An external validation study of the quick sequential organ failure assessment for Japanese patients undergoing hemodialysis

Hiroki Nishiwaki1, Takeshi Hasegawa2, Sho Sasaki1, Shun Minatoguchi3, Masahide Furusho4, Hiroo Kawarazaki5, Diasuke Uchida6, Masahito Miyamoto7, Kenichiro Koitabashi8, 1Fukushima Medical University, Center for Innovative Research for Communities and Clinical Excellence, Fukushima, JAPAN, 2Showa University, Office for Promoting Medical Research, Tokyo, JAPAN, 3Chubu Rosai Hospital, Department of Nephrology, Nagoya, JAPAN, 4Iizuka Hospital, Department of Nephrology, Iizuka, JAPAN, 5Inagi Municipal Hospital, Department of Nephrology, Inagi, JAPAN, 6St. Marianna University School of Medicine Hospital, Division of Nephrology and Hypertension, Kawasaki, JAPAN, 7Shonan Kamakura General Hospital, Department of Nephrology, Immunology, and Vascular Medicine, Kamakura, JAPAN, 8St. Luke´s International Hospital, Department of Nephrology, Tokyo, JAPAN.

Background

- Patients undergoing hemodialysis (HD) are at high risk for bloodstream infections due to daily punctures required for vascular access. In a previous study, the quick sequential organ failure assessment (qSOFA) showed predictive validity (area under the receiver operating characteristic [AUROC] curve = 0.81; 95% CI = 0.80-0.82) among non-ICU encounters without hemodialysis.
- We already have reported that SIRS (Systemic inflammatory response syndrome) had a low sensitivity for predicting blood stream infection in HD patients (sensitivity, 71.9%; specificity, 45.2%; positive likelihood ratio, 1.31; negative likelihood ratio, 0.62).

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- This study aimed to examine the performance of qSOFA, which has been proposed as an easy-to-use score that rapidly identifies sepsis in patients undergoing HD.

Methods

- Design
  - multi-center retrospective observational study
- Patients
  - Patients undergoing HD, including
    - maintenance HD patients,
    - aged >18 years,
    - with suspected bloodstream infections, who had blood cultures drawn in an outpatient setting or within 2 days after admission from August 2011 to July 2013 in 11 Japanese tertiary care centers in the JOINT-KD group.
- The outcome measure
  - in-hospital mortality – primary outcome-
  - Bacteremia (positive blood culture)

- qSOFA was composed
  - using a baseline risk model that included age, Charlson comorbidity index, race, sex,
  - and the score with a range of 0-3 points
    - 1 point each for
      - systolic hypotension [100 mmHg]
      - tachypnea [22/min]
      - altered mentation [GCS < 13]
  - The cutoff point was defined as 2 or higher.
- The performances of qSOFA both with and without the baseline risk model were evaluated using the AUROC curves for discrimination and the Hosmer–Lemeshow test for calibration.
- We performed a complete data analysis in this study. We also did an analysis with multiple imputation.

Results

Table 1. Patient characteristics(N=507)

	Median(quartile or %)		Missing Data(%)			Median(quartile or %)		Missing Data(%)	
Age, years	73	(66,81)	0	0.0%	Vascular Access			44	8.7%
Sex, female, %	185	36.5%	0	0.0%	AV fistula	375	74.0%		
Dialysis vintage, months	61.0	(23, 117)	25	4.9%	AV graft	59	11.6%		
Cause of ESRD, n (%)			14	2.8%	Superficial artery	17	3.4%		
Diabetic Nephropathy	203	40.0%			Permanent catheter	12	2.4%		
Nephrosclerosis	100	19.7%			History of bacteremia	50	9.9%	4	0.8%
Glomerulonephritis	87	17.2%			Medication				
Others and Unknown	103	20.3%			Steroid use	50	9.9%	3	0.6%
Vital signs					Immunosuppressant use	7	1.4%		
Body temperture(℃)	37.1	(36.6, 38.0)	36	7.1%	Antibiotics use within 1 week	83	16.4%	6	1.2%
Systolic blood pressure	136	(113, 159)	30	5.9%	Laboratory findings				
Systolic hypotension (≦100mmHg)	71	14.0%	30	5.9%	White blood cell(/μL)	7900	(5660, 11200)	12	2.4%
Respiratory Rate(/min)	20	(16, 24)	255	50.3%	Platelet count(10^4/μL)	15.3	(10.7, 20.9)	12	2.4%
Tachypnea(≧22/min)	89	17.6%	255	50.3%	Albumin(g/dl)	3.3	(2.9, 3.7)	53	10.5%
Heart rate(/min)	86	(75, 100)	35	6.9%	C-reacted protein(mg/dl)	5.9	(1.7, 12.6)	18	3.6%
SpO_2(%)	97	(95, 100)	118	23.3%	Charlson comorbidity index	3	(2, 5)	2	0.4%
GCS<15	65	12.8%	84	16.6%	Positive blood culture	68	13.4%	0	0.0%
Comorbidities					In-hospital death	74	14.6%	0	0.0%
Malignancy, %	61	12.0%	1	0.2%					
Diabetes, %	222	43.8%	1	0.2%					

