The Time for Action is Now: The Impact of Timing with Infectious Diseases Consultation for *Staphylococcus aureus* Bacteremia

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Background

- *Staphylococcus aureus* (*S. aureus*) bacteremia (SAB) is a leading cause of bloodstream infections and is frequently complicated by metastatic diseases (e.g. endocarditis)
- Based on published literature, the standard of care includes repeat blood cultures within 2-4 days of index cultures, echocardiography, source control, and early empiric intravenous antibiotic therapy
- Limited studies evaluate the impact of the timing of the infectious disease consultation (IDC) on disease management and clinical outcomes

Purpose & Endpoints

- Determine a defined time to IDC threshold value
- Compare the difference in clinical outcomes in patients with SAB who received an early vs late IDC

Primary Composite Endpoint

- Identification of source in ≤ 4 days
- Follow-up blood cultures in ≤ 4 days
- Use of IV (anti-MSSA or anti-MRSA) therapy
- Appropriate recommended treatment duration
- Procurement of an echocardiogram in ≤ 4 days

Secondary Endpoints

- All-cause in-hospital mortality
- SAB reoccurrence within one year
- 30-day, 60-day, and 90-day readmission rate
- Early utilization of a β-lactam for MSSA
- Length of stay

MSSA: methicillin-susceptible *Staphylococcus aureus;* MRSA: methicillin-resistant *Staphylococcus aureus*

Study Design & Methods

- IRB approved, retrospective, single-center, cohort study
- Study Period: January 1, 2015 to January 1, 2020 (N = 670)
- Time to IDC was defined as time from collection of index positive blood culture to placement of IDC order

Adults ≥18 years old admitted to UF Health Jacksonville with an initial episode of SAB & received an IDC during the encounter

Exclusion Criteria
- No IDC (*n* = 241)
- Death, Hospice, Transfer within 4 days (*n*= 44)
- Relapse/Reinfection (*n* = 34)
- Age < 18 (*n* = 20)
- Refusal of Treatment (*n* = 10)

Results

Figure 1. Distribution of Time to IDC

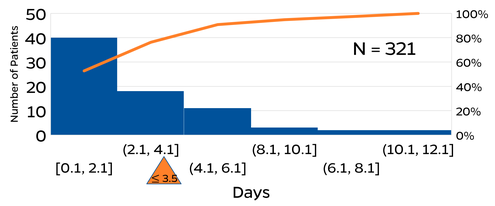
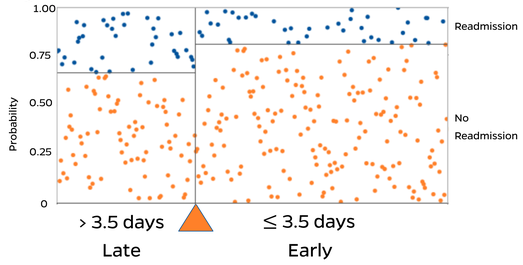


Figure 2. ML Model's for Time to IDC Threshold



Early time to IDC was defined by machine learn (ML) algorithm as ≤ 3.5 days and late as › 3.5

Table 1. Patient and SAB Demographics

Baseline Characteristics	Early (*n* = 204)	Late (*n* = 117)	*p* - value
Age, mean (SD)	52.9 (±15.2)	54.1 (±15.6)	0.701
Male gender	127 (62.3)	69 (59.0)	0.562
White race	149 (57.1)	26 (43.3)	<0.001
Diabetes	75 (36.8)	52 (44.4)	0.176
Injection drug user	30 (14.7)	23 (19.7)	0.250
End-stage renal disease	21 (10.3)	24 (20.5)	0.011
Immunosuppressed	28 (13.7)	10 (8.6)	0.167
Charlson Comorbidity Index score, mean (SD)	3.5 (±2.8)	4.0 (±3.2)	0.088
qPitt score, mean (SD)	1.5 (±1.7)	2.1 (±2.0)	0.010
qSOFA, mean (SD)	1.1 (±0.9)	1.4 (±0.9)	0.021
MRSA	105 (51.5)	63 (53.9)	0.682
Complicated SAB	161 (78.9)	93 (79.5)	0.904
Source Control Procurement	80 (39.2)	51 (43.6)	0.443
Source Mortality Risk	-	-	0.698
-- Low-Risk	32 (15.7)	22 (18.8)	-
-- Intermediate-Risk	138 (67.7)	74 (63.3)	-
-- High-Risk	34 (16.7)	21 (18.0)	-

Data presented as n (%) unless noted otherwise.

