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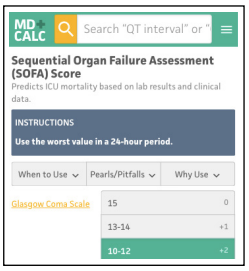

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Sequential Organ Failure Assessment (SOFA) Score

Introduction: The SOFA score predicts mortality risk for patients in the intensive care unit based on lab results and clinical data.

Points & Pearls

- The Sequential Organ Failure Assessment (SOFA) is a mortality prediction score that is based on the degree of dysfunction of 6 organ systems.
- The score is calculated at admission and every 24 hours until discharge, using the worst parameters measured during the prior 24 hours.
- The scores can be used in several ways, including:
  - » As individual scores for each organ to determine the progression of organ dysfunction.
  - » As a sum of scores on a single intensive care unit (ICU) day.
  - » As a sum of the worst scores during the ICU stay.
- The SOFA score stratifies mortality risk in ICU patients without restricting the data used to admission values.

Critical Actions

Clinical prediction scores such as the SOFA and the Acute Physiologic Assessment and Chronic Health Evaluation (APACHE II) can be measured on all patients who are admitted to the ICU, to determine the level of acuity and mortality risk. This information can then be used in various ways, such as to provide the family with a prognosis, for clinical trials, and/or for quality assessment.

The SOFA score is not designed to influence medical management. It should not be used dynamically or to determine the success or failure of an intervention in the ICU.

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Why to Use

The SOFA score can be used to determine the level of organ dysfunction and mortality risk in ICU patients.

When to Use

- The SOFA can be used on all patients who are admitted to an ICU.
- It is not clear whether the SOFA is reliable for patients who were transferred from another ICU.

Instructions

Calculate the SOFA score using the worst value for each variable in the preceding 24-hour period.

Next Steps

Even though it is calculated sequentially based on the worst value for each variable in the past 24 hours, the SOFA score is not meant to indicate the success or failure of interventions or to influence medical management.

Abbreviations: ICU, intensive care unit; SOFA, sequential organ failure assessment.

Evidence Appraisal

The SOFA variables were selected by a working group of the European Society of Intensive Care Medicine (Vincent 1996). In the initial validation study, 1449 patients were enrolled over a period of 1 month from 40 ICUs in 16 countries (Vincent 1998). The study found that the SOFA score had a good correlation to organ dysfunction/failure in critically ill patients.

The SOFA score was also prospectively validated in an observational cohort study conducted by Ferreira et al (2001) at the ICU of a university hospital in Belgium. The study included 352 patients and found that the SOFA score was a good indicator of prognosis.

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Calculator Creator

Jean-Louis Vincent, MD, PhD
Click here to read more about Dr. Vincent.

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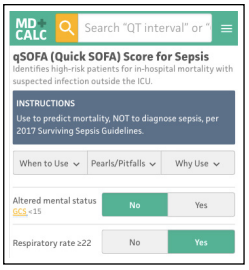

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qSOFA (Quick SOFA) Score for Sepsis

Introduction: The qSOFA score identifies patients with suspected infection who are at high risk for in-hospital mortality outside of the intensive care unit.

Points & Pearls

- The quick Sequential Organ Failure Assessment (qSOFA) was introduced by the Third International Consensus Definitions for Sepsis and Septic Shock ("Sepsis-3") as a simplified version of the Sequential Organ Failure Assessment (SOFA). The SOFA is a validated intensive care unit (ICU) mortality prediction score; the qSOFA was derived by Sepsis-3 to help identify patients with suspected infection who are at high risk for poor outcome (defined as in-hospital mortality or an ICU stay of ≥ 3 days) outside of the ICU.
- The qSOFA simplifies the SOFA significantly by including only 3 clinical criteria, each of which are easily assessed at the bedside.
- Calculation of the qSOFA score can be repeated serially if there is a change in the patient's clinical condition.
- The qSOFA score predicts mortality but does not diagnose sepsis, and it still has an unclear role in the sequence of events from screening to diagnosis to the triggering of sepsis-related interventions.
- At this time, no prospective studies have demonstrated that clinical decisions based on the qSOFA lead to better patient outcomes.
- The most recent Surviving Sepsis Campaign guidelines, published in March 2017, do not integrate the qSOFA into recommendations for screening or diagnosis of sepsis.

