Staphylococcus aureus Bacteremia Antimicrobial Scoring

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Staphylococcus aureus bacteremia

- Staphylococcus aureus (SA) is a virulent organism commonly associated with bacteremia and metastatic infection
  - 20-40% mortality rate
  - $20,000-70,000 per episode
  - Department of Health and Human Services identified MRSA bacteremia as 1 of 6 categories for its 5-year National Prevention Targets
  - CMS requirement to report all MRSA bloodstream infections
  - Recently identified as a CDC threat

IDSA Guidelines

- Identify source and extent of infection (AII)
- Repeat blood cultures 2-4 days after initial positive blood cultures and as needed thereafter to document clearance (AII)
- Echocardiography (TTE/TEE) recommended for all patients (AII)
- Appropriate duration of therapy (2 vs 4-8 weeks)
- Appropriate therapy
  - MRSA- Vancomycin
  - MSSA- Nafcillin or cefazolin
SA Bacteremia

- Relationship between ID specialist consultation and improved outcomes for patients with SAB has been well established.
- Greater acquisition of echocardiogram and diagnosis of infective endocarditis and metastatic disease
- Reductions in relapsed or recurrent bacteremia, hospital readmission and mortality with ID specialist consultation
- Rates of ID consultation are not 100%

Outcome of SAB according to compliance with recommendations of ID MDs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Time to consultation, median days (IQR)</th>
<th>Impact of routine ID consultation</th>
<th>Outcome of SAB according to compliance with recommendations of ID MDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute osteomyelitis</td>
<td>5 (1–10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vascular infection</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep-vein septic thrombophlebitis</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septic arthritis</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epidural infection or abscess</td>
<td>5 (3–28)</td>
<td></td>
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</tr>
<tr>
<td>Visceral abscess</td>
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</tr>
<tr>
<td>Septic pulmonary emboli</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonvertebral osteomyelitis</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertebral osteomyelitis</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meningitis</td>
<td>5 (3–28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>5 (3–28)</td>
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</table>
Impact of routine ID consultation

Table 1: Impact of routine ID consultation on SAB outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>ID Consult</th>
<th>No ID Consult</th>
<th>P</th>
</tr>
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<tbody>
<tr>
<td>Mean duration of fever (days)</td>
<td>3.1 ± 1.1</td>
<td>4.0 ± 1.2</td>
<td>.03</td>
</tr>
<tr>
<td>Patients with positive blood culture</td>
<td>43.7%</td>
<td>62.5%</td>
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</tr>
<tr>
<td>Mean temperature at time of discharge</td>
<td>39.3°C</td>
<td>39.1°C</td>
<td>.434</td>
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<td>Mean time from ID consult to discharge</td>
<td>21.1 ± 10.1</td>
<td>29.6 ± 12.3</td>
<td>.003</td>
</tr>
<tr>
<td>Mean time to death</td>
<td>2.3 ± 1.9</td>
<td>3.2 ± 2.0</td>
<td>.055</td>
</tr>
<tr>
<td>Mortality in patients with positive blood culture</td>
<td>37.5%</td>
<td>42.9%</td>
<td>.154</td>
</tr>
<tr>
<td>Mortality in patients with positive blood culture and fever &gt;39°C</td>
<td>27.3%</td>
<td>36.4%</td>
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ID consult associated with decreased mortality in SAB

Table 2: Factors associated with decreased mortality in SAB

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ID consult associated with decreased mortality in SAB

Figure 4: Survival curve of Staphylococcus aureus bacteremia episodes. Patients with ID consultation prior to antibiotic therapy are more likely to survive (P = 0.001).

