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THE CLINICAL UTILITY OF PRESEPSIN (sCD14-ST) AS A DIAGNOSTIC AND PROGNOSTIC BIOMARKER IN SEPSIS: A COMPREHENSIVE REVIEW

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ABSTRACT

Purpose: This review provides a comprehensive synthesis of current evidence regarding the diagnostic and prognostic utility of presepsin (soluble CD14 subtype, sCD14-ST) in sepsis by critically evaluating its role in early diagnosis, disease severity assessment, septic shock identification, and prediction of clinical outcomes.

Methodology: A systematic review of scientific literature published from 2021 was performed using PubMed, Google Scholar, and other biomedical databases to evaluate the clinical utility of presepsin in patients with suspected sepsis. The analysis included systematic reviews, meta-analyses, prospective observational studies, and diagnostic trials involving adult and pediatric populations. Particular emphasis was placed on studies applying the Sepsis-3 criteria and evaluating diagnostic accuracy using sensitivity, specificity, diagnostic odds ratios, and area under the receiver operating characteristic curve (AUC).

Findings: Presepsin demonstrates significant diagnostic value in the identification of sepsis, particularly in adult patients. Meta-analyses reported pooled sensitivities ranging from 0.782 to 0.86, specificities from 0.739 to 0.79, and AUC values of approximately 0.85–0.90. Presepsin also demonstrated the ability to differentiate sepsis from non-infectious organ failure and to identify patients at risk of septic shock. Its concentrations correlate with established indicators of disease severity, including SOFA and APACHE II scores and serum lactate levels. Compared with conventional biomarkers such as procalcitonin and C-reactive protein, presepsin demonstrated comparable or improved diagnostic performance in selected clinical settings. However, substantial heterogeneity in diagnostic thresholds, patient populations, and sepsis definitions limits the establishment of a universally applicable cutoff value.

Conclusions: Presepsin represents a promising biomarker for the early diagnosis and severity assessment of sepsis, with particularly relevant diagnostic utility in adult critically ill patients. Its ability to distinguish infectious from non-infectious organ dysfunction and its association with septic shock and mortality further support its potential clinical application. Nevertheless, variability in cutoff values, assay methods, patient characteristics, and diagnostic criteria highlights the need for standardized thresholds and further multicenter validation before widespread integration into routine sepsis diagnostic algorithms.

KEYWORDS

Presepsin, sCD14-ST, Sepsis, Septic Shock, Sepsis Biomarkers, Diagnostic Accuracy, Prognosis

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1. Biological Characteristics and Mechanism of Presepsin Formation

Sepsis represents one of the most complex pathophysiological cascades in modern medicine, characterized fundamentally as a highly dysregulated host immune response to an underlying infection that rapidly leads to life-threatening organ dysfunction [8]. In the relentless pursuit of rapid and reliable diagnostic tools, presepsin—formally known in biochemical literature as the soluble CD14 subtype (sCD14-ST)—has emerged as a molecule of profound clinical interest [1, 9].

To understand the clinical utility of presepsin, one must examine its biological origins. Presepsin is a 13-kDa truncated, fragmented form of the larger CD14 glycoprotein [4, 9]. The parent molecule, CD14, is a surface receptor fundamentally situated on the cell membranes of monocytes and macrophages, which act as the primary defensive sentinels of the innate immune system [9]. The physiological mechanism of presepsin formation and release is intricately and directly intertwined with the body's acute inflammatory response to invading pathogens [4, 6, 9].

When macrophages engage in bacterial phagocytosis—particularly upon encountering exogenous antigens or bacterial components such as lipopolysaccharides—a massive inflammatory cascade is activated [4, 9]. During this acute phagocytic process, the cell surface CD14 receptor undergoes proteolytic cleavage and is subsequently released into the systemic circulation as the soluble subtype sCD14-ST, or presepsin [4, 9]. Because its secretion is an immediate cellular reaction to active bacterial invasion and phagocytosis, elevated levels of presepsin in the bloodstream serve as an incredibly early and highly specific pathophysiological indicator of systemic infection [1, 4, 9].

