

## Original Research Article

# Comparison of glasgow coma scale with full outline of unresponsiveness score in measuring consciousness level of endotracheal tube intubated patient in the intensive care unit

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### ABSTRACT

**Background:** Assessment of consciousness level is a basic ability that medical personnel, especially doctors and nurses shall master. It is due to assessment of consciousness as a basis of clinical decision making and determining the patient's prognosis. There are various types of scales to measure consciousness level of patient. One of the most famous and most widely applied is Glasgow Coma Scale (GCS). However, the use of GCS is less precise in measuring consciousness level of patients, especially in Endotracheal Tube Intubated patients (ETT). Another measure of consciousness assessment is FOUR Score. In contrast to GCS, the use of four score as a measurement tool for consciousness assessment is still not yet familiar especially in Indonesia. Four score has different component with GCS where the four score component has no assessment of verbal response but it has brainstem and respiratory pattern assessment components.

**Methods:** This research was an observational research using prospective non-experimental approach. The sampling technique used was consecutive sampling with a sample size of 33 people. Observation of the sample was undertaken at the same time. The instruments used in this research were GCS and FOUR Score observation sheet. Data analysis was performed by measuring the sensitivity, specificity, positive predictive value, negative predictive value and ROC.

**Results:** Four Score has sensitivity of 86.7 specificity of 83.3 predictive positive value of 81.3 and negative predictive value 88.2 and under curve area of 0.848. Meanwhile, GCS has sensitivity of 80.0, specificity of 77.8, predictive positive value of 75, and negative predictive value of 82.4 and under curve area of 0.819.

**Conclusions:** Four scores have a better assessment in measuring the consciousness level of ETT intubated patients.

**Keywords:** Four score, GCS, Intubation, ICU

### INTRODUCTION

Consciousness is a condition in which a person is able to be aware of himself and respond to the provided stimulus from the environment.<sup>1</sup> An assessment of consciousness level is one of the basic skills a nurse must possess. It is an key indicator in determining the patient's prognosis.<sup>2,3</sup> There are various measurement tools for consciousness assessment, but not yet known accurately to be applicable to the ICU-treated patients. This is because the ICU-

treated patients have their own characteristics such as ventilator use or the use of sedative and analgesic drugs that may affect the patient's level of consciousness.

The most commonly used consciousness assessment tool is glasgow coma scale.<sup>4</sup> However, the use of GCS to assess the patients' consciousness level in the ICU room is less appropriate as many ICU-treated patients are ETT intubated and some use ventilators. Thus the assessment of verbal components as one component of GCS is

considered less accurate.<sup>5</sup> The results represented that around 20-48% of patients using GCS measuring devices as a measure of consciousness became less useful as they were ETT intubated.<sup>5,6</sup>

In 2005 new consciousness measurement tool called the full outline of responsiveness (four) score was developed. In contrast to the GCS that has assessment component focused on visual, verbal, and motor, the four score have no verbal assessment component. Four scores have four components consisting of assessment of visual, motor responsiveness, brain stem, and respiratory with a rating scale of 0-4 for each component.<sup>7</sup>

Therefore, the researcher required to compare the effectiveness of GCS and four score in assessing the level of consciousness in ETT intubated patients in the intensive care unit.

## METHODS

This study used prospective non-experimental experimental study as the researcher gave no treatment to the research subject, but the researcher will only test the difference of instruments. The samples used in this study were taken from the patient population intubated in the ICU Room of Raden Mattaher Province Hospital, Jambi, Indonesia.

The sampling technique used consecutive sampling. Consecutive sampling is a sampling technique by including all the incoming subjects that meet the selection criteria into the study in order to reach the required number of subjects. The number of samples in this study was 33 people.

### Inclusion criteria

- Aged > 18 years old.
- The ETT intubated atients.

### Exclusion criteria

The ETT intubated patients with terminal conditions.

The data collection was undertaken from May to August 2017. Chief researcher and the members conducted observation or measurement of consciousness level at the same time. At consciousness measurement, the two assessors agreed not to discuss the results of the examination with each other. Having assessed four scores and GCS, the patient was observed for 7 days whether the patient had mortality or not. Data analysis was performed by measuring sensitivity, specificity, positive predictive value, negative predictor value, and ROC.

## RESULTS

This study was conducted on ETT intubated patients of 33 respondents who were treated in ICU Raden Mattaher

Province Hospital Jambi, Indonesia. thirty-three respondents participated in the study, out of which 14 (42.4%) were males while 19 (57.6%) were females. The largest number of participants was from the age of group 26 to 60 years representing 51.5% while the least represented age group was those aged 18 to 25 years representing (5%). Eighteen (54.6%) respondents were alive and fifteen (45.4%) respondents were died.

**Table 1: Respondents characteristics (N=33).**

Variable	Frequency	Percentages
<b>Gender</b>		
Male	14	42.4
Female	19	57.6
<b>Age</b>		
18-25	5	15.1
26-60	17	51.5
>60	11	33,4
<b>Mortality</b>		
Dead	15	45.4
Alive	18	54.6

### Four score and GCS reliability analysis

Two observers conducted this research that the fit test on 33 respondents was using Kappa test. The reliability of four scores and GCS conducted by Kappa test had the following results.

Table 2 shows the reliability of GCS and Four Score. The reliability score of GCS was 0,718 while the reliability of four score was 0,759.