Impact of ASP-led intervention for SAB

Impact of ASP-led intervention for SAB

Antibiogram

Antibiogram

~350 patients/year diagnosed with SAB
OSUWMC Data

<table>
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<th>Quality Measure</th>
<th>Results</th>
</tr>
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<tr>
<td>Patients with SAB who have an ID consult</td>
<td>80%</td>
</tr>
<tr>
<td>Patients with SAB who have echocardiography performed during same encounter</td>
<td>85%</td>
</tr>
<tr>
<td>30-day readmission</td>
<td>15%</td>
</tr>
<tr>
<td>Length of stay, days</td>
<td>17.5 ± 13.2</td>
</tr>
<tr>
<td>30-day mortality</td>
<td>11%</td>
</tr>
</tbody>
</table>

Management of MSSA/MRSA Bacteremia

- Suspected line-related infection
- Triagecultures ordered
- Line removed if positive
- Blood cultures performed
- Medication initiated
- Empiric antibiotics as per local bacteriology guidelines
- Line placed if negative

Management of MSSA/MRSA Bacteremia

- Immediate head consults
- Blood cultures ordered
- Immediate intensivist consult
- Empiric antibiotics as per local guidelines
- Line placed if negative

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Management of MSSA/MRSA Bacteremia

- Recommended duration of therapy for bacteremia without disseminated infection (i.e., endocarditis, septic arthritis, discitis, osteomyelitis, meningitis) is at least 4 weeks. If first documented negative blood culture with resolution of symptoms, 2 weeks of therapy may be considered. All of the following criteria are met:
  - Eruption of abscesses
  - TTE/TEE is negative or untreatable (PPM, ICO)
  - Follow-up cultures are negative after 72 hours
  - Negative CRP after 48 hours of therapy
  - No evidence of relapsing sites of infection
  - Sepsis is completely resolved
  - Patient is not immunocompromised
  - Neutropenia with ANC < 500 cells/μL
  - HIV with CD4 count < 100 cells/μL
  - Recent chemotherapy within previous 2 weeks for active malignancy
  - Administration of immunosuppressive agents (prednisone, cyclosporine, tacrolimus, methotrexate, and mycophenolate)
  - Administration of corticosteroids above equivalent to 0.5 mg prednisone for at least 1 month

Compliance with Guideline

- Appropriate antimicrobial therapy
- ID consult
- Repeat blood cultures every 72 hours until negative
- TTE/TEE

Antimicrobial Patient Scoring System

Documentation in IHIS
Introduction

- Fourth patient scoring system at OSUWMC
- Goal is to identify patients with potential antimicrobial related interventions using rules in IHIS

- **Antimicrobial “My List”**
  - Identifies patients needing review using a scoring system

- **Antimicrobial Accordion Report**
  - Single screen displaying relevant info for antimicrobial monitoring

- **Progress Note**
  - Documentation in medical record for antimicrobial related management

S. aureus Bacteremia Patient Monitoring

- A component within the Antimicrobial Patient Scoring System

24-7 Service

- Will be implemented across all three shifts
- Weekend staff will also be responsible

<table>
<thead>
<tr>
<th>Shift</th>
<th>S. aureus Identified in 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>127</td>
</tr>
<tr>
<td>2nd</td>
<td>124</td>
</tr>
<tr>
<td>3rd</td>
<td>126</td>
</tr>
<tr>
<td>Total</td>
<td>377</td>
</tr>
</tbody>
</table>
Objectives of S. aureus Bacteremia

Patient Monitoring
- Identify patients with S. aureus bacteremia
- Prompt pharmacists to provide evidence-based recommendations to the care team
- Provide standardized documentation across the pharmacy department

Overall Process

Patient Identification
- 500 points will be added to the Antimicrobial Score Column if the rapid diagnosis assay has identified S. aureus DNA in one of the blood samples
- The score will stay in the column for 24 hours after the S. aureus DNA result comes back
- 500 points → 0 points
Chart Review

- Investigate the following four things:
  - Is ID consult already placed?
  - Is there an order for repeat blood cultures?
  - Is there an order for TTE or TEE?
  - What antibiotics are the patient currently on?
ID Consult
- Under Notes → Consult Notes:

Repeat Blood Cultures
- Under Manage Orders → Labs:

Repeat Blood Cultures
- Under Chart Review → Micro:
When to Leave a Progress Note?

Every time when there is a patient with S. aureus bacteremia on any given shift.

