

# The timing of Glasgow Coma Score documentation in a trauma database: implications for patient care, research, and performance metrics



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## Introduction

It is possible that the timing of collection of certain elements may improve or detract from the accuracy of models trying to explain clinical severity of injury or disease. The Glasgow Coma Scale (GCS) is intended as an objective, reliable measure of a trauma patient's mental status. This study looks to determine the contribution of the timing of the GCS to the performance of a commonly used risk-adjustment tool for trauma patients.

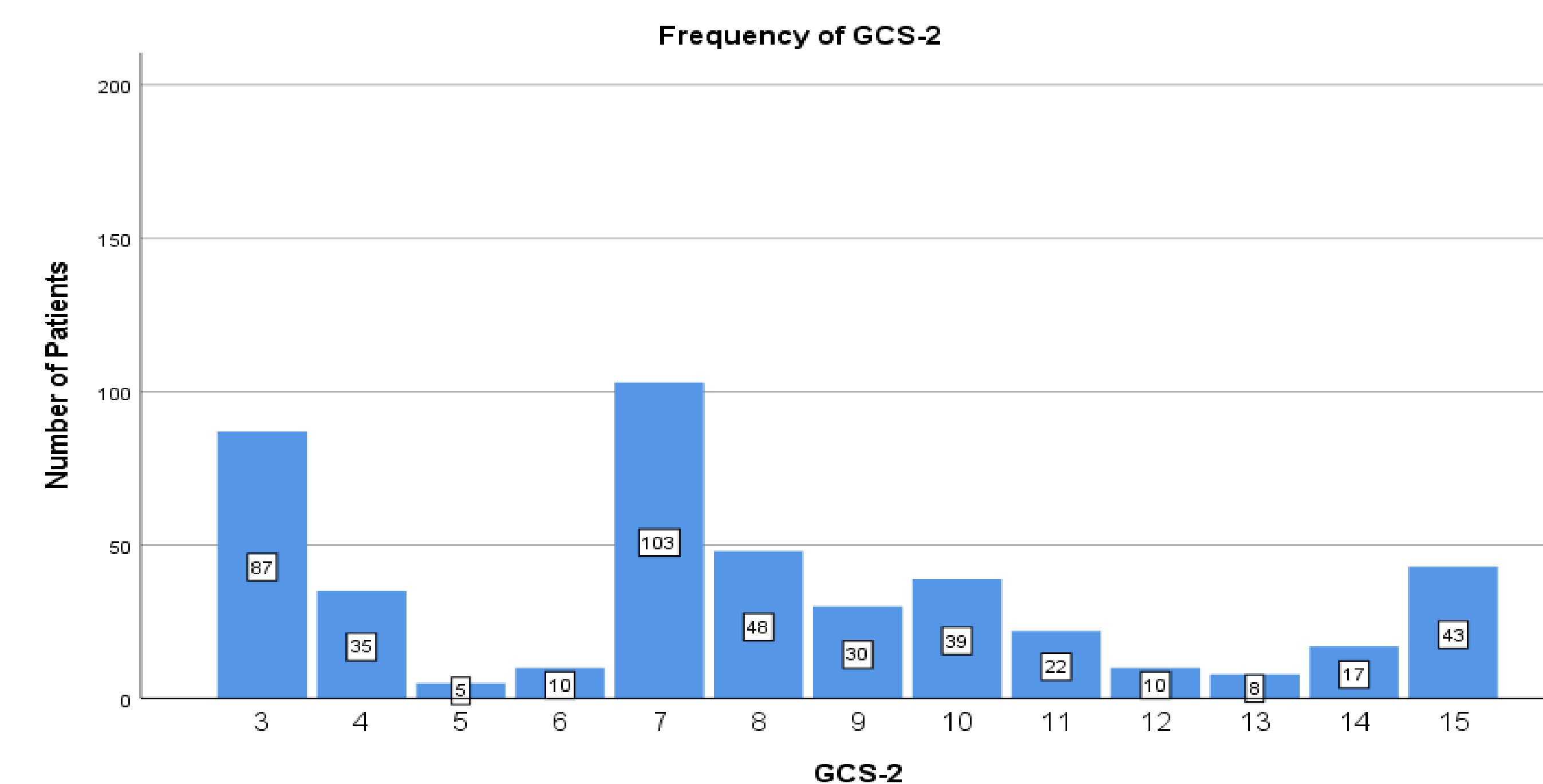
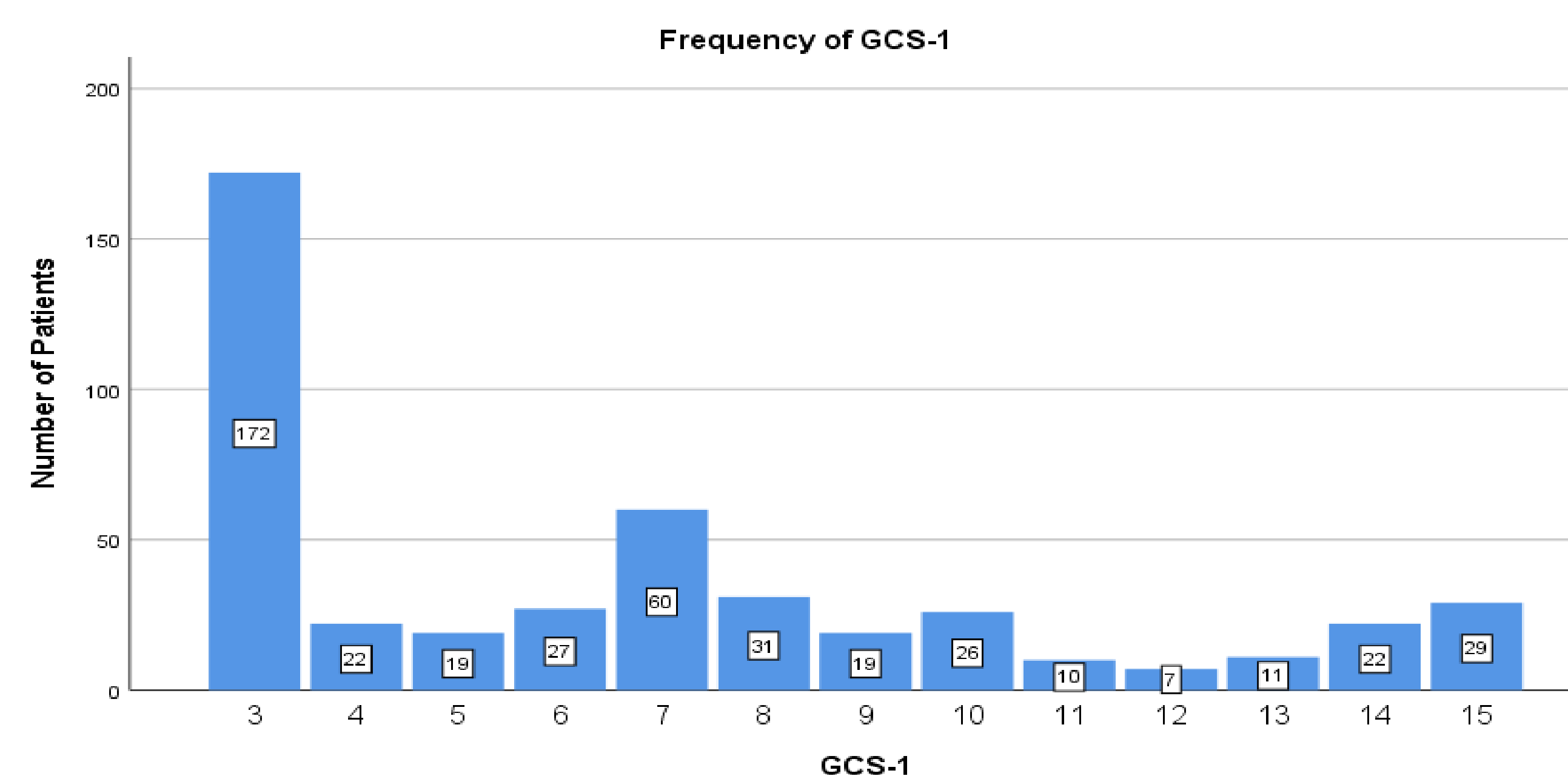
## Methods