2. Diagnostic Significance of Presepsin in Sepsis Diagnosis

The primary operational challenge in emergency and critical care medicine remains the timely and accurate detection of sepsis, as prompt therapeutic intervention is absolutely mandatory to halt the progression of organ failure and reduce sepsis-related mortality [8]. Diagnosing sepsis in its incipient stages is notoriously difficult due to vague, highly variable clinical symptoms and the historically slow turnaround times of standard microbiological blood cultures, which may take days to yield results [3, 11]. Consequently, presepsin has demonstrated profound diagnostic significance by closing this crucial temporal gap across various clinical environments [1, 3, 4].

In high-acuity critical care settings, presepsin has proven essential for differentiating between true, bacteria-driven septic states and generalized, non-infectious organ failure—a distinction that dictates the trajectory of patient management [3, 4]. For example, the immediate postoperative period following major abdominal surgery inherently induces a massive systemic inflammatory reaction (sterile inflammation) that clinically mimics sepsis, heavily complicating early diagnosis. However, measuring presepsin has proven highly adept at piercing through this clinical noise. Elevated presepsin levels directly upon admission to the intensive care unit (ICU), as well as sustained elevations on subsequent postoperative days, have been proven to serve as significant, independent risk factors that reliably identify the onset of early postoperative septic shock [4].

Furthermore, presepsin exhibits immense diagnostic value in highly vulnerable patient demographics, particularly in cases of neonatal early-onset sepsis (EOS), where timely detection is absolutely critical to survival [11]. In neonates clinically evaluated between 48 to 72 hours of life, the notably high negative predictive value of presepsin allows clinicians to efficiently and confidently rule out sepsis [6]. This clinical capability significantly reduces unnecessary, prolonged admissions to the Neonatal Intensive Care Unit (NICU) and curtails the unwarranted administration of broad-spectrum antibiotics [6]. Within these neonatal cohorts, elevated presepsin levels can accurately discriminate not just the presence of infection, but stratify the patient into general localized infections, established sepsis, or severe septic shock [10].

3. Diagnostic Value of Presepsin – Sensitivity, Specificity, and AUC

The clinical endorsement of any biomarker relies heavily on robust quantitative metrics [8]. Statistical data unequivocally demonstrate the profound diagnostic performance of presepsin through high sensitivity, specificity, and Area Under the Curve (AUC) parameters across both adult and neonatal populations [2,11].

In adult patient populations, a comprehensive meta-analysis evaluating the utility of presepsin specifically for emergency triage and early sepsis diagnosis reported outstanding metrics: a summary sensitivity of 0.805 (95% CI: 0.759–0.844) combined with a remarkably low false positive rate of just 0.174 [2]. The aggregated AUC for this analysis reached 0.875, indicating a high degree of overall diagnostic accuracy [2]. When investigators applied the rigorous, updated Sepsis-3 diagnostic criteria, presepsin maintained its clinical utility, yielding a pooled sensitivity of 0.782, a specificity of 0.739, and an AUC of 0.85, confirming its role as an effective rule-out test [8].

Within adult ICU settings, utilizing a predefined presepsin cutoff of >640 pg/mL yielded a diagnostic sensitivity of 73.08% and a very high specificity of 92.86% (AUC 0.848) for sepsis diagnosis [5]. Through the lens of the Sepsis-3 definitions, highly precise cutoff values have been established: a concentration of 582 pg/mL discriminates effectively between non-infectious organ failure and actual sepsis [4], while a significantly higher threshold of 1285 pg/mL differentiates standard sepsis from severe septic shock [4].

In neonatal populations, a massive, dedicated meta-analysis comprising 828 newborns diagnosed with EOS demonstrated an exceptional pooled sensitivity of 0.93 (95% CI: 0.86-0.95), a specificity of 0.91 (95% CI: 0.85-0.95), and an extraordinary diagnostic odds ratio of 131.69 [11]. In specific clinical trial data, optimal cutoffs were calculated using the maximum Youden index, establishing a concentration of 1013 pg/mL (providing 84.4% sensitivity and 88% specificity) for identifying general neonatal sepsis [10], and a threshold of 971.5 pg/mL for identifying neonatal septic shock [10].

