

## Alphabet Soup: SIRS, SOFA, qSOFA and MEWS

### SIRS – Systemic Inflammatory Response Syndrome (1991)

Defines a clinical response to a nonspecific insult of either infectious or noninfectious origin. SIRS is defined as two or more of the following variables:

- Fever of more than 38°C (100.4°F) or less than 36°C (96.8°F)
- Heart rate of more than 90 beats per minute
- Respiratory rate of more than 20 breaths per minute or arterial carbon dioxide tension (PaCO<sub>2</sub>) of less than 32 mmHG
- Abnormal white blood cell count (> 12,000/μL or < 4,000/μL or > 10% immature bands)

SIRS is nonspecific and can be caused by ischemia, inflammation, trauma, infection or several insults combined. Thus, SIRS is not always related to infection (Kaplan, 2018).

### SOFA – Sequential Organ Failure Assessment (1996)

The SOFA tool uses a scoring system that evaluates six key system measures: respiration, coagulation, liver, cardiovascular, central nervous system and renal. “For clinical operationalization, organ dysfunction can be represented by an increase in the SOFA score of 2 points or more . . . a higher SOFA score is associated with an increased probability of mortality” (Singer, 2016). The SOFA scoring tool is used in the intensive care unit (ICU). “A score of two or more (see chart below) and a suspicion of infection is indicative of sepsis” (SIRS, SOFA, qSOFA, and MEWS – The Alphabet Soup, 2018).

System	Score				
	0	1	2	3	4
<b>Respiration</b> PaO <sub>2</sub> /FIO <sub>2</sub> (mmHg)	≥400	<400	<300	<200	<100
<b>Coagulation</b> Platelets 10 <sup>3</sup> /mm <sup>3</sup>	≥150	<150	<100	<50	<20
<b>Liver</b> Bilirubin (mg/dL)	<1.2	1.2-1.9	2.0-5.9	6.0-11.9	>12.0
<b>Cardiovascular</b> Hypotension	MAP ≥70 mmHg	MAP <70 mmHg	Dopamine <5 or dobutamine (any)	Dopamine 5.1-15 or norepinephrine ≤0.1	Dopamine >15 or norepinephrine >0.1
<b>CNS</b> Glasgow Coma Score	15	13-14	10-12	6-9	<6
<b>Renal</b> Creatinine (mg/dL)	<1.2	1.2-1.9	2.0-3.4	3.5-4.9	>5.0

### qSOFA – quick Sepsis Related Organ Failure Assessment (2016)

The qSOFA score (also known as quickSOFA) is a bedside prompt that may identify patients with suspected infection who are at greater risk for a poor outcome in areas outside the ICU. It uses three criteria, assigning one point for low blood pressure (SBP ≤ 100 mmHg), high respiratory rate (≥ 22 breaths per min) or altered mentation (Glasgow coma scale < 15). If a patient has two out of three variables, they are at greater risk for needing ICU care and have a poorer prognosis. The third international consensus definitions for sepsis and septic shock (Sepsis-3) recommends replacing SIRS criteria with qSOFA (Singer, 2016).

## MEWS – Modified Early Warning Score (2001)

This scoring system assigns a number between zero and three to six vital signs: respiratory rate, heart rate, systolic blood pressure, conscious level, temperature and hourly urine output. A total score  $\geq$  four is often used as an indicator to contact a provider or trigger an alert (Early Warning Systems: Scorecards That Save Lives, n.d.).

MEWS (Modified Early Warning System)							
	3	2	1	0	1	2	3
Respiratory Rate per minute		Less than 8		9-14	15-20	21-29	More than 30
Heart Rate per minute		Less than 40	40-50	51-100	101-110	111-129	More than 129
Systolic Blood Pressure	Less than 70	71-80	81-100	101-199		More than 200	
Conscious level (AVPU)	Unresponsive	Responds to Pain	Responds to Voice	Alert	New agitation Confusion		
Temperature (°C)		Less than 35.0	35.1-36	36.1-38	38.1-38.5	More than 38.6	
Hourly Urine For 2 Hours	Less than 10 mLs/hr	Less than 30 mLs/hr	Less than 45 mLs/hr				

### Why use these tools?

These clinical screening tools are used for early detection of a decompensating patient or for the presence of infection and presumed sepsis. SOFA and qSOFA are better in their prognostic capabilities of poor clinical outcome vs. identification of condition. If SOFA or qSOFA are used exclusively for identification some patients with sepsis will be missed. MEWS is not specific to sepsis but is able to capture a patient who is declining better than a health care team that may only see a snapshot of a patient's status. All tools need health care team validation for clinical expertise and judgment.

### What about sensitivity and specificity?

Each tool has its own level of sensitivity and specificity. For example, one study found that SIRS is more sensitive, but qSOFA is more specific (Fernando, 2018). MEWS has been found to be more sensitive, but less specific. It is better to cast a wide net and catch more than is necessary than to cast a single line and miss what you need.

## References

- Early Warning Systems: Scorecards That Save Lives. (n.d.). From Institute for Healthcare Improvement website. Retrieved at <http://www.ihi.org/resources/Pages/ImprovementStories/EarlyWarningSystemsScorecardsThatSaveLives.aspx>
- Fernando, S. M., Tran, A., Taljaard, M., Cheng, W., Rochwerg, B., Seely, A. J. E., & Perry, J. J. (2018). Prognostic accuracy of the quick sequential organ failure assessment for mortality in patients with suspected infection. *Ann of Intern Med*, V168(4), 266-276. DOI: 10.7326/M17-2820
- Kaplan, L.J. (2018). Systemic Inflammatory Response Syndrome. Retrieved from: <https://emedicine.medscape.com/article/168943-overview>
- Singer, M., Deutschman, C. S., Seymour, C. W., Shankar-Hari, M., Annane, D., Bauer, M., . . . Angus, D. C. (2016). The third international consensus definitions for sepsis and septic shock (Sepsis-3). *JAMA*, 315(8), 801-810. doi:10.1001/jama.2016.0287
- SIRS, SOFA, qSOFA, and MEWS – The Alphabet Soup. (2019). From [dascena.com](http://www.dascena.com) website. Retrieved at <https://www.dascena.com/articles/sirs-sofa-qsofa-and-mews-the-alphabet-soup>