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Lack of standardization in the use of the Glasgow Coma Scale.

Results of international surveys.

Running title: Lack of standardization in the use of the GCS

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ABSTRACT

The Glasgow Coma Scale (GCS) was introduced 40 years ago and has received worldwide acceptance. The GCS rates eye, motor and verbal responses to assess the level of consciousness. Concerns have been expressed with regard to reliability and consistency of assessments. We considered that lack of standardization in application techniques and reporting of the GCS may have contributed to these concerns, and aimed to assess current procedures in its use. Questionnaire-based assessments were conducted via an on-line survey and during neurosurgical training courses. Overall, 616 participants were recruited, representing 48 countries and including physicians and nurses from different disciplines. Use of the GCS was reported by nearly all participants for assessment of patients with traumatic brain injury, but not for all patients with a reduced level of consciousness from other causes (78%). Major differences were found regarding the type of stimulus applied when patients do not obey commands: nail bed pressure, supra-orbital pressure, trapezius or pectoralis pinch and sternal rub were all frequently used, whilst 25% percent of responders reported to never use a peripheral stimulus. Strategies for reporting the GCS varied greatly and 35% of participants limited the reporting to a summary score. Moreover, different approaches were used when one of the components could not be assessed. Overall, the surveys have identified a general lack of standardization in assessment and reporting of the GCS. The results illustrate the need for continued education to improve reliability of assessments through guidance to a standard approach.

Key words: Consciousness, Glasgow Coma Scale, Humans, Questionnaires, Reproducibility of results.

INTRODUCTION

The Glasgow Coma Scale (GCS) was developed 40 years ago to permit serial and consistent assessment of patients with impaired consciousness. At that time, prevailing methods caused many ambiguities and misunderstandings in the exchange of clinical information and the scale provided a simple, structured, and reliable method for assessing consciousness.¹ The GCS is now used clinically throughout the world and the 1974 paper, in which it was introduced, is the most frequently cited neurosurgical paper². There are, however, concerns that with the passage of time, its widespread dissemination has been accompanied by variations in technique and consequently by variations in reliability.³⁻⁶

Misinterpretations of patients' true clinical status will adversely affect their management. Therefore, consistent assessment and communication of the GCS at different times and between different observers is essential in patient care and depends on standardization in the determination of each of the three components of the scale: eye, motor and verbal responses. Assessment of each component requires observation of either a spontaneous activity, or of the response following application of a stimulus. The early descriptions of the GCS recommended that stimulus is first applied to the finger nail, and, if a flexion response was observed, then the head and neck or trunk to test for localizing response.¹ Full reporting of each of the three components of the GCS was advised for assessment in individual patients. The use of its derived sum score is more appropriate for classification and prognosis.⁷

There are some reports of variations in methods used to assess the GCS such as differences in techniques used to elicit responses when assessing the GCS,⁶ in how confounding factors such as intubation are dealt with and in the way the findings are reported.⁶ Furthermore, in some studies reliability appears to be influenced by teaching and experience.^{3,8,9} In order to define the extent of these variations in current practice we have carried out surveys of large numbers of users, drawn from key professional backgrounds across many countries. We aimed to learn the ways in which the GCS is currently employed, perceptions of its usefulness for different

purposes, the main sources and types of variation, their relative frequency and the influence of professional background. The information driven from this study provides guidance to re-expression of a standard approach to assessment that would support the continuing use of the GCS appropriately and reliably on a global scale.

METHODS

Surveys

We performed a questionnaire-based assessment among health care practitioners on the methodology of GCS assessment, reporting of the GCS and attitudes to its current use in daily practice. The questions were devised based on clinical experience, study of the literature and expert opinions. Data on professional status and country of work were collected. Responses were collected in different target groups using either a paper form (Supplemental Data 1) or an online questionnaire tool (SurveyMonkey®).