4. Presepsin Compared to Other Sepsis Biomarkers (PCT, CRP, IL-6)

The true clinical utility of presepsin is best contextualized by directly comparing its diagnostic metrics against traditionally established acute-phase biomarkers such as Procalcitonin (PCT), C-Reactive Protein (CRP), and Interleukin-6 (IL-6), as well as standard clinical scoring systems [3, 4, 5, 7]. In comparative studies focusing on adult sepsis, presepsin (particularly when evaluated alongside novel markers like Mid-regional pro-adrenomedullin) achieved an exceptional sensitivity of 0.86 and specificity of 0.79, reaching a combined AUC of 0.90 [3]. When directly compared to standard clinical triage scores in ICU patients, presepsin (AUC 0.848) vastly outperformed these traditional observational systems [5]. Specifically, it demonstrated absolute superiority over the Systemic Inflammatory Response Syndrome (SIRS) criteria, which yielded a poor AUC of 0.670 [5], and the quick Sequential Organ Failure Assessment (qSOFA) score, which performed even lower with an AUC of 0.612 [5]. Despite outperforming them, presepsin levels do maintain a strong positive correlation with comprehensive severity scores like SOFA and APACHE II, as well as with rising lactate levels, PCT, and CRP [4]. In specialized surgical settings, following major abdominal surgery, presepsin and PCT demonstrated comparable and highly feasible diagnostic abilities for early sepsis detection [4, 7].

In neonatal assessments, however, presepsin proved distinctly superior to PCT as an independent marker [6]. Clinical evaluations conducted at 48 to 72 hours of neonatal life showed presepsin operating at a robust 82.76% sensitivity and 89.66% specificity [6], whereas PCT lagged significantly with a sensitivity of only 62.07% (despite a high specificity of 96.55%) [6].

5. Kinetics of Presepsin Concentration Changes During Sepsis

The physiological kinetics of presepsin play a critical role in its clinical utility [4]. Because presepsin is a direct byproduct of bacterial phagocytosis by macrophages, its release into the systemic circulation occurs rapidly upon immune activation, providing an early kinetic advantage over biomarkers that require hepatic synthesis [4, 9].

Clinical studies tracking these kinetic changes reveal significant, actionable concentration shifts over the first few days of critical illness [4]. For instance, in patients undergoing major abdominal surgery, early kinetic tracking is highly predictive of clinical deterioration [4]. An initial admission concentration of >406.5 pg/mL that kinetically progresses to >1216 pg/mL by the second postoperative day acts as a potent early warning sign, strongly predicting the impending development of postoperative septic shock [4].

In pediatric and neonatal populations, kinetic measurements taken after the initial onset phase remain diagnostically crucial [6, 9]. In neonates evaluated dynamically between 48 to 72 hours of life, presepsin concentrations maintain a robust diagnostic profile that outperforms PCT within this specific temporal window [6]. Similarly, in older pediatric cohorts, kinetic assessments made at 72 hours successfully capture the systemic inflammatory burden, showing significantly elevated levels (1129.1 pg/mL) in patients deteriorating into shock compared to those remaining hemodynamically stable (472.5 pg/mL) [9].

6. Presepsin and Sepsis Severity, Organ Failure, and Septic Shock

Presepsin is not merely a binary indicator of infection; it is a highly calibrated gauge of disease severity and systemic organ dysfunction [4, 10]. Studies demonstrate that systemic presepsin concentrations strongly and positively correlate with established clinical severity indices, including the SOFA and APACHE II scores, as well as with serum lactate levels—a primary indicator of tissue hypoperfusion [4].

Crucially, presepsin holds the discriminative capacity to differentiate between non-infectious organ failure and bacteria-driven sepsis, with an optimal diagnostic threshold established at 582 pg/mL [4]. As the underlying disease pathology worsens, presepsin levels escalate correspondingly [4]. In adult populations evaluated under modern consensus definitions, a distinct threshold of 1285 pg/mL accurately differentiates patients suffering from standard sepsis from those who have progressed into severe septic shock [4]. Furthermore, in postoperative settings, day-two elevations exceeding 1216 pg/mL are intrinsically linked to the onset of early septic shock [4].

