The Glasgow Coma Scale: Do We Know How to Assess?

John Jeffery, Mohamed Mussa, Euan Stirling, Ihsaan Al-Hadad.
Department of Orthopaedics, Northampton General Hospital, Northampton, UK.
Correspondence: Mohamed Mussa
Email: mohamedaltayeb@gmail.com
©The Author(s). This article is an open access publication.

Abstract
Objective: to determine the knowledge of GCS amongst clinical staff that cares for Traumatic brain injury (TBI) patients. Methods: A self-administered anonymous questionnaire was used to assess the knowledge of Junior Nurses (JNs), Senior Nurses (SNs), Junior Doctors (JDs) and Specialist Registrars (SRs) working with TBI patients. Following this, a PowerPoint based tutorial was delivered to staff within the department. 4 months later, same questionnaire was given out and results compared. Results The initial questionnaire had an overall correct response rate of 53.5% with only 9.7% of all healthcare professionals accurately scoring the GCS of a patient in a clinical scenario (JNs=0%, SNs=9.1%, JDs=20%, SRs=20%). Following the delivery of teaching, the repeat questionnaire had an overall correct response rate of 92.9% with 71% accurately scoring the GCS in the scenario (JNs=63.6%, SNs=70%, JDs=83.3%, SRs=75%). Results demonstrated a higher level of knowledge amongst doctors with overall correct response rates of 84% for JDs and SRs, compared to 36% and 41.8% for JNs and SNs respectively. The greatest improvement overall was seen in JNs who gave correct responses to 89.1% of questions in the follow up questionnaire compared to 36% in initial questionnaire. Conclusions Our study identified inconsistencies in knowledge of GCS and its application amongst staff in the department and demonstrated that the intervention of a single teaching session could improve this. Improving the accuracy of GCS calculation allows for better assessment, monitoring, prognostication and use of imaging facilities and is necessary to optimise outcome in TBI patients.

Keywords
Head injury, Glasgow coma scale, Questionnaire, Health care professionals

Introduction:
For the last 40 years, the level of consciousness following traumatic brain injury (TBI) has been quantified using the Glasgow Coma Scale (GCS). This is widely recognized as a simple and effective clinical tool for assessing the severity of neurological impairment and for predicting outcomes in TBI patients.

Within our department the GCS is used to monitor patients admitted to the Trauma and Orthopaedic wards with head injury and are used to identify those requiring additional investigation or airway support and escalation of care. Previously published studies have shown clinicians working with TBI patients to have a poor working knowledge of the GCS [1-3] and that levels of knowledge are poorer in doctors with less experience and who have not been on certified trauma courses [3].

Our objective was to determine how accurately clinical staff who care for patients with head injuries were able to assess a patient’s GCS score, to further assess their knowledge of the component parts of the GCS and to see if this could be improved with the delivery of intra-departmental teaching.
Jeffery et al. The Glasgow Coma Scale: Do We Know How to Assess?

Figure 1: Overall correct response rate before and after teaching

Figure 2: Accuracy of assessing GCS score in a scenario before and after teaching

<table>
<thead>
<tr>
<th>Questions</th>
<th>JNs (n=10)</th>
<th>SNs (n=11)</th>
<th>JDs (n=5)</th>
<th>SRs (n=5)</th>
<th>Overall (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many components</td>
<td>40%</td>
<td>54.5%</td>
<td>100%</td>
<td>100%</td>
<td>64.5%</td>
</tr>
<tr>
<td>List components and points</td>
<td>20%</td>
<td>45.5%</td>
<td>100%</td>
<td>100%</td>
<td>54.8%</td>
</tr>
<tr>
<td>Min score</td>
<td>30%</td>
<td>18.2%</td>
<td>100%</td>
<td>100%</td>
<td>48.4%</td>
</tr>
<tr>
<td>Max score</td>
<td>90%</td>
<td>81.8%</td>
<td>100%</td>
<td>100%</td>
<td>90.3%</td>
</tr>
<tr>
<td>Scenario</td>
<td>0%</td>
<td>9.1%</td>
<td>20%</td>
<td>20%</td>
<td>9.7%</td>
</tr>
<tr>
<td>Overall</td>
<td>36%</td>
<td>41.8%</td>
<td>84%</td>
<td>84%</td>
<td>53.5%</td>
</tr>
</tbody>
</table>

Table 1: Initial questionnaire results
Methods

Ethical approval:
The study protocol was approved by our hospital’s clinical governance committee.

Study design:

A prospective self-administered anonymous questionnaire was used to gather information on the current level of knowledge of the GCS amongst Junior Nurses (JN), Senior Nurses (SN), Junior Doctors (JD) and Specialist Registrars (SR) working within the trauma and orthopaedic department. This asked staff to identify how many components there were to the GCS and to list these, to give the maximum and minimum possible scores and then to apply this knowledge by determining the GCS score of a patient in a given clinical scenario.