Participants

A total of 613 participants contributed to the survey voluntarily and anonymously. They were recruited during a neurosurgical residents' half yearly training course in Belgium (N = 37, response rate = 92%), an international training course for neurosurgeons in Krakow (N = 70, response rate = 93%), and a national meeting of nurses specialized in neurology/neurosurgery in Belgium (N = 60, response rate 15%). Responders to the web-based survey (N = 446) were recruited via the British Neurosurgical Trainees' Association, The European Association of Neurosurgeons, The Neuroanaesthesia Society of Great Britain and Ireland, the British Association of Neurosurgical Nurses and the UK College of Emergency Medicine.

Statistical analyses

Statistical analyses were performed using IBM SPSS Statistics version 22.0.0. The one-way analysis of variance (ANOVA) test was used to compare values between multiple subgroups of disciplines. Since equal variances were not assumed, the Games-Howell test was used as post hoc test for multiple comparisons. Results were considered statistically significant when the p-value was less than 0.05.

RESULTS

The origin and professional background of the responders is shown in Table 1. A total of 96% of responders reported that they use the GCS in the assessment of patients with a head injury, and 78% use it also in patients with other neurological disorders. Where English was not the primary language of the responder, 61% used the scale in translation. The 5-step motor scale is still applied, as 30% of responders do not differentiate between normal and abnormal flexion response. Other coma scales commonly used included the Alert, Voice, Pain, Unresponsive scale (AVPU) in 38%, the Glasgow Liège Scale (GLS) in 14%, FOUR score in 9%, and the Simplified Motor Score (SMS) in 7%.

The main reported uses of the GCS were in: classification of the severity of injury (51%), the serial evaluation of a patient over time (33%) and clinical decision-making (44%). Only a few responders reported that it had an important role in prognostication (17%). Clinical decisions that were reported to be influenced by the GCS included determination of the need to obtain urgent cranial imaging, to instigate airways management, or to triage for admission of patients to the ICU. Assessment of the GCS less often impacted on decisions to start or stop ICP monitoring. A number of responders reported using the GCS to facilitate communication between medical staff about a patient's condition (51%), whilst others reported that this depended on the person who performed the assessment (52%).

Overall, responders rated the relevance of the GCS to daily medical practice as high, with a median score of 4 out of 5, where 5 reflects 'essential to good care'. No responders reported being able to do without the GCS in their daily medical practice. The responders were also fairly satisfied with the GCS as clinical assessment tool with a median satisfaction rate of 4 out of 5 with 5 being 'very satisfied', and most concluded that the GCS is easy to use (median score of 4 out of 5, with 5 being 'easy to use').

Current methods of assessment of the GCS

The majority of responders (78%) stated that they use a standardized approach for application of a stimulus. The GCS was assessed in both the arms and the legs by 62% of responders, whereas 37% assesses the GCS in the arms only. There was great variation, however, with regard to the type of painful stimulus applied (table 2). The frequency of application of each stimulus, except earlobe stimulation, differed significantly between disciplines. Thus, nail bed pressure was used less often by intensive care givers compared to neurosurgeons and nurses ($F(4,577)=4.0$ $p=0.003$), whilst-supra-orbital nerve pressure was used less often by nurses compared to all other disciplines ($F(4,573)=16.2$, $p<0.001$). Likewise, trapezius or pectoralis pinch were used less often by nurses compared to all other disciplines except anesthesiologists ($F(4,562)=4.9$, $p=0.001$). Sternal rub was used significantly more often by neurosurgeons and emergency physicians compared to intensive care physicians and nurses ($F(4,568)=15.27$, $p<0.001$). Pressure on the nail bed was used by only 20% as their initial stimulation technique and never used by 25% of responders. There was also variation in the proportion of responders who felt that it was useful to distinguish an abnormal flexion response (motor score 3) from a normal flexion response (motor score 4) (table 3). This disagreement was consistent over all subgroups mentioned ($F(4,584)=1.90$, $p=0.11$).

