Impact of a Pharmacist-Driven Collaborative Initiative on *Staphylococcus aureus* Bacteremia Management

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INTRODUCTION

- *Staphylococcus aureus* bacteremia (SAB) is associated with considerably high healthcare costs and mortality ranging from 20%-40%.[1,2]
- Infectious diseases (ID) consultation has been previously associated with a reduction in mortality and optimization of patient care through compliance with evidence-based management for patients with SAB.[3,4]
- Evidence-based management for SAB includes infectious disease consultation, source control, repeat blood cultures every 48 hours, echocardiography, and appropriate antibiotic therapy.[5,6]
- SUNY Upstate University Hospital implemented an ID pharmacist-driven collaborative initiative in August 2018 to improve SAB management.

OBJECTIVE

- To evaluate the impact of an ID pharmacist-driven collaborative initiative on SAB management and clinical patient outcomes.

METHODS

- **Study Design**: Single-center, quasi-experimental study (pre: 8/1/16-7/31/17 and post-intervention: 8/1/18-7/31/19)
- **Study Location**: SUNY Upstate University Hospital is a 472-bed, academic medical center located in Syracuse, NY.
- **Inclusion criteria**: Patients ≥ 18 years with at least 1 monomicrobial blood culture positive for *S. aureus*.
- **Exclusion criteria**: Patients <18 years of age, blood cultures were polymicrobial, an ID consultation was placed prior to a blood culture resulted positive for *S. aureus*, were placed on palliative care or expired prior to *S. aureus* speciation, left against medical advice, and were pregnant or incarcerated.
- **Intervention:** After direct notification of SAB and penicillin-binding protein assay results from microbiology, the ID pharmacist promptly contacted the primary team to facilitate ID consultation and optimized management.
- **Primary Outcome**: Adherence to SAB management recommendations.
- **Secondary Outcomes**: Time to definitive therapy, duration of bacteremia, infection-related hospital length of stay (LOS), 90-day readmission secondary to SAB, and in-hospital all-cause mortality.
- **Statistical Analysis:** Descriptive statistics were utilized, and statistical comparisons were performed using the chi-squared test, Mann-Whitney U-test, or student's t-test.

RESULTS

Figure 1. Patient Inclusion.

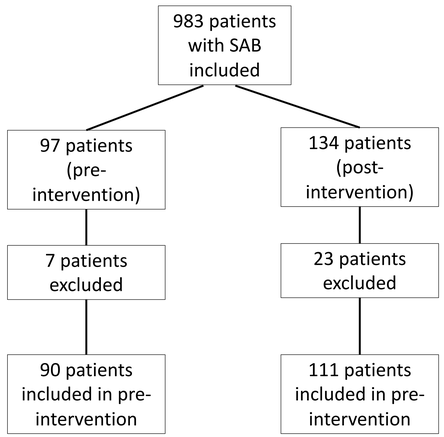

Table 1. Baseline Demographics

	Pre-intervention (n=90)	Post-intervention (n=111)	P-value
Age (years), median (IQR)	60 (44, 70)	58 (42, 68)	0.757
Male, n (%)	55 (61.1)	81 (72.9)	0.074
Weight (kg), median (IQR)	84 (37, 181)	80.6, (39.6, 181.4)	0.989
Intensive care unit admission, n (%)	49 (54.4)	46 (41.4)	0.066
APACHE II score, median (IQR)	13 (8, 17)	10 (6, 14)	<0.001
Pitt bacteremia score, median (IQR)	1 (0, 9)	1 (0, 10)	0.931
Comorbidities			
Diabetes mellitus, n (%)	24 (26.7)	43 (38.7)	0.071
Chronic kidney disease, n (%)	20 (22.2)	21 (18.9)	0.563
Renal replacement therapy, n (%)	16 (17.8)	14 (12.6)	0.307
Liver disease, n (%)	14 (15.6)	11 (9.9)	0.228
Heart failure, n (%)	20 (22.2)	14 (12.6)	0.071
Intravenous drug user, n (%)	12 (13.3)	21 (18.9)	0.288
Immunocompromised, n (%)	25 (27.8)	13 (11.7)	0.004
Solid organ transplant, n (%)	0 (0)	4 (3.6)	0.129
History of *Staphylococcus aureus* bacteremia in past 90 days, n (%)	1 (1.1)	0 (0)	0.448
Presence of hardware or prosthesis, n (%)	17 (18.9)	35 (31.5)	0.042

Abbreviations: ICU: Intensive Care Unit; APACHE II Score: Acute Physiology And Chronic Health Evaluation

