Awareness of Glasgow Coma Scale in anaesthesiology post-graduates in India: A survey

Shikha Bansal, Rajiv Chawla

Abstract

Background: Glasgow Coma Scale (GCS) is a universal clinical means of quantifying the level of impaired consciousness. It has completed 40 years and has stood the test of time. The assessment is best when done by trained personnel. Anaesthesiologists often manage unconscious patients. Thus, they must be well versed with GCS. This survey aimed to assess the awareness of GCS in anaesthesiology post-graduates in India. **Methods:** A questionnaire-based survey was carried out in 250 anaesthesiology post-graduates attending a refresher course in September 2014. **Subjects and Methods:** The questionnaire had 14 questions. Four questions were about the respondent, 5 questions on theoretical information and 5 questions on clinical scenarios. The available data were analysed using Epi Info. Results were considered statistically significant when $P < 0.05$. **Results:** Response was received from 174 students (response rate: 70%). Ninety percent of students felt that GCS is important in assessing unconscious patients, 94% students used GCS for unconscious patients. Fifty-eight percent of students have been formally trained in GCS. Mean of correct answers to theoretical questions was 3.98 ± 0.71. Mean of correct answers to clinical questions was 3.2 ± 1.24. Difference between the two means is 0.78. This difference is considered to be statistically significant with $P < 0.0001$. **Conclusions:** While the post-graduates are well versed with 'theoretical aspects' of GCS, they need to strengthen their skills on clinical application. Hence, there is a need for reinforcement of GCS training for anaesthesiology post-graduates.

Key words: Anaesthesiology, Glasgow Coma Scale, India, knowledge, post-graduates

INTRODUCTION

Glasgow Coma Scale (GCS) was published by Graham Teasdale and Bryan J. Jennett in 1974.[1] It has completed 40 years, stood the test of time and gained worldwide acceptance.[2] It is employed in over eighty countries, translated into more than sixty languages and has more than 18,000 references to its use.[1] It is a clinical means of quantifying the level of impaired consciousness, a guide to prognosis and an essential tool for research studies. In its current usage, the summation of the components is used to grade the level of consciousness not only in traumatic brain injury (TBI), but also in other clinical conditions resulting in altered consciousness.[3] The correct assessment of GCS shows variability among caregivers and its assessment has been shown to be difficult.[4] Inaccurate reporting may result in unnecessary treatment and diagnostic tests. Hence, assessment of GCS is best done by trained personnel. Anaesthesiologists often manage unconscious patients. They must, therefore, be well versed with GCS.

Department of Anaesthesiology, Govind Ballabh Pant Institute of Postgraduate Medical Education and Research, Maulana Azad Medical College, New Delhi, India

Address for correspondence:
Dr. Rajiv Chawla, Room No. 629, Department of Anaesthesiology, Govind Ballabh Pant Institute of Postgraduate Medical Education and Research, Maulana Azad Medical College, New Delhi - 110 002, India.
E-mail: drrajivchawla@gmail.com

The authors are in the process of devising a teaching–training program on GCS for anaesthesiology post-graduate students in India. This study was conducted to know the current level of understanding of the target audience on the subject. Hence, the present study aimed to assess the awareness of GCS among anaesthesiology post-graduates in India.

SUBJECTS AND METHODS

A questionnaire-based survey was carried out in 250 anaesthesiology post-graduates attending a post-graduate refresher programme in September 2014. They had no prior notice of the study. A message was given before the survey explaining the intent of the study and instructing participants not to use any reference materials or seek assistance in any form. Participation was voluntary and the data collected from all subjects was kept strictly confidential. Questionnaires were administered simultaneously and all participants were requested to fill out the questionnaire within a time limit of 10 min.

The questionnaire had 14 questions: Four questions about the respondent, 5 theoretical questions on GCS and 5 questions on clinical scenarios [Appendix 1].

