

Abstract (Revised)

Background: *Staphylococcus aureus* bacteremia (SAB) is a major cause of mortality. Recovery of SAB may be enhanced with new blood culture systems resulting in a longer observed duration of bacteremia.

Methods: We performed a 24-month retrospective study of adults hospitalized with SAB at a 1250-bed academic hospital. Between 1/2018-12/2018 the VersaTREK system was used and 1/2019-12/2019 the BACT/ALERT VIRTUO (VIRTUO) system was used. We excluded patients without an Infectious Diseases (ID) consult. We defined SAB duration as short (1-2 days), intermediate (3-6 days), or prolonged (≥ 7 days). We compared SAB detection and management pre- and post-implementation of VIRTUO.

Results: 456 patients had SAB during study period; 420 (92%) had ID consultation: 178 (42%) pre- and 242 (58%) post-implementation. Similar proportion of methicillin-resistant SAB was seen (44.9% pre- vs. 36.8% post-implementation, $p=0.09$). Post-implementation, patients were more likely to have intermediate (22.4% pre- vs. 40.1% post-implementation; $p<0.001$) and prolonged SAB duration (3.9% pre- vs. 13.6% post-implementation; $p<0.001$). Median time to positivity for the index blood culture was shorter (19.9 pre- vs. 15.0 hours post-implementation, $p<0.001$). Dual anti-staphylococcal therapy was used more frequently in the post-implementation period (6.2% pre- vs. 15.7% post-implementation; $p=0.003$). No difference was noted in frequency of diagnostic studies (transesophageal echocardiography, magnetic resonance imaging, and computed tomography) except for PET-CT scans. Source control was similar (46.1% pre- vs. 45.0% post-implementation; $p=0.84$) but the median time to source-control was shorter post-implementation (4 pre- vs. 2 days post-implementation; $p=0.02$). Median planned duration of intravenous antibiotics did not vary between pre- and post-implementation periods (6 vs. 6 weeks, $p=0.31$). There was no difference in 90-day readmissions (38.2% pre- vs. 34.3% post-implementation; $p=0.41$).

Conclusion: VIRTUO blood culture system was associated with a decreased time to positivity and increased frequency of prolonged SAB compared to the VersaTREK system. This resulted in increased use of dual anti-staphylococcal therapy, and shorter time to source-control, but no difference in interventions, planned duration of antibiotics, or readmissions.

Background / Methods

- Persistent bacteremia is considered a surrogate for complicated *Staphylococcus aureus* bacteremia (SAB) and may be an independent predictor of mortality.
- Recovery of *S. aureus* may be enhanced with newer blood culture (BC) systems, resulting in a longer observed duration of bacteremia.
- We performed a retrospective study of adults hospitalized with SAB at a 1250-bed academic hospital.
- Between Jan 1, 2018 - Jan 13, 2019 the VersaTREK blood culture (BC) system was used, and between Jan 14, 2019- Dec 31, 2019 the BACT/ALERT VIRTUO (VIRTUO) BC system was used.
- We excluded patients without an Infectious Diseases (ID) consult (7.3% pre- vs. 8.3% post-implementation; $p=0.68$).
- SAB duration was calculated as the number of days between the first and last positive BC and classified as short (1-2 days), intermediate (3-6 days), or prolonged (≥ 7 days).
- We compared SAB detection and management pre- and post-implementation of VIRTUO.

Results

- 456 patients had SAB during study period; 420 (92%) had ID consultation
 - 178 (42%) pre- implementation
 - 242 (58%) post-implementation.
- Similar overall clinical characteristics in both groups (Table 1)
- The post-implementation group had higher rates of intermediate (22.4% pre- vs. 40.1% post-implementation; $p<0.001$) and prolonged SAB (3.9% pre- vs. 13.6% post-implementation; $p<0.001$).
- Dual anti-staphylococcal therapy was used more frequently in the post-implementation period (6.2% pre- vs. 15.7% post-implementation; $p=0.003$).

- Source-control was similar (Table 1) but the median time to source-control was shorter post-implementation (4 pre- vs. 2 days post-implementation; $p=0.02$).
- No difference in 90-day readmissions or 90-day mortality
- Median time to positivity for the index blood culture was shorter (19.9 pre- vs. 15.0 hours post-implementation, $p<0.001$).