The initial questionnaire was returned by 31 respondents (10 JNs, 11 SNs, 5 JDs and 5 SRs). Following this, a power point-based tutorial was given to physicians and nursing staff within the department. 4 months after the initial data collection was carried out, the same questionnaire was given out and received 31 respondents (11 JNs, 10 SNs, 5 JDs and 5 SRs). The result of the initial and follow up questionnaires were then compared.

Results

The initial questionnaire had an overall correct response rate of 53.5% with 0% of JNs, 9.1% of SNs, 20% of JDs and 20% of SRs correctly scoring the GCS of a patient in the given clinical scenario (table 1). When asked to identify how many components there were to the GCS, correct responses were given by 40% of JNs, 54.5% of SNs, 100% of JDs and 100% of SRs. When asked to name these components and how many points each one was scored out of, 20% of JNs, 45.5% of SNs, 100% of JDs and 100% of SRs answered correctly.

This initial questionnaire demonstrated a higher level of knowledge of the GCS and its application amongst doctors with overall correct response rates of 84% for both JDs and SRs, compared to overall correct response rates of 36% and 41.8% for JNs and SNs respectively. This prospective study showed that only 9.7% of all healthcare professionals questioned were able to accurately score the GCS of a patient in a given scenario thus indicating a need for education to improve the accuracy of GCS assessment amongst healthcare professionals and to improve inter-observer reliability (figure 1).

Following the delivery of teaching within the department the repeat questionnaire had an overall correct response rate of 92.9% with 63.6% of JNs, 70% of SNs, 83.3% of JDs and 75% of SRs correctly scoring the clinical scenario (table 2). 100% of all staff that returned the repeat questionnaire were able to correctly describe the components of the GCS and how many points each one was scored out of. The greatest improvement in overall correct responses was seen in JNs who gave correct responses to 89.1% of the questions in the follow up questionnaire compared to 36% in the initial questionnaire (figure 2).

<table>
<thead>
<tr>
<th>Questions</th>
<th>JNs (n=11)</th>
<th>SNs (n=10)</th>
<th>JDs (n=6)</th>
<th>SRs (n=4)</th>
<th>Overall (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many components</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>List components and points</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Min score</td>
<td>90.9%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>96.8%</td>
</tr>
<tr>
<td>Max score</td>
<td>90.9%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>96.8%</td>
</tr>
<tr>
<td>Scenario</td>
<td>63.6%</td>
<td>70%</td>
<td>83.3%</td>
<td>75%</td>
<td>71%</td>
</tr>
<tr>
<td>Overall</td>
<td>89.1%</td>
<td>94%</td>
<td>96.7%</td>
<td>95%</td>
<td>92.9%</td>
</tr>
</tbody>
</table>

Table 2: Follow up questionnaire results

---

**Jeffery et al. The Glasgow Coma Scale: Do We Know How to Assess?**

---

Discussion

The GCS is a widely used and validated tool for assessing level of consciousness and for trauma triage in patients with traumatic brain injury (TBI). Its use has also been extended beyond TBI and it is used for assessment and prognostication in patients with end stage Alzheimer’s [4], CO intoxication [5] and in stroke patients [6] (1). Limitations of the GCS include a skew towards the motor sub score, the effects of intubation [7], and a low inter-rater reliability in inexperienced users [8][2]. The motor component of the score has been shown to be the most inaccurately assessed component of the GCS [9]. Namiki et al found that the assessment of “confused conversation (V4)” and "withdrawal motor response (M4)" were the most commonly inaccurately scored components of the GCS suggesting that specific instruction regarding these is necessary during training [10]. However it is still widely used and has been shown to be an excellent predictor of outcome in TBI patients [11-13]. Its predictive value can be increased further when combined with simple bedside examinations such as pupil evaluation and other physiological measures in the ITU setting [14]

Our results have identified a significant risk of inaccurate scoring of the GCS of patients admitted to our unit with TBI. There was a particularly notable difference before the delivery of teaching between knowledge of the GCS in nurses and doctors respectively. In our unit the first documented GCS score given to a patient is normally by the admitting junior doctor and subsequent ones are by nurses on the wards and the change in this score helps to guide further escalation and the need for repeat imaging studies. We have therefore identified a potential patient safety issue and demonstrated the need for regular departmental teaching in areas where TBI patients are nursed.

Conclusions

The GCS is an appropriate tool to use for assessing the degree of neurological impairment in individuals with TBI. Our study identified inconsistencies in knowledge of the GCS and its application amongst staff in the department and demonstrated that the intervention of a single teaching session could improve this. Improving the accuracy of GCS calculation allows for better assessment, monitoring, prognostication and use of imaging facilities and is necessary to optimize outcome in TBI patients.

References