

Japan Coma Scale as a Scale to Assessment the Severity of Multi Trauma Patients

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Abstract

Aim: The Japan Coma Scale (JCS) is a criteria standard for assessing the consciousness in prehospital and emergency care settings. Our aim was to assess the relationship between Glasgow Coma Scale (GCS) and JCS scores as well as compare them to the outcomes of trauma patients to see if JCS can be used instead of GCS in the emergency department.

Materials and Methods: This was a case-control field study using cross-sectional data in the emergency department that evaluated 268 trauma patients, including 86 women and 182 men from September to December 2020, who were referred to the Tabriz emergency department. A checklist in the emergency department gathered patient information, which was then compiled using in-hospital charts and prehospital records. The level of consciousness of the patients was assessed using the JCS (1-3) and GCS (3-15) scales, and the outcomes were compared.

Results: Two hundred-twenty nine of the 268 patients examined were discharged, while 37 were admitted to the hospital. Unfortunately, two of the patients passed away. The relationship between GCS and JCS of patients is significant, strong, and inverse ($P=0.001$; correlation coefficient=-0.999), according to the data analysis. In the JCS, the sensitivity of the test is 64.10%, the specificity is 100%, the positive predictive value is 100%, and the negative predictive value is 94.24%. Thus, in GCS 82.05%, 100%, 100%, and 97.03%.

Conclusion: based on the findings of this study and the important correlations in patient results between GCS and JCS, using JCS instead of GCS has a major effect on improving the process of caring for trauma patients in the emergency room, and it can be recognized as a standard coma scale.

Keywords: Japan coma scale, multiple patients, emergency department

Introduction

Trauma is a leading cause of death and disability across all ages worldwide (1). Rapid transport of patients from the site of injury to the emergency department and prompt and accurate assessment of consciousness level are the most significant factors in saving lives, reducing disability and improving long-term outcomes in trauma patients (2,3). Thus, attention to the level of consciousness in patients is one of the most critical factors for triage, sorting, and patient transport to the tertiary critical care centre (2).

Importance

Immediate assessment of the consciousness of trauma patients is necessary for the emergency department (2). By and large,

the Glasgow Coma Scale (GCS) is the most common measure used by emergency department paramedics and other medical professionals in a variety of settings to assess level of consciousness (4). This scale is time-consuming and complicated and therefore it may not be practical for rapid assessment (4). According to the high load of patients in the emergency department (5), work pressure and high stress level of emergency staff, present of people who lack sufficient knowledge and experience (6), moreover, The importance of time management to help emergency patients in Golden Time (7), a faster and simpler tool, which is easy to assess, easy to register, and easy to share with medical staff and medical assistants is needed.

The Japan Coma Scale (JCS), a grading system for assessing loss of consciousness, was first published in 1974 (8-10) and has since



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become a standard tool for assessing the level of consciousness on the scene by firefighters and agencies. Japan's disaster management has been confirmed. The JCS is used to classify a patient's level of consciousness into one of three categories determined by reactive eye opening: Level 1 is spontaneous eye opening; Level 2 is eye opening in response to a verbal stimulus or pain, and level 3 is no eye opening. In the emergency department, a basic evaluation scale like the JCS would be helpful and practical.

Goals of This Investigation

Although the JCS is used by paramedics in prehospital trauma care in Far Eastern countries (3), the diagnostic capacity of the JCS to assess and classify trauma patients in emergency departments is less recognized. In this study, our aim is to identify the sensitivity and specificity of JCS compared to GCS results.

Materials and Methods

Study Design and Setting

The current research design is a case-control field study that was conducted in a cross-sectional manner in the emergency department. Included data were obtained from the emergency department of Tabriz Imam Reza Hospital between September and December 2020. This department is a trauma center in northwestern Iran, East Azerbaijan province, and provides care to 11,000 patients per year. Using various approaches, this department increases the quality of trauma care and speed up the diagnosis and sorting of patients. Replacing the GCS with a simpler and easier method of assessing the level of consciousness of trauma patients is one of the most appropriate ways to improve the pace of surgery in trauma care. The study compared GCS and JCS outcomes and analyze the results to determine how sensitive and specific JCS is compared to GCS.

The Selection of Participation

Trauma patients who were transferred from the scene of the accident to the emergency department from September to December 2020 were considered eligible for inclusion.

We excluded patients who were paralyzed, deaf, had ocular trauma, or had a history of ocular disease. Also, all the patients who were transported from the scene of the accident in any way other than direct transportation by ambulance along with other rescuers.

Measurement

Data were collected with a checklist and in-hospital charts and pre-hospital records that are routinely sent to hospitals by paramedics. They included patient demographic information

(age, sex), mechanism of injury, vital signs, consciousness scale ratings based on JCS and the GCS scores on arrival and in-hospital mortality were collected by check list. Patients were classified by age into the following groups: <20, 20-39, 40-59, 60-79 and ≥80 years. They were also divided into groups based on vital signs: JCS, level 1, 2, and 3 digits and GCS 3-15. Thus, patient's recovery process and the length of the hospital stay were followed.