ESRD: End-stage renal disease, GCS: Glasgow Coma Scale

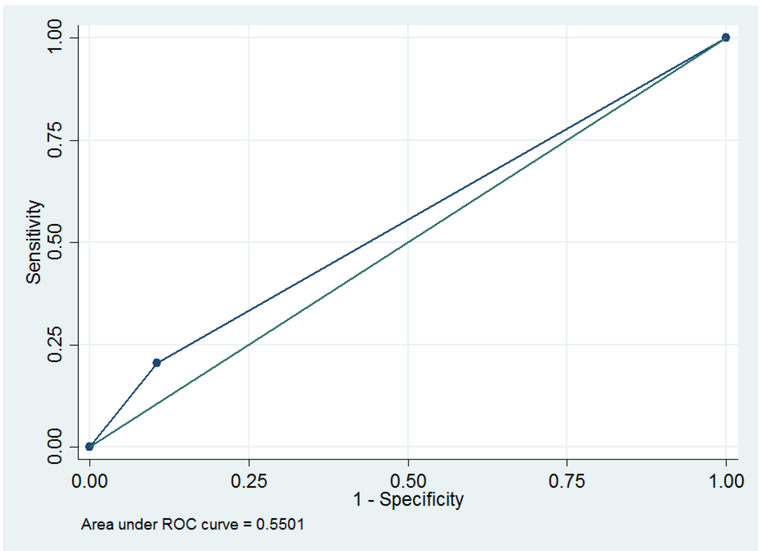

Figure. ROC for positive blood culture
AUROC for bacteremia was 0.55 (95%CI 0.48-0.62).
Sensivity 20.5%, Specificity 89.5%

Table2 Logistic Regression Analysis and Validatoin for In-hospital death

		Analysis with complete data(N=220)			Analysis with Multiple Imputation(N=507)		
	variable	Odds Ratio	95%CI		Odds Ratio	95%CI	
Model1 (without baseline model)	qSOFA	7.58	3.18	18.06	6.23	3.56	10.91
		ROC=0.65 (95%CI 0.57-0.73) Sensitivity=36.8%, Specificity=92.9%			ROC=0.70 (95%CI 0.63-0.76)		
Model2 (with baseline model)	qSOFA	6.70	2.75	16.32	5.77	3.24	10.25
	Age	1.03	0.97	1.04	1.03	1.00	1.06
	gender	1.01	0.01	10.01	1.38	0.14	13.15
	Charlson Index	1.25	0.99	1.61	1.12	0.95	1.32
		ROC=0.73 (95%CI 0.67-080)			ROC=0.73 (95%CI 0.67-080)		

The Hosmer-Lemeshow test (HL) for Model 1 showed p<0.01. Whereas, HL for Model2 showed p=0.99

Discussion & Conclusion

- Compared with the previous studies for non-HD patients, the prognostic accuracy of qSOFA2 for HD patients were worse than non-HD patients.
- qSOFA for HD patients could be useless for the prediction of positive blood culture.
- Based on our previous study, SIRS was more useful for HD patients suspected of bacteremia than qSOFA.

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◆ We concluded that qSOFA could be useless for HD patients suspected of bacteremia.

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