Blood Lactate in Early Sepsis: A Predictor to "Keep Up" Rather than "Catch Up"

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Sepsis is a life-threatening illness and currently the major cause of mortality in critically ill patients. Given its aggressive course, sepsis requires rapid recognition and urgent treatment. Early and accurate identification of septic patients will certainly reduce this burden on economy and public health considerably. Optimal decision-making to improve clinical outcomes can be achieved with simple predictors.

Use of biomarkers in early sepsis along with severity of illness scores enhances the prognostication and management of septic patients effectively.[1]

The complex and varied pathophysiology of sepsis demands that a single biomarker is often inadequate to cater precise information. Although there are plenty of biomarkers that have been studied in sepsis patients, those that are readily available, cost-effective, and reliable to qualify as predictors of clinical outcomes, still remain to be established.[2]

For a risk stratification score to be of value, it is highly dependent upon the chosen outcome. Many studies regarding sepsis have used mortality as the primary outcome.[3,4] However, focusing only on mortality implies that worsening physiologic outcomes are not clinically important. As the long-term effects of sepsis have become more apparent, the development of sepsis itself is an important outcome.

Measurement of plasma lactate still remains a primary component for an effective diagnostic and therapeutic line of management in critical care.[5] In most clinical critical-care situations, hyperlactatemia must be perceived as an adaptive response to an aggressive state. Lactate kinetics in sepsis has been extensively researched in the past and acknowledged as an important biomarker of tissue hypoxia and dysfunction.[6]

Extensive research highlighting the efficacy of serum lactate as a prognostic tool for clinical outcomes both in the early and late phases of sepsis management already exists. Initial serum lactate level is independently associated with mortality of patients presenting to Emergency Department (ED) with septic shock. However, currently, elevated blood lactate levels have been used to identify critically ill patients at high risk of death even before hemodynamic instability manifests, i.e., at the stage of "cryptic shock" or "occult shock".[7] These patients require more aggressive care as they are at a higher risk for deterioration. Hence, initial lactate levels as a prognostic tool in normotensive patients are what is proposed in recent times.

Several retrospective cohort studies on severe sepsis and septic shock patients report that patients admitted to the ICU from the ED

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with initial blood lactate of more than 2 mmol/L were at increased risk of death.[8]

In addition, a variety of clinical variables and tools are used for sepsis screening, such as systemic inflammatory response syndrome (SIRS) criteria, vital signs, signs of infection, quick Sequential Organ Failure Score (qSOFA), Sequential Organ Failure Assessment (SOFA) criteria, National Early Warning Score (NEWS), or Modified Early Warning Score (MEWS).

While qSOFA is a good prognostic tool in an ICU, it is less sensitive in predicting sepsis-related adverse outcomes if used as an emergency triage tool. It measures three parameters: level of consciousness, respiratory rate, and systolic blood pressure. However, a screening tool must exhibit high sensitivity. The current sepsis guidelines have not recommended using qSOFA as a single screening tool for sepsis.[9]

Globally, growing evidence suggests that NEWS is a sensitive screening tool in the ED for predicting sepsis-related outcomes. The NEWS was first introduced by the Royal College of Physicians in 2012 as a predictor of patient deterioration.[10] National Early Warning Score has started to emerge as a promising tool that may be utilized in the assessment and risk stratification of patients suspected of having sepsis in the ED. It includes seven parameters (temperature, systolic blood pressure, respiratory rate, oxygen saturation, oxygen supply, heart rate, and level of consciousness) with a score range between 0 and 20. A high score (NEWS ≥7) has been observed to be very sensitive in predicting an association between ICU admission and mortality. The ease of use and repeatability makes it a valuable substitute screening tool for qSOFA. However, it is not specifically designed for septic patients.

In the current issue of the journal, Noparatkailas et al. have published their retrospective cohort study reports on the association of initial blood lactate levels with mortality and

development of subsequent shock in normotensive septic patients admitted to a single center.[11] Data were collected over a year, and 448 patients with sepsis were included in the cohort. They measured blood lactate levels at the ED along with four clinical predictive scores – SIRS criteria, SOFA, qSOFA, and NEWS. Patients were classified as high lactate and normal lactate group, with a blood lactate level of 2 mmol/L as a cutoff. They report that the median initial blood lactate was 2.19 (1.45, 3.23) mmol/L. The median SIRS and qSOFA scores were found to be 3 (2, 3) and 1 (1, 2), respectively, but all four scores were significantly higher in the high-lactate group. Predictive validity was assessed and they proposed that a combination of blood lactate level >2 mmol/L and NEWS >7 had a high ability to predict mortality and subsequent septic shock among nonshock septic patients.

Designing a tool that integrates clinical risk factors with the physiological parameters used in the NEWS to enhance specificity is the need of the hour to face the challenges posed in handling early sepsis. Further prospective multicentric studies focusing on this issue will help us "keep up" and tackle sepsis early rather than "catch up" to handle the challenges later.

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