Reporting the GCS

Wide variations were found in methods for communicating and reporting the GCS of an individual patient. Most responders (46%) use a numerical scale (e.g. E1M1V1) to report their findings of the three components of the scale, however, 35% of responders report the summary score. Figure 1 shows the marked differences in how the GCS is communicated among different groups of responders. There is a significant difference in the use of the different reporting

methods between each subgroup. Post hoc tests revealed that nurses communicate a patient's responses significantly less often as numbers compared to other disciplines ($F(4,564)=8.53$, $p<0.001$). It appeared that nurses report their findings significantly more often as a summary total score than anesthesiologists and intensive care givers ($F(4,564)=3.59$, $p=0.007$). Anesthesiologists describe a patients responses in words significantly less often than nurses and neurosurgeons ($F(4,564)=3.0$, $p=0.018$).

Assigning scores in specific situations

In some patients, components of the GCS can be impossible or difficult to assess. In a patient who is moving his or her arms and legs spontaneously, but does not obey commands, 52% reported that they would record the best response to pain, 17% would record this patient as M6 (obeying commands) and 28% as M5 (localizing). When a patient sticks out his or her tongue to command, but does not move the limbs, 74% would score this as obeying commands, whereas 10% would record the best response to pain. Conversely, if a patient grips the examiners finger with their hand, only 34% would classify this as obeying commands, whereas 41% would score the best motor response to pain.

When the patient is dysphasic, but obeys commands, 18% of the responders denote a score of V1 (no verbal response), whereas 34% scores the same patients as V5 (oriented). If the patient is intubated, 67% would record the designation 'T,' 17% assign a score of 1 (V1), whereas 15% excluded the item all together. There was a similar degree of discordance in the application of the GCS to patients who were sedated: 42% of responders felt that this rendered the application of the GCS impossible, but 29% assigned the best score under the sedation. Some variation in methodology amongst different disciplines is shown in table 4.

Teaching

Regular teaching of how to clinically assess patients with reduced consciousness is essential for reliable assessment. The responders to the paper surveys declared that 68% of students, both medical and nursing, are generally not competent in using the GCS, even though the majority of participants had received instructions during training. Moreover, the GCS appeared not to be taught in a standardized manner. Many reported being educated by their colleagues, simply taking over local cultural habits in assessment.

DISCUSSION

The results of this survey-based study underline the widespread use of the GCS for assessing the level of consciousness in head injured patients and in most patients suffering from other disorders causing diminished conscious level. The views expressed affirm the continuing influence of the GCS in daily medical practice and decision-making. However, the findings also confirm a substantial lack of standardization in its use.

The GCS was developed to promote clear consistent communication of the level of consciousness of patients suspected to have recently sustained any kind of injury or insult to the brain.² The view of many responders that the GCS is important in serial evaluation of individual patients confirms the initial justifications for development of the GCS.^{1, 6} Reliability is then of paramount importance, as discrepancies in approach could cause miscommunication amongst caregivers and consequently result in suboptimal management. Reliability has been investigated in many studies since the introduction of the GCS. The results have been variable and the kappa correlation coefficient has been reported to range from 0.85 to 0.32.⁴ According to the system for interpreting the magnitude of kappa proposed by Landis and Koch,¹⁰ these values equate to levels of agreement ranging from almost perfect down to only fair. Consistently good or excellent levels of reliability are desirable.

'Conscious level' is a complex phenomenon and its assessment is influenced by both observers and the observed. Clinical settings differ between studies, the patient's condition may change and reliability of assessments has been shown to depend on the training and experience of observers.¹¹⁻¹³ Previous studies have emphasized that consistency in application is of major relevance to the reliability of GCS assessments.¹⁴ In our study we did not aim to assess observer agreement in the assessment of the GCS, but to investigate root causes for variability. We found lack of standardization in many aspects of practice, including varying techniques of assessment,

inconsistent use of the 15-point scale, as well as lack of standardization in methodology and reporting.

