Revista Cientifica Estudiantil MedEs

MedEst|2026 | Vol.6: e463 | ISSN: 2789-7567 |RNPS: 2524| LETTERS TO THE EDITOR

Glasgow Coma Scale in Traumatic Brain Injury: Universality and Limitations

Escala de coma de Glasgow en traumatismo craneoencefálico: universalidad y limitaciones

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How to cite this article:
Castell-Martínez LM; Fleitas-Almirall AA; Lorente-Espronceda Y. Glasgow Coma Scale in Traumatic Brain Injury: Universality and Limitations. MedEst. [Internet]. 2026 [cited access date]; 6:e463. Available in: https://revmedest.sld.cu/index.php/medest/article/view/463

Palabras Clave:
Traumatismo Craneoencefálico, Escala de Coma de Glasgow, Limitaciones, Neuroimagen, Evaluación Integral.

Keywords: ICU Traumatic Brain Injury, Glasgow Coma Scale, Limitations, Neuroimaging, Comprehensive Evaluation.

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Received: 01/01/2026

Approved: 01/02/2026

Editor(s) in charge:
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Dear Director:

Traumatic brain injury (TBI) remains one of the most significant clinical entities in emergency and intensive care units worldwide, constituting a leading cause of mortality and persistent neurological disability in the economically active population. Its initial management, which largely determines the patient's functional and vital prognosis, depends critically on a rapid, standardized, and reliable neurological assessment.

In this context, the Glasgow Coma Scale (GCS) has become established, since its description in 1974, as the most universally adopted tool for assessing the level of consciousness. Its strength lies in its operational simplicity, its high reproducibility among different evaluators, and its ability to semi-objectively quantify the impairment of consciousness through the assessment of three key parameters: motor response, verbal response, and eye opening. (1)

Numerous studies, including those by Rivera-Ordóñez et al. (1) and Belío-Samitier et al. (2) support its usefulness in classifying the severity of TBI (mild: 13-15 points, moderate: 9-12, severe: ≤8), thus guiding immediate therapeutic decisions and facilitating interdisciplinary communication with a common language.

The authors of this letter consider, however, that it is imperative to critically reflect on the inherent limitations of this scale, the omission of which can lead to errors in clinical assessment.

MedEst. 2026| Vol. 6: e463
ISSN: 2789-7567 | RNPS: 2524

The main limitation, in their opinion, lies in its purely physiological-functional nature. The GCS provides a numerical score reflecting the degree of global neurological dysfunction, but it completely lacks topographic or etiological specificity. That is, it provides no information on the precise anatomical location of the lesion, its extent, the underlying pathophysiological mechanism (contusion, hematoma, diffuse axonal injury, edema), or its structural nature.

A patient with an evolving epidural hematoma and another with an extensive frontal contusion may initially present with the same GCS score, although their pathophysiology, evolution, and management requirements are radically different. This limitation is accentuated in specific injury patterns, such as diffuse axonal injury, where consciousness impairment may be profound (low GCS score) from the outset, despite initial computed tomography (CT) neuroimaging being surprisingly normal or showing only subtle findings. In these cases, exclusive reliance on the GCS could underestimate the true severity of the brain damage. [3]

Furthermore, the authors suggest paying special attention to clinical situations that compromise the validity of one or more components of the scale, which they term "blind spots" of the assessment. In intubated or tracheostomized patients, the verbal component becomes inapplicable, forcing the use of a specific notation (e.g., "V intubated") and basing the evaluation primarily on motor and ocular response, with the risk of losing crucial nuances.

Similarly, patients with pre-existing or acquired aphasia, severe dysphonia, or those under the effects of pharmacological sedation or muscle relaxation in the intensive care unit setting, present an adulterated assessment that does not differentiate between primary neurological deficit and iatrogenic or pre-existing limitations. [4] Even in the absence of these conditions, inter-observer variability, although low, can persist in the interpretation of partial or ambiguous motor responses.

This critique does not seek to diminish the unquestionable value of the GCS, but to frame it within what the authors propose as a paradigm of comprehensive neurotrauma assessment. [3] They firmly believe that the GCS should never be used in isolation as the sole parameter for decision-making. Its true diagnostic and prognostic

MedEst. 2026| Vol. 6: e463
ISSN: 2789-7567 | RNPS: 2524

power emerges, and its deficiencies are compensated, when it is systematically and synergistically integrated within a broader clinical process. [4]

This process must mandatorily include a complete and serial neurological examination that assesses other signs of focalization (pupil size and reactivity, presence of meningeal irritation signs, abnormal respiratory patterns, brainstem reflexes) and the patient's general condition.

Even more crucially, the authors emphasize that the essential synergy is established between the GCS and advanced neuroimaging techniques. In the acute phase of TBI, non-contrast head computed tomography (CT) maintains its role as the primary and irreplaceable first-line study. Its main objective is to quickly identify life-threatening lesions requiring urgent neurosurgical intervention, such as epidural or subdural hematomas, hemorrhagic contusions with significant mass effect, depressed fractures, or acute hydrocephalus.

Thus, CT acts as the indispensable anatomical complement to the functional assessment provided by the GCS. On the other hand, in the subacute stage and for more refined prognostic purposes, brain magnetic resonance imaging (MRI) acquires a preponderant role. Sequences such as diffusion-weighted imaging (DWI), susceptibility-weighted imaging (SWI), and diffusion tensor imaging (DTI) are superior to CT for characterizing diffuse parenchymal lesions, microhemorrhages, and especially the degree of diffuse axonal injury, correlating more closely with long-term functional outcomes. Hilario-Barrio et al. [5] precisely highlight the ability of MRI to reveal the true extent of the damage that the GCS suggests but cannot map.

In the prognostic realm, although the GCS score at admission and its evolution in the first 24-48 hours are robust predictors, the authors consider that the most accurate contemporary predictive models are those that combine clinical variables (including GCS), demographic data (age), and quantified radiological findings. Integrating data such as hematoma volume, the magnitude of midline shift, or the presence of specific brainstem lesions on MRI with the functional GCS score generates a much more powerful risk stratification. [5]

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In conclusion, the authors reiterate that the Glasgow Coma Scale maintains an undisputed relevance as the initial, universal, and fundamental pillar in the standardized assessment of the patient with traumatic brain injury. It is the cornerstone of clinical language in neurotrauma. However, its application must be imbued with a critical awareness of its limits. This awareness must inevitably drive the clinician, whether in the emergency room, neurosurgery unit, or intensive care, to transcend the isolated number.

Optimal practice requires systematically complementing the GCS with a comprehensive and repeated neurological assessment and, crucially, with the judicious request and interpretation of appropriate neuroimaging studies for each clinical phase. Only this integrated diagnostic triad – detailed clinical examination, standardized functional scale, and anatomical correlation by imaging – allows translating neurological dysfunction into precise pathophysiological and anatomical correlates.

This synergy not only optimizes immediate and medium-term therapeutic management but also provides a more solid and reliable basis for predicting outcomes and counseling families, culminating in patient care for the neurotraumatized that is scientific, humane, and of the highest quality.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.