We conducted a sensitivity analysis to solve the missing data about JCS and in-hospital mortality due to the possibility of missing patients, such as those who were in good condition, had outpatient visits, or died while being transferred to the hospital or upon arrival.

The status of "fully awake and alert" was not included in the JCS when it was first published in 1974. Strictly speaking, JCS level 1 showed spontaneous eye opening but was not fully awake and alert. However, in recent decades, fully awake and conscious patients have been labeled and classified as "stages 0". As a result, the JCS "0" in the Japan Trauma Data Bank was paired with JCS level 1 patients in our study.

Outcome

The study's primary outcome was to predict the outcome of trauma patients in the emergency department using GCS and JCS criteria at the outset, which would be useful in how patients are treated, triaged, sorted, and finally discharged, hospitalized, or died, resulting in an emergency and the secondary outcome was use of JCS to prioritize patients and its positive impact on improving the pace of triage and patient care, as well as its use instead of GCS.

Primary Data Analysis

Upon entering the hospital, we identify patients' characteristics and their GCS and JCS scores. We used JCS level as an explanatory variable and each outcome as an objective variable to see if there was a link between GCS and JCS levels and primary and secondary outcomes. We used logistic regression analysis to produce crude ORs with 95% confidence intervals for the JCS stages. We used a multivariate logistic regression analysis to measure the modified ORs of JCS levels with 95% confidence CIs for possible confounders such as age, sex, and type of injury. The JCS c-statistics for the primary and secondary outcomes were determined to assess JCS discriminatory results.

Statistical Analysis

The needed statistical population in this study was estimated at 278 based on the available records and Morgan table, which included the input of about 1000 multitrauma patients. Excell software (Microsoft®, IBM) was used to randomize patients, and those whose last digit of their case number matched the numbers

produced by the software were included in the analysis. All statistical results were calculated as point estimates with 95% Cis. All statistical analyses were performed using Statistical Package for the Social Sciences® release 20.0.0 (IBM®, Chicago Ltd).

Results

Characteristics of Study Subjects

This study included 268 trauma patients who met the inclusion criteria, including 86 women and 182 men who did not follow the normal distribution according to the Kolmogorov-Smirnov statistical method. Table 1 summarizes the characteristics of the study population. The median age of the patients was 35.47±17.89 years (CI 95%: 33.32±37.63), ranging from 21 to 45 years in the 25% to 75% range. The majority of traumas were caused by car-to-car accidents. The level of consciousness in most patients was 15 on GCS and 1 on JCS. For the distribution between JCS and GCS on arrival at the hospital, almost all JCS level 1 patients had a GCS of 14-15, JCS level 2 patients had a GCS of 10-13 and most JCS level 3 patients had a GCS ≤9 (Table 2). Two patients died from the 268 cases studied, and 229 patients were discharged; therefore, the overall in-hospital mortality was 0.74% (n=2).

Main Results

According to the study, there is a significant relationship between GCS and patient outcome, which is strong and direct (Pv<0.001;

Characteristic	No. (%)
Gender no. (%)	
Women	86 (32.08)
Men	182 (67.91)
Age y, no. (%)	
<20	61 (22.76)
20-39	113 (42.16)
40-59	70 (26.11)
60-79	19 (7.08)
≥80	5 (1.86)
The mechanism of trauma no. (%)	
Car crash with car	103 (38.43)
Car crash with motorcycle	34 (12.68)
Car crash with bike	9 (3.35)
Car to pedestrian accident	12 (4.47)
Car overturning	14 (5.22)
Bike/motorcycle overturn	17 (6.34)
Fall down	39 (14.55)
Falling from a height	40 (14.92)

correlation coefficient=0.780). also, the JCS of patients has a significant relationship with patient outcome, but it is a strong and inverse relationship direct (Pv<0.001; correlation coefficient=-0.780). The relationship between the level of consciousness based on the JCS and patient outcome has a diagram level of 0.983 in the ROC figure (Figure 1).

According to the data analysis, the relationship between GCS and JCS of patients is significant, strong, and inverse (Pv<0.001; Correlation Coefficient=-0.999). In the JCS, the sensitivity of the test was 64.10%, the specificity was 100%, the positive predictive value was 100%, and the negative predictive value was 94.24%. Thus, in the GCS, test sensitivity is 82.05%, specificity is 100%, positive predictive value is 100%, and negative predictive value is 97.03% (Table 3).

Discussion

To the best of our knowledge, this is the first study to compare the outcomes of GCS and JCS in the Department of Emergency Medicine with the aim of replacing JCS with GCS. There are also a variety of standards for gathering prehospital data, clinical data during hospitalization, and trauma diagnoses, such as the abbreviated injury scale and injury severity score (ISS), among others (11). JCS is primarily concerned with eye responses. As a single test, JCS has two distinct advantages as a coma scale: flexibility and applicability, both of which should reduce interpreter errors. Communication between physicians, nurses, and paramedics must be simple, particularly in emergencies. The predictability of early outcome in trauma patients is a benefit of this study. The incredible simplicity of this criterion is one of the most significant features of JCS compared to GCS.

