DOI: 10.4274/cayd.galenos.2025.71324
J Pediatr Emerg Intensive Care Med

The Dawn of Phoenix: A New Era in the Definition of Pediatric Sepsis

Phoenix'in Doğuşu: Pediatrik Sepsis Tanımında Yeni Bir Dönem

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Editorial: The Dawn of Phoenix: A New Era in the Definition of Pediatric Sepsis?

Pediatric sepsis continues to be one of the most critical topics in child health, from both a clinical and an academic perspective. Recent advances in the definition of sepsis have introduced innovative approacheswith the potential to transform the diagnosis and treatment processes for patients. In this editorial, we examine how the phoenix sepsis score (PSS), introduced in 2024, represents a turning point in pediatric sepsis management and discuss the implications of this new paradigm for clinical practice, research, and ethical considerations. Our journal aims to present these significant developments in child health to our readers, thereby strengthening the role of data-driven medicine in clinical practice and promoting a patient-centered approach to care.

A Paradigm Shift in Pediatric Sepsis

The year 2024 heralded a fundamental transformation in the definition of pediatric sepsis with the introduction of the PSS. Developed from the data of 3.6 million pediatric patients across six continents, the PSS has entered the medical literature as the first data-driven global consensus criterion.[1,2] Unlike the 2005 IPSCC SIRS-based definition, the PSS redefines sepsis as "infection + life-threatening organ dysfunction", shifting the focus from inflammation to organ-specific risk stratification.[2] This transformation also marks a philosophical evolution-from intuitive classification toward measurable pathophysiology.

Phoenix Sepsis Score: Development and Validation

The PSS evaluates dysfunction in four major organ systems-respiratory, cardiovascular, coagulation, and neurological-using objective parameters, thereby excluding subjective or non-specific triggers present in previous definitions. Children with suspected infection and a PSS ≥2 are classified as septic, while those with a score ≥2 and at least one cardiovascular point are defined as having septic shock.[2] Validation data show that the PSS outperforms previous scoring systems such as PRISM III and PELOD-2 in predicting in-hospital mortality.[1,3]

However, while this statistical superiority is noteworthy, translating it into therapeutic decisions-especially in hemodynamic support-remains a challenge. This progress necessitates a reevaluation of treatment approaches used in pediatric sepsis.

Therapeutic Implications and the "Press On" Paradigm

Given the Phoenix criteria's emphasis on organ dysfunction, timely cardiovascular support has become central in the new management paradigm. This brings into focus the "press on" concept-advocating for early vasopressor therapy. A 2025 meta-analysis by Shi et al.[4] showed that early initiation of norepinephrine during the early phase of septic shock reduces 30-day mortality by 35%, lowers fluid requirements, and decreases the time to reach target mean arterial pressure by over an hour. MacLaren's[5] editorial interprets these findings as strong support for the indispensable role of early vasopressor administration in modern sepsis management.

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Received/Geliş Tarihi: 01.08.2025 **Accepted/Kabul Tarihi:** 04.08.2025 **Epub:** 18.08.2025
Cite this article as: Yılmaz HL. The dawn of phoenix: a new era in the definition of pediatric sepsis. J Pediatr Emerg Intensive Care Med. [Epub Ahead of Print]

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Additionally, a study by Eisenberg et al.[6] reported 0% mortality among children who received norepinephrine as first-line treatment, compared to 4.1% in those treated with epinephrine. Specifically, 6 out of 147 patients (4.1%) in the epinephrine group died within 30 days, while no deaths were observed among the 84 patients in the norepinephrine group. In a secondary analysis using propensity score matching-a method employed because the primary inverse probability of treatment weighting analysis was not feasible for 30-day mortality outcomes due to the absence of deaths in the norepinephrine group-epinephrine was associated with a statistically significant greater 30-day mortality compared to norepinephrine (3.7% vs. 0%), with a risk difference of 3.7% (95% confidence interval, 0.2-7.2%). The fact that this confidence interval does not include zero indicates a statistically significant difference favoring norepinephrine.[6]

Beyond a Binary Question: Quantifying Shock with Norepinephrine Equivalent (NEE) and Vasoactive-Inotropic Score (VIS)

In clinical practice, the mere question of "is a vasopressor being used?" or the number of agents used does not provide sufficient information about the true severity of shock. The NEE score was developed to address this gap by providing a quantitative measure of hemodynamic support, converting the doses of different vasoactive agents into a standardized norepinephrine dose. This score can be used to standardize heterogeneous vasoactive agent regimens and to measure the severity of shock in a comparable manner. Its formula was updated by Kotani et al.[7] in 2023 to include a variety of vasopressor agents, specifically for adult intensive care patients.