The questionnaire was sent to five anaesthesiologists who were not involved in the survey. After taking their inputs on the format of questions and making necessary changes, it was again sent to a set of five different anaesthesiologists. Once, no further correction was required, it was used for the study.

Data were analysed using Epi Info™ 7.1.5 software (Atlanta, Georgia (USA)). Pearson correlation coefficient was computed to assess the relationship between the answers to theoretical questions and answers to clinical questions (i.e., theoretical knowledge and clinical knowledge). Data were also assessed using paired t-test. Analysis of variance (ANOVA) was used to compare the relation of study year, frequency of contact with unconscious patients and formal training of GCS with the theoretical and clinical questions correct. Tukey's HSD *post hoc* test was used for in-between group comparisons. Results were considered statistically significant when $P \leq 0.05$.

RESULTS

A total of 250 anaesthesiology post-graduate students participated in the questionnaire. Response was received from 174 trainees (response rate: 69.6%).

GCS was perceived as an important scale for assessing unconscious patients by 90.23% trainees and 94.25% trainees used GCS for unconscious patients. However, only 58.05% trainees had been formally trained in GCS [Table 1].

Questions on GCS full form, components, minimum score and cadaveric GCS were answered correctly by 98.85%, 91.95%, 89.08% and 91.38% trainees, respectively. However, the question on TBI grading on basis of GCS was answered correctly by 27% trainees only [Table 2].

Table 3 shows the percentage of trainees who accurately answered the GCS in different clinical scenarios. Out of 174, only 21.26% and 16.67% of trainees could answer correctly all the five questions for theory and clinical questions, respectively.[Table 4] This shows that despite

Table 1: Respondent information, *n* (%)

	Very frequently (%)	Often (%)	Occasionally (%)	Rarely (%)	Not answered (%)
1. How often do you come in contact with unconscious patients in your clinical practice?	60 (34.5)	79 (45.4)	30 (17.24)	3 (1.72)	2 (1.14)

	Yes (%)	No (%)	Not answered (%)
2. Do you use GCS for assessment of these patients?	164 (94.25)	4 (2.3)	6 (3.45)

	Very important (%)	Somewhat important (%)	Not answered (%)
3. In your opinion, how important is GCS in assessing unconscious patients?	157 (90.23)	15 (8.62)	2 (1.15)

	Yes (%)	No (%)	Not answered (%)
4. Have you been trained on how to assess GCS of a patient?	101 (58.05)	44 (25.28)	29 (16.67)

GCS=Glasgow Coma Scale

Table 2: Theoretical questions, *n* (%)

	Correct (%)	Incorrect (%)	Not answered (%)
1. Abbreviation 'GCS' full form?	172 (98.85)	0 (0)	2 (1.15)
2. Components of GCS?	160 (91.95)	6 (3.45)	8 (4.6)
3. Grading of TBI on basis of GCS?	47 (27)	60 (34.5)	67 (38.5)
4. Minimum score in GCS?	155 (89.08)	12 (6.9)	7 (4.02)
5. GCS of 'cadaver'?	159 (91.38)	9 (5.17)	6 (3.45)

GCS=Glasgow Coma Scale, TBI=Traumatic brain injury

Table 3: Clinical questions, *n* (%)

	Correct (%)	Incorrect (%)	Not answered (%)
1. Patient with GCS of 9	97 (55.75)	72 (41.38)	5 (2.87)
2. Patient with GCS of 6	102 (58.62)	69 (39.66)	3 (1.72)
3. Patient with GCS of 13	107 (61.5)	64 (36.78)	3 (1.72)
4. Patient with GCS of 10	88 (50.6)	83 (47.7)	3 (1.7)
5. Patient with GCS of 3	163 (93.7)	7 (4)	4 (2.3)

GCS=Glasgow Coma Scale

Table 4: Theoretical versus clinical questions, *n* (%)

Number of questions answered correctly	Theoretical questions (%)	Clinical questions (%)
0	0 (0)	4 (2.3)
1	1 (0.58)	10 (5.75)
2	2 (1.15)	37 (21.26)
3	33 (18.96)	48 (27.58)
4	101 (58.05)	46 (26.44)
5	37 (21.26)	29 (16.67)

the trainees being aware of the importance of GCS, the overall scoring was very low. This implies training is inadequate at the current state.