Figure 3. Primary Composite Endpoint

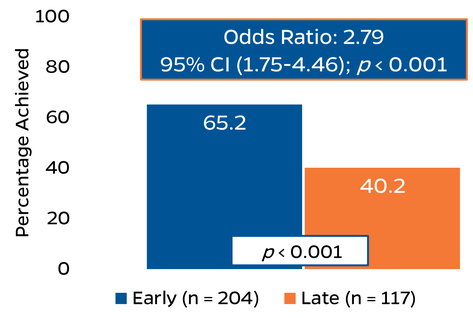


Figure 4. Primary Endpoint Components

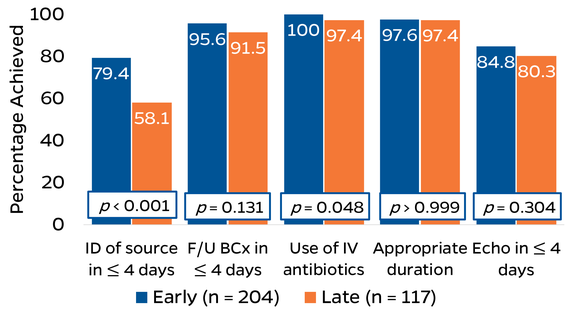


Table 2. Secondary Endpoints

Secondary Endpoints	Early (*n* = 204)	Late (*n* = 117)	*p* - value
All-Cause In-Hospital Mortality	10 (4.9)	6 (5.1)	0.929
Median Length of Stay, days (IQR)	13.8 (8.9 – 21.5)	16.9 (11.2 – 30.0)	< 0.001
Median Duration of *S. aureus* bacteremia	3.1 (2.0 – 4.8)	3.7 (2.2 – 6.2)	0.070
SAB Reoccurrence	7 (3.4)	8 (6.8)	0.164
30-Day Readmission	39 (19.1)	38 (32.5)	0.007
60-Day Readmission	63 (30.9)	46 (39.3)	0.125
90-Day Readmission	73 (35.8)	49 (41.8)	0.279
Early β-lactam Utilization for MSSA (n = 153)	79/99 (78.4)	39/54 (72.2)	0.286

Data presented as n (%) unless noted otherwise. Early β-lactam was defined as within 48 hours of blood culture positivity of MSSA.

Results, cont.

Table 3. Multivariable Analysis & Composite Primary Endpoint

Covariates	Unadjusted OR (95% CI)	*p* - value	Adjusted OR (95% CI)	*p* - value
Early IDC	2.79 (1.75, 4.46)	< 0.001	3.47 (2.07, 5.81)	< 0.001
Community-acquired SAB	2.37 (1.20, 4.69)	0.013	2.69 (1.27, 5.68)	0.009
Source control procurement	3.46 (2.14, 5.60)	< 0.001	4.12 (2.45, 6.93)	< 0.001
Non-ICU admit	1.32 (0.82, 2.11)	0.252	-	-
Complicated SAB	0.89 (0.52, 1.54)	0.692	-	-
End-stage renal disease	1.50 (0.78, 2.89)	0.225	-	-
Injection drug user	1.03 (0.57, 1.86)	0.932	-	-
MRSA	1.15 (0.74, 1.79)	0.529	-	-

Conclusions

- Those who received an IDC in less than or equal to 3.5 days:
  - Were more likely to achieve all five quality care indicators
    - Identification of SAB source was the main difference
  - Had a significantly shorter length of stay
  - Experienced a lower 30-day readmission rate
- No significant difference was seen between groups regarding all-cause in-hospital mortality, SAB reoccurrence, 60-, and 90-day readmission
- Our findings suggest that all patients with SAB should have an IDC as soon as a positive blood culture with *S. aureus*

Discussion

- Time to IDC started from collection to blood culture
- Institution does not require IDC for SAB (~ 64% have IDC)
- Rapid diagnostics and stewardship work effectively with IDC
- Potential misclassification by identifying previous episodes & recurrences of SAB diagnosed at outside hospitals
- Potential delay in implementation of ID recommendations
- Future studies should evaluate early IDC in combination with optimized antimicrobial therapy

Disclosures

The authors of this presentation have nothing to disclose concerning possible financial or personal relationships with commercial entities.

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