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Why to Use
The qSOFA score identifies patients with suspected infection who are at high risk for in-hospital mortality outside of the ICU. It may help increase suspicion or awareness of a severe infectious process and prompt further testing and/or closer monitoring of the patient.

When to Use
Use the qSOFA for patients aged ≥18 years who have a confirmed or suspected infection and are in a non-ICU setting (ie, prehospital, ward, emergency department, or step-down unit).

Instructions
The qSOFA score should be used to predict mortality, not to diagnose sepsis, per the 2016 Surviving Sepsis Campaign guidelines.

Next Steps
A "positive" qSOFA score (≥ 2) suggests high risk of poor outcomes in patients with suspected infection. These patients should be more thoroughly assessed for evidence of organ dysfunction. A positive qSOFA score by itself should not trigger sepsis-directed interventions such as the initiation of broad-spectrum antibiotics; rather, it should prompt clinicians to further investigate for the presence of organ dysfunction or increase the frequency of patient monitoring.

Abbreviations: ICU, intensive care unit; qSOFA, quick sequential organ failure assessment.

Advice
The Sepsis-3 task force recommended that a positive qSOFA score should prompt the calculation of a SOFA score to confirm the diagnosis of sepsis. This recommendation remains controversial, as the qSOFA has been shown to be more predictive than the SOFA outside of the ICU setting. Even if the patient's qSOFA score is initially "negative" (< 2), it can be repeated if there is a change in the patient's clinical status.

Critical Actions
The qSOFA is a mortality predictor, not a diagnostic test for sepsis. It is still not clear how it will be used in the sequence of events from screening to diagnosis of sepsis to the triggering of sepsis-related interventions. The management of sepsis is continuously evolving and is detailed in the 2016 Surviving Sepsis Campaign: International Guidelines for the Management of Sepsis and Septic Shock (Rhodes 2017).

Evidence Appraisal
The qSOFA was introduced in February 2016 by the Sepsis-3 task force as a rapid, bedside clinical score to identify patients with suspected infection who are at greater risk for poor outcomes. The primary outcome was in-hospital mortality, and the secondary outcome was an ICU length of stay of ≥ 3 days. The qSOFA was meant to replace the systemic inflammatory response syndrome (SIRS) criteria, which were believed to be less sensitive and specific, although this remains controversial.

Seymour et al retrospectively derived and internally validated the qSOFA in a 2016 study that included 148,907 patients with suspected infection, either inside or outside of the ICU setting. For patients outside of the ICU with a qSOFA score ≥ 2, there was a 3- to 14-fold increase in the rate of in-hospital mortality. Among ICU patients, however, the predictive validity of the SOFA for in-hospital mortality was statistically greater than the qSOFA.

The qSOFA was prospectively validated in an emergency department population in a study by Freund et al published in 2017. The study, which included 879 patients across 30 emergency departments in 4 countries, found that use of the qSOFA resulted in greater prognostic accuracy for in-hospital mortality than either SIRS or severe sepsis.

Raith et al (2017) externally validated the SOFA and the qSOFA in a retrospective cohort analysis of 184,875 patients who had an infection-related admission diagnosis. The study found that, in an ICU population, an increase in the SOFA score of ≥ 2 points had greater prognostic accuracy for in-hospital mortality than the SIRS criteria or the qSOFA.

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Calculator Creator
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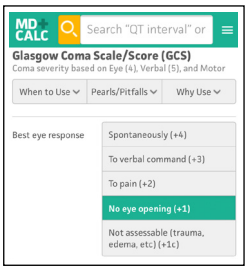

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Glasgow Coma Scale

Introduction: The Glasgow coma scale (GCS) estimates coma severity based on eye, verbal, and motor criteria.