Pearson correlation coefficient was computed to assess the relationship between the answers to theoretical questions and answers to clinical questions (i.e., theoretical knowledge and clinical knowledge). There was a weak positive correlation between the two variables, $r = 0.207$, $n = 174$, but it was statistically significant ($P = 0.006$) at 0.01 level.

Mean of correct answers to theoretical questions was 3.98 ± 0.71. Mean of correct answers to clinical questions was 3.2 ± 1.24. Difference between the two means was 0.78. 95% and confidence interval of this difference was 0.59–0.98. This difference was statistically significant with $P < 0.0001$.

By applying ANOVA, it was found that there was no significant difference between the study year of trainees and theoretical questions answered correctly ($F = 1.95$, $P = 0.123$). However, there was a significant difference between the study year of trainees and clinical questions answered correctly ($F = 2.89$, $P = 0.037$). However, while comparing pairs by *post hoc* test, no pair showed a significant difference.

On comparing the frequency with which trainees encounter unconscious patients and their accuracy in theoretical and clinical questions, it was found that there was a significant difference in case of theoretical questions answered correctly. By comparing pairs in *post hoc* test, there was a significant difference between trainees who often contacted unconscious patients as compared to trainees who very frequently contacted unconscious patients ($P = 0.019$), with the mean being higher in the often group (4.15 vs. 3.78). There was no significant difference between any other group comparisons. However, there was a non-significant difference in case of clinical question answered correctly ($F = 1.54$, $P = 0.961$).

Theoretical and clinical questions answered correctly were compared with formal training of trainees regarding GCS. A significant difference was found in case of theoretical questions answered correctly ($F = 3.39$, $P = 0.036$). By comparing pairs in *post hoc* test, the difference was significant between those who had received formal training and those who had not answered the question (0.038). There was no significant difference between any other group comparisons. However, the difference in case of clinical question answered correctly was non-significant ($F = 0.712$, $P = 0.492$).

Mean score in theoretical questions was achieved by 58.04% of the trainees. Mean score in clinical questions was achieved by 75.28% of the trainees.

DISCUSSION

The various steps involved in devising a training programme include training needs analysis,[5] training

design and training evaluation. Training needs analysis[5] helps to identify the gap between existing and needed knowledge and skills of the employees. Training design includes the actual content of the training programme. Training evaluation helps to evaluate how training affected employee's behaviour, performance and organisation. The present survey was a 'training needs analysis' to assess the theoretical as well as clinical knowledge of anaesthesiology post-graduates regarding GCS.

This study confirms the earlier findings that GCS is a widely used scale to assess the level of consciousness among physicians. In our study, 94.25% of respondents used GCS for the assessment of unconscious patients. This is similar to the data obtained by Reith et al.[6] who conducted an online survey in 616 physicians and nurses in European institutions and found that 96% of them use GCS in patients of TBI. In addition, in a questionnaire-based survey of 100 physicians in a Nigerian university hospital by Adeleye et al.,[7] 93% conceded it to be an important clinical rating scale.

