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REVIEW ARTICLE

Analysis of the Full Outline of UnResponsiveness (FOUR) Score: Neurological Assessment Tool in Critically Ill Patients

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ABSTRACT

Introduction: neurological assessment in critically ill patients requires precise tools that overcome the limitations of traditional scales such as Glasgow.
Objective: to evaluate the applicability and effectiveness of the Full Outline of Unresponsiveness (FOUR) score in neurological monitoring of patients in intensive care.
Methods: a systematic review of the scientific literature was conducted across several databases. The search was performed using an algorithm with keywords and Boolean operators, allowing the identification of relevant sources. Selected studies, after applying inclusion and exclusion criteria, were critically analyzed considering timeliness, methodological quality, and thematic relevance, and integrated into the final synthesis of the review.
Development: the FOUR score evaluates ocular and motor responses, brainstem reflexes, and respiration, providing a comprehensive view of neurological status. Literature highlights its superiority over Glasgow in detecting vegetative states and locked-in syndrome. Studies confirm its interobserver reliability and ease of clinical application, even by personnel with limited experience. Although some authors question its validation due to its relatively recent introduction, most support its usefulness in early prognosis and therapeutic decision-making in neurocritical patients.
Conclusions: the FOUR score consolidates itself as a complete and reliable tool for neurological assessment in ICUs. Its practical applicability and early detection capacity position it as a superior alternative to Glasgow, although broader multicenter validation is required for universal adoption.

Keywords: Critical Illness; Glasgow Coma Scale; Health Evaluation; Neurologic Examination; Intensive Care Units.

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INTRODUCTION

Severe traumatic brain injury (TBI) is, worldwide, one of the leading causes of death in the first four decades of life, and the few survivors often suffer varying degrees of physical, cognitive, and behavioral disability. Treatment costs are among the highest in hospital care, compounded by years of rehabilitation during which the patient cannot reintegrate into society normally. TBI is defined as any physical injury or functional impairment of intracranial contents secondary to a sudden transfer of mechanical energy. This definition includes all external causes capable of producing contusion or laceration of the brain, cerebellum, and brainstem.[1]

When performing neurological examination in patients admitted to critical or semi-critical care units, several basic considerations must be taken into account. First, it is essential to thoroughly understand the pathology that prompted admission, as well as the duration of stay in these units or the estimated length of stay. Most neurological pathologies rarely require intensive care initially, and when needed, it is usually not prolonged. Second, it is necessary to gather as much clinical information as possible—personal and family history, details of previous examinations, and chronopathology (the relationship between diseases and biological rhythms)—to enable an appropriate estimation of disease progression and prognosis.[2]

Finally, special attention must be paid to medications involved in patient management, particularly neuroleptics, sedatives, or muscle relaxants. It is important to emphasize the significance of the latter, as they do not alter the level of consciousness but significantly impair motor capacity and can be confounding factors during examination.[3] In intensive care units (ICUs), critically ill patients are constantly admitted; due to physiological instability, medical staff often require a rapid assessment of the patient's neurological status to maintain continuous monitoring and prevent potential complications.[4]

Several scales have been proposed over the years to achieve more accurate neurological assessment.[5,6] Among the most comprehensive, user-friendly, and reliable is the FOUR score (Full Outline of UnResponsiveness). Developed in 2005 by the Neurocritical Care Unit at the Mayo Clinic in Rochester, Minnesota,[4,7] the FOUR scale comprises four components focused on motor response, eye response, respiratory pattern, and brainstem reflexes. [6,8,9,10,11]

Despite the reliability and comprehensiveness of the FOUR scale, certain uncertainties and gaps remain. Part of the controversy stems from the limited number of pre-existing studies validating its use, making it appear, to some extent, incomplete and less trustworthy for both healthcare personnel and ICU patients. [12,13,14] This gap motivated the present review, which aimed to evaluate the applicability and efficacy of the Full Outline of UnResponsiveness (FOUR) scale in neurological monitoring of critically ill patients.

METHODS

This study was designed as a systematic literature review following the PRISMA 2020 guidelines to ensure transparency, reproducibility, and methodological rigor. The search period spanned from 2005 to 2024 to identify the most relevant evidence on the applicability and efficacy of the Full Outline of UnResponsiveness (FOUR) scale in neurological assessment of critically ill patients in intensive care units.

