Critical Review Form
Diagnostic Test

HYPERLINK "http://pmid.us/32152051"Lane DJ, Wunsch H, Saskin R, Cheskes S, Lin S, Morrison LJ, Scales DC. Screening strategies to identify sepsis in the prehospital setting: a validation study. CMAJ. 2020 Mar 9;192(10):E230-E239.

<u>Objectives:</u> "To determine which approach to screening for sepsis is optimal in the prehospital setting, we completed a validation of the accuracy and predictive ability of published approaches for identification of patients with sepsis within a large cohort of patients with suspected infection who were transported by emergency medical services." (p. E230)

<u>Methods:</u> This retrospective validation study was conducted at a large provincial emergency medical service in Alberta, CA between April 1, 2015 and March 31, 2016. Adult patients aged 18 years or older transported by EMS with a bacterial or fungal infection diagnosed in the emergency department (ED) were included in the cohort. Patients who were discharged from the ED were excluded. A subcohort of patients in whom paramedics documented a suspected infection was also identified. Patient characteristics were extracted from the emergency medical services records.

The primary objective was to compare the ability of 21 unique screening strategies to identify sepsis. Sepsis was defined by the diagnosis of an infection in the ED along with "organ dysfunction characteristic of sepsis."

Out of 146,626 patients transported during the study period, 131,745 were linked to hospital databases. Of these, 12740 had an infection and therefore comprised the primary cohort. The subcohort consisted of 2740 (22%) patients in whom sepsis was diagnosed in the ED.

	Guide	Comments
I.	Are the results valid?	
A.	Did clinicians face diagnostic uncertainty?	Yes. EMS providers often work with limited information when stabilizing and transporting patients. In particular, diagnosis of sepsis (specifically non-viral sepsis) is often difficult, as it requires results of diagnostic testing not available in the prehospital setting (and often not available in the ED). The identification of accurate screening tools to identify sepsis in the prehospital setting would hence be valuable in directing care prior to hospital arrival.
B.	Was there a blind comparison with an independent gold standard applied similarly to all patients?	No. The "gold standard" in this study was "previously validated diagnosis codes for use in the emergency department consistent with a bacterial or fungal infection." These codes relied on diagnoses

	(Confirmation Bias)	made in the emergency department rather than the results of bacterial and fungal cultures, final hospital diagnosis, or expert consensus. It is likely that such a strategy would result in inclusion of patients who ultimately did not have a bacterial or fungal infection as well as exclusion of patients who did have such infections.
C.	**Did the results of the test being evaluated influence the decision to perform the gold standard?** **(Ascertainment Bias)**	No. No true gold standard testing was used. As this was a retrospective analysis, the results of the various screening strategy scores would not have affected testing performed in the emergency department or documented diagnoses.
II.	**What are the results?**	
A.	**What likelihood ratios were associated with the range of possible test results?**	The sensitivity and specificity of the various screening tools ranged widely: sensitivity ranged from 0.02 to 0.85 while specificity ranged from 0.38 to 1.00. The authors do not evaluate receiver operating characteristic curves. • The highest sensitivities were observed with the use of the SIRS plus end-tidal CO_2 (74%) Robson (75%), and HEWS scores (85%). The specificities associated with these scores were 40%, 54%, and 41%, respectively. • The highest specificities were observed with the PRESS (98%), Sepsis Alert (99%), and PITSTOP scores (100%). The specificities associated with these scores were 11%, 7%, and 2%, respectively. • The only score with a positive likelihood ratio above 10 was the PITSTOP score, with a LR+ of infinity and a LR- of 0.98. • None of the scores had a negative likelihood ratio less than 0.10.
III.	**How can I apply the results to patient care?**	
A.	**Will the reproducibility of the test result and its interpretation be satisfactory in my clinical setting?**	Mostly yes. The components of the scores (see appendix) were mostly quite objective, including initial vital signs and GCS. A couple of scores included suspicion of infection (Suffoletto, MBIS) and the SEPSIS score included other criteria such as jaundice, pallor, or mottling of skin that are more subjective.
B.	**Are the results applicable to the patients in my practice?**	Yes. Patients with sepsis and noninfectious inflammatory syndromes are frequently transported by EMS to our institution. The ability to screen patients for sepsis, particularly among the very ill, while still en route to the hospital would be beneficial to assist with both triage and prehospital management.

C.	Will the results change my management strategy?	No. None of the scoring systems evaluated had reasonable combinations of sensitivity and specificity to make them useful as prehospital screening tools to affect patient management. The HEWS score was the most sensitive (only 85%) and had a specificity of only 41%; the most specific studies all had sensitivities of 11% or lower.
D.	Will patients be better off as a result of the test?	No. Again, none of these scoring systems performed particularly well.

Limitations:

1. The "gold standard" for bacterial or fungal infection was based on ED diagnostic codes alone rather than utilizing hospital discharge codes, culture results, or expert consensus.

2. This was a retrospective study in which missing data varied between criteria from the screening tools, with 24% of patients missing blood glucose level and 86% missing end-tidal carbon dioxide.

3. Some of the screening tools included subjective criteria whose validity is suspect in this retrospective study.

4. The included screening tools did not perform well, with sensitivities that only reaches 85%; among studies with high specificity, the sensitivities were 11% or less.

Bottom Line:

This retrospective observational study failed to identify a clinically useful screening tool for sepsis in the prehospital setting.