The Trauma Registry records of consecutive admitted patients with blunt trauma during a 4-year period (2013-2017) was further parsed to include only patients with a traumatic brain injury, excluding penetrating trauma and patients discharged from the emergency department. The GCS documented during the trauma resuscitation (GCS-1) and during the initial neurosurgery consult (GCS-2) were collected. The  $\Delta$ GCS was calculated as the difference of GCS-2 and GCS-1. Probability of survival (POS) was calculated using the Trauma Injury Severity Score (TRISS) method. This was done once using GCS-1 (POS-1) and again using GCS-2 (POS-2). Other variables from the trauma registry that were analyzed included age, gender, race, injury intent, injury severity score (ISS), toxic substance screen results, discharge location, mortality, primary payor and hospital length of stay (LOS).

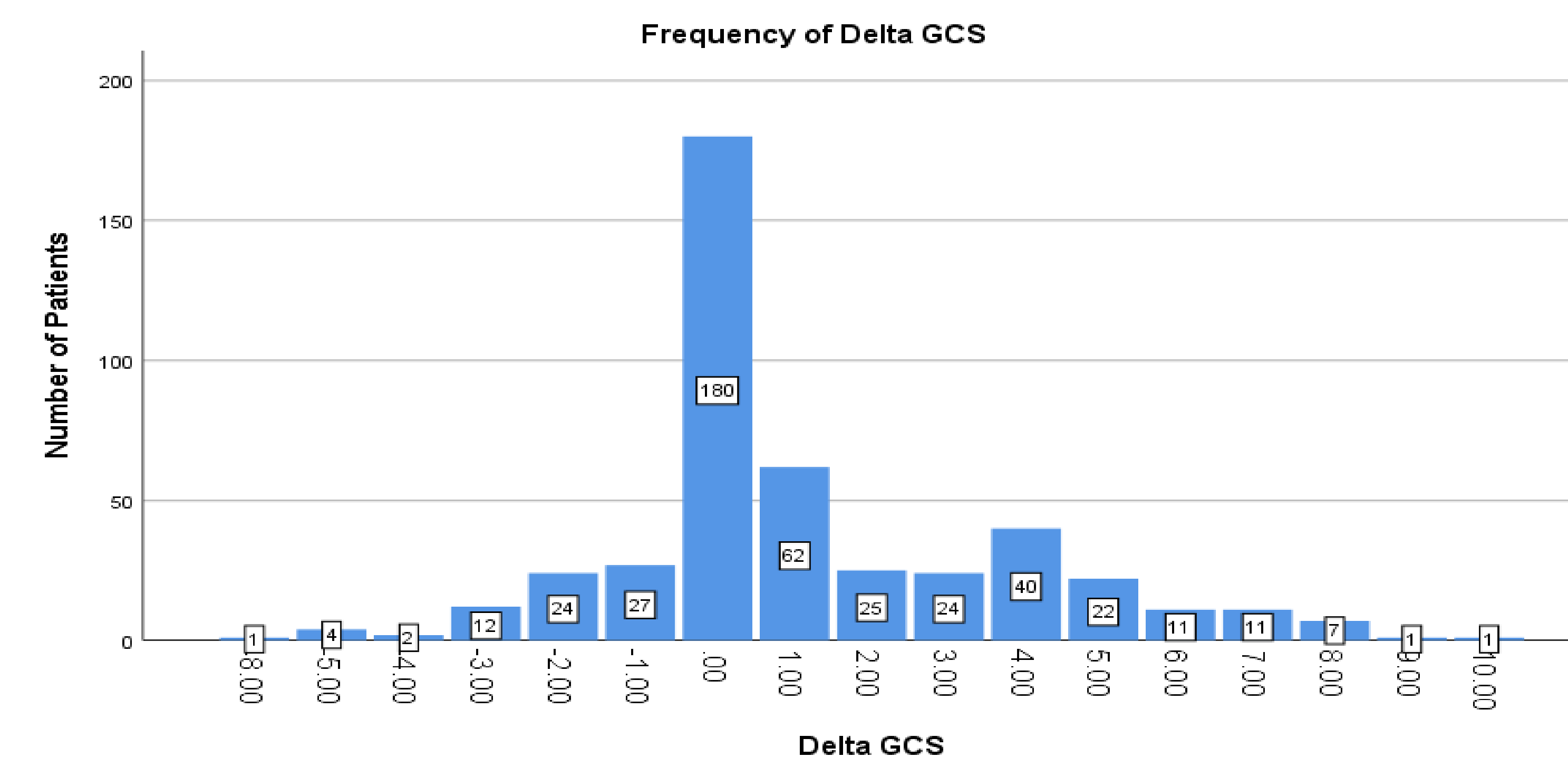
Glasgow Coma Scale		
Response	Scale	Score
Eye Opening Response	Eyes open spontaneously	4 Points
	Eyes open to verbal command, speech, or shout	3 Points
	Eyes open to pain (not applied to face)	2 Points
	No eye opening	1 Point
Verbal Response	Oriented	5 Points
	Confused conversation, but able to answer questions	4 Points
	Inappropriate responses, words discernible	3 Points
	Incomprehensible sounds or speech	2 Points
	No verbal response	1 Point
Motor Response	Obeys commands for movement	6 Points
	Purposeful movement to painful stimulus	5 Points
	Withdraws from pain	4 Points
	Abnormal (spastic) flexion, decorticate posture	3 Points
	Extensor (rigid) response, decerebrate posture	2 Points
	No motor response	1 Point