Lack of standardization in GCS assessment techniques

Fischer et al. emphasized the importance of consistency in application of the GCS to ensure that the tool is a reproducible indicator of patient's clinical condition.¹⁵ This survey demonstrated substantial variation in several aspects of the examination of a patient to determine their GCS. In particular, it showed several discrepancies in the type of stimulus used to provoke a response. These stimuli may cause discomfort, and some are not without a certain risk to patients, such as bruising when rubbing the sternum or inadequately pinching the trapezius muscle, damage of the nail fold due to inappropriate and recurring nail bed pressure and nerve damage when using undue force to the supra-orbital notch. The original descriptions recommended the application of peripheral stimulus and a central stimulus using respectively the fingernail and either shoulder or supra-orbital notch.¹⁶ However, the description was not very explicit or rigid in order to leave room for the skills of experienced users.² In a more recent review by Middleton et al. the trapezius pinch is preferred over supra-orbital pressure as central stimulus, because the former causes no local damage when simply comprising point pressure on a large muscular area.⁶ The current study found that about 25% of practitioners never use a peripheral stimulus, and further demonstrate use of a broad range of stimuli to elicit responses. It has, however, been suggested that different stimulation techniques elicit different responses.⁸ The three originally described stimuli (finger nail pressure, supra-orbital pressure and trapezius pinch) as well as the sternal rub are used with the about the same frequency by the responders. Three other stimuli, pressure at lateral side of the finger, retromandibular and earlobe stimulation, are also applied, but less frequently. The majority of participants stimulated both arms and legs when assessing the GCS. The lower extremities should, however, be approached with caution, since stimulation of the feet can provoke a triple flexion response, a sign of upper motor neuron

impairment. This can mimic a withdrawal response in reaction to a stimulus. The authors of the GCS therefore did not recommend assessment of the GCS from the legs.¹

Inconsistent reporting

Standardized reporting is of major relevance to comparisons of assessments over time and for communicating assessments between observers. The surveys show little agreement on how the GCS of an individual patient should be communicated. Of responders, 35% communicated assessments as the sum score, despite evidence that aggregation of the three components in a total score implies a substantial loss of information.¹⁷ Moreover, a single total score can result from multiple variations of GCS components and outcome differs according to the specific combinations of components adding up the same sum score.¹⁸ A clear distinction should be made between the use of the GCS scale and the GCS sum score.⁷ Reporting the full GCS is recommended when assessing the level of consciousness in individual patients and use of the GCS sum score is better reserved for comparisons at the group level for purposes of classification and prognosis.²

Inconsistent use of the 15-point scale

The GCS was initially introduced with a 5-step motor scale so that when numbers were added, these totaled to 14. When soon afterwards, an additional distinction was made between normal and pathologic flexion response, this resulted in a maximum score of 15.¹⁹ Application of both the 14- and 15 total scale is described.⁵ The current study found that 30% of responders still use the original motor scale, totaling to 14. Such variation is inconsistent with reliable assessment of the GCS.² A clear recommendation has recently been made to use the extended 6-step motor subscale and a total sum score of 15.²

Confounding factors

The ability to assess the GCS is influenced by several confounding factors.^{5, 20} Components of the GCS can become untestable, for example as a result of early intubation and sedation in the pre-hospital arena. It is particularly relevant to the use of the GCS sum score in the construction of aggregated severity scores, such as the APACHE score.²¹ Health care professionals use various strategies to overcome these issues as revealed by the results of this study. As a consequence, responders are using different approaches to score the same patient and findings in research will be influenced. Recently, Teasdale et al. provided guidance on the approach of dealing with 'missing components', stating that whenever a component is not testable the reason why should be recorded, rather than assigning a score of 1, since differentiation between a true score of 1 and an untestable component is relevant.² Moreover, pseudoscore techniques should be avoided in bedside practice, since the remaining components offer sufficient information for clinical decision-making.² Additional comprehensive guidance on interpretation and approach of dealing with confounding factors caused by specific medical conditions were recently published.²²

Insufficient teaching and lack of experience can explain part of the variation in GCS assessment. It was shown that reliability of GCS scoring is lower in untrained and inexperienced staff.^{4, 23} The perception of most who responded is that majority of medical students are not competent in assessing the GCS, which emphasizes a failure to embed the standardized teaching of the GCS in undergraduate curricula.

