

Jordan R. Smith<sup>1,2</sup>, Jeremy J. Frens<sup>1</sup>, Cynthia Snider<sup>1</sup>, Kimberly C. Claeys<sup>3,4</sup>

<sup>1</sup>Cone Health, Greensboro, NC; <sup>2</sup>Fred Wilson School of Pharmacy, High Point University, High Point, NC; <sup>3</sup>University of Maryland School of Pharmacy, Baltimore, MD <sup>4</sup>University of Maryland Medical Center, Baltimore, MD

## Background and Rationale

- Background
  - Staphylococcus aureus* bacteremia (SAB) is an important cause of morbidity and mortality
  - Suboptimal treatment has been associated with poor patient outcomes
- Rationale
  - Several elements of SAB care are important to ensure appropriate treatment and the best patient outcome
  - These elements include the following:
    - Appropriate, targeted antimicrobial therapy upon specific identification of the organism
    - Appropriate assessment for metastatic sites of infection (echocardiogram, CT-scan, etc.)
    - Repeated blood cultures to document bacterial clearance
    - Duration of therapy consistent with the best patient outcomes
  - At Cone Health a novel pharmacist-driven SAB Care Intervention was implemented to improve outcomes by addressing these four elements
  - The elements of care above were evaluated individually and collectively as part of a novel "optimal care score" (OCS) consisting of 4 points, one for each element

## Study Hypothesis

- A pharmacist-driven antimicrobial stewardship intervention, constructed of the four elements previously determined to be important to SAB management, will improve SAB care and demonstrate improved patient outcomes
- Primary endpoint was time to appropriate, targeted antibiotics
- Secondary endpoints were all elements of the optimal care score, average optimal care score, patients with perfect optimal care score, infectious diseases consult, relapse, and death

## Study Design

- Quasi-experimental, propensity score matched (2:1) study of SAB management
  - Retrospective evaluation of SAB care from October 2011 to October 2012
  - Active, pharmacist-driven intervention cohort from November 2012 to December 2015
- Patients were  $\geq 18$  years old meeting the diagnostic criteria for SAB
- Medication therapy monitoring software (Vigilanz) first alerted the pharmacist to the presence of gram-positive cocci then subsequently alerted for species confirmation and determination of resistance profile
- After intervention, patients were matched 1:1 from the historic and intervention cohorts based on age, diabetes, hardware, MRSA vs MSSA, and stratified infection source risk from 1 to 3
  - 1 – Central venous catheter, hardware, urine
  - 2 – Osteomyelitis, SSTI, unknown
  - 3 – Endocarditis, pneumonia
- Groups were compared using  $\chi^2$  for categorical values and student's t-test for continuous values
- Cumulative hazards function for time to appropriate antibiotic therapy pre-versus post-intervention, log-rank test for significance

## Results

### Baseline Demographics & Clinical Characteristics

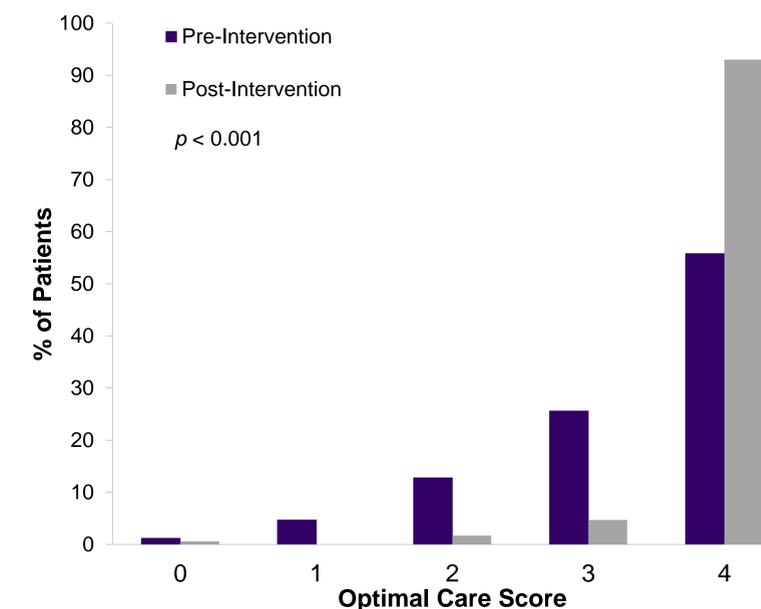
	Pre (N = 86)	Post (N = 172)	p-value
Age (mean, SD)	63.37 (14.90)	62.91 (15.62)	0.226
Male (n, %)	54 (63%)	108 (63%)	1.000
Presence of Diabetes (n, %)	40 (47%)	87 (51%)	0.380
Presence of Hardware (n, %)	19 (22%)	37 (22%)	0.915
Presence of CKD (n, %)	38 (44%)	65 (38%)	0.323
Presence of ANY SIRS (n, %)	64 (74%)	141 (82%)	0.157
IV Drug Use (n, %)	6 (7%)	3 (2%)	0.031
HIV/AIDS (n, %)	3 (4%)	6 (4%)	0.699
MRSA (n, %)	37 (43%)	73 (42%)	0.929
Source Risk = 1 (n, %)	32 (37%)	46 (27%)	0.084
Source Risk = 2 (n, %)	39 (45%)	112 (65%)	0.002
Source Risk = 3 (n, %)	15 (17%)	29 (11%)	0.026

