Methicillin-Resistant Staphylococcus aureus (MRSA)

A new challenge for a new century
Laura L. Radke, MD
March 5th, 2008
History

- Initially appeared in hospitals in the 1960’s – Healthcare associated (HA MRSA)
- Highly resistant to commonly used antibiotics
- Risk factors included:
  - Hospitalization
  - Nursing Home residence
  - Chronic dialysis
  - Antibiotic use
  - Use of invasive devices and/or procedures
History

- Associated with increased morbidity and mortality
- Also associated with increased healthcare costs related to prolonged hospital stays, courses of intravenous antibiotics for treatment and lost productivity
- Capable of colonizing nares of healthcare workers and causing hospital outbreaks
In the 1990’s, infections with MRSA began to emerge in persons without risk factors for HA MRSA.

New type of MRSA identified – Community associated MRSA (CA MRSA)

Defined as infection in a person with no prior history of health care exposure, i.e. hospitalization, surgery, permanent devices or hemodialysis.
Characteristics of CA MRSA

- Genetically different from HA MRSA
  - Contains mec IV resistance chromosome
  - Less resistant, more susceptible to more classes of antibiotics
  - Carries the Panton Valentine Leukocidin (PVL) gene
    - Allows production of necrotizing cytotoxin
    - May be responsible for increased invasiveness of the organism
Characteristics of CA MRSA

- Typically causes skin and soft tissue infections
  - Early lesions look like spider bites
  - Often present with boils, abscesses or cellulitis
- Can cause more serious infections such as bacteremia, pneumonia, wound and surgical site infections
## Comparison of HA MRSA and CA MRSA

<table>
<thead>
<tr>
<th></th>
<th>HA-MRSA</th>
<th>CA-MRSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health care contact</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Mean age at infection</td>
<td>Older</td>
<td>Younger</td>
</tr>
<tr>
<td>Skin and soft tissue infections</td>
<td>35%</td>
<td>75%</td>
</tr>
<tr>
<td>Antibiotic resistance</td>
<td>Many agents</td>
<td>Some agents</td>
</tr>
<tr>
<td>Resistance gene</td>
<td>SCCmeC Types I, II,III</td>
<td>SCCmeC Type IV, V</td>
</tr>
<tr>
<td>Strain type</td>
<td>USA 100 and 200</td>
<td>USA 300 and 400</td>
</tr>
<tr>
<td>PVL toxin gene</td>
<td>Rare (5%)</td>
<td>Frequent (almost 100%)</td>
</tr>
</tbody>
</table>

Epidemiology of CA MRSA

- Wide geographic variation in infection rates
- Incidence in Wisconsin is unknown
- Generally, < 1% of population
- Based on personal experience, appears to be increasingly more frequent
- Native Americans, Pacific Islanders and Alaskan natives appear to be more susceptible
Epidemiology of CA MRSA

- Transmission is primarily person-to-person.
- Can occur through indirect contact with contaminated surfaces and items.
- Outbreaks have occurred among sports team members, prisoners, military recruits, men having sex with men and IVDU’s.
- Transmission has also occurred in hospitals among postpartum women and orthopaedic surgery patients.
Epidemiology of CA MRSA

- Nasal carriage not as common as with HA MRSA
- Recent nasal colonization associated with 10-fold risk of developing skin and soft tissue infection
- Previous colonization may confer some immunity and decrease risk for development of invasive disease
Risk Factors for CA MRSA Infection

- History of MRSA infection or colonization of pt. or close contact
- High prevalence of CA MRSA in local community
- Recurrent skin disease, i.e. eczema, dermatitis
- Crowded living conditions, i.e. military barracks, homeless shelter
Risk Factors for CA MRSA Infection

• History of or current incarceration
• Participation in contact sports
• Skin/soft tissue infection with poor response to B-lactam antibiotics
• Recent/frequent antibiotic use
• IVDU
• Native American, Pacific Island or Alaskan Native ethnicity
Risk Factors for CA MRSA Infection

- Child under the age of 2
- Male with history of having sex with men
- Shaving of body hair, especially extensive shaving of arms and/or legs related to sports participation
Presentation of CA MRSA Infection

- Skin and soft tissue infection
  - Abscesses
  - Pustular lesions
  - Boils
  - Lesions resembling “spider bites”
- More severe disease compatible with Staph infection
  - Osteomyelitis
  - Necrotizing pneumonia
  - Septic arthritis
  - Necrotizing fasciitis
Management of CA MRSA

- Incision and drainage of abscesses
  - Should be the primary treatment
  - Often the only treatment necessary
- Material sent for culture
- Instruct patients to return for:
  - worsening local symptoms
  - no improvement in 48-72 hours
  - signs/symptoms of systemic illness
Management of CA MRSA

- **Outpatient antibiotic therapy**
  - Based on local prevalence of MRSA
  - Severity of illness
  - Patient comorbidity