We acknowledge that the results of the paper-base questionnaires mainly reflect European experience. Results of the online survey, with representation from 48 countries, support a worldwide need for continuous education of professional health care members.

Recommendations on how to improve the use of the GCS

The findings of this study point to a number of ways that more consistent use of the GCS can be achieved in both daily practice and research. A recent paper, drawing on the preliminary findings in this study, is addressing this by introducing a standard structured approach to examination.²² A four stage approach to assessment is recommended: check, observe, stimulate and rate (COSR). The recommended site for applying a peripheral stimulus is the nail bed, with pressure to the distal part to the nail and regularly alteration of the finger used, and as central stimulus either trapezius muscle pinch or supra-orbital nerve pressure. Descriptions of the clinical state of an individual patient should be made in the terms of the three component responses of the scale. The sum score provides a summary useful in classification of severity and, to resolve the confusion between the possibility of a total score of either 14 or 15, a clear recommendation has been made to use the extended 6-step motor subscale and a total sum score of 15.² When a component of the GCS appears undeterminable it may be possible to assess the patient by an adapted method.²² Finally the importance of education in achieving reliable assessment needs to be recognized and implemented during both basic training and professional practice.

CONCLUSION

In this study we have assessed current procedures in GCS assessment as potential confounder of reliable assessment. The overall judgment of responders to this survey about the role of the GCS in clinical practice was very positive and despite some expression of criticism no other scale is in such extensive use. However, these surveys identified undesirable variations in approaches to the assessment of the GCS and its reporting. These variations point to a number of ways that more consistent use of the GCS can be achieved in both daily practice and research.

Furthermore, they highlight the need for continued efforts to improve standardization and teaching of the assessment of the GCS. A free online educational tool has recently been developed (www.glasgowcomascale.org) to overcome these issues by reconfirming a standard approach to assessment, but equal attention should be paid to basic training and professional practice alike.

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AUTHOR DISCLOSURE STATEMENT

No competing financial interests exist.

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APPENDICES LEGENDS

- **Supplemental Data 1:** Glasgow Coma Scale Questionnaire

FIGURE LEGENDS

Figure 1

- Caption:
Methods of reporting Glasgow Coma Scale results
- Legend:
Various disciplines are using different methods to report the results of assessment of a patient's Glasgow Coma Scale.

Table 1 – Characteristics of responders

Responders (N %)	
Cohort	

Web-based survey (results collected May 27 th , 2014)	446 73%
International neurosurgical training course, Poland	70 11%
National nursing conference, Belgium	60 10%
National neurosurgical training course, Belgium	37 6%
Countries represented	
United Kingdom	229 37%
Belgium	105 17%
Germany	41 7%
Other countries (N=45)	213 35%
Unknown	25 4%
Disciplines represented	
Neurosurgery	366 60%
Nursing	77 13%
Emergency medicine	69 11%
Anesthesia	59 10%
Others	38 6%
Unknown	4 1%

Table 2 – Frequent use* of different stimuli

	Neurosurgeons	Emergency physicians	Anesthesiologists	Intensivists	Nurses	All responders
	N %	N %	N %	N %	N %	N %
Nail bed pressure	343 59%	69 48%	59 54%	35 31%	76 67%	588 57%
Lateral side of finger	248 23%	67 9%	56 18%	34 24%	55 31%	466 22%
Supra-orbital nerve pressure	346 56%	68 53%	58 64%	34 71%	72 11%	584 52%
Trapezius or pectoralis pinch	334 51%	69 62%	59 39%	33 64%	72 32%	573 50%
Sternal rub	339 60%	68 71%	57 46%	35 23%	74 23%	578 53%
Retromandibular stimulation	332 21%	68 37%	57 47%	35 34%	75 7%	572 24%
Earlobe stimulation	330 17%	68 13%	58 14%	35 14%	67 19%	562 16%