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Information sources included widely recognized biomedical and scientific databases: PubMed/MEDLINE, ScienceDirect, Cochrane Library, Google Scholar, and the Journal of the Neurological Sciences. The search was complemented with secondary references from selected articles to broaden identification of relevant studies and reduce publication bias. The search strategy employed an algorithm combining keywords and Boolean operators. MeSH and DeCS terms such as "FOUR score," "neurological assessment," "critical care," "coma scale," and "Glasgow Coma Scale" were combined using AND and OR operators to maximize sensitivity and specificity. Publications in Spanish and English were included to integrate evidence from diverse clinical and cultural contexts.

Inclusion criteria encompassed original articles, clinical trials, cohort studies, and systematic reviews published within the defined timeframe that directly addressed the application of the FOUR scale in critically ill patients. Duplicates, articles without full access, irrelevant documents, publications prior to 2005, as well as letters, editorials, clinical practice guidelines, and theses were excluded.

The selection process occurred in several phases: initial title and abstract screening to exclude non-relevant studies, followed by full-text evaluation of potentially eligible articles. Initially, approximately 600,666 records were identified; after removing duplicates and applying exclusion criteria, the sample was reduced to 7,765 articles; finally, 28 studies were included in the qualitative synthesis. The procedure was documented using a PRISMA flow diagram (Figure 1), illustrating each selection stage.

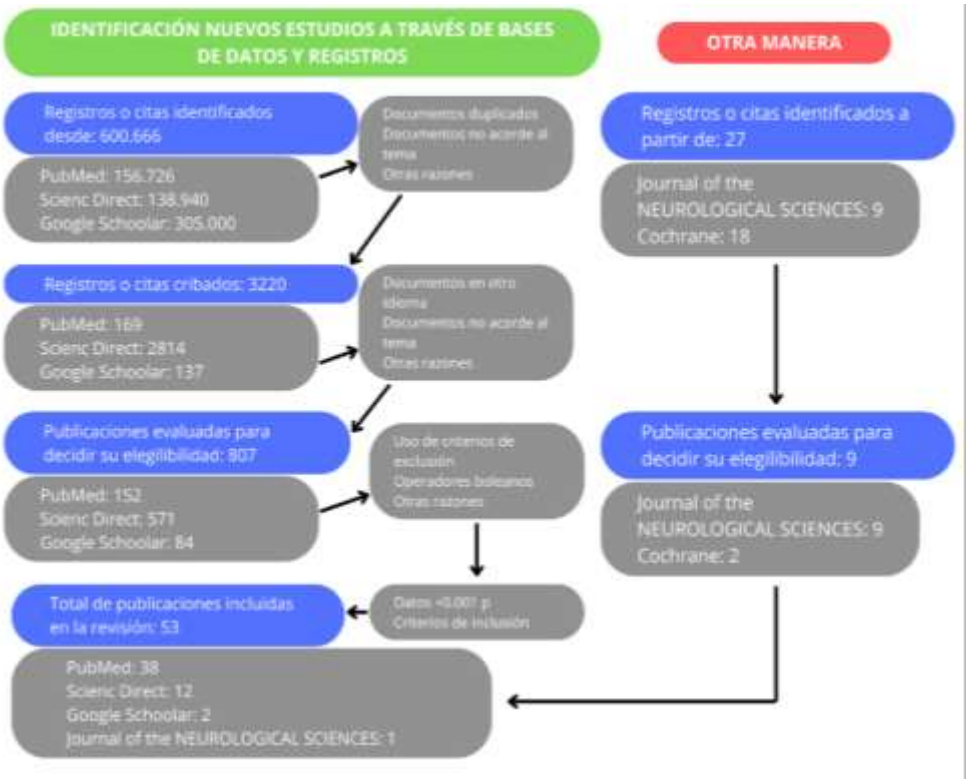

Fig. 1 Flowchart.

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Data extraction and analysis were performed systematically, collecting key variables such as author, publication year, methodological design, population characteristics, scale used, clinical outcomes, and main findings. Information was organized into comparative matrices to facilitate interpretation. A qualitative synthesis was conducted, as methodological and outcome heterogeneity precluded formal meta-analysis. This approach enabled integration of available evidence and provided a critical, up-to-date overview of the FOUR scale's utility in clinical practice, highlighting its advantages over other neurological assessment tools such as the Glasgow Coma Scale.