However, while the NEE score focuses solely on vasopressor effects and excludes inotropes, the VIS offers a more comprehensive metric that includes both vasoactive agents and inotropes, based on dopamine dosage. A recent retrospective cohort study in adult sepsis patients (Li et al.[8]) highlighted that in the second hour after sepsis onset, both NEE (>0.10 μg/kg/min) and VIS (>15.04) scores were independently associated with 28-day mortality; higher scores correlated with an increased risk of death.[8]

VIS has also been validated as an independent predictor of mortality in pediatric septic shock patients. In a study by Çeleğen and Çeleğen[9] on children with pediatric septic shock, a high VIS (with a cutoff value of ≥16.2) was shown to be associated with lower lactate clearance and a higher mortality rate. As noted in an editorial commentary by Dhochak and Lodha[10], a study by Kallekkattu et al.[11] reported cutoff values such as >42.5 for mean VIS to predict mortality in pediatric septic shock. Furthermore, a larger study by McIntosh et al.[12] also indicated that VIS was associated with mortality in critically ill children. Li et al.[8] noted that the threshold value identified for VIS in their study was lower than the prognostic threshold in pediatric patients (15.04 vs. 42.5), reflecting the significant heterogeneity between pediatric and adult patients.

The NEE has its limitations. The conversion ratios for each vasoactive agent can be arbitrary and may not always be based on high-quality evidence.[8] Furthermore, NEE only considers vasopressor effects and cannot measure the impact of other hemodynamic interventions, such as mechanical circulatory support. Despite these limitations, the future integration of quantitative hemodynamic indicators like NEE and VIS into subsequent versions of the Phoenix definition holds the potential to enhance both definitional sensitivity and prognostic prediction.

Implementation Challenges and Ethical Debates

The application of Phoenix criteria has sparked debate. Concerns include limited feasibility in resource-constrained settings, potential exclusion of high-risk patients, and paradoxes such as the decatecholaminization strategy that aims to reduce sympathoadrenal stress-potentially conflicting with Phoenix's use of vasopressor requirement as a diagnostic marker.[13,14] While the implementation of the PSS in emergency departments may face challenges in resource-limited settings due to its reliance on objective organ dysfunction parameters, proponents emphasize that it serves as a standardized classification tool to guide early recognition and management of pediatric sepsis, rather than a standalone clinical diagnostic instrument.[15,16]

Future Outlook: Data, Artifical Intelligence (AI), and the Limits of Precision

Phoenix's structural properties make it well-suited for integration into AI-based systems. Early research indicates that AI-supported decision systems can effectively predict deterioration in septic patients.[17] However, these models must be calibrated against standardized frameworks like Phoenix. Ethical questions also emerge: Will algorithms replace clinical intuition? Who bears legal responsibility for automated decisions?[18]

Conclusion: Bridging Data-driven Medicine and Compassionate Care

The PSS charts a modern and necessary course for pediatric intensive care. Yet, this technological orientation must not supplant clinical experience, empathy, or a patient-centered approach. True success will be measured not only by a reduction in mortality rates but also by an improvement in the quality of life for patients and their families. The future of pediatric sepsis care lies in a synthesis that harmonizes the data-driven power of Phoenix with the irreplaceable wisdom of clinical intuition.

Keywords: Phoenix sepsis score, sepsis, septic shock, pediatrics, organ dysfunction, vasoactive-inotropic score, vasopressors, critical care, mortality, consensus

Anahtar Kelimeler: Phoenix sepsis skoru, sepsis, septik şok, çocuk, organ disfonksiyonu, vazoaktif-inotropik skor, vazopressörler, kritik bakım, mortalite, konsensüs

Footnotes

Financial Disclosure: The author declared that this study received no financial support.

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