

The Clinical Application Value of SepSMART for Early Diagnosis and Risk Prediction of Sepsis

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Abstract

Background: Sepsis is a life-threatening condition with high morbidity and mortality, largely due to delayed diagnosis. SepSMART is an RT-qPCR assay targeting six host-response genes (S100A8, HK3, CYP1B1, S100A12, RETN, MCEMP1) that enables rapid sepsis risk assessment within 90 minutes. This study aimed to evaluate the value of the SepSMART model for early identification and risk prediction of sepsis.

Methods: The single-center prospective observational study enrolled adult patients with severe infection or suspected sepsis within 24 hours of admission. Residual specimens were collected for SepSMART detection, and patients without initial sepsis were followed up (10 days) for subsequent sepsis assessment. The final diagnosis of sepsis was confirmed retrospectively by senior physicians according to clinical criteria.

Results: SepSMART showed excellent performance in early sepsis recognition, with an AUC of 0.816 (cutoff = 0.57), significantly higher than procalcitonin (PCT, 0.680). For 24-hour and 72-hour sepsis prediction, SepSMART demonstrated higher sensitivity and specificity (24-hour: 92.42% and 81.03%, respectively), consistently outperforming PCT in diagnostic efficacy. During follow-up, 23 initially non-septic patients subsequently developed sepsis. All 23 patients were identified as high-risk by SepSMART on admission, compared with only 9 patients (39.13%) by PCT. Among patients designated high-risk by SepSMART, 36.28% were admitted to the ICU during follow-up. A new model including SepSMART was set after various feature selection and then was applied to assess the performance of the model for diagnosing sepsis, with an AUC value of 0.978.

Conclusion: The SepSMART model is a rapid and objective tool for early sepsis risk stratification in patients with severe infection. Its clinical application may improve treatment outcomes, optimize antibiotic use, and reduce sepsis-related mortality.

Key words: SepSMART; Sepsis; Diagnosis; Risk Prediction

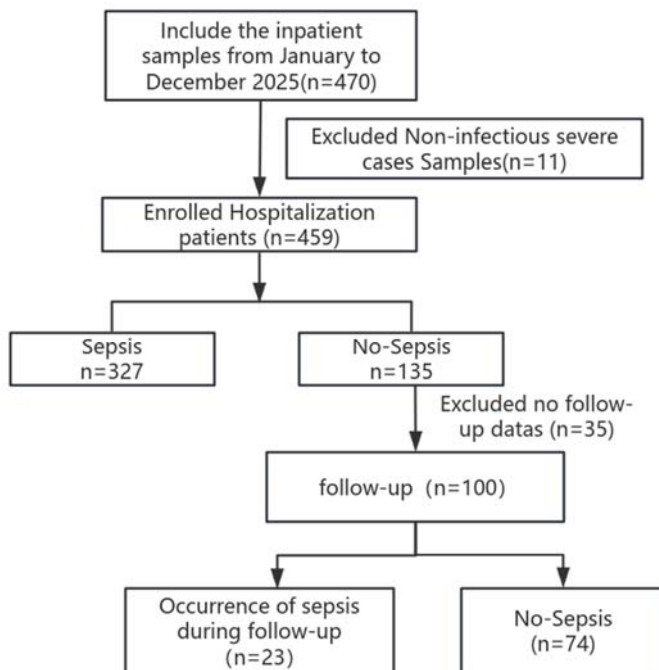


Fig. 1 Patient enrollment flowchart.

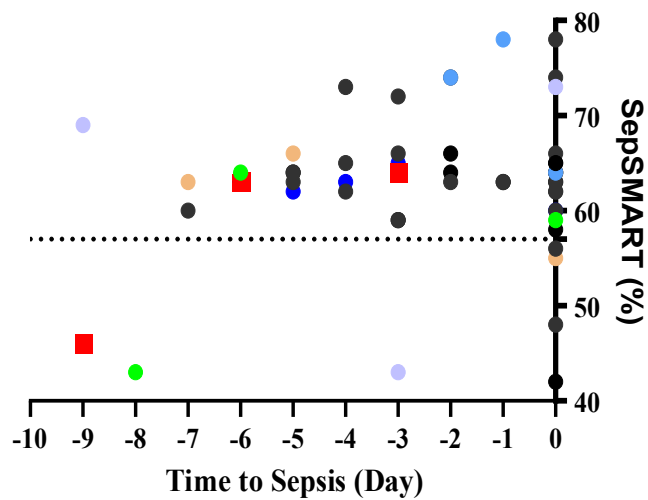


Figure 2. Analysis of infected patients progressing to Sepsis after enrollment. Risk levels and times from sampling to the development of sepsis are indicated.