DEVELOPMENT

The FOUR scale consists of four components based on responses: Ocular (E4), which helps assess vegetative state (eye opening without gaze tracking); Motor (M4), reflecting withdrawal and posturing responses; Brainstem (B4), focusing on midbrain and medulla oblongata function, including pupillary and corneal reflexes; and Respiratory (R4), assessed via Cheyne-Stokes breathing patterns to determine irregular respiration and respiratory control dysfunction.[4,12] In this scale, a score of 4 indicates normal function, while 0 indicates no function.[13,14]

Table 1. Components of the FOUR Score.

Component	Response	Score
Eye response	Tracks horizontal or vertical gaze or blinks twice on command	4
	Spontaneous eye opening without gaze tracking	3
	Eye opening to loud verbal stimuli	2
	Eye opening to painful stimuli	1
	Eyes closed; no opening to pain	0
Motor response	Gives thumbs-up, makes a fist, or shows "victory" sign on command	4
	Localizes to pain (supraorbital or temporomandibular stimulus)	3
	Flexor response to pain (decorticate posturing or withdrawal) in upper limbs	2
	Extensor response to pain	1
	No response to pain or generalized myoclonus	0
Brainstem reflexes	Both corneal and pupillary light reflexes present	4
	Unilateral absent pupillary light reflex	3
	Absent corneal or pupillary light reflex	2
	Absent corneal and pupillary light reflexes	1
	Absent corneal, pupillary, and cough reflexes	0
Respiration	Not intubated; regular breathing	4
	Not intubated; Cheyne-Stokes breathing	3
	Not intubated; irregular breathing	2
	Intubated; breathes above ventilator rate	1
	Intubated; breathes at ventilator rate or apneic	0

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Another frequent issue with the FOUR scale is its constant comparison with the Glasgow Coma Scale, which has been used longer in ICUs. However, the Glasgow scale has notable limitations, particularly in detecting vegetative states, contributing to increased morbidity and mortality in TBI patients.[8,9] The FOUR scale replaces verbal responses with brainstem reflexes and respiratory patterns, enabling more accurate coma assessment. [13,15,16,17]

One key benefit of the FOUR scale is its ability to anticipate vegetative states or locked-in syndrome in intubated and ventilated ICU patients.[4,9,18]

Camacho et al.,[10] argue that the Full Outline of UnResponsiveness (FOUR) score is more comprehensive than the Glasgow Coma Scale due to its components and should therefore be more widely applied in hospital settings. Similarly, Wolf et al.,[19] and Visoso et al.,[20] agree with this view, considering that the FOUR scale provides more neurological information than the Glasgow scale.

Furthermore, Ocampo-Contreras et al.,[21] note that the "Full Outline of UnResponsiveness" (FOUR) score does not require extensive prior knowledge for its application, allowing easier and faster implementation in intensive care units. Thus, the FOUR scale addresses the deficiencies of other neurological assessment scales. [22,23,24,25]

However, it is crucial to emphasize that, despite being regarded as one of the best scales for neurocritical patient assessment, some authors argue that, due to its novelty, it lacks sufficient scientific foundation to justify replacing established tools, preferring traditional, well-practiced methods over newer approaches that may yield more effective results.[19,26]

Moreover, the literature reports that, despite all FOUR score components, it does not demonstrate significant superiority over other neurological assessment scales—at least not to a clinically meaningful degree.[27] Therefore, some consider that no scale should replace the simplicity of the Glasgow Coma Scale or its standardized approach to critically ill ICU patients.[22,28] Nevertheless, the FOUR scale is regarded as more accessible for healthcare personnel with limited experience in neurological assessment.

Thus, the FOUR scale is considered one of the most suitable tools for early diagnosis in critically ill patients and is highly reliable for predicting potential pathologies that may affect them.[20] However, some authors maintain that, due to its recent development, it should not replace established practices, as tradition is still perceived as more trustworthy than the FOUR scale.[26]

CONCLUSIONS

Based on the literature analysis of the "Full Outline of UnResponsiveness" (FOUR) score, it can be concluded that this is one of the best scales for neurological assessment in critically ill patients, as it is highly comprehensive and easy to apply in clinical settings. Additionally, it enables earlier prevention of conditions such as locked-in syndrome or vegetative state. Therefore, the FOUR scale should be considered the optimal tool for neurological evaluations in intensive care units.

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