*Frequent means use of a stimulus with frequencies: 'often' or 'always' in the paper surveys. In the online survey, participants were asked to rank the different stimuli in the order that they would use them to assess the motor response. We have interpreted rank 1 to 3 as 'frequently used'

Table 3 – Frequency that different professional groups differentiate between normal and abnormal flexion response

	Neurosurgeons N %	Emergency physicians N %	Anesthesiologists N %	Intensivists N %	Nurses N %
Differentiation	353 71%	69 64%	58 67%	35 77%	74 82%
No differentiation	353 29%	69 36%	58 33%	35 23%	74 18%

Table 4 – Methods used in different medical disciplines to deal with factors interfering with assessment of the Glasgow Coma Scale

	Neurosurgeons N %	Emergency physicians N %	Anesthesiologists N %	Intensivists N %	Nurses N %
Verbal score in intubated patients					
Exclude verbal component	348 16%	69 20%	59 8%	35 0%	65 15%
Assign score of 1: V1	348 14%	69 19%	59 17%	35 9%	65 31%
Use designation 'T': Vt	348 68%	69 59%	59 73%	35 89%	65 54%
Pseudo scoring technique	348 2%	69 1%	59 2%	35 3%	65 0%
Approach in sedated patients					
No assessment in sedated patients	347 40%	69 42%	57 51%	35 49%	16 44%
Discontinue sedation to assess	347 29%	69 4%	57 14%	35 20%	16 0%
GCS					

Reverse sedation to assess GCS	347 8%	69 0%	57 0%	35 6%	16 0%
Give best score possible under sedatives	347 22%	69 54%	57 35%	35 26%	16 56%

Supplemental Data 1 - Glasgow Coma Scale Questionnaire

1.

Is the Glasgow Coma Scale (Eye, Motor, Verbal score) routinely used in clinical practice for assessing the level of consciousness in your institution?

☐ Yes

☐ No
2.

Who is using the GCS at your institution? (Multiple options possible)

	YES	NO
<div><div>▪</div>Pre-hospital care givers</div>	☐	☐
<div><div>▪</div>Emergency physicians</div>	☐	☐
<div><div>▪</div>Care givers from referring hospitals</div>	☐	☐
<div><div>▪</div>Neurosurgeons</div>		
<div><div><div>○</div>Residents</div></div>	☐	☐
<div><div><div>○</div>Specialists</div></div>	☐	☐
<div><div>▪</div>Intensivists</div>	☐	☐
<div><div>▪</div>Neurologists</div>		
<div><div><div>○</div>Residents</div></div>	☐	☐
<div><div><div>○</div>Specialists</div></div>	☐	☐
<div><div>▪</div>Nurses in ICU/ ward</div>	☐	☐
3.

How satisfied are you with the GCS as consciousness level assessment tool?
(Please circle what is applicable)

Not satisfied
at all

Very satisfied

4. What is your opinion concerning the complexity of the GCS?
(Please circle what is applicable)

Very complex

Easy to use

5. How do you report the GCS in daily practice?
- ☐ As a *scale*: reporting the 3 components separately as numerical scale (e.g. E3M5V2)
 - ☐ As a *descriptive report of the 3 components* (e.g. Eye opening to pain, Localize pain, Incomprehensible verbal response)
 - ☐ Only as a single *score*: summing the 3 scores (e.g. GSC 10)
6. To what patient population should the GCS be applied to?
- ☐ All patients experiencing (or at risk for) reduced level of consciousness
 - ☐ Specific populations, such as traumatic head injury patients and subarachnoid hemorrhage patients
7. Please, prioritize (1 to 5) the following purposes of the GCS according to the use in your institution (#1 being the most frequent purpose of the GCS)
- a. Classification of severity
 - b. Clinical decision making
 - c. Monitoring / Evaluation of clinical status over time
 - d. Prognosis
 - e. Research / Comparison of patient series
8. How often are the following clinical decisions based upon the GCS?

