Clinical Outcomes of *Staphylococcus aureus* Bacteremia

Following Introduction of Mandatory Infectious Disease Specialist Consultation

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**Background**

- *Staphylococcus aureus* bacteremia (SAB) is a leading bloodstream infection with 10-30% mortality.
- Infectious Diseases Society of America (IDSA) recommend immediate management for SAB with repeat blood culture, echocardiography (TTE and/or TEE), removal of infectious foci, early empiric antibiotic therapy, and appropriate duration of antibiotic therapy.
- ID consultation became mandatory for any patients with SAB at Mount Sinai Hospital (MSH) and University Health Network (UHN) starting December 2014.
- Hypothesis: mandatory infectious disease (ID) specialist consultation improves SAB management and thereby improves outcomes.

**Objectives**

- To compare in-hospital mortality, length of stay, and adherence to quality measures between SAB patients who did not receive ID consultation versus SAB patients who did receive ID consultation.
- To compare SAB outcomes at 3 acute-care academic hospitals before and after mandatory ID consultation implementation.

**Methods**

- A pre- and post-intervention quasi-experimental study design was used to compare SAB outcomes at 3 acute-care academic hospitals before and after mandatory ID consultation implementation.
- Pre-intervention population consisted of SAB patients from 2007 to 2010; post-intervention population consisted of SAB patients from 1 December 2014 to 30 November 2015.
- Patients were included if they had >1 positive SAB blood culture.
- Exclusion criteria:
  - Age <18 years
  - Death within 2 days of blood culture
  - Transfer to another institution within 2 days of blood culture
  - Deemed palliative within 2 days of blood culture
  - Primary outcome: in-hospital mortality within 90 days.
- Secondary outcomes:
  - Time to discharge from hospital
  - Adherence to IDSA quality management measures mentioned above

**Results**

- **Secondary outcomes:**
  - Time to discharge from hospital
  - Adherence to IDSA quality management measures mentioned above

**Clinical Outcomes and Process Outcomes**

- **ID consultation was performed in 239/411 (58%) and 196/205 (96%) in the pre-intervention and post-intervention group respectively (p<0.001).**
- **Compared to pre-intervention period, post intervention period had better adherence to quality of care measures including:**
  - **Echocardiography:** 319/411 (78%) vs. 186/205 (91%) (p<0.001)
  - **Subsequent blood culture within 2-4 days:** 174/411 (42%) vs. 143/205 (70%) (p<0.001)
  - **Avoidance of Vancomycin as definitive antibiotic therapy for methicillin-susceptible S. aureus (MSSA):** 54/347 (16%) vs. 13/177 (7%) (p<0.001)
  - **In-hospital mortality rate was 94/411 (23%) vs. 33/205 (16%) (p<0.001).**
- **Compared to pre-intervention group, the unadjusted sub-distribution hazard ratio (aSHR) for post-intervention period:**
  - **In-hospital mortality:** 0.67 (95% CI: 0.45-0.99, p=0.0447)
  - **Discharged alive:** 1.23 (95% CI: 1.02-1.49, p=0.0304)

**Conclusion**

- **ID consultation for SAB resulted in improved adherence to certain quality measures and led to reduced in-hospital mortality, as well as shortened hospital stay.**

**Next Steps**

- **These findings support the need for a large, well-conducted cluster-randomized controlled multicenter trial to further validate the results.**

**Acknowledgments**

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**Table 1. Baseline patient and clinical characteristics**

<table>
<thead>
<tr>
<th>Age median</th>
<th>All patients (N=616)</th>
<th>Pre-intervention period (N=411)</th>
<th>Post-intervention period (N=205)</th>
<th>p-value of pre-vs. post-intervention period (N=562)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age HS</td>
<td>60 (50-70)</td>
<td>60 (50-70)</td>
<td>60 (50-70)</td>
<td>0.3985</td>
</tr>
<tr>
<td>Male</td>
<td>399 (63%)</td>
<td>222 (54%)</td>
<td>177 (86%)</td>
<td>0.0011</td>
</tr>
<tr>
<td>Hospital site</td>
<td>391 (63%)</td>
<td>222 (54%)</td>
<td>177 (86%)</td>
<td>0.0011</td>
</tr>
<tr>
<td>MSH</td>
<td>165 (27%)</td>
<td>121 (29%)</td>
<td>44 (21%)</td>
<td>0.0197</td>
</tr>
<tr>
<td>TGH</td>
<td>271 (44%)</td>
<td>175 (42%)</td>
<td>96 (47%)</td>
<td>0.0197</td>
</tr>
<tr>
<td>TS</td>
<td>150 (29%)</td>
<td>117 (28%)</td>
<td>33 (16%)</td>
<td>0.0197</td>
</tr>
<tr>
<td>Attending service</td>
<td>30 (5%)</td>
<td>30 (5%)</td>
<td>30 (5%)</td>
<td>0.7730</td>
</tr>
<tr>
<td>Medical</td>
<td>362 (59%)</td>
<td>282 (68%)</td>
<td>80 (43%)</td>
<td>0.0042</td>
</tr>
<tr>
<td>Surgical</td>
<td>2 (0.3%)</td>
<td>2 (0.3%)</td>
<td>0 (0%)</td>
<td>0.0842</td>
</tr>
<tr>
<td>Total</td>
<td>393 (64%)</td>
<td>223 (54%)</td>
<td>170 (83%)</td>
<td>0.7683</td>
</tr>
</tbody>
</table>

**Table 2. Management of SAB in pre- and post-intervention period**

<table>
<thead>
<tr>
<th>Pre-intervention period (N=411)</th>
<th>Post-intervention period (N=205)</th>
<th>Pre vs. Post-P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Echocardiogram</td>
<td>Any echo in 28 days</td>
<td>319 (78%)</td>
</tr>
<tr>
<td>TTE</td>
<td>TTE in 28 days</td>
<td>309 (75%)</td>
</tr>
<tr>
<td>TEE and TEE in 28 days</td>
<td>Subsequent Culture</td>
<td>63 (16%)</td>
</tr>
<tr>
<td>Subsequent culture in 2-4 days</td>
<td>Subsequent culture in 2-4 days</td>
<td>174 (42%)</td>
</tr>
<tr>
<td>Post-intervention culture</td>
<td>Post-intervention culture</td>
<td>285 (70%)</td>
</tr>
<tr>
<td>Antibiotic Therapy</td>
<td>395 (96%)</td>
<td>195 (96%)</td>
</tr>
<tr>
<td>Appropriate empiric antibiotic</td>
<td>Days to appropriate antibiotics</td>
<td>1.00 (1.00)</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>Median (IQR)</td>
<td>20.00 (14.00-32.00)</td>
</tr>
</tbody>
</table>

**Flowchart 1. Pre-Intervention Inclusion Patients**

Of 454 SAB patients in the pre-intervention period, 411 patients were eligible for the study.

**Flowchart 2. Post-Intervention Inclusion Patients**

Of 256 SAB patients in the post-intervention period, 205 patients were eligible for the study.

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**References**


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