



## GCS vs FOUR Score in predicting outcome of TBI patients in Surgical Intensive Care Unit

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### Abstract

**INTRODUCTION** Traumatic brain injury (TBI) is one of the main reasons of mortality in worldwide. The GCS has repeatedly been criticized for its several failures to reflect verbal reaction in intubated patients, and to test brain stem reflexes. Recently, the full outline of unresponsiveness (FOUR) score was introduced, which is composed of four clinically distinct categories of evaluation: eye reaction, motor function, brainstem reflexes and respiratory pattern.

**AIM** This study aimed to determine whether the Full Outline of Unresponsiveness (FOUR) score is an accurate predictor of outcome in traumatic brain injury (TBI) patients and to compare its performance to Glasgow coma scale (GCS).

### MATERIALS & METHODOLGY

**Study Design:** Prospective observational study

**Study Location:** This was a tertiary care teaching hospital-based study done in Department of General Surgery, MGM hospital, Navi Mumbai.

**Study Duration:** June 2020 to May 2021

**Sample size:** 51 patients.

**Subjects & selection method:** The study population was drawn from all traumatic head injury patients who presented to the Emergency Department at Mahatma Gandhi Missions Hospital, Navi Mumbai from June 2021 to October 2021.

### Inclusion criteria:

- a) All patients
- b) Age above 16 years

### Exclusion criteria:

- a) Patients whose eye, verbal, or motor GCS components were not identified
- b) Patients who were heavily sedated or receiving neuromuscular function blockers.
- c) Pregnant females
- d) Pediatric age group

### CONCLUSION

The FOUR score is an accurate predictor of discharge outcome in TBI patients. Thus, researchers recommend for therapeutic Schematization to use in neurosurgical patients at admission day.

**Keywords:** Glasgow Coma Scale, FOUR Score, Traumatic Brain Injury

### Introduction

Traumatic brain injury (TBI) is one of the main reasons of mortality in worldwide. It is estimated that 1.5 million peoples expire annually due to TBI and millions of people need intensive care after TBI. The mortality rate in these patients depends on severity and TBI mechanism although unpleasant outcomes due to TBI can stimulate upto 12% also<sup>1,2</sup>. The

Glasgow coma scale (GCS) was introduced as a scoring system for patients with impaired consciousness after traumatic brain injury (TBI). Since, it has become the worldwide standard in TBI assessment. The GCS has repeatedly been criticized for its several failures to reflect verbal reaction in intubated patients, and to test brain stem reflexes.

Recently, the full outline of unresponsiveness (FOUR) score was introduced, which is composed of four clinically distinct categories of evaluation: eye reaction, motor function, brainstem reflexes and respiratory pattern. This study aims to validate the FOUR score in neurosurgical patients.

### Aim

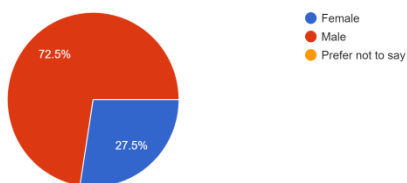
This study aimed to determine whether the Full Outline of Unresponsiveness (FOUR) score is an accurate predictor of outcome in traumatic brain injury (TBI) patients and to compare its performance to Glasgow coma scale (GCS).

### Materials & Methodology

A prospective study was carried out in 51 traumatic brain injury patients at MGM Medical College and Hospital, Navi Mumbai at Department of General Surgery admitted in the Surgical ICU from a period of June 2020 to May 2021 and both GCS and FOUR scores were calculated at presentation, at arrival to Surgical ICU, at 24 hours from presentation and at 72 hours from presentation. The outcome of all these patients were calculated and the predicted outcome according to both the scores was compared to the final outcome. **Inclusion criteria:** All patients above 16years of age. **Exclusion criteria:** Patients whose eye, verbal, or motor GCS components were not identified, Patients who were heavily sedated or receiving neuromuscular function blockers, Pregnant females, Pediatric age group.

