Hospital-Wide Impact of Mandatory Infectious Disease Consultation on Staphylococcus Aureus Septicemia

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Hospital-wide Impact of Mandatory Infectious Disease Consultation for *Staphylococcus aureus* Septicemia

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Introduction

Staphylococcus aureus bacteremia (SAB) is a major human pathogen that causes a wide-range of clinical infections.[6] It is a leading cause of bacteremia and infective endocarditis, as well osteoarticular, skin and soft tissue, and device-related infections.[6] It is also one of the main contributors to both hospital and community-onset bloodstream infections worldwide.[5] SAB continues to grow in number and complexity, which is why it is presently associated with a 10%-30% mortality.[1,7]

This study focused on determining if mandatory Infectious Disease (ID) consultations:

1) **improved adherence to published guidelines on quality-of-care indicators, and**
2) **improved outcomes of patients with *Staphylococcus aureus* bacteremia (SAB)**

Methods

- A total of 276 patients from Lehigh Valley Cedar Crest (CC) and Muhlenberg (MHC) campuses had positive *S. aureus* blood cultures and met the predefined study inclusion criteria during this study.
  - 179 patients from January 1st 2013 to December 31st 2013, prior to the institution of mandatory ID SAB consultation
  - 197 patients from May 12, 2014 to May 11, 2015, the intervention period.
- Patients with positive blood cultures for methicillin-resistant or methicillin-susceptible *Staphylococcus aureus* (MRSA/MSSA) were identified using ICD-9 codes as well as from lists of culture results provided by the microbiology laboratory.
- The patients' medical records were reviewed for demographic data, features of *S. aureus* bacteremia, details regarding treatment, and outcomes.
- All variables were compared and analyzed using the Mann-Whitney test or t test on Minitab 17 to determine significance.

Figure 1: Protocol for mandatory *S. aureus* ID consultation

All positive blood culture reports for *S. aureus* were entered into the microbiology system with the notation "An Infectious Disease consult is indicated for patients identified with *Staphylococcus aureus* bacteremia."

→ Positive *S. aureus* blood cultures were faxed to the ID office

→ If no consult placed within 24 hours, the attending of record was asked to place a consult

Results

Table 1: Characteristics of Patients with *Staphylococcus aureus* bacteremia

	Pre-Intervention Period (n=179)	Intervention Period (n=197)	P-Value
Age, median years (IQR)	64 (54-78)	68 (52-76)	0.937
Female	83 (46)	65 (33)	0.007
White	152 (85)	180 (91)	0.404
APACHE II Score, mean	13.4	13.5	0.995
Pitt bacteremia score, mean	1.53	1.26	0.134
How-acquired			
Community-acquired	80 (45)	122 (62)	0.003
Hospital-acquired	25 (14)	12 (6)	0.190
Healthcare-associated	74 (41)	62 (31)	0.104
Penicillin allergy	28 (16)	28 (14)	0.811

Figure 2: Source of *Staphylococcus aureus* Infection during the Pre-Intervention and Intervention Periods

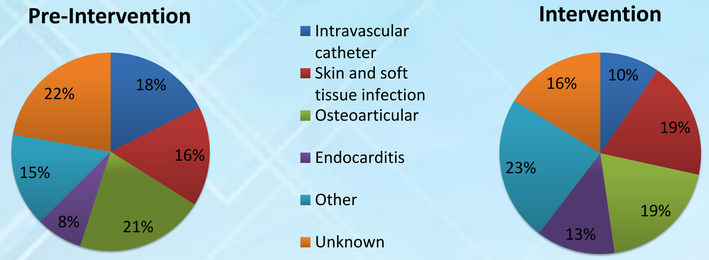

Table 2: Infectious Diseases (ID) Consultation and Adherence to Quality-of-Care (QCI) Indicators

	Pre-Intervention Period (n=179)	Intervention Period (n=197)	P-Value
ID Consult	176 (98)	193 (98)	0.953
Days to ID consult, mean	0 (0-1)	0 (0-1)	0.072
Follow-up blood cultures obtained	159 (89)	151 (77)	0.042
Early source control[¶]	46 (82)	29 (85)	0.718
Echocardiography performed	149 (83)	182 (92)	0.126
TTE	143 (80)	150 (76)	0.531
TEE	66 (37)	108 (56)	0.0026
Treatment duration, median days (IQR)	28 (14-42)	29 (19-42)	0.363
Appropriate duration[§]	109 (72)	152 (91)	0.009
Appropriate deescalation[±]	66 (37)	105 (53)	0.012
Hours to deescalation, median (IQR)[°]	64 (42-83)	41 (20-60)	0.0001

