Predictors of Vancomycin Switch or Escalation in Patients with Methicillin-Resistant *Staphylococcus aureus* Bloodstream Infection

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Background

- Vancomycin (VAN) is considered the standard of care treatment for methicillin-resistant *Staphylococcus aureus* (MRSA) bloodstream infections (BSI)[1]
- VAN is frequently combined with a second agent or switched to an alternative anti-MRSA agent due to clinical failure or intolerance[2-4]
- The objective of this analysis was to determine the potential risk factors for patients requiring therapy escalation or switch.

Methods

- Retrospective, observational cohort study from 2006 to 2018 at the Detroit Medical Center and Henry Ford Hospital
- Inclusion criteria: Age ≥ 18 years, ≥ 1 positive MRSA blood culture, and initially treated with VAN (>24 h) for MRSA BSI
- Exclusion criteria: Respiratory BSI source and polymicrobial BSI
- Baseline clinical and infection characteristics were compared between patients who received VAN as the sole anti-MRSA agent and continued on VAN until discharge and patients who switched or had a second anti-MRSA agent added during their admission (switch/escalate group)
- VAN MIC values determined by automated testing
- Etest testing only available for 30 (15.3%) of isolates
- Nominal variables were compared using the Chi-square and Fisher's exact tests. Ordinal and continuous variables were analyzed using the Mann-Whitney-U test and Student's t-test, as appropriate
- Multivariable logistic regression was performed to identify independent predictors of therapy switch or escalation
- Model fit assessed with Hosmer-Lemeshow goodness-of-fit
- All analysis performed using SPSS Statistics, IBM SPSS software, version 24.0 (IBM Corp., Armonk, NY).

Results

Table 1. Comparison of Patient Characteristics between Treatment Groups

Characteristic	Vancomycin N = 66	Switch/escalate N = 129	*P* value
Demographics			
Age (years), median (IQR)	56 (46 – 61.7)	56 (48.5 – 64)	0.843
Male, n (%)	44 (66.7)	89 (69.0)	0.741
African American, n (%)	54 (81.8)	104 (80.6)	0.840
Community-onset bloodstream infections, n (%)	49 (74.2)	104 (80.6)	0.305
Comorbidities and Past Medical History			
Charlson comorbidity index, median (IQR)	2 (1-4)	3 (1-5)	0.017
Diabetes with end organ damage , n (%)	18 (27.3)	48 (37.2)	0.165
Chronic kidney disease, n (%)	20 (30.3)	59 (45.7)	0.038
Acute kidney Injury, n (%)	15 (22.7)	48 (37.2)	0.041
Liver disease, n (%)	14 (21.2)	25 (19.4)	0.762
Heart failure, n (%)	10 (15.2)	34 (26.4)	0.077
Asthma, n (%)	2 (3.0)	16 (12.4)	0.036
Human Immunodeficiency Virus (HIV), n (%)	3 (4.5)	4 (3.1)	0.691
Intravenous drug use, n (%)	11 (16.7)	32 (24.8)	0.195
Prior hospitalization in past 90 days, n (%)	19 (28.8)	55 (42.6)	0.059
Prior systemic antibiotic in past 90 days, n (%)	22 (33.3)	50 (38.8)	0.457
Prior MRSA infection in 365 days, n (%)	12 (18.2)	29 (22.5)	0.486
APACHE II[a] , median (IQR)	11 (7-17.5)	15 (7-21)	0.001
Intensive Care Unite (ICU) after Index culture, n (%)	6 (9.5)	29 (22.8)	0.026
Vancomycin-MIC Automated Tested <2, n (%)	47 (71.2)	42 (32.6)	------
Vancomycin-MIC Automated Tested =>2, n (%)	19 (28.8)	87 (67.4)	<0.001
Treatment Information			
Time to switch/escalation (h), median (IQR)	0	67 (44-97)	N/A
Add or switch therapy			
Daptomycin, n (%)	0	108 (83.7)	N/A
Ceftaroline, n (%)	0	12 (9.3)	N/A
Others[b], n (%)	0	9 (6.9)	N/A
Infectious diseases consult, n (%)	48 (72.7)	118 (91.5)	<0.001
Source control pursued, n (%)	27 (42.5)	71 (57.3)	0.062

APACHE II[a], acute physiology and chronic health evaluation; Others [b] , Linezolid, trimethoprim/sulfamethoxazole, rifampin and gentamicin

Results

Figure 1. Primary Source of MRSA BSI

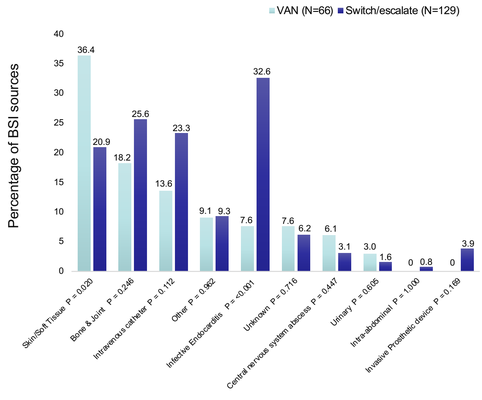

Figure 2. Vancomycin MIC via Etest (mg/L)

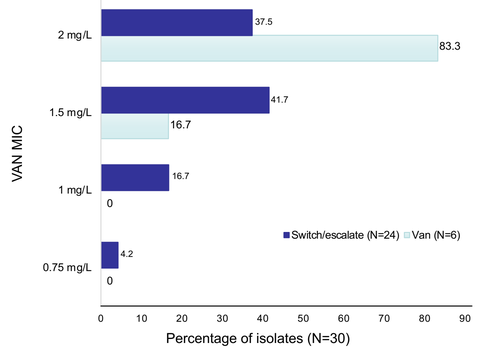

Table 2. Logistic Regression Model for therapy switch or escalation

Variable	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
APACHE II[a]	1.08 (1.03-1.13)	0.001	1.07 (1.01-1.12)	0.009
Prior hospitalization in past 90 days	2.0 (1.2-3.3)	0.05	1.9 (1.1-3.2)	0.02
Infective endocarditis	5.8 (2.2-15.7)	<0.001	6.1 (2.2-16.9)	<0.001
Skin/Soft tissue infection	0.46 (0.24-0.89)	0.020	---------	--------
Heart failure	2.0 (0.9-4.3)	0.07	---------	--------
Chronic kidney disease	1.9 (1.03-3.6)	0.038	---------	--------

APACHE II[a], acute physiology and chronic health evaluation

Conclusions

- Infective endocarditis as a source of bacteremia, APACHE II score and prior hospitalization in past 90 days were independently associated with switch/escalation therapy
- The difference in baseline clinical and infection characteristics should be taken into account for a clinician to predict the likelihood of switch or escalation in vancomycin-treated patients with MRSA BSI
- Future studies evaluating the impact of upfront alternative therapies in these higher-risk patients are needed

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Disclosures

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