Mortality predictors for central line-associated bloodstream infection caused by *Staphylococcus aureus*

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INTRODUTION

Central line associated bloodstream infection (CLABSI) caused by *S. aureus (Staphylococcus aureus)* remains an important cause of hospital mortality. Vancomycin is considered the drug of choice for the treatment of MRSA (Meticilin-resistant *S. aureus*), although there is some controversy about its efficacy in specimens with higher minimal inibitory concentration.

In-hospital mortality of *S. aureus* bacteremia varies from 20% to 47%, and the predictors of mortality in this population are not well understood.

OBJECTIVE

To evaluate risk factors for mortality in patients with central line associated bloodstream infection (CLABSI) caused by *S. aureus.*

METHODS

A retrospective cohort of patients aged 18 or older was performed at a major 1000-bed teaching hospital.
Investigated variables were age, sex, hypertension, *diabetes mellitus*, hepatopathy, immunosuppression, methicillin resistance, dialysis, surgery, concomitant infection.
Minimal inhibitory concentrations (MIC) were obtained by automated method (VITEK®) and confirmed by E-test for vancomycin when MIC ≥ 1 mg/ml.

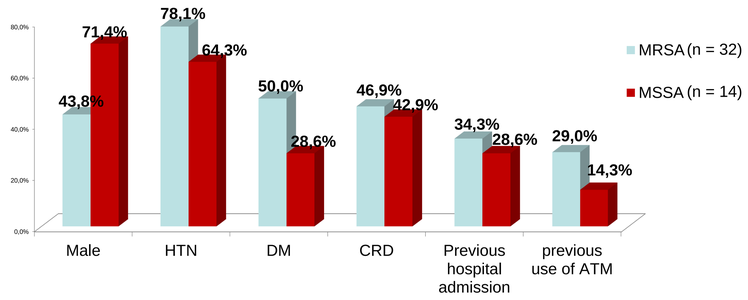
Study design	• Retrospective cohort study
Outcome	• All causes 14 and 30-day mortalities
Inclusion criteria	• ≥18 years-old, hospital admission between jan/2011-mar/2012 • first episode of CLABSI caused by *S. aureus* • Inpatient period >48h
Data collection	• Chart review

Treatment was considered to be adequate if adequate drug was given for more than 48 hours and for vancomycin, through levels >= 15 mg/L in at least 70% of dosages).
Chi-square and Fisher exact tests were used for categorical variables. Means were analysed by t-student test. Relative risks and confidence interval (CI 95%) were calculated. Epi Info 3.5.4 was used.

RESULTS

Forty six cases were included. Mean age was 55 years (range 18 to 90), 52% of patients were male. Methicillin resistant *Staphylococcus aureus* (MRSA) caused 69.6% of infections. There were no demographic differences between MRSA and Methicillin susceptible *Staphylococcus aureus* (MSSA) infected patients, as shown in Fig. 1. Data about mortality are shown in Fig. 2.

Figure 1: overall characteristics of patients with CLABSI caused by *S. aureus* according to specie susceptibility to meticilin, Hospital das Clinicas, University of Sao Paulo, jan/11 - mar/12*



HTN: hypertension; DM: diabetes mellitus; CRD: chronic renal disease; ATM: antimicrobial
* p>0,05 for all variables

Figure 2: mortality of CLABSI caused by *S. aureus*, Hospital das Clinicas, Brazil , jan/11 - mar/12

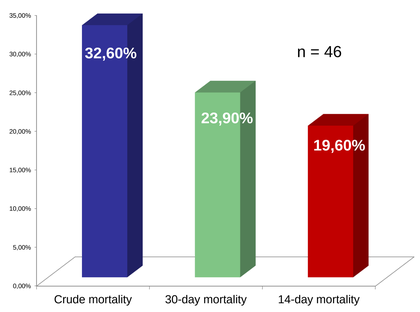
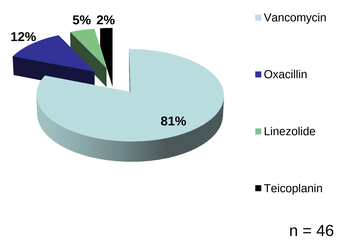


Figure 3: drugs used for treatment of CLABSI by *S. aureus*, Hospital das Clinicas, Brazil , jan/11-mar/12



Mean length of hospital stay between diagnosis and death was 18.6 days (0 to 64 days). Receiving adequate treatment was the only protective factor for survival (CI=0.4-0.99;*p*=0.05) – Table 1. Thirty-four patients received vancomycin (Fig. 3) and only 56% had adequate vancomycin through levels. There was no significant difference in mortality if patients achieved or not adequate through levels (CI= 0.03-2.11; *p*=0.18).
Among 42 patients who had MIC reported for vancomycin, 22 (52%) presented with 1 mg/ml and 11 died, 6 (14%) with ≤ 0.5 mg/ml and three (7%) presented with 2 mg/ml with no deaths(Table 2).

Table 1: univariate analysis of exposition variables related to 14-day mortality in patients with CLABSI caused by *S. aureus*, Hospital das Clinicas, São Paulo, Brazil

	Yes (n = 9)		No (n = 37)		RR (CI 95%)	*p* value
	N	%	N	%		
Age (mean ± SD)	57,6 ± 13,8		55 ± 21,2			0,72
Male	5	55.5	19	51.4	0,9 (0.6-1,2)	0.86
MRSA	6	66.7	26	70,3	0.96 (0.7-1.3)	0.56
Empiric treatment	6	66.7	26	70.3	0.96 (0.7-1.3)	0.56
Hemodyalisis	4	44.4	21	56,8	0.90 (0.7-1.2)	0.38
Surgical procedure	4	44.5	21	56.8	1.03 (0.7-1.3)	0.55
Complicated/persistent bacteremia	2	22.2	7	18.9	1.40 (0.7-1.5)	0.57
BSI by other agent	4	44.5	13	35.1	1.08 (0.8-1.5)	0.43
Adequate treatment	2	22.2	22	59.5	0.7 (0.4-0.99)	0.05
Adequate vancomycin levels*	1	20.0	13	54.2	0.3 (0.03-2.11)	0.18

RR: relative risk; CI 95%: confidence interval 95%

*** Vancomycin though levels ≥15 mg/L in at least 70% of dosages (n=24)**

Table 2: minimal inibitory concentrarion (MIC) reported for vancomycin among *S. aureus* in patients with CLABSI, Hospital das Clínicas, Sao Paulo, Brazil

MIC (mg/ml)	Number of patients	14 or 30 –days death (%)
≤ 0,5	06	0 (0%)
1,0	22	11 (50%)
2,0	03	0 (0%)

CONCLUSION

Adequate treatment was the only predictor of good outcome in the study population. Although adequate through levels are indicated in current guidelines for successful MRSA treatment, this was not observed in this cohort. Limitation of this study are its retrospective design and small assessed population. Prospective clinical studies might be more adequate to answer this issue.

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