Minor Brain Injury = 13-15 points; Moderate Brain Injury = 9-12 points; Severe Brain Injury = 3-8 points

## Results: Frequency of GCS-1 and



GCS-1 significantly differed from GCS-2 ( $6.69$  vs  $7.84$ ,  $\pm 2.553$ ,  $p < .001$ ), as the GCS-1 group average was influenced by many patients with GCS of 3. There was no  $\Delta$ GCS in 180 patients. The cohort with a decrease in GCS (70 patients) showed a significant difference between the mean GCS-1 and GCS-2 ( $9.46 \pm 3.317$ ,  $7.36 \pm 3.266$ ,  $p < .001$ ). The cohort with an increase in GCS (204 patients) showed a significant difference between the mean GCS-1 and GCS-2 ( $5.39 \pm 3.113$ ,  $8.69 \pm 3.067$ ,  $p < .001$ ). There were 330 (72.69%) patients with severe TBI (GCS  $\leq 8$ ) as noted by GCS-1 and 288 (63.44%) patients with severe TBI as noted by GCS-2.



## Results: POS-1 vs. POS-2

There was a statistically significant difference ( $p < 0.001$ ) in the means of POS-1 ( $74.7\% \pm 26.6\%$ ) and POS-2 ( $79.3\% \pm 24.4\%$ ). The actual observed survival rate for the cohort was  $71.0\%$  (325/458). When compared to the observed value, the predicted POS-1 was significantly greater ( $71.0\%$  vs  $74.7\% \pm 26.6\%$ ,  $p = .004$ ), and when compared with POS-2 there was an increasingly significant difference in means ( $71.0\%$  vs  $79.3\% \pm 24.4\%$ ,  $p < .0001$ ).

## Conclusions

GCS-1 recorded on patient emergency department arrival differed significantly from GCS-2 recorded by the neurosurgery team at late times. This significantly altered the POS as calculated by the TRISS Methodology. GCS-1 was more closely correlated with patient survival. This could impact risk-adjusted benchmarking, assessments of quality of care, and injury severity stratification for research. More research into the optimal timing of GCS recording or changes in GCS and the impact on survival is warranted.