

The VIRSTA score, a prediction score to estimate risk of infective endocarditis and determine priority for echocardiography in patients with *Staphylococcus aureus* bacteremia

Supplementary Appendix

Methods

Data acquisition and definitions

Nosocomial SAB was defined as infection developing in a patient hospitalized for more than 48 hours prior to the onset of signs/symptoms consistent with bloodstream infection. Non-nosocomial healthcare-associated infection was defined as SAB diagnosed within 48 hours of admission in an outpatient with extensive healthcare contact as reflected by any of the following criteria: (1) received intravenous therapy, wound care, or specialized nursing care at home within the 30 days prior to the onset of SAB; (2) attended a hospital or hemodialysis clinic within the 30 days before the onset of SAB; (3) was hospitalized in an acute care hospital for 2 or more days in the 90 days before the onset of SAB; or (4) resided in a nursing home or long-term care facility. Community-acquired SAB was defined as SAB diagnosed within 48 hours of admission in a patient who did not fit the criteria for healthcare associated infection.

Table S1. Final predictive models of sensitivity analyses VIRSTA Study (Stepwise backward approach)

	echo sensitivity analysis* (N=1,728)			Duke modified criteria sensitivity analysis † (N=1,950)		
	Odds Ratio	(95% CI)	p-value	Odds Ratio	(95% CI)	p-value
Cerebral or peripheral emboli	10.3	(5.8 ; 18.2)	<0.0001	9.2	(5.0 ; 17.1)	<0.0001
Meningitis	12.5	(3.5 ; 45.0)	<0.0001	11.9	(3.8 ; 37.4)	<0.0001
Permanent intracardiac device or previous IE	7.2	(4.8 ; 10.8)		7.8	(5.1 ; 12.1)	<0.0001
Native valve disease	3.6	(2.3 ; 5.8)	<0.0001	3.2	(1.9 ; 5.4)	<0.0001
Intravenous drug use	5.8	(2.8 ; 12.1)	<0.0001	3.5	(1.4 ; 8.3)	0.0050
Persistent bacteremia	3.8	(2.7 ; 5.5)	<0.0001	4.1	(2.7 ; 6.1)	<0.0001
Vertebral osteomyelitis	2.9	(1.0 ; 7.9)	0.040	--	--	NA‡
Community or Non nosocomial HCA acquisition	2.3	(1.6 ; 3.3)	<0.0001	2.5	(1.7 ; 3.6)	<0.0001
Unknown setting of acquisition	0.4	(0.1 ; 1.6)		0.4	(0.1 ; 2.0)	
CRP > 190 mg/L	2.0	(1.4 ; 2.9)	0.0005	1.6	(1.1 ; 2.4)	0.023
Severe sepsis or shock	2.0	(1.4 ; 2.9)	0.0001	2.2	(1.5 ; 3.2)	0.0001

*echo sensitivity analysis performed in the 1,728 patients who underwent echocardiography or in those for whom the addition of a putative echocardiographic major criterion would not upgrade the Duke classification to definite IE case

†Duke modified criteria sensitivity analysis performed in the 1,950 without IE or those in whom IE was surgically based or defined by 2 major criteria

‡ NA: No patient with IE had vertebral osteomyelitis

CRP,C-reactive protein; HCA, Health Care Associated; IE, Infective Endocarditis; NA, Not Available

Table S2. Studies proposing criteria to guide the use the of echocardiography in patients with staphylococcus aureus bacteremia

Study	Study design	Study population	No. of SAB patients	Echo rate (%)	Systematic follow-up	12-week	Clinical Prediction score for endocarditis	Score validation	Study findings/Prediction criterion
Kaasch et al. [18]	Post hoc analysis of 2 prospective SAB cohorts (INSTINCT and SABG)	Nosocomial SAB	304+432	TTE/TEE within 14 days : - 39.8% (INSTINCT) - 57.4% (SABG)	None of the 2 cohorts designed to measure rate of IE at 3 months after onset of SAB		No multivariate scoring system (2-sided Fisher exact test)	Predictors identified in 2 cohorts	<ul style="list-style-type: none"> - Bacteremia > 4 days - Permanent intracardiac device - Hemodialysis - Spinal infection/non vertebral osteomyelitis
Khatib et al. [19]	Patients included from 3 previous prospective observational studies	All SAB patients	805	36.6% TTE within 28 days	No. Follow-up for 100 days attempted by reviewing subsequent medical		No multivariate scoring system	No validation	Authors concluded that TEE is dispensable in patients with uncomplicated SAB
Showler et al. [25]	Retrospective cohort study	All SAB patients	833	53.9% TTE <i>Statistical analysis only performed in this subpopulation</i>	No		Predictors identified in the final multivariable regression model	Internal validation Split sample method : diagnostic properties determined in the Validation cohort	<ul style="list-style-type: none"> - Indeterminate or positive TTE - Intravenous drug use - High-risk cardiac condition - Community-acquired
Palraj et al. [26]	Retrospective cohort study	All SAB patients	678	68% TEE within 14 days	No. Electronic medical records reviewed to collect follow-up data		Predictors identified in the 2 final models	Bootstrap sample method to internally validated the fit and performance of both final models	<ul style="list-style-type: none"> - Community-acquired - presence of cardiac device - prolonged bacteremia ≥ 72 h
Our study	Prospective multicenter cohort study	All SAB patients	2 008	67% TTE/TEE	12-weeks phone contact		Predictors identified in the final multivariable regression model	.632 Bootstrap sample method to internally validated the fit and performance of the model	<ul style="list-style-type: none"> - Early extra-cardiac events (emboli, meningitis, vertebral osteomyelitis, severe sepsis) - Persistent bacteremia ≥48 hours - Presence of cardiac device/native valve disease - IVDU - CRP≥190 mg/L - Community acquired or non-nosocomial health care associated acquisition

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