Parameters	Score	No. (%)
GCS	14-15	247 (92.16)
	13-10	15 (5.59)
	≤9	6 (2.23)
JCS	Level 1	249 (92.91)
	Level 2	15 (5.59)
	Level 3	4 (1.49)

GCS: Glasgow Coma Scale, JCS: Japan Coma Scale

Scale	JCS	GCS (gks)
Sensitivity	64.10%	82.05%
Specificity	100%	100%
Positive predictive value	100%	100%
Negative predictive value	94.24%	97.03%

GCS: Glasgow Coma Scale, JCS: Japan Coma Scale

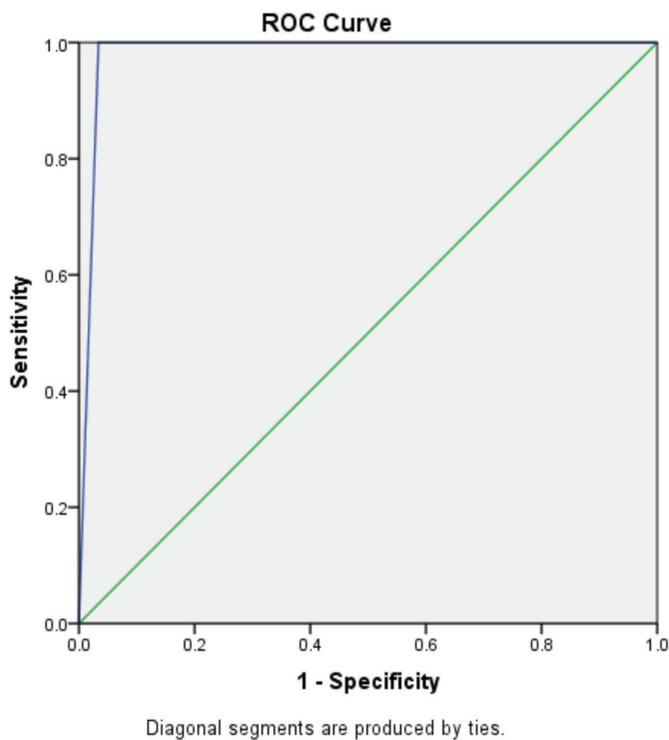


Figure 1. Relationship between JCS and patient outcome
JCS: Japan Coma Scale

The JCS is a four-point scale (ranging from 0 to 3) with only one test: eye responses. For instance, GCS is a 13-point scale (ranging from 3 to 15) that includes three tests: eye, verbal, and motor responses. JCS is similar to GCS's eye response test, but it is much easier to use. The only thing that raters need to do is check the eye responses in terms of three distinct categories: open, open only after stimuli, and closed. There is no need for specialized expertise, such as that required to determine the decerebrate or decorticate response. Moreover, the minimum time spent triaging patients, which is achieved using the JCS criterion, is another critical factor determining the outcome of trauma patients in emergencies. according to the protocol of Japanese guidelines for pre-hospital evaluation and treatment, paramedics can triage trauma patients at the scene of an accident within the first 15 seconds to evaluate the JCS level while also performing initial evaluations of the airway, respiration, and circulation (12). Although JCS has its benefits, it also has limitations. JCS, for example, does not perform well enough to determine the patient's consciousness in situations such as serious burns, ocular injuries, and facial muscle paralysis due to multiple factors such as a history of stroke and deafness.

Study Limitations

The sample size was less than the calculated amount due to the study's timing with the Coronavirus disease-2019 pandemic, which restricted hospital and research facilities, and the study was performed as a single center. Although our aim was to triage and prioritize patients, we did not evaluate the outcome or severity of patient trauma using the ISS criteria. Emergency medicine specialists and assistants measured the patients' consciousness, with the majority of them find it simple to quantify GCS. To achieve more generalizable results, it is best to use general practitioners with less experience in the study.

Conclusion

Considering the data of this study, as well as the substantial similarities in patient outcomes between GCS and JCS, and the ease and reliability with which JCS can be used in emergency situations, considering that GCS is designed for trauma patients with brain damage, but the questions related to JCS are consistent with cerebrovascular accidents, it seems appropriate to place JCS instead of GCS (gcs) in trauma patients. Thus, it can be concluded that using JCS instead of GCS has a significant impact on improving the process of caring for trauma patients in the emergency department, and it can be recognized as a standard coma scale.

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Ethics

Ethics Committee Approval: The study was approved by the Islamic Azad University-Tabriz Branch of Research Ethics Committees (approval ID: IR.IAU.TABRIZ.REC.1400.041, date: 26.06.2021).

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: S.S.V., Concept: M.P., Design: A.A., Data Collection or Processing: M.Z., Analysis or Interpretation: S.S.V., Literature Search: E.A., Writing: M.P.

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