Points & Pearls

- The Glasgow coma scale (GCS) allows providers in multiple settings and with varying levels of training to communicate succinctly about a patient's mental status.
- The GCS score has been shown to have statistical correlation with a broad array of adverse neurologic outcomes, including brain injury, need for neurosurgery, and mortality.
- The GCS score has been incorporated into numerous guidelines and assessment scores (eg, Advanced Cardiac Life Support, Advanced Trauma Life Support, Acute Physiology and Chronic Health Evaluation I-III, the Trauma and Injury Severity Score, and the World Federation of Neurologic Surgeons Subarachnoid Hemorrhage Grading Scale)

Points to keep in mind:

- Correlation with outcome and severity is most accurate when the GCS is applied to an individual patient over time; the patient's trend is important.
- A GCS score of 8 should not be used in isolation to determine whether or not to intubate a patient, but does suggest a level of obtundation that should be evaluated carefully.
- Reproducibility of the GCS score can be low; if individual institutions have concerns about agreement between providers, training and education are available online from the GCS creators at www.glasgowcomascale.org.
- There are simpler scores that have been shown to perform as well as the GCS for initial evaluation in the prehospital and emergency department setting; these are often contracted versions of the GCS itself. For example, the simplified motor score (SMS) uses only the motor portion of the GCS. THE SMS and other contracted scores are less well studied than the GCS for outcomes like long-term mortality, and the GCS has been studied as trended over time, while the SMS has not.

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Critical Actions

Although it has been adopted widely and in a variety of settings, the GCS score is not intended for quantitative use. Clinical management decisions

Why to Use

The GCS is an adopted standard for mental status assessment in the acutely ill trauma and nontrauma patient and assists with predictions of neurological outcomes (complications, impaired recovery) and mortality.

When to Use

- The GCS is designed for use in serial assessments of patients with coma from either medical or surgical causes and is widely applicable.
- The GCS is commonly used in the prehospital and acute care setting as well as over a patient's hospital course to evaluate for mental status assessment in both traumatic and nontraumatic presentations.

Next Steps

- The GCS can indicate the level of critical illness.
- Trauma patients presenting with a GCS score < 15 warrant close attention and reassessment.
- A declining GCS score is concerning in any setting, and should prompt airway assessment and possible intervention.
- Conversely, a GCS score of 15 should not be taken as an indication that a patient (trauma or medical) is not critically ill. Decisions about the aggressiveness of management and treatment plans should be made based on clinical presentation and context, and should not be overridden in any way by the GCS score.
- Clinical management decisions should not be based solely on the GCS score in the acute setting.
- If a trauma patient has a GCS score < 8 and there is clinical concern that the patient is unable to protect his or her airway or there is an expected worsening clinical course based on examination or imaging findings, then intubation can be considered.
- In any patient, a rapidly declining or waxing and waning GCS score is concerning and intubation should be considered in the context of the patient's overall clinical picture.

Abbreviation: GCS, Glasgow Coma Scale.

should not be based solely on the GCS score in the acute setting.

Evidence Appraisal

The modified Glasgow coma scale (modified GCS) is a 15-point scale that has been widely adopted, including by the original unit in Glasgow, as opposed to the 14-point scale. The modified GCS was developed to be used in a repeated manner in the inpatient setting to assess and communicate changes in a patient's mental status and to measure the duration of coma (Teasdale 1974).

In the acute care setting, the GCS has been shown to have highly variable reproducibility and interrater reliability (ie, 56% among neurosurgeons in 1 study, 38% among emergency department physicians in another study). In its most common usage, the 3 sections of the GCS are often combined to provide a summary of severity. The authors themselves have explicitly objected to the score being used in this way, and analysis has shown that patients with the same total score can have huge variations in outcomes, specifically mortality. A GCS score of 4 predicts a mortality rate of 48% if calculated 1 (eye) + 1 (verbal) + 2 (motor), and a mortality rate of 27% if calculated 1 (eye) + 2 (verbal) + 1 (motor), but a mortality rate of only 19% if calculated 2 (eye) + 1 (verbal) + 1 (motor) (Healey 2014).

In summary, the modified GCS provides an almost universally accepted method of assessing patients who have acute brain damage. The summation of the GCS components into a single overall score results in information loss and provides only a rough guide to severity. In some circumstances, such as early triage of severe injuries, an assessment of only a contracted version of the motor component of the scale (such as the SMS), can perform as well as the GCS and is significantly less complicated. However, the SMS may be less informative in patients with less severe injuries.

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Calculator Creator

Sir Graham Teasdale, MBBS, FRCP
Click here to read more about Dr. Teasdale.

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