FOUR Score or GCS in Neurocritical Care: Modification or Adaptation

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Evaluating impaired consciousness in the clinical and surgical intensive care unit (ICU) is challenging. The eye response, motor response, brainstem reflexes, and respiration pattern (FOUR) score and Glasgow coma scale (GCS) score are two standard scoring systems for uniform, quantitative, and objective assessment of the severity of illness and predicting outcomes in neurocritical care. It is not clear which score has better calibration and discrimination power in predicting critical patients' outcomes. The debate has different implications for children as scoring systems face unique challenges when they are used for critically ill children. The GCS has been regularly utilized in neurosurgical ICUs, but its dependability in predicting patient outcomes is continuously debated.[1] The FOUR score is an indicator of the prognosis of fundamentally sick patients which has significant favorable circumstances.[2,3] The FOUR score depends on the absolute minimum of tests essential for evaluating a patient with altered consciousness by incorporating many essential data that is not surveyed by the GCS or other scales. It includes the estimation of brainstem reflexes, determination of eye-opening, a broad spectrum of motor responses, and the presence of anomalous breath rhythms and a respiratory drive.[4]

Arguments in favor of FOUR score

It is precious for patients with intense metabolic derangements, sepsis, shock, or other nonstructural brain injuries, since it distinguishes early consciousness changes.[2,3] The FOUR score was initially tried with staff individuals from a neuroscience ICU and approved by tests with experienced neuroscience ICU nurses.[5] The FOUR score incorporates an evaluation of Cheyne–Stokes respiration and irregular breathing; such signs can demonstrate bihemispheric or lower brainstem dysfunction of respiratory control. According to a prospective study, the FOUR score results have gained significant traction among clinical intensivists, including nursing staff, colleagues, and specialists.[3] Wijdicks et al performed an analysis of critically sick patients admitted to ICU with various findings and proposed that the FOUR score improved prognostic results of in-ICU mortality generally by brainstem and respiration systems.[6] Also, another study has revealed that substituting GCS with the FOUR score in predictive models for a result after traumatic brain injury (TBI) has many advantages.[3] It is undeniably valuable for patients who have encountered a cataclysmic neurologic event as an inconvenience of clinical sickness or medical procedure.[2,3] It has been shown and advanced as an ideal or corresponding GCS tool

for mortality prediction.[6-8] The FOUR score helps in precisely predicting which patients will have a poor outcome and can also anticipate brain death in a sick patient.[2,3,9] It is argued that GCS loses its discrimination power for predicting outcomes, due to its inability to assess verbal outcomes in intubated patients. As the FOUR score incorporates variables like brainstem reflexes and respiration in place of verbal response, it may be a better scoring system.[10] Nyam et al claimed in their cohort study of fifty-five (*n* = 55) patients of TBI that the FOUR score has similar predictive powers to GCS.[11] What is interesting in their study is that each component of the FOUR score showed a significant difference between the mortality and the survival group, which is absent for the eye and verbal part of the GCS.[11]

Arguments not in Favor of FOUR Score

Although Wijdicks et al reported in a comparative study that the FOUR score can further classify the patients with the lowest GCS scores, thereby providing greater neurological detail, but the same was not validated by other studies.[10] Although the FOUR score provides a better estimate of in-hospital mortality and herniation stages, it merely subclassifies the lowest GCS score patients and does not certainly perform better for the patients with GCS. The fundamental difference between the GCS and FOUR score is the presence of brainstem reflexes and respiration in the latter. Therefore, FOUR score is likely to give a detailed neurological picture in cases where brainstem compression is expected and not in other cases. Calibration of a predictive model can deteriorate over time, due to a mix of issues and altered care quality, reducing the discriminative power.[12] Ramazani et al reported in a study comparing three scoring systems in critically ill children that FOUR score and GCS score discriminatory power is similar, but the calibration power is suitable only for GCS.[13] It means that the reliability of GCS for agreement between the observation and prediction outcomes is applicable only for the GCS in critically ill children. The most cited disadvantage of GCS is missing verbal data in intubated patients. However, the imputation model has been addressed to get over the missing oral data.[14] Yet, this would require further validation in clinical studies.

To conclude, it is prudent that GCS and FOUR scores have similar predictive power and strengths and limitations of their own. Rather than being used as an alternative to each other, the two scoring systems are complimentary, as one will complement the limit of others. The GCS can be modified to adapt the FOUR score parameters for patients with low GCS and predict in-hospital mortality for critically sick patients. Similarly, GCS can complement the FOUR score to predict critically ill children's outcomes.

Conflict of Interest
None declared.

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