with chlorhexidine or other agents may be used in addition to one or both of the above regimens.