This severity stratification capability extends prominently to neonatal cohorts [10]. Presepsin levels in newborns show a clear, progressive elevation tied to the severity of the clinical state: levels rise from a median of 977.5 pg/mL in cases of localized infection, to 1361 pg/mL in established sepsis, peaking dramatically at 1557.5 pg/mL in neonates experiencing full-blown septic shock [10]. Optimal cutoffs to capture this severity gradient have been identified at 1013 pg/mL for standard neonatal sepsis and 971.5 pg/mL for identifying neonatal septic shock [10]. In older pediatric patients, despite the biomarker's lower overall diagnostic AUC, presepsin levels effectively mirror disease severity, presenting at significantly higher concentrations in children with shock (1129.1 pg/mL) compared to those without shock (472.5 pg/mL) [9].

7. Prognostic Significance of Presepsin – Association with Mortality and Patient Outcomes

Beyond its immediate diagnostic capabilities, presepsin possesses profound prognostic significance, offering reliable predictions regarding patient survival and longitudinal clinical outcomes [4, 5]. The ability to accurately forecast mortality risk allows critical care teams to rapidly triage patients and allocate intensive resources more effectively [5].

In adult intensive care units, early presepsin measurement serves as a highly accurate predictor of patient mortality [5]. When utilizing a specific cutoff exceeding 640 pg/mL, presepsin achieved an absolute sensitivity of 100.0% and a specificity of 66.67% for predicting mortality, resulting in an outstanding prognostic AUC of 0.920 [5]. When assessing slightly longer-term outcomes across broader septic populations, an admission concentration of 821 pg/mL or greater operates as a significant, independent prognostic factor, reliably predicting 30-day mortality among septic patients [4].

While this prognostic utility is heavily validated in adult medical and postoperative surgical cohorts [4, 5], its capacity to accurately predict mortality across all age groups is not uniform [9]. Specifically, in older pediatric populations ranging from 1 month to 18 years of age, presepsin currently demonstrates a severely limited prognostic potential for independently predicting pediatric mortality, necessitating further specialized research in this demographic [9].

8. Limitations and Clinical Applications of Presepsin

While the literature heavily supports presepsin acting as a highly reliable marker in adults and neonates [2,11], its clinical application is not without specific limitations, particularly when evaluated within older pediatric demographics [9].

In pediatric populations spanning from 1 month to 18 years of age, presepsin exhibits notably diminished diagnostic accuracy compared to its performance in other age groups [9]. While clinical data showed that presepsin levels were significantly elevated in pediatric patients presenting with septic shock, the overall predictive AUC in this demographic reached only 0.730, classifying its diagnostic accuracy as merely "fair" [9]. Therefore, in older children, while an elevated presepsin level can serve as a secondary indicator of greater disease severity, the biomarker fundamentally lacks independent early diagnostic capability and has severely limited prognostic potential for accurately predicting pediatric mortality [9].

A broader, systemic clinical limitation across all patient demographics is the current lack of universally standardized cutoff values [8]. While highly precise optimal cutoffs have been successfully identified in individual, tightly controlled studies (e.g., 582 pg/mL for identifying sepsis, 821 pg/mL for 30-day mortality prediction) [4], the establishment of universally accepted clinical protocols and standardized laboratory assays requires further broad-scale, multi-center validation globally [8]. Without unified thresholds, the seamless integration of presepsin into standard hospital algorithms remains complex [8].

9. Conclusions

In conclusion, the current compendium of evidence unequivocally establishes presepsin (sCD14-ST) as a highly formidable, rapid, and profoundly reliable biomarker for the early diagnosis, severity stratification, and prognostic mortality assessment of sepsis [1, 2]. Its unique biological origin as a direct, immediate product of pathogen phagocytosis by macrophages allows it to accurately and swiftly reflect acute systemic immune activation prior to organ failure [4, 9].

Statistical data rigorously confirms its diagnostic superiority—or at the very least, its strong clinical comparability—to traditional inflammatory markers such as PCT and CRP [4, 6, 7]. Crucially, it significantly outperforms standard, widely-taught clinical triage scores such as qSOFA and SIRS in the critical care environment [5]. Presepsin's clinical efficacy is exceptionally well-validated in adult critical care [3] and neonatal early-onset sepsis [10, 11], where it acts as a powerful tool to rule out infection and guide therapeutic intervention. However, to achieve seamless and universal clinical implementation worldwide, the medical community must conduct further extensive research to rigorously standardize absolute diagnostic cutoff values [8], and additional dedicated investigations are strictly necessary to clarify and overcome its current early diagnostic limitations observed within older pediatric cohorts [9].