- **Antibiotic choices**
  - Topical mupirocin 2% or bacitracin for local infection
  - Trimethoprim/Sulfamethoxazole
    - Most frequent antibiotic with sensitivity in vitro
    - May penetrate abscesses poorly, i.e. less effective for undrained abscesses
Management of CA MRSA

- Antibiotic choices, cont.
  - Clindamycin for sensitive organisms
    - Must be sensitive to both erythromycin and clindamycin – requires D test (St. Joe’s lab performing regularly)
    - Inducible resistance appears to be increasing
  - Tetracycline/Doxycycline for sensitive organisms
    - Less intrinsic antistaphylococcal activity
Management of CA MRSA

- Antibiotic choices, cont.
  - Macrolides and Fluoroquinolones are not appropriate treatment for CA MRSA
    - Even if susceptible in vitro, may be ineffective in vivo
    - Rapid development of resistance can occur

- Patient education is essential!
  - Review wound care, hand washing and hygiene at home
Clinical presentation
- Looks like spider bite
- Folliculitis, pustular lesions
- Furuncle, carbuncle (boils)
- Abscess (esp. with tissue necrosis)
- Cellulitis
- Impetigo
- Infected wound

History/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 other medical device, dialysis, renal failure, diabetes, or other co-morbidities
- Injection drug use
- Incarceration
- Member of contact sports team
- Close contact with someone known to be infected or colonized with MRSA
- High prevalence of MRSA in the community or population
- Local risk factors: consult local public health department

MSSA: methicillin susceptible S. aureus
MRSA: S. aureus resistant to all penicillins and cephalosporins
β-lactam antibiotics: includes all nafcillin and cephalosporins

no antibiotics or further treatment needed
Infection resolves
Perform incision and drainage (I & D) of abscesses and other lesions when possible and appropriate. CULTURE

infection does not resolve, or I & D is not possible or appropriate
CULTURE draining wounds, or aspirate or biopsy central area of inflammation; request sensitivity testing (include “D-test” for clindamycin resistance if MRSA).

CULTURE

Mild Illness
afebrile, healthy other than SSTI

Outpatient management
- Local care, I & D, +/- topical antibiotics may be sufficient
- If oral antibiotics are needed and selected empirically:
  - When at least one risk factor for MRSA is present, select antibiotic with activity against MRSA
  - When no risk factors for MRSA are present, use a β-lactam antibiotic preferred for MSSA
- Review antibiotics based on results of culture and sensitivity testing
- Monitor response to therapy

Moderate Illness
febrile, appears ill, but no unstable co-morbid

Outpatient management
- Low suspicion for MRSA:
  - Use β-lactam antibiotics effective against MSSA
- If increased suspicion for MRSA based on presence of at least one risk factor:
  - Use empiric therapy effective against MRSA
  - Adjust antibiotics based on results of culture and sensitivity testing
  - Monitor response to therapy

Severe/Critically Ill
appears toxic, unstable co-morbid conditions, sepsis syndrome, or limb- or life-threatening infection, e.g. necrotizing fasciitis

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

Provide education on infection control and wound care to patients and care-givers

“Community Associated Methicillin Resistant Staphylococcus Aureus (CA MRSA) — Guidelines for Management and Control of Transmission”, PPH 42160, October 2005, Wisconsin DFHS
Management of CA MRSA

- Decolonization
  - Routine use of mupirocin intranasally is not recommended
  - Resistance to mupirocin has begun to emerge
  - Can be considered in patients with recurrent infections or in household where several members have had skin/soft tissue infections
  - Family contacts should not be routinely screened
Management of CA MRSA

- **Decolonization**
  - Patients with nasal colonization can be treated with 2% intranasal mupirocin for 5 days.
  - Daily bathing/showering using chlorhexidine gluconate and/or tea tree oil is recommended along with mupirocin treatment.
Management of CA MRSA

- Decolonization
  - Oral or IV antibiotics should not be routinely administered
    - Short courses of po antibiotics may assist in decolonization; repeated courses should not be given
  - Follow-up cultures are not recommended unless recurrent infections are noted
Prevention of Transmission of CA MRSA

- Healthcare settings
  - Contact precautions should be used for all patients with known MRSA infections
  - Contact precautions should also be used for all patients with skin/soft tissue infections compatible with a diagnosis of Staph infection and for all patients with uncontained secretions/wound drainage
Prevention of Transmission of CA MRSA

- Community settings
  - More studies needed to determine best methods
  - Increased awareness by healthcare providers
  - Early detection, including screening of inmates, military recruits, sports participants, shelter residents, close contacts of known MRSA cases
  - Appropriate treatment when risk factors are present/suspicion is high
Prevention of Transmission of CA MRSA

- Community settings
  - Improved personal hygiene
  - Environmental cleanliness in gyms, spas, health clubs
  - Improved hygiene amongst participants in contact sports
  - Improved hand hygiene in schools and work settings