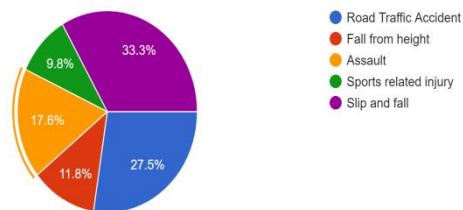
### Observation & Results

SEX  
51 responses



**GRAPH 1: DISTRIBUTION OF STUDY POPULATION BY SEX**

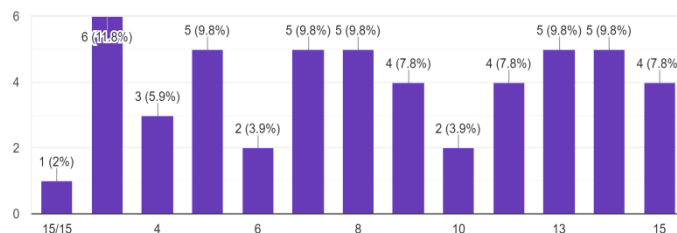
MECHANISM OF INJURY  
51 responses



**GRAPH 2: GRAPHICAL REPRESENTATION OF MECHANISM OF INJURY**

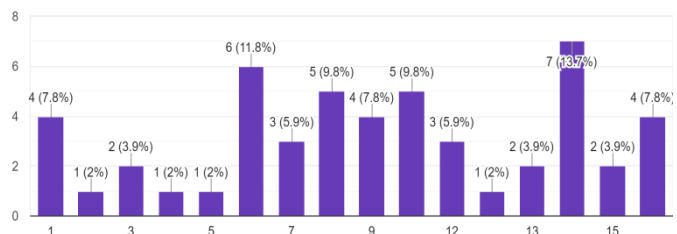
In this study, 27.5% of the populations out of 51 cases were females and 72.5% were males. 33% patients suffered a TBI due to slip and fall, 27.9% due to road traffic accident, 17.6% due to assault, fall from height accounted for 11.8% and 9.8% accounting to sports related injury.

GCS AT PRESENTATION  
51 responses



**GRAPH 3: DISTRIBUTION OF GCS AT PRESENTATION**

FOUR SCORE AT PRESENTATION  
51 responses



**GRAPH 4: DISTRIBUTION OF FOUR SCORE AT PRESENTATION**

SCORES		PREDICTION	OUTCOME
<b>FOUR</b>	Death	8(15.7%)	10 (19.7%)
	Alive	44	41 (80.3%)
<b>GCS</b>	Death	6 (13.8%)	10 (19.7%)
	Alive	45	41 (80.3%)

**TABLE 1: TABLE FOR PREDICTION AND OUTCOME AMONG FOUR SCORE AND GCS SCORE**

The prediction of death was in 15.7% cases by FOUR score and 13.8% cases by GCS. The outcome of the overall study was – 19.8% cases succumbed to death and 80.3% patients were alive. Thus FOUR score is proved to be a better indicator than GCS.

### Discussion

The FOUR score is easy to use and includes the minimal necessities of neurological testing in impaired consciousness, and specifically recognizes certain unconscious states<sup>4</sup>. This new coma scale consists of important clinical neurological findings in patients with impaired consciousness<sup>8</sup>. Furthermore, this study confirmed previous studies that the FOUR score is a robust predictor of in-hospital mortality, functional outcome at hospital discharge, and overall survival in patients seen for neurologic complaints<sup>4,9</sup>. The results of this study showed that FOUR scale is better than GCS. Compared to Glasgow Coma Scale, this new coma scale does not depend on a verbal response and provides greater neurological detail by inclusion of brainstem reflexes and breathing patterns<sup>15,16</sup>.

Ours is a single-center study, however this also ensured that other factors such as level of care and management strategy would be similar for all the study subjects. The FOUR score and GCS were assessed by the same investigator, so we cannot comment about inter-rater reliability.

### Conclusion

The finding of the current study revealed that FOUR is an applicable tool for high predictive power of outcomes in discharge time for patients with TBI. The FOUR score is straightforward to apply and, at

the same time, more refined in assessment of patients with severely impaired consciousness. Though GCS has some shortcomings, its accuracy was similar to the FOUR score for predicting mortality. However, the FOUR score can be used in patients with severe coma for sub-categorization of patients with lowest GCS.

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