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Practice and Factors Associated with Using the Glasgow Coma Score by Health Workers in the Maritime, Lomé-Commune, and Kara Regions

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Abstract

Background: The GCS is a universally recognized instrument for assessing patients' level of consciousness. Although doctors, nurses, anaesthetists and medical assistants generally receive training on this score during their studies, it appeared that their practice in the concrete evaluation of the GCS might not be sufficiently thorough, as suggested by some studies. **Method**: We conducted a descriptive and analytical cross-sectional study over a period of 7 months, covering the health regions of Togo (Lomé-commune, Maritime, and Kara). Five clinical scenarios were used to evaluate the practice of the health workers, considering as having a good practice those who answered correctly to at least 3 clinical scenarios. Data were collected using an online form and a self-administered questionnaire. The Chi2 test was used to analyze the variables influencing the use of the Glasgow Scale. A logistic regression model was used to identify factors associated with good practice. **Results**: The overall good practice rate for use of the GCS was 35.96%. The frequency of use influences good practice. However, the seniority of the agents surveyed was not associated with good practice. **Conclusion**: Practical assessment of the Glasgow Coma Scale (GCS) by healthcare professionals remains inadequate. Despite good theoretical knowledge of the tool, there is a lack of practical assessment.

Keywords

Glasgow Coma Scale, Good Practice, Healthcare Professionals, Knowledge, Performance, Togo

1. Introduction

The Glasgow Coma Scale (GCS) is a neurological tool used to assess the severity of traumatic brain injury. Developed over 40 years ago by Bryan Jennett and Graham Teasdale, it evaluates three parameters: verbal response, eye-opening, and motor response. It is a numerical scale with a total score ranging from 3 to 15 points. This total score helps determine the severity of a head injury. A traumatic brain injury is classified as severe when the GCS is ≤8 after hemodynamic stabilization. Since its creation, the GCS has played a crucial role in prognostic assessment, monitoring, and the follow-up of patients' neurological status [1]. The GCS has not only been deemed clinically useful but also considered very easy to learn. Physicians and nurses at the Glasgow Institute of Neurology, where the scale was developed, have also demonstrated its reliability through the consistency of scores among different evaluators [2]. Although the GCS fulfilled its objective and was quickly adopted, its memorization for daily practical use was not as straightforward, posing a significant challenge [3] [4]. Despite its limitations and the noted lack of inter-observer reliability, numerous assessment tools for evaluating consciousness have emerged. However, the applications of the GCS have significantly expanded, even beyond the context of trauma, aiding in the assessment of consciousness across nearly all types of conditions. Given that this tool is widely used in various clinical settings, it is crucial for healthcare professionals to assess it accurately, as specific intervention measures must be implemented based on the severity level.

Unfortunately, numerous studies assessing healthcare professionals' knowledge of the GCS have reported a lack of familiarity with this important tool. In Switzerland, an evaluation of GCS assessment by military physicians in patients with traumatic brain injury revealed poor practical application despite a good theoretical understanding of the scale [5]. In India, a study on nurses' knowledge of the GCS reported that 70.2% of nurses had a poor understanding of the tool [6]. Similar studies conducted in Malaysia, Jordan, and Iraq have also reported insufficient knowledge of the GCS among nurses [7] [8]. In Vietnam, while 90% of nurses surveyed in a study were able to correctly answer basic questions about the GCS, 52.1% responded incorrectly to questions based on clinical scenarios requiring the application of fundamental knowledge [9].

In the sub-region of Nigeria, 45% of physicians did not accurately know the components of the GCS. In the same country, 33% of nurses demonstrated insufficient knowledge of the tool [10]. In Ghana, more than half of the physicians demonstrated poor practice in assessing the GCS [11].

This concerning trend of healthcare professionals' lack of familiarity with such a simple and potentially life-saving tool in many countries highlights the need for an assessment of the situation in Togo, where, to our knowledge, no such study has ever been conducted. Our study thus provides a solid foundation for future research in this important field in Togo.

We hypothesize that 65% of healthcare professionals demonstrate good practice

in GCS assessment. The primary objective was to evaluate the level of practice among healthcare professionals in assessing the GCS in traumatic brain injury (TBI) cases across the Maritime, Lomé-Commune, and Kara regions. The secondary objective was to identify factors associated with good practice.

2. Setting and Methods

To conduct this study, we selected three (03) health regions out of the six (06) available in Togo. These were the Lomé-Commune, Maritime, and Kara regions. This selection was justified by the strong representation of the healthcare system pyramid in these regions.

2.1. Study Type and Period

We conducted a cross-sectional, descriptive, and analytical study, with data collected prospectively from October 1, 2023, to April 30, 2024. The study took place in university teaching hospitals (CHUs), regional hospitals (CHRs), and district hospitals (CHPs) within the selected health regions. As district hospitals (CHPs) serve as the first level of referral, they frequently receive trauma patients requiring GCS assessment, making them key sites for this study.