Questions on GCS full form, components, minimum score and cadaveric GCS were answered correctly by 98.85%, 91.95%, 89.08% and 91.28%, respectively. Likewise, Adeleye et al.[7] reported that 98% participants correctly spelled out what the three letter abbreviation, GCS, stands for. This is also similar to the results obtained by Yusuf et al. who performed a survey in 141 physicians, in which majority of the respondents (97%) could state correctly what GCS represents.[3] This is in contrast to the results obtained by Emejulu et al. who conducted a questionnaire-based survey in 139 doctors in a teaching hospital in Nigeria and found that only 70% of the doctors could recollect what GCS stood for and only 54% could correctly describe all the variables and parameters of GCS. The gap in knowledge was partly because there was no formal neuroscience program or service in the centre they surveyed.[8]

The study year of trainees did not correlate with their accuracy in theoretical ($P = 0.123$) and clinical questions. In addition, trainee's theoretical and clinical knowledge ($P = 0.492$) was comparable irrespective of formal training. The probable reason is that our survey was conducted among anaesthesiology post-graduates belonging to different medical institutions across the country. Hence, they represent a heterogeneous group exposed to different teaching and training environments. Considering that they were attending a post-graduate refresher course, they can be assumed to be keen inquisitive minds.

There was a significant difference between trainees who often contacted unconscious patients as compared to trainees who very frequently contacted unconscious patients ($P = 0.019$), with the mean being higher in the often group (4.15 vs. 3.78). However, the terms 'often' and 'very frequently' are subject to interpretation by the candidate and both fall into the category of frequent contact with unconscious patients.

Their mean score for clinical questions (3.2) was significantly lower ($P < 0.0001$) than the mean score for theoretical questions (3.98). This suggests that though they are theoretically aware about GCS, their clinical knowledge of the same seems inadequate. These results corroborate with the study of Reith et al.[6] which showed that 68% students were not competent in using GCS in spite of training. Mattar et al.[9] conducted a questionnaire-based study in 114 nurses in an acute care hospital in Singapore and suggested educational interventions to maintain and improve knowledge of GCS. Similar results have also been obtained by Heim et al.[4] who performed a survey in 130 trained air physicians in Switzerland and found that even though theoretical knowledge of GCS by out-of-hospital physicians was correct, significant errors were made in scoring a clinical case (36.9%). Studies by Heim et al.,[4] Reith et al.,[6] Adeleye et al.,[7] Emejulu et al.[8] and Mattar et al.[9] stress that working knowledge of GCS is inadequate, and education in basic training and professional practice of GCS is required to reduce undesirable variations in GCS scoring.

Over the past 40 years, professor Teasdale and team noticed marked variability in the use of GCS.[1] Hence, the new and simplified version: 'The Glasgow Structured Approach to Assessment of the GCS' has been introduced recently.[1] In view of the popularity of the score, now GCS assessment aid has been translated into various languages (http://glasgowcomascale.org/download-aid/) including various Indian languages. This might promote better understanding and ensure uniformity in the assessment of GCS.

This is the only study in medical literature investigating the knowledge of GCS among anaesthesiology post-graduates in India. All the participants had proper theoretical knowledge of GCS. This validates the wide application and theoretical knowledge of the score. However, its poor correlation with its clinical application implies that GCS ought to be given more stress in the curriculum of students. With the new version of GCS brought in, the target audience has increased.

CONCLUSIONS

GCS remains the most frequently used scale for unconscious patients in India also. Though anaesthesiology post-graduates in India are well versed with theoretical aspects of GCS, their clinical application of the same is not optimum.

This study indicates the need for education to reduce variability in GCS scoring and an imminent need for re-inforcement of the teaching and training of GCS among anaesthesiologists in India. Anaesthesiologists have a social responsibility to teach GCS at the community level to various health-care providers involved in managing unconscious patients. This is possible only if they are themselves well versed with all aspects of GCS.