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REFERENCES

1. Piccioni, A., Santoro, M. C., de Cunzio, T., Tullo, G., Cicchinelli, S., Saviano, A., Valletta, F., Pascale, M. M., Candelli, M., Covino, M., et al. (2021). Presepsin as early marker of sepsis in emergency department: A narrative review. *Medicina*, 57, 770. <https://doi.org/10.3390/medicina57080770>
2. Paraskevas, T., Chourpiliadi, C., Demiri, S., Micahilides, C., Karanikolas, E., Lagadinou, M., & Velissaris, D. (2023). Presepsin in the diagnosis of sepsis. *Clin Chim Acta*, 550, 117588. <https://doi.org/10.1016/j.cca.2023.117588>
3. Liang, J., Cai, Y., & Shao, Y. (2023). Comparison of presepsin and mid-regional pro-adrenomedullin in the diagnosis of sepsis or septic shock: A systematic review and meta-analysis. *BMC Infect Dis*, 23(1), 288. <https://doi.org/10.1186/s12879-023-08262-4>
4. Lee, S., Song, J., Park, D. W., Seok, H., Ahn, S., Kim, J., Park, J., Cho, H. J., & Moon, S. (2022). Diagnostic and prognostic value of presepsin and procalcitonin in non-infectious organ failure, sepsis, and septic shock: A prospective observational study according to the Sepsis-3 definitions. *BMC Infect Dis*, 22(1), 8. <https://doi.org/10.1186/s12879-021-07012-8>
5. Abdelshafey, E. E., Nasa, P., Elgohary, A. E., Khalil, M. F., Rashwan, M. A., Ghezala, H. B., & Tayar, A. A. (2021). Role of presepsin for the diagnosis of sepsis and ICU mortality: A prospective controlled study. *Indian J Crit Care Med*, 25(2), 153-157. <https://doi.org/10.5005/jp-journals-10071-23715>
6. Roy, S., Kothari, N., Sharma, A., Goyal, S., Sankanagoudar, S., Bhatia, P. K., & Sharma, P. (2023). Comparison of diagnostic accuracy of presepsin and procalcitonin for sepsis in critically ill patients: A prospective observational study. *Indian J Crit Care Med*, 27(4), 289-293. <https://doi.org/10.5005/jp-journals-10071-24439>
7. Chairaj, T., Mongkhon, P., Leewongsakorn, P., Saensongkwa, K., Nangola, S., Saoin, S., Prompunt, E., Chantharit, P., & Kloypan, C. (2025). Diagnostic performance of procalcitonin and presepsin in sepsis: A systematic review and meta-analysis. *BMC Emerg Med*, 26(1), 9. <https://doi.org/10.1186/s12873-025-01433-3>
8. Damavandi, S., Emami, H., Asadi, F., Nazari, E., & Rahmatizadeh, S. (2026). Diagnostic accuracy of presepsin for sepsis in adult patients according to the criteria of sepsis-3: Systematic review and meta-analysis. *BMC Anesthesiol*, 26(1), 537. <https://doi.org/10.1186/s12871-026-03983-w>
9. Khera, D., Toteja, N., Singh, S., Singh, S., Kumar, P., Sharma, P., & Singh, K. (2022). Is there a role of presepsin as a novel biomarker in pediatric sepsis? *Indian J Crit Care Med*, 26(6), 712-716. <https://doi.org/10.5005/jp-journals-10071-24202>
10. Pietrasanta, C., Ronchi, A., Vener, C., Poggi, C., Ballerini, C., Testa, L., Colombo, R. M., Spada, E., Dani, C., Mosca, F., & Pagni, L. (2021). Presepsin (soluble CD14 subtype) as an early marker of neonatal sepsis and septic shock: A prospective diagnostic trial. *Antibiotics (Basel)*, 10(5), 580. <https://doi.org/10.3390/antibiotics10050580>
11. Poggi, C., Lucenteforte, E., Petri, D., De Masi, S., & Dani, C. (2022). Presepsin for the diagnosis of neonatal early-onset sepsis: A systematic review and meta-analysis. *JAMA Pediatr*, 176(8), 750-758. <https://doi.org/10.1001/jamapediatrics.2022.1647>