2.2. Study Population

Our study population consisted of all physicians, anesthetic technicians, nurses, and medical assistants working in the Maritime, Lomé-Commune, and Kara health regions

2.3. Inclusion and Exclusion Criteria

Included: All healthcare professionals and care providers who had been practicing for more than six months in the selected study centers, regardless of their geographical origin.

Excluded: Healthcare professionals who did not provide their consent to participate in the study.

2.4. Sample Size Calculation

The study focused on healthcare professionals working in university teaching hospitals (CHUs), regional hospitals (CHRs), and district hospitals (CHPs) within the selected health regions. The minimum sample size was calculated using the following formula:

$$n = \frac{p \times (1-p) \times z_{\frac{\alpha}{2}}^2}{i^2}$$

Based on experience, we estimated that 65% of healthcare professionals demonstrate good practice in GCS assessment, given the lack of data in the literature in Togo. Thus, for an expected prevalence of 65%, with an alpha error risk of 5% and a margin of error of 6%, the required sample size for this study was 243 healthcare

professionals.

2.5. Data Collection

The questionnaire was designed based on previous research studies [1] [12] [13]. Its validity was primarily assessed through content validity, relying on a literature review and expert opinions from clinical specialists, including department heads from the two university teaching hospitals in Togo. They deemed the clinical scenarios appropriate for evaluating good practice. The internal consistency of the questionnaire was found to be acceptable, with a Cronbach's alpha of 0.615. The questionnaire is divided into multiple sections.

Section 1: Collects the sociodemographic characteristics of the surveyed healthcare professionals.

Section 2: assesses knowledge of the GCS through eight questions, allowing participants to be classified into two groups:

Good knowledge: those who answered at least 4 out of 8 questions correctly.

Poor knowledge: those who answered fewer than 4 out of 8 questions correctly.

Section 3: evaluates good practice in GCS assessment using five clinical scenarios.

Section 4: explores healthcare professionals' perception of the limitations of the GCS

Access to the survey was made available through an online form, with the link sent to healthcare professionals. After the initial distribution, four follow-up reminders were sent. However, this approach did not yield sufficient data. To address this, we decided to supplement online data collection with in-person data collection. Using a non-probability sampling method, we were able to survey 253 healthcare professionals

2.6. Data Analysis

A descriptive analysis of the data was conducted. Qualitative variables were presented as frequencies and proportions, while quantitative variables were expressed as means and standard deviations.

Variables associated with good practice with a p-value < 0.25 were then included in an initial multivariable model to obtain adjusted odds ratios (AORs) and their 95% confidence intervals. A bivariate analysis comparing two proportions was performed using the Chi-square test or Fisher's exact test, depending on the applicability conditions. The significance threshold for all tests was set at 0.05. All analyses were performed using R Studio (version 4.3.2)

2.7. Ethical Aspect

We obtained authorization from the administrations of the study centers where in-person data collection was conducted. Each recruited healthcare professional was assigned a unique identification number to ensure anonymity. No personal, direct, or indirect identifying information was collected in this study. Only

anonymous and aggregated data were used for statistical analysis.

2.8. Operational Definitions

Practice: Refers to the application of theoretical concepts in clinical situations.

Good practice: Defined as healthcare professionals who correctly answered at least 3 out of 5 clinical scenarios

Poor practice: Defined as healthcare professionals who correctly answered fewer than 3 out of 5 clinical scenarios

3. Results

3.1. Sociodemographic Characteristic

A total of 253 healthcare professionals meeting the inclusion criteria were enrolled in the study. Men constituted the majority at 66%, corresponding to a sex ratio of 1.94. The mean age of participants was 28.74 ± 6.51 years, ranging from 19 to 53 years. The 20 - 30 age group was the most represented, accounting for 64.82% of the sample. Regarding professional groups, physicians constituted the largest proportion (50.19%), followed by nurses (22.52%). Among the 253 participants, 194 (76.6%) had been practicing for less than 5 years. Healthcare professionals working in surgical and surgical specialty departments were the most represented (52.96%), while those in medical departments accounted for 47.04% (Table 1).

Table 1. Sociodemographic characteristic of healthcare professionnals (N = 253).

		Count (n)	Frequency (%)
Sex	Man	167	66.00
	Woman	86	34.00
Age	<20 years	4	1.58
	[20 - 30[years	164	64.82
	[30 – 40[years	64	25.29
	[40 - 50[years	18	7.11
	≥50 years	3	1.20
Qualification	Medical doctor	127	50.19
	Nurse	57	22.52
	Anesthesia technicians	50	19.76
	Medical assistants	19	7.53
Years of experience	<5 years	194	76.60
	[5 - 10[years	33	13.04
	≥10 years	26	10.36
Spécialty	Medical	119	47.04
	Surgery	134	52.96

3.2. Practical Assessment of GCS Using Clinical Scenarios

Among all surveyed healthcare professionals, 35.96% demonstrated good practice in GCS assessment. Only 91 participants (35.96%) correctly answered at least 3 out of 5 clinical scenarios (Table 2).