Progress Note

- To start, type in “.rxasp”

Progress Note

- Select the correct note type
Progress Note

Select MSSA bacteremia or MRSA bacteremia

Progress Note

Fill in patient’s current empiric treatment(s)

Progress Note

If patient has MRSA
Progress Note

If patient has MRSA and needs to initiate therapy

Department of Pharmacy, Infectious Disease Documentation Note

Staphylococcus aureus Bacteremia Monitoring
The patient's microbiology lab has resulted in MRSA of ST239O4 as an ongoing therapy.
A member of the Pharmacy team has reviewed the patient's medical record and the following recommendations are based on the Ohio State University Wexner Medical Center's Pneumococcal and Management of Staphylococcal Bacteremia in Adults patient guideline.

1. Continue therapy for 2 weeks and monitor MRSA.
2. Antimicrobial agents are not recommended in patients with a prosthetic valve or congenital heart disease.

Link to the guidelines:

Please contact with any questions.
Phone...
Page...

Progress Note

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Link to the guidelines:

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Phone...
Page...
If the patient has MSSA:

1. Obtain Infectious Diseases consult.
2. Order oral cephalosporin and aminoglycoside (if needed) for 72 hours.
3. Consider oral cephalosporin and aminoglycoside for at least 2 days but no less than 72 hours.
4. Antimicrobial treatment for S. aureus bacteraemia. Consider the use of vancomycin if the patient has a history of rash, fever, or other symptoms.

If patient has MSSA and needs to initiate therapy:

1. Obtain Infectious Diseases consult.
2. Order an appropriate combination of antibiotics such as a cephalosporin and an aminoglycoside.
3. Consider using vancomycin if the patient has a history of rash, fever, or other symptoms.
4. Antimicrobial treatment for S. aureus bacteraemia. Consider the use of vancomycin if the patient has a history of rash, fever, or other symptoms.
If patient has MSSA and is already on a narrow spectrum therapy
Progress Note

If patient has MSSA and is on broad spectrum therapy; however, the pharmacist is not comfortable with de-escalation.

Progress Note

If patient has MSSA and requires de-escalation:

Department of Pharmacy, Antimicrobial Stewardship, and Infection Control.
When to Contact the team?

- Minimum requirements for 1st shift:
  - When initiation of a new therapy is needed
  - When de-escalation is needed

- Minimum requirement for 2nd or 3rd shift:
  - When initiation of a new therapy is needed

*Should make the best attempts to reach the team before the end of the shift.*
Overall Process

Hand-off
- RX Action Items Sticky Note
  - If unable to reach the treatment team by the end of the shift
  - If you would like the 1st shift pharmacist to follow up with de-escalation
- RX Handoff Sticky Note
  - Not required, but encouraged to use for hand-off purposes

Responsibilities for 1st shift
- Sort by the Antimicrobial Score Column, for all 500 points, check the following:
  - Is there a green checkmark
  - Is there any Rx Action Items Sticky Note
- For any new *S. aureus* bacteremia patient:
  - Perform chart review
  - Compose the progress note
  - Call the team for any drug therapy initiation or broad spectrum therapy de-escalation is needed
  - Leave an Rx Action Items Sticky Note if unable to reach the care team
  - Mark the patient as reviewed
- Ensure all patients at end of first shift are “green”
Responsibilities for 2nd shift

- Sort by the Antimicrobial Score Column, for all 500 points, check the following:
  - Is there a green checkmark
  - Is there any Rx Action Items Sticky Note
- For any new *S. aureus* bacteremia patient:
  - Perform chart review
  - Compose the progress note
  - Call the team if any drug therapy initiation is needed
  - Leave an Rx Action Items Sticky Note if de-escalation is needed or unable to reach the care team
  - Mark the patient as reviewed
- Ensure all patients at end of second shift are "green"

Responsibilities for 3rd shift

- Sort by the Antimicrobial Score Column, for all 500 points, check the following:
  - Is there a green checkmark
  - Is there any Rx Action Items Sticky Note
- For any new *S. aureus* bacteremia patient:
  - Perform chart review
  - Compose the progress note
  - Call the team if any drug therapy initiation is needed
  - Leave an Rx Action Items Sticky Note if de-escalation is needed or unable to reach the care team
  - Do NOT mark the patient as reviewed

Thank you!
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