Limitations

The score of individual components (eye, verbal and motor) was not compared separately. The modality of investigation was questionnaire-based, which cannot create the same stressful situation as might be experienced at the scene of the clinical situation. In addition, it was requested that participants fill out the questionnaire without external help and within a time limit of 10 min. However, the study design does not allow the assessment of the rate of compliance with these instructions.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Teasdale G, Allan D, Brennan P, McElhinney E, Mackinnon L. Forty years on: Updating the Glasgow Coma Scale. Nurs Times 2014;110:12-6.
2. Teasdale G, Maas A, Lecky F, Manley G, Stocchetti N, Murray G. The Glasgow Coma Scale at 40 years: Standing the test of time. Lancet Neurol 2014;13:844-54.
3. Yusuf AS, Salaudeen AG, Adewale AA, Babalola OM. Knowledge of Glasgow Coma Scale by physicians in a tertiary health institution in Nigeria. Niger Postgrad Med J 2013;20:34-8.
4. Heim C, Schoettker P, Gilliard N, Spahn DR. Knowledge of Glasgow Coma Scale by air-rescue physicians. Scand J Trauma Resusc Emerg Med 2009;17:39.
5. Gould D, Kelly D, White I, Chidgey J. Training needs analysis. A literature review and reappraisal. Int J Nurs Stud 2004;41:471-86.
6. Reith FC, Brennan PM, Maas AI, Teasdale GM. Lack of standardization in the use of the Glasgow Coma Scale: Results of international surveys. J Neurotrauma 2016;33:89-94.
7. Adeleye AO, Owolabi MO, Rabiu TB, Orimadegun AE. Physicians' knowledge of the Glasgow Coma Scale in a Nigerian university hospital: Is the simple GCS still too complex? Front Neurol 2012;3:28.
8. Emejulu J, Nkwerem S, Ekweogwu OC. Assessment of physicians' knowledge of Glasgow coma score. Niger J Clin Pract 2014;17:729-34.
9. Mattar I, Liaw SY, Chan MF. A study to explore nurses' knowledge in using the Glasgow Coma Scale in an acute care hospital. J Neurosci Nurs 2013;45:272-80.

APPENDIX

Appendix 1: Questionnaire

Knowledge of GCS amongst Postgraduate Students of Anaesthesiology

Name: Institution Name:

Present course: DA/MD/DNB/Others   City:

Year: 1st /2nd/ Final   Email id:

1.   How often do you come in contact with unconscious patients in your clinical practice? *(Tick one)*

     a) Very frequently   b) Often   c) Occasionally   d) Rarely

2.   Do you use GCS for assessment of these patients? *(Just Tick)*   YES   NO

3.   What does GCS stand for: G:_____C:_____S:_____

4.   In your opinion, how important is GCS in assessing unconscious patients? *(Tick One)*

     a) Very important   b) Somewhat important c) Not so important d) Not sure

5.   Have you been trained on how to assess GCS of the patient?

     If Yes, when:

6.   What are the three key components assessed in GCS and what is their maximum score.

     1)   Max Score: 2)   Max Score :   3)   Max Score :

7.   What is the minimum possible score of GCS? :

8.   On the basis of GCS when do you label a patient of Traumatic Brain Injury (TBI) as :

      a) Mild TBI: b) Moderate TBI   c) Severe TBI:

9.   The GCS of a cadaveric donor for organ transplant is : *(Tick one)*

     a)   0   b)   3   c)   6   d)   9

10. An adult patient with TBI moves his hand away when pressure is applied to his nail bed. The patient can say some words but cannot form sentences. He opens his eyes to pain, but does not obey commands.
     The GCS is : _____

11. An adult unconscious patient flexes his elbow and wrist when pressure is put on the nail bed. However, he does not open his eyes at all, and makes grunting noises which are not understood. The GCS is : _____

12. A 40 year old man is involved in a head on collision while driving to work. In the casualty resuscitation room he opens his eyes to pain, is mumbling inappropriately, and tries to stop the medical officer putting a cannula in his arm. The GCS is : _____

13. A 50 year old woman jumps from the seventh floor in an attempt to commit suicide. In the casualty resuscitation room there is no eye opening or speech. She does not respond when her nail bed is pressed.
     The GCS is : _____

14.   An adult patient in the ICU is seen to obey simple commands and opens his eyes when he hears you speak. He can talk to you in sentences but seems confused and not sure where he is at present. The GCS is : _____