Table 2. Distribution of responses to clinical scenarios among healthcare professionals in the Lomé-commune, maritime, and kara health regions (N = 253).

	Response	n	%
1) An 18-year-old man is struck on the head with a baseball bat. He withdraws and opens his eyes in response to deep painful stimuli. He mumbles incomprehensibly. His Glasgow Coma Scale (GCS) score is:	Correct	85	33.60
	Incorrect	168	66.40
2) An unconscious adult patient flexes the elbow and wrist when pressure is applied to the nail bed. However, he does not open his eyes at all and produces incomprehensible groaning sounds. His Glasgow Coma Scale (GCS) score is:	Correct	120	47.43
	Incorrect	133	52.57
3) While on his way to work, a 40-year-old man is involved in a head-on collision. He opens his eyes in response to pain, mumbles inappropriately, and attempts to stop the doctor from inserting a cannula into his arm. His Glasgow Coma Scale (GCS) score is:	Correct	96	37.94
	Incorrect	157	62.06
4) A 50-year-old woman jumps from the seventh floor in a suicide attempt. In the resuscitation room, there is no eye opening, no speech, and no verbal response. She does not react to pressure applied to the nail bed. Her Glasgow Coma Scale (GCS) score is:	Correct	228	90.12
	Incorrect	25	9.88
5) Following a traumatic brain injury, a 31-year-old man is seen in the emergency department for a brief neurological assessment. He is unable to open his eyes, move his arms, or make any sounds. His Glasgow Coma Scale (GCS) score is:	Correct	217	85.78
	Incorrect	36	14.22

The various variables were analyzed using binary logistic regression. Sex, qualification, age, level of education, years of experience, frequency of GCS use, and the department of practice were all examined to determine whether they had a significant association with good practice in GCS evaluation. To control for confounding factors, all variables with a p-value < 0.25 were subsequently included in a multivariable logistic regression model. Qualification and frequency of use had a p-value below 0.25 in the univariable model. Among these two factors, only the frequency of use (OR = 1.25; CI = [1.03 - 1.55]) had a p-value below 0.05 in the final multivariable model. Although physicians initially appeared to have better practice compared to nurses in the univariable model, this was not confirmed in the multivariable model (Table 3).

Table 3. Univariable and multivariable analysis of factors associated with good practice in GCS evaluation by healthcare professionals.

	Univariable analysis			Final multivariable analysis		
Characteristic	**OR**	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Qualification			**0.035**			0.289
Nurse	1.00	—		1.00	—	
Anesthesia technicians	2.00	0.62 - 6.81		1.79	0.54 - 6.30	
Medical assistants	1.56	0.20 - 8.95		1.61	0.19 - 10.4	
Medical doctor	3.71	1.46 - 10.8		2.73	0.98 - 8.55	
Sex			0.874			0.969
woman	1.00	—		1.00	—	
man	0.94	0.47 - 1.94		1.02	0.47 - 2.21	
Age	0.98	0.93 - 1.03	0.507	1.05	0.96 - 1.14	0.279
Years of experience			0.359			0.468
<5 years	1.00	—		1.00	—	
≥10 years	0.42	0.09 - 1.43		0.34	0.04 - 2.26	
5 - 10 years	0.73	0.24 - 1.96		0.60	0.18 -1.84	
Fréquency of use	1.31	1.10 - 1.61	**0.002**	1.25	1.03 - 1.55	**0.024**

Abbreviations: CI = Confidence Interval at 95%, OR = Odds Ratio.

4. Discussion

The Glasgow Coma Scale (GCS) is a universally recognized tool for assessing patients' levels of consciousness. Initially developed for use in traumatic brain injury (TBI) cases in neurosurgery, it has gradually been adopted in other medical fields. Given the high incidence of head trauma, it is crucial for healthcare professionals to be able to assess the severity of a TBI. This study was therefore conducted to evaluate good clinical practice in GCS assessment.

The majority of surveyed healthcare professionals belonged to the 20 - 30 age group. Our results are similar to those of Andualem *et al.* (2022), who observed a high representation (57%) of nurses aged between 20 and 30 years [1]. In Vietnam, a similar observation was made in 2011 by Hien *et al.*, with 64.9% of nurses working in intensive care units [9]. However, Ehwarieme *et al.* in Nigeria reported a high representation of nurses aged between 30 and 40 years, accounting for 64.6% [10].

This difference could be explained by the heterogeneity of the surveyed healthcare workers in our study, which included various professional groups.

