

Early Sepsis Detection: Combining a Novel and Standard Biomarker to Improve Diagnostic Performance

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INTRODUCTION

The diagnosis of sepsis remains a major challenge, and an early and accurate diagnosis is central to improving outcomes. No single biomarker fully captures this syndrome's complexity. Pancreatic stone protein (PSP), C-reactive protein (CRP), and procalcitonin (PCT) each reflect different aspects of the host response to infection. We hypothesized that a combination of biomarkers would prove complementary in enhancing the diagnosis of sepsis.

OBJECTIVES

To assess the potential of various combinations of PSP, CRP, and PCT for both the diagnosis and exclusion of sepsis, laying the groundwork for optimized biomarker based diagnostic algorithms

METHODS

Data source: Retrospective pooling of two prior prospective validation studies

Study Setting: 20 ICUs across France, Switzerland, Italy, UK and USA

Participants: Adult ICU patients at risk of sepsis (based on SEPSIS-3 criteria), with an expected ICU stay of at least 3 days ; Prevalence: of sepsis in studies: EU 21% vs U.S 49%

Sample Size: 688 participants

Measurements: PSP, CRP and PCT measured on Day 1. PSP measured within 5 minutes on the abioSCOPE point of care device.

Statistics: The diagnostic performance of PSP, CRP, and PCT was analyzed individually and in combination.

- For ruling in sepsis, a logical **OR** method was used, considering a test positive if at least one biomarker exceeded its respective threshold.
- For ruling out sepsis, a logical **AND** method was employed, considering a test negative only if all combined biomarkers were below their thresholds. Receiver operating characteristic (ROC) analysis was used to evaluate sepsis detection and exclusion.

CONCLUSIONS

These findings suggest that the combination of PSP **AND** CRP offers the best diagnostic performance for both identifying and excluding sepsis. PSP+CRP (**OR**) showed high accuracy for ruling in sepsis, while PSP+CRP (**AND**) performed best for ruling out sepsis. These results support a biomarker-driven approach using tailored algorithms to improve sepsis diagnosis. Combination biomarker testing can be employed accurately in different ways that focus on specific clinical question facing clinicians.

RESULTS AND DISCUSSION

Combination	Purpose	AUC (%)
PSP	Sepsis Detection	74.9 (71.2–78.7)
PSP + CRP (OR)	Sepsis Detection	80.2 (76.8–83.7)
PSP + PCT (OR)	Sepsis Detection	78.8 (75.3–82.3)
PSP + CRP + PCT (OR)	Sepsis Detection	80.8 (77.4–84.2)
PSP	Sepsis Exclusion	75.0 (71.5–78.5)
PSP + CRP (AND)	Sepsis Exclusion	80.2 (77.0–83.3)
PSP + PCT (AND)	Sepsis Exclusion	78.7 (75.4–82.0)
PSP + CRP + PCT (AND)	Sepsis Exclusion	76.6 (73.2–80.0)

Table 1 | Area under the curve (AUC) of PSP individually and in combination.

The logical AND combination of PSP AND CRP led to the highest accuracy for ruling out sepsis. The ROC curves illustrate the improved diagnostic accuracy achieved when combining PSP with CRP and PCT for sepsis detection (Figure 1).

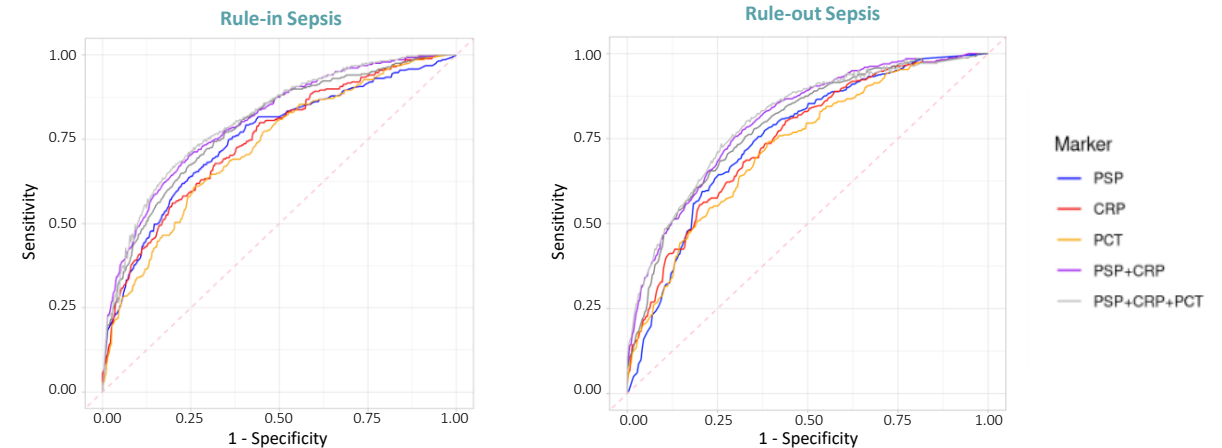


Figure 1 | ROC curves illustrating the individual and combined diagnostic performance of PSP, CRP, and PCT for ruling in and out sepsis. The left panel shows ROC curves for sepsis detection using the OR combination, while the right panel shows performance for sepsis exclusion using the AND combination.