Table 3: Outcomes of Patients with *Staphylococcus aureus* Bacteremia

	Pre-Intervention Period (n=179)	Intervention Period (n=197)	P-Value
Length of hospitalization, median days (IQR)	12 (7-9)	13 (8-21)	0.329
Attributable mortality	28 (48)	25 (66)	0.149
All-cause morality	58 (32)	38 (19)	0.0281
14 days	18 (31)	16 (42)	0.295
30 days	8 (13)	8 (21)	0.510

Discussion

- Most of the baseline characteristics were similar between the two groups. There was a female-predominance in the pre-intervention group (46% vs 33%, p=0.007), and an increased the number of community-acquired infections in the intervention period (62% vs 45%, 0.003) (Table 1). This is most likely a result of the study's small data size.
- There was no difference in the incidence of ID consultation between the pre-intervention and intervention periods (98% vs. 98%, p=0.953), nor in days to ID consult (median, 0 (0-1) vs 0 (0-1), p=0.072, Table 2).
- There was a significant increase in the amount of SAB patients with appropriate antibiotic duration (72% vs. 91%, p=0.009) and the amount of methicillin-sensitive SAB with appropriate deescalation (p=0.012) (Table 2).
- Interestingly, there was better adherence to follow up blood cultures being obtained 48-96 hours later during the pre-intervention period versus the intervention period (89% vs. 77%, p=0.042, Table 2). This is likely secondary to the specific time frame noted and the data will be reevaluated to look for repeat blood cultures without the time constraints.
- Four patients in the intervention group never received an ID consult (Table 2). This is likely secondary to human error.
- There was an increase in the number transesophageal echocardiograms (TEE) performed (Table 2).
- There were significantly more endocarditis patients in the intervention period than there were during the pre-intervention period (28% vs 21%, p=0.009, Figure 2).
- There was no significant difference in outcome measures between the two groups for hospital length of stay, attributable mortality (48% vs 66%, p=0.149) and 14-day and 30-day mortality. However, there was a significant difference in all-cause mortality between the two cohorts (32% vs 19%, p=0.0281) (Table 3). This is likely a reflection of the short duration of follow-up with patients from the intervention period.

Future Analyses

- The mandatory ID consultation protocol is still in effect, allowing LVHN to continue improving on its adherence to quality-of-care indicators.
  - An auto-fax system to alert the ID consultants earlier to patients identified with SAB will go into effect shortly.
  - There is still a 24-hour hold in place on ID consultations which needs to be evaluated further.
- This protocol warrants future investigations into continued compliance with QCI's in SAB patients.

REFERENCES

1. Chang, Feng-Yee, MacDonald BB, Peacock JE Jr, et al. A prospective multicenter study of Staphylococcus aureus bacteremia: incidence of endocarditis, risk factors for mortality, and clinical impact of methicillin resistance. Medicine. 82(5):322-32, 2003 Sep.
2. Outcome of Staphylococcus aureus bacteremia according to compliance with recommendations of Infectious diseases specialists: experience with 244 patients. Clin Infect Dis 1998; 27:478.
3. Infectious diseases consultation lowers mortality from Staphylococcus aureus bacteremia. Medicine (Baltimore) 2009; 88:263.
4. Impact of routine infectious diseases service consultation on the evaluation, management, and outcomes of Staphylococcus aureus bacteremia. Clin Infect Dis 2008; 46:10005.
5. Lopez-Cortes LE, Del Toro MD, Galvez-Acebal J, et al. Impact of an evidence-based bundle intervention in the quality-of-care management and outcome of Staphylococcus aureus bacteremia. Clin Infect Dis. 2013; 57:122
6. Tong SYC, Davis JS, Eichenberger E, Holland TL, Fowler VG, Jr. 27 May 2015. Staphylococcus aureus infections: epidemiology, pathophysiology, clinical manifestations, and management. Clin Microbiol Rev 2015; 10.1128/CMR.00134-14.
7. Boucher HW, Corey RG. Epidemiology of methicillin-resistant Staphylococcus aureus. Clin Infect Dis 2008; 46:S
8. Kim SH, Kim KH, Kim HB et al. Outcome of vancomycin treatment in patients with methicillin-susceptible Staphylococcus aureus bacteremia. Antimicrobial Agents and Chemotherapy 2008: 52:192