## Results

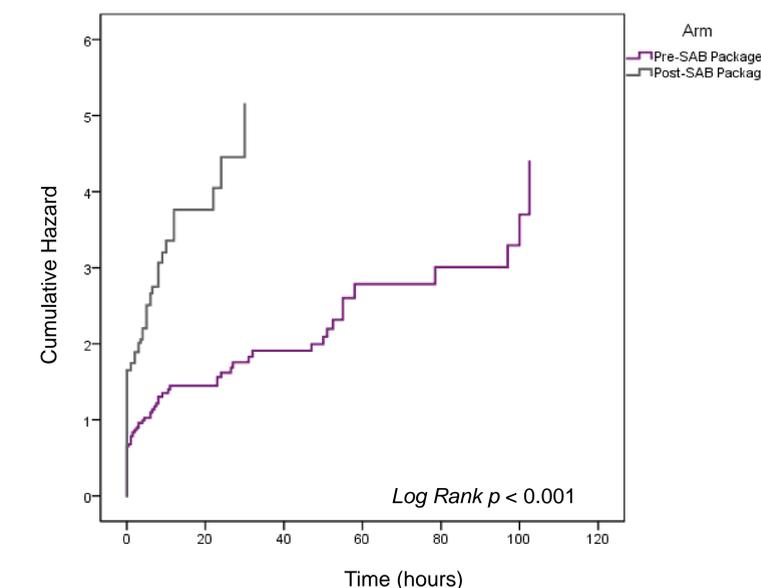
### Clinical Outcomes: Pre- versus Post-SAB Package

	Pre (N = 86)	Post (N = 172)	p-value
Perfect Optimal Care Score (n, %)	48 (56%)	160 (93%)	<0.001
Appropriate antibiotics within 24 h (n, %)	65 (76%)	169 (98%)	<0.001
Repeat blood cultures to document clearance (n, %)	70 (81%)	169 (98%)	<0.001
Assessment for metastatic site (n, %)	78 (91%)	167 (97%)	0.027
Appropriate duration (n, %)	69 (80%)	166 (97%)	<0.001
Infectious Diseases Consult (n, %)	64 (74%)	172 (100%)	<0.001
Relapse (n, %)	9 (11%)	6 (4%)	0.024
Death (n, %)	5 (6%)	5 (3%)	0.254
Death OR relapse (n, %)	14 (16%)	11 (6%)	0.011

### Optimal Care Score Distribution



### Cumulative Hazard– Time to Appropriate Antibiotics



Mean (95% CI) Time to appropriate antibiotics (hours)  
 Pre-intervention group = 14.19 (8.37 – 20.01) hours  
 Post-intervention group = 1.48 (0.79 – 2.17) hours

## Conclusions

- Pharmacist-driven antimicrobial stewardship interventions on cases of SAB improved disease-state management and resulted in significantly fewer relapses of SAB
- More patients in the intervention portion achieved a perfect optimal care score of 4 compared to those in the pre-intervention group
- Perfect OCS was not significantly associated with decreased relapse – this could be due to limited sample size or other interventions that were not captured in analysis
- This intervention protocol can be successfully implemented elsewhere and requires validation in further studies