



## Sepsis Screening in the ED

For many years we have used the sepsis screening criteria put forth by the Society of Critical Care and the Surviving Sepsis

### SIRS, Sepsis, Severe Sepsis Definitions

<p><b>Systemic Inflammatory Response Syndrome (SIRS)</b> Two or more of:</p> <ul style="list-style-type: none"> <li>• Temperature &gt; 38°C or &lt; 36°C</li> <li>• Heart rate &gt; 90/min</li> <li>• Respiratory rate &gt; 20/min or PaCO<sub>2</sub> &lt; 32 mmHg (4.3 kPa)</li> <li>• White blood cell count &gt; 12,000/mm<sup>3</sup> or &lt; 4,000/mm<sup>3</sup> or &gt; 10% immature bands</li> </ul>
<p><b>Sepsis</b></p> <ul style="list-style-type: none"> <li>• Criteria meeting SIRS <b>AND</b></li> <li>• Source of infection</li> </ul>
<p><b>Severe Sepsis = sepsis-induced tissue hypoperfusion or organ dysfunction</b></p> <ul style="list-style-type: none"> <li>• Criteria meeting sepsis (SIRS + source of infection) <b>AND ANY OF THE FOLLOWING:</b></li> <li>• Lactic acidosis ≥ 2.2 mmol/L</li> <li>• Urine output &lt; 0.5 mL/kg/hr for more than 2 hours despite adequate fluid resuscitation</li> <li>• Acute lung injury with PaO<sub>2</sub>/FIO<sub>2</sub> &lt; 250 in the absence of pneumonia as infection source</li> <li>• Acute lung injury with PaO<sub>2</sub>/FIO<sub>2</sub> &lt; 250 in the presence of pneumonia as infection source</li> <li>• Creatinine &gt; 2.0 mg/dL</li> <li>• Bilirubin &gt; 2 mg/dL</li> <li>• Platelet count &lt; 100,000 μL</li> <li>• Coagulopathy (international normalized ratio &gt; 1.5)</li> </ul>

### **These traditional criteria are impractical, insensitive and non-specific**

- Impractical from ED standpoint in that depend on lab tests that are not readily available (WBC)
- Insensitive in that in a recent NEJM study, approximately 12% of critically ill septic patients did not meet SIRS/sepsis criteria
- Non-specific: The specificity of sepsis criteria for patients who truly wind up having sepsis ranges from 20 to 40%.
- If we were to rely specifically on these, we may be overtriaging and overtreating a number of patients.

### **qSOFA**

In 2016 Investigators and experts from the Society of Critical Care Medicine and the European Society of Intensive Care Medicine proposed new criteria and definitions to update and replace SIRS and Severe Sepsis criteria. SOFA is intended for ICU and Quick

Sequential Organ Failure Assessment (qSOFA) criteria, consisting of systolic blood pressure  $\leq 100$  mm Hg, respiratory rate  $\geq 22$  breaths per minute, and altered mental status (Glasgow Coma Score [GCS]  $< 15$ ), can be used in the ED or outside of ICU. Patients are given 1 point for each criterion and patients with a qSOFA score of  $\geq 2$  are thought to be at high risk for poor outcomes.

### **Potential problems w qSOFA in ED**

- 1) Developed in heterogeneous group of patients most of which were not in the ED
- 2) Developed to screen for 30 d mortality, which is not an ED centric outcome. ED screening tools are meant to predict many other outcomes (need for critical care, progression to septic shock, organ failure).
- 3) 30 d mortality is too long of a period for prediction from the ED (many things happen in that time)

*Rodriguez RM, Greenwood JC, Nuckton TJ, et al. Comparison of qSOFA with current emergency department tools for screening of patients with sepsis for critical illness. Emerg Med J. 2018; 35:350-6.*