We observed a male predominance of 66%, similar to the findings of Andualem *et al.*, who reported a high proportion of men at 57.3% [1]. In contrast to Ahamed *et al.* and Ehwarieme *et al.*, who reported a female predominance of 85.6% and 67.8%, respectively [10] [14].

This difference could be explained by the sociodemographic characteristics

specific to each region. Additionally, the ongoing feminization of the medical field in some Maghreb countries may also play a role.

The present study indicates that only 35.96% of participants correctly assessed the GCS. Our results remain lower than those found in Vietnam, where 47.9% of nurses correctly evaluated the GCS [9]. However, our results are significantly higher than those found in Ghana, where only 5.2% of nurses correctly recorded the GCS [15]. This observed disparity could be explained by differences in the quality of theoretical and practical training received by respondents. Additionally, variability in healthcare policies and the availability of assessment tools for the GCS in different healthcare facilities may also contribute to this gap.

In this study, sex did not significantly influence the accurate measurement of the GCS. Our results differ from those of Alhassan *et al.* (2019) in Ghana, who reported a statistically significant relationship between gender and clinical practice. [15]. Nurses demonstrated better practice. Similarly, Andualem *et al.* reported a higher level of good practical attitudes among male nurses compared to female nurses [1]. We believe that gender, whether male or female, could influence the assessment of the GCS. This assumption is based on the fact that the three parameters used to evaluate the GCS involve nociception, especially when the score decreases. Physiologically, male voices tend to be deeper and more aggressive compared to the generally softer and more nurturing female voices. Additionally, due to greater muscle mass, male healthcare providers may generate a more intense pain stimulus than female providers under the same conditions. Consequently, a male healthcare provider might theoretically obtain a higher GCS score compared to a female provider for the same patient, under identical conditions, and assuming proper evaluation criteria are followed.

In each of the studies we have referenced, clinical scenarios were used as the primary criterion for assessing good practice. It is possible that factors such as sample selection and knowledge updates contribute to the observed differences. The use of qualitative methods, such as bedside patient evaluations, could help determine whether biological differences related to gender—such as voice depth and physical build—affect the accurate assessment of the GCS. While previous studies have objectively evaluated inter-examiner reliability in GCS assessment, none have reported a statistically significant difference based on gender. Conducting an in-depth study on this aspect would therefore be of great interest.

A high frequency of GCS use was found to be associated with good practice. Healthcare professionals who reported using the GCS almost always in their daily practice performed better than those who used it only occasionally. Our findings align with those of Yusuf *et al.*, who observed a correlation between daily practice and the ease of recalling GCS components [11]. However, this contrasts with the findings of Alhassan *et al.*, who reported better performance in GCS assessment among healthcare providers who used it occasionally compared to those who used it regularly [15]. Although surprising, this difference suggests that frequency of use alone may not be sufficient to influence good practice and that other factors

could be involved.

In our study, the level of qualification was not identified as a factor associated with good GCS practice. Our findings are consistent with those reported by Holdgate *et al.* (2006) and Juarez *et al.*, who observed excellent inter-rater reliability between physicians and nurses in GCS assessment. [16] [17].

This could be explained by the fact that, in most public hospitals in Togo, although patient examination is typically the physician's responsibility, this is not always the case in rural settings. Due to a shortage of physicians, paramedical staff often play a primary role in patient assessment. Additionally, evaluating the level of consciousness using the GCS is a routine component of patient examination. Previous studies have reported that inter-observer reliability is linked to the experience of healthcare providers in performing the assessment.

In the present study, years of experience were not identified as a factor associated with good practice. This contrasts with the findings of Mattar *et al.* (2013), who observed that good practice among nurses working in intensive care units improved with experience [18]. Similarly, Rowley *et al.* found that the accuracy of GCS assessment varied depending on the level of experience [3].

This finding may suggest the importance of continuous professional training and the retention of knowledge acquired during academic education among young healthcare professionals.

Study Limitations

The primary limitation of our study lies in the non-random sampling method, which may introduce selection bias. Additionally, the use of self-administered clinical scenarios to assess practice has certain shortcomings. A more comprehensive evaluation could have been achieved through qualitative methods and an observational checklist.

5. Conclusion

The practical assessment of the Glasgow Coma Scale (GCS) by healthcare professionals remains insufficient, despite a generally good theoretical understanding of the tool. This issue is particularly concerning given that it is not limited to the Togolese context; studies conducted in other countries have also highlighted a low level of proficiency in GCS assessment among physicians and nurses. It is therefore essential to reconsider how this skill is taught. The teaching approach should be more structured and continuous, incorporating practical demonstrations. We recommend a comparative study on best practices in GCS evaluation between developing and developed countries to identify more effective strategies for its implementation

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Conflicts of Interest

The authors declare no conflict of interest.

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