BIOMARKER-GUIDED DIAGNOSIS OF SEVERE INFECTIONS IN PEDIATRIC ICU: REDUCING MORBIDITY AND MORTALITY

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Relevance. Severe infections and sepsis in pediatric patients are major causes of morbidity and mortality, particularly in critical care. Delayed recognition and inappropriate antimicrobial use worsen outcomes and drive antimicrobial resistance (AMR). Current diagnostics rely on clinical judgment and conventional biomarkers, which often lack specificity, leading to delayed intervention and increased ICU burden. This study evaluates a biomarker-driven approach to enhance early detection and targeted treatment of severe infections in pediatric intensive care. **Purpose:** to assess the efficacy of procalcitonin (PCT) and interleukin-6 (IL-6) in early diagnosis and severity stratification of severe infections and sepsis in pediatric ICU (PICU) patients. This study aims to establish a predictive model integrating biomarkers with clinical parameters to optimize early intervention and reduce ICU morbidity and mortality.

Materials and methods. Study Design: Prospective cohort study (2020–2024) analyzing biomarker levels and clinical progression in pediatric ICU patients. Inclusion Criteria: Children (0–18 years) admitted with suspected severe infections, sepsis, or septic shock. Data Collected: PCT and IL-6 levels on admission and at 24, 48, and 72 hours. Blood cultures, inflammatory markers (CRP, WBC), and clinical severity scores (PELOD-2, SOFA-Pediatrics). Antibiotic escalation/de-escalation patterns, ICU stay, and mortality rates. Statistical Analysis: Correlation between biomarker kinetics, infection severity, and clinical outcomes, assessed using multivariate regression models.

Results. Elevated PCT (> 2 ng/mL) and IL-6 (> 150 pg/mL) strongly correlated with ICU admission and progression to septic shock ($p < 0.001$). Biomarker-driven diagnosis reduced antibiotic overuse by 37%, optimizing antimicrobial stewardship. Patients with persistently elevated IL-6 (> 72 hours) had a 4.2x higher risk of multiple organ dysfunction syndrome (MODS). Early risk stratification using PCT/IL-6 enabled targeted intervention, reducing ICU mortality by 21% ($p = 0.003$).

Conclusion. Biomarker-guided infection management significantly enhances early sepsis detection, antibiotic stewardship, and survival rates in pediatric critical care. This study provides strong evidence for integrating PCT and IL-6 into standardized sepsis protocols, potentially reshaping pediatric ICU guidelines worldwide. Implementing this approach could lead to earlier interventions and improved long-term outcomes.

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