Table 2. Bacteremia Characteristics

	Pre-intervention (n=90)	Post-intervention (n=111)	P-value
Methicillin-resistant Staphylococcus aureus, n (%)	39 (43.3)	39 (35.1)	0.236
Community-acquired, n (%)	65 (72.2)	90 (81.1)	0.137
Complicated bacteremia, n (%)	75 (83.3)	80 (72.1)	0.059
Duration of therapy from first negative blood culture, median (IQR)	42 (14, 42)	42 (14, 56)	0.180
Infective endocarditis, n (%)	24 (26.7)	19 (17.1)	0.101
Bacteremia source			
Catheter or line-related, n (%)	21 (23.3)	26 (23.4)	0.988
Skin and soft tissue, n (%)	19 (21.1)	33 (29.7)	0.165
Endovascular, n (%)	13 (14.4)	8 (7.2)	0.095
Bone or joint, n (%)	8 (8.9)	18 (16.2)	0.124
Abscess, n (%)	4 (4.4)	13 (11.7)	0.066
Pulmonary, n (%)	10 (11.1)	7 (6.3)	0.223
Other, n (%)	3 (3.3)	2 (1.8)	0.658
Unknown, n (%)	12 (13.3)	4 (3.6)	0.011
Definitive antibiotic therapy			
Cefazolin, n (%)	20 (22.2)	51 (45.9)	<0.001
Ceftaroline, n (%)	1 (1.11)	5 (4.5)	0.227
Daptomycin, n (%)	8 (8.9)	5 (4.5)	0.209
Oxacillin, n (%)	28 (31.1)	21 (18.9)	0.045
Vancomycin, n (%)	32 (35.6)	35 (31.5)	0.547
Other, n (%)	7 (7.8)	12 (10.8)	0.465

Table 3. Adherence with Evidence-Based SAB Management and Clinical Outcomes

	Pre-intervention (n=90)	Post-intervention (n=111)	P-value
Adherence to 3 bundle elements[a], n (%)	45 (50)	101 (91.0)	<0.001
Adherence to 4 bundle elements[b], n (%)	25 (27.8	80 (87.0)	<0.001
Source control if applicable, n (%)	42 (46.7)	88 (79.3)	<0.001
Infectious diseases consultation, n (%)	74 (82.2)	111 (100)	<0.001
Time to ID consult from first positive blood culture in hours, median (IQR)	43.5 (22, 71)	32 (18, 44)	<0.001
Echocardiogram, n (%)	81 (90)	111 (100)	<0.001
Repeat blood cultures every 48 hours, n (%)	55 (61.1)	101 (90.9)	<0.001
Duration of bacteremia in hours, median (IQR)	95 (46, 146)	66 (43, 103)	0.009
Persistent bacteremia, n (%)	17 (18.9)	10 (9.0)	0.041
Time to definitive therapy in hours, median (IQR)	48 (31, 66)	16 (8, 33)	<0.001
Infection-related hospital LOS in days, median (IQR)	14 (1, 84)	13 (3, 62)	0.027
90-day readmission for SAB, n (%)	5 (5.6)	3 (2.7)	0.471
90-day all-cause mortality, n (%)	16 (17.8)	12 (10.8)	0.156

[a]Repeat blood cultures every 48 hours, ID consultation, echocardiogram, source control as indicated.
[b]Repeat blood cultures every 48 hours, ID consultation, echocardiogram, source control as indicated.

DISCUSSION

- We implemented a pharmacist-driven collaborative initiative for *S. aureus* bacteremia in an effort to improve adherence with evidence-based recommendations and patient outcomes as well as to increase the role of AS pharmacists.
- Previous studies have investigated strategies to optimize SAB management, but have had limited or varying approaches with microbiology, ID consultation, and AS pharmacist collaboration.[7-9]
  - Wenzler et al performed a quasi-experimental study to evaluate SAB management via a pharmacist-driven initiative (pre=45 and post=39 patients)[7]
    - Significantly more patients had adherence to 4 evidence-based recommendations (68.9 vs. 92.3%; p=0.008).
    - No significant differences in infection-related LOS, LOS, bacteremia duration, readmission, or all-cause mortality.
- Limitations
  - Single-center, quasi-experimental design and results may not be generalizable.
  - More patients were immunocompromised and had a higher APACHE 2 score in the pre-intervention yet patients had similar Pitt bacteremia scores.

CONCLUSIONS

- A pharmacist-driven collaborative initiative for SAB improved adherence to evidence-based management recommendations and several clinical patient outcomes.

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DISCLOSURES

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