Never Occasionally Often Always

▪ Airway management	☐	☐	☐	☐
▪ ICU admission / discharge	☐	☐	☐	☐
▪ Imaging, such as emergency CT scan	☐	☐	☐	☐
▪ Surgery	☐	☐	☐	☐

- Start/stop ICP monitoring ☐ ☐ ☐ ☐

9. H

How would you score the influence of the GCS on your daily medical practice?
(Please circle what is applicable)

Unimportant,
can do without

Essential to good
patient care

10. Does the GCS facilitate communication between medical practitioners?

- ☐ Yes
- ☐ Yes, depending on the person who performed the assessment
- ☐ No

11. Did you receive instructions on how to perform and interpret the GCS correctly?

- ☐ Yes
- ☐ No (go to question 13)

12. Who provided the instructions?

(Multiple options possible)

- ☐ The university – medical training
- ☐ The hospital – resident training
- ☐ A specific department
- ☐ Colleagues
- ☐ Other, please specify

13. Are medical students generally competent in using the GCS?

- ☐ Yes
- ☐ No

14. How do you score the verbal response when the patient is intubated?

- ☐ I exclude the item
- ☐ I assign an score of one point (V1)
- ☐ I use a non-numerical designation of "T" (denoting tube or tracheotomy)

- ☐ I use a pseudo-score technique in which I assess the average value of the testable scores and apply it to the verbal score
- ☐ I use a linear regression model to predict the expected verbal score
- ☐ Other, please specify

15. How do you assess the GCS when the patient is sedated and paralyzed at admission?

- ☐ I don't assess GCS in sedated patients
- ☐ I discontinue sedation and wait until the sedative effect has diminished before assessing GCS
- ☐ I reverse sedation to check the GCS
- ☐ I assign the best score possible under sedative agents
- ☐ Other, please specify

16. When your patient is admitted at the ICU ward, sedated and intubated, do you perform a daily wake-up test to assess the level of consciousness?

- ☐ Yes
- ☐ Only if I have no ICP measurement
- ☐ No

17. Do you use a standardized approach in applying a painful stimulus?

- ☐ Yes
- ☐ No

18. Do you use one of these to evaluate the motor score?

	Never	Occasionally	Often	Always
▪ Sternal rub	☐	☐	☐	☐
▪ Supra-orbital nerve pressure	☐	☐	☐	☐
▪ Trapezius or pectoralis major pinch	☐	☐	☐	☐
▪ Pressure on nail bed	☐	☐	☐	☐
▪ Retromandibular stimulation	☐	☐	☐	☐
▪ Earlobe stimulation	☐	☐	☐	☐
▪ Other, please specify.....	☐	☐	☐	☐

19. Do you differentiate between motor score 3 (pathologic flexion) and 4 (withdrawal)?

- ☐ Yes

☐ No

20. Do you assess the best motor response at the arms or at the legs?

☐ Arms

☐ Legs

☐ Both

21. Alternative consciousness level assessment scales have been developed.

Is your institution (at any department) *using* one of these?

	Never heard of it	No, it's not being used	Yes, it's being used
AVPU (Alert, Voice, Pain, Unresponsive)			
ACDU (Alert, Confused, Drowsy, Unresponsive)			
Simplified Motor Score (SMS)			
FOUR (Full Outline of Unresponsiveness)			
Glasgow-Liège Scale (GLS)			
Reaction Level scale (RLS85)			
Japan Coma scale (JCS)			
Emergency Coma scale (ECS)			
Innsbruck Coma Scale (ICS)			
Pittsburgh Brain Stem Score (PBSS)			
Maryland Coma Scale (MCS)			
Comprehensive Level of Consciousness Scale			
Edinburgh-2 coma scale (E2CS)			

22. What is according to you the major limitation of the GCS in assessing the level of consciousness?

Do you have any suggestions for improvement?

Thank you for your participation!