



Bringing sepsis care back to the emergency department: New prognostic tools and extended role of emergency physicians

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Despite recent advances in diagnosis and treatment, sepsis remains a significant common final pathway to death in patients with infection worldwide. The constant threat of sepsis to mankind has been amplified during the COVID-19 pandemic. Yet, the effort to fight sepsis is undermined by health inequalities. How to advance prevention, survival, and survivorship of sepsis and COVID-19 was the theme of the World Sepsis Congress 2021 in April 2021 (<https://www.worldsepsiscongress.org>). It highlights a number of key questions clinicians of our generation need to answer.

Emergency departments (EDs) are at the forefront in combating community-acquired infection and sepsis. However, over the years, the role of emergency physicians has weakened with interventions hindered because of the most recent definition of sepsis that heavily relies on laboratory test results to confirm organ dysfunction (the Sepsis-3 definition), a lack of reliable sepsis screening and prognostic tools outside the intensive care unit (ICU), limited ED access to imaging studies to identify the source of infection and ED overcrowding. Technological advances such as novel sepsis biomarkers may help clinicians to make a more precise diagnosis, but the turn-around time, added cost and complexity are creating a force to move sepsis care away from the hands of emergency physicians, especially in resource-poor settings.

There is a need to bring sepsis care back to the ED. To achieve this, we need better prognostic tools that are best based on routinely collected clinical or laboratory parameters. We also need to extend the role of emergency physicians in managing severe infection including bloodstream infection. A number of articles featured in this edition represent such endeavours to explore how emergency physicians can improve sepsis care in the ED.

One of the key issues is to recognise tissue hypoperfusion quickly with easily available clinical or laboratory parameters in order to avert multi-organ failure and reduce sepsis mortality. In a systemic review and meta-analysis of 13 clinical studies that involved 940 patients, Wang et al. found that the venous-to-arterial carbon dioxide pressure changes and the arteriovenous oxygen content difference

ratio (Pcv-aCO₂/Ca-vO₂), a marker for global anaerobic metabolism, is an important predictor for mortality in patients with sepsis or septic shock. A higher ratio of Pcv-aCO₂/Ca-vO₂ was associated with a higher 28-day mortality (risk ratio=1.89, 95% confidence interval=1.48–2.41) and a higher Sequential Organ Failure Assessment (SOFA) score (standardised mean difference=1.58, 95% confidence interval=0.88–2.28).¹ Wang et al. recommended that the use of this ratio combined with lactic acid clearance and central venous blood oxygen saturation to guide the effects of early resuscitation treatment in sepsis patients.

While clinicians often focus on white cell counts in the complete blood picture in making clinical decision, the value of red cell parameters in sepsis prognostication has not been fully explored in the literature. A study by Zhang et al. on 236 patients with sepsis or septic shock found that the red blood cell distribution width (RDW), a parameter reflecting the heterogeneity of red blood cell volume, is an independent predictor of 28-day mortality (hazard ratio=1.311, 95% confidence interval=1.119–3.011) in sepsis or septic shock patients. The area under curve (AUC) of RDW was comparable to that of procalcitonin (0.727 vs 0.768),² making RDW a potentially valuable prognostic marker in settings with limited access to procalcitonin or other sophisticated sepsis biomarkers.

Another interesting study by Gho et al. featured in this edition evaluated the use of electrical cardiometry (EC) in pneumonia. The study involved 368 ED patients and found that the thoracic fluid content (TFC), a measure of water contained in the lung and pulmonary vasculature, can reliably predict mortality and ICU admissions. EC is a non-invasive method that can measure cardiac output continuously at the bedside. The AUC was 0.72 (95% confidence interval=0.71–0.74) for 28-day mortality and 0.73 (95% confidence interval=0.62–0.82) for ICU admission.³

Finally, a local study by Cheung et al. reviewed and described the experience and outcome of 64 patients with bloodstream infection managed in the emergency



medicine ward (EMW) of a rural hospital with limited acute general and ICU beds. The in-hospital mortality was low (7.8%), with four out of the five fatal cases in end-of-life programme with a care ceiling. Patients were managed according to a protocol that included septic workup, identification of the source of infection with bedside ultrasound, computerised tomography or echocardiogram as clinically indicated and empirical antibiotics. Cheung et al.⁴ demonstrated that with appropriate clinical expertise and guidelines, a critical care management programme run by emergency physicians in the EMW for bloodstream infection is feasible without compromising care quality. Such a care model also helped reduce unnecessary patient transfer to tertiary hospital.

These studies demonstrated there are still many opportunities emergency physicians can contribute to better sepsis care. The high mortality and time-sensitive nature of sepsis management requires not only investment of new resources and novel technologies, but it also calls for a better use of available clinical information and resources by clinicians and researchers. Knowledge gap still exists regarding the best strategy of early identification of patients at risk in the ED setting. The movement of digitalising ED workflow using structured data and electronic medical record in EDs in Hong Kong and in many countries represents a unique resource clinicians and research can tap into. Digitalisation has the beauty of data standardisation, consistency and automation. Predictive models based on in-built scoring system or artificial intelligence can create useful digital alerts to aid clinical decisions. Current evidence shows that digital alerts integrated to ED workflow can reduce hospital and ICU length of stay for patients with sepsis.⁵

With sepsis registries being established across the world, it is important for us to continue to improve patient care and sepsis survival. At this time point in history when we are building our health systems back better from the

COVID-19 pandemic, it is essential that we bring sepsis care back to the ED.

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