Figure 1. Median time to positivity (h) by day blood culture was obtained after index blood culture date (Day 0)

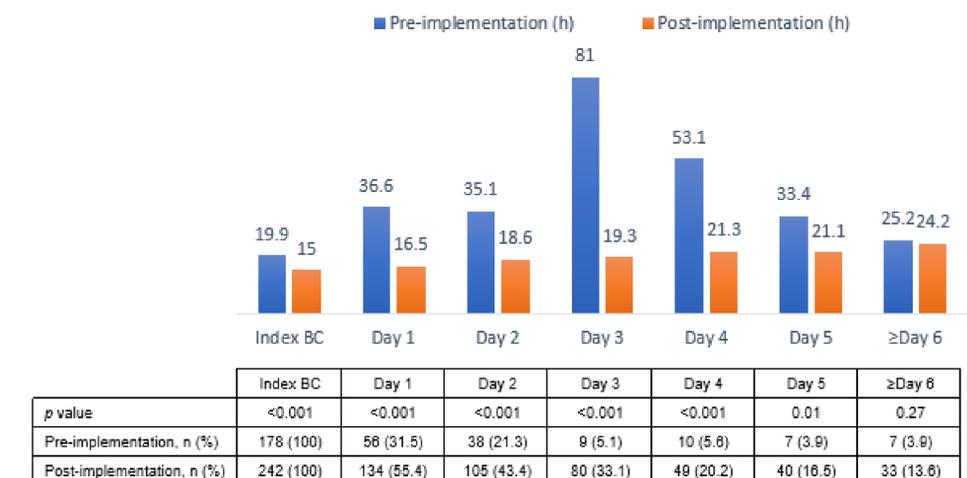


Table 1. Clinical Characteristics and Outcomes of patients with *Staphylococcus aureus* bacteremia by intervention period

Variable, n (%) or Median (IQR)	Pre-implementation (n=178)	Post-implementation (n= 242)	p value
Age, years	57.5 (46-69)	58 (43-69)	0.96
Sex, male	102 (57)	151 (62)	0.29
MRSA bacteremia	80 (45)	89 (37)	0.09
Bacteremia onset, community-acquired	122 (69)	162 (67)	0.73
Site of infection			
Isolated bacteremia	35 (20)	53 (22)	0.58
Central line- associated bacteremia	51 (29)	49 (20)	0.05
Skin & soft tissue infection	23 (13)	31 (13)	0.97
Osteomyelitis	24 (14)	30 (12)	0.74
Septic arthritis	12 (7)	16 (7)	0.96
Epidural abscess	8 (5)	5 (2)	0.13
Endocarditis	28 (16)	40 (17)	0.83
Vascular graft infection	5 (3)	9 (4)	0.41
Lower respiratory tract infection	18 (10)	29 (12)	0.55
Bacteremia duration			
Short (1-2 days)	130 (74)	111 (46)	
Intermediate (3-6 days)	40 (23)	97 (40)	<0.001
Prolonged (>7 days)	7 (4)	33 (14)	
Dual antistaphylococcal therapy	11 (6)	38 (16)	0.003
Recommended duration	6 (4-6)	6 (4-6)	0.31
Source control			
Was source of SAB removable?, Yes	109 (62)	150 (63)	0.82
Was source controlled?, Yes	82 (75)	109 (73)	0.74
Transthoracic echocardiography	171 (96)	233 (96)	0.91
Transesophageal echocardiography	48 (27)	81 (33)	0.15
MRI total spine	36 (20)	38 (16)	0.23
CT chest/abdomen/pelvis	27 (15)	53 (22)	0.08
PET CT scan	1 (1)	13 (5)	0.004
Outcomes			
Length of stay, days	15.5 (8-28)	17 (9-30)	0.30
90-day all cause readmission	91 (51)	105 (43)	0.12
90-day mortality	59 (33)	78 (32)	0.84

Conclusions

- VIRTUO BC system was associated with increased frequency of prolonged SAB compared to the VersaTREK system without difference in mortality or readmission.
- VIRTUO BC system was associated with decreased time to positivity for *S. aureus* detection for initial and subsequent BC performed.
- Persistent bacteremia detected by VIRTUO system may have influenced management with a decreased time to source-control and higher frequency use of dual anti-staphylococcal antibiotics.