- **Objective of this study was to assess qSOFA as a sepsis screening tool from a pragmatic, ED-centered vantage point.**
  - Specifically, we sought to determine the screening performance of qSOFA for predicting infectious disease patients' need for critical care and mortality within the first 72 hours of admission to the hospital from the ED, comparing the screening performance of qSOFA with the most commonly used current ED sepsis identification tools (SIRS/Sepsis criteria, Severe Sepsis criteria and lactate levels).
- **Methods**
  - Sites and Inclusions: At 5 hospitals (3 academic centers and 2 community hospitals) we conducted this retrospective study of adult (age  $> 17$  years) patients admitted to an observation unit, inpatient ward, or intensive care unit from the ED with an infectious disease-related illness
- **Excluded**
  - Patients who 1) were transferred from an outside hospital, 2) admitted to the hospital primarily for other reasons beyond their infectious disease illness (i.e. a patient with cellulitis and severe trauma who was primarily admitted for the trauma would be excluded); and 3) left against medical advice (AMA) prior to hospital admission.
- **Primary outcome**
  - A composite of ICU stay, receipt of vasopressor support, and unexpected hospital death (excluding hospice or "do not resuscitate" patients) within 72 hours of presentation (any of the three occurring within 72 hours qualified as a positive outcome).
- **Results**
  - Of 21,038 patients who were admitted from the EDs of the study sites, 3743 admitted for ID diagnosis
  - 2202 (58.8%) met Sepsis criteria and 1085 (29.0%) met Severe Sepsis criteria
  - The qSOFA scores were  $\geq 1$  in (49.1%),  $\geq 2$  in (16.7%) and  $\geq 3$  in (3.9%) of patients
  - Of the 2584 patients who had lactate levels in the ED, 888 (34.4%) had a lactate level  $\geq 2$  and 205 (7.9%) had a lactate level  $\geq 4$ .

- Of the 512 (13.7%) patients who had the primary composite outcome, 493 (96.3%) were admitted to an ICU, 219 (42.8%) of patients received a vasopressor, and 45 (8.8%) of patients died unexpectedly within 72 hours of ED presentation; 216 (42.2%) of patients had more than one of these outcomes.
- The screening performance for the primary composite outcome measure of SIRS/Sepsis, Severe Sepsis, qSOFA threshold scores, and lactate levels are shown in Table 3 of the article.
  - qSOFA  $\geq 1$  and SIRS had the highest (nearly identical) sensitivity and negative likelihood ratios with overlapping 95% confidence intervals 86.1% versus 86.7% and 0.24 versus 0.29 but qSOFA  $\geq 1$  had significantly greater corresponding specificity 56.7 versus 45.6
  - A qSOFA  $\geq 2$  had higher specificity than Severe Sepsis criteria (89.1% versus 77.5% at the expense of lower sensitivity
  - A qSOFA  $\geq 3$  had very high specificity but lower sensitivity than any other screening criteria.
  - A lactate level  $\geq 2$  had relatively balanced screening performance but much lower sensitivity than qSOFA  $\geq 1$
  - Like qSOFA  $\geq 3$ , a lactate level  $\geq 4$  had high specificity but very low sensitivity.
  - The combination of lactate  $\geq 2$  or qSOFA  $\geq 1$  had high sensitivity but extremely low specificity
  - The combination of lactate  $\geq 4$  or qSOFA  $\geq 2$  had balanced screening performance that was in-between that of Severe Sepsis and qSOFA  $\geq 2$ .
- **Limitations**
  - Retrospective
  - Did not examine patients w infections who were discharged from the ED

### **Other investigators of this topic**

Most other investigators on this topic have focused also on mortality and have found mixed results – some found better screening performance and others poorer.

Other risk stratification tools for critical illness have been proposed as useful alternatives to current standard critical illness screening tools. The National Early Warning Score (NEWS) and Modified Early Warning Score (MEWS) criteria consist of readily available physiologic parameters and have performed well when used to identify critical illness in heterogeneous patient populations. In a single site validation study examining the same patient inclusions as the original qSOFA study (patients on hospital wards and in the ED who received cultures and antibiotics), Churpek et al., found that both NEWS and MEWS were more accurate than qSOFA  $\geq 2$  at predicting early mortality and need for ICU transfer.

### **Bottom Line**

qSOFA criteria had slightly better screening performance for critical illness than currently used sepsis screening tools. For ruling out critical illness, qSOFA  $\geq 1$  had equivalent sensitivity and negative predictive value to SIRS criteria, with slightly higher specificity and positive predictive value. Without the need for blood sampling, a qSOFA  $\geq 1$  would be an attractive clinical screening tool to replace SIRS/Sepsis criteria in the ED.