**Table 2: The reliability of GCS and four score.**

Reliability	
GCS	0.718
Four score	0.759

### Sensitivity, specificity, positive predictive value, and negative predictive value of GCS and fours score

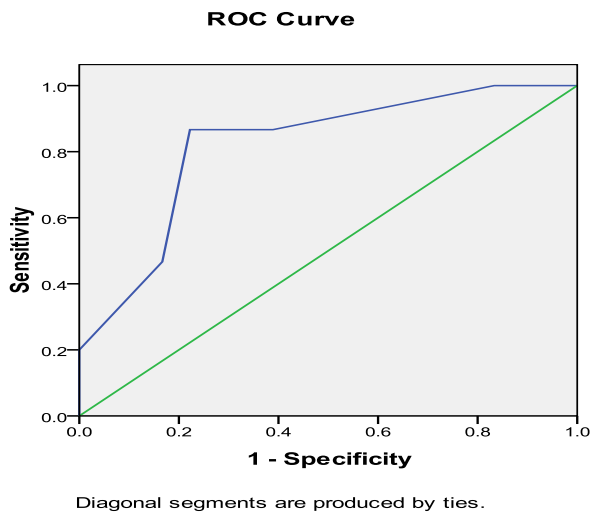
From Table 3 it represented that the value of GCS Cut of Point was worth of 7%, GCS sensitivity was 80%, specificity of 77.8%, positive predictive value of 75%, and negative predictive value of 82.4%.

While the value of cut of point four score was worth of 9, four score sensitivity was 86.7%, specificity was 83.3%, positive predictive value was 81.3%, and negative predictive value was 88.2%. Meanwhile, the value of area under the curve is presented in the Figure 1 and 2.

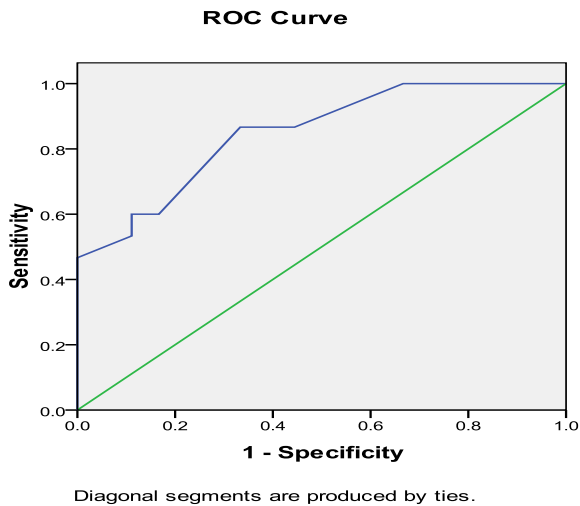
Based on the Figure 1, the area under the GCS curve is 0.819. Meanwhile, in Figure 5.2 reflects area under the curve of 0.848. Having wide area under the curve, this indicates that Four Score has better validity than GCS.

**Table 3: Sensitivity, specificity, positive predictive value, and negative predictive value of GCS and four score.**

Variable	Cut of point	Sensitivity	Specificity	Positive predictive value	Negative predictive value
GCS	8	80.0	77.8	75.0	82.4
Four	9	86.7	83.3	81.3	88.2



**Figure 1: Curve of ROC GCS.**



**Figure 2: Curve of ROC four score.**

**DISCUSSION**

Good measuring scale of consciousness assessment is valid, reliable, and easy to use. This research obtained reliability value of GCS 0.718 and four score of 0.759. Meanwhile, the results of Iyer et al, indicated the reliability of four score 0.99 and GCS 0.98. 5 Whereas research of Cohen, J obtained the results of inter rater

reliability test of GCS 0.738, while four score was 0.951.<sup>8</sup> Thus, it can be concluded that four score and GCS can be used as consciousness assessment tool. However, four score has better reliability value compared to GCS.

In this research, the value of GCS cut of point was 8, GCS sensitivity of 80%, specificity of 77.8%, positive predictive value of 75%, and negative predictive value of 82.4%. While the value of four score cut of point was 9, four score sensitivity of 86.7%, specificity of 83.3%, positive predictive value of 81.3%, and negative predictive value of 88.2%. These results indicate that four score has higher sensitivity and specificity than GCS. The result of this research was in line with Silvitasari et al, research, which obtained the sensitivity value of Four Score 0,861 and specificity of 0.816.<sup>9</sup>

Meanwhile, the sensitivity value was GCS 0.722 and specificity was 0.737. Research conducted by Baratloo also obtained the results of sensitivity and specificity of four score higher than GCS. Whereas the sensitivity value of four score was 0.869 and specificity was 0.884. While the sensitivity value of GCS was 0.842 and specificity 0.886.<sup>10</sup>

The GCS measurement scale is commonly used measure of consciousness assessment. However, GCS has limitation in the assessment of verbal components in the intubated patients by Iyer et al. In addition, another disadvantage of the GCS measurement scale is that the GCS does not examine brainstem reflex and respiration, whereas sedation drugs commonly used in ICU will affect the patients' ability to open their eyes and motor responses.

However, the use of sedation drugs will not affect the patients' brainstem reflex and respiration by Iyer et al. In contrast to GCS, the four score measurement scale will not only provide an assessment of visual component and motor responsiveness but respiration and brainstem reflexes as well. In addition, the Four Score scale is also easy to memorize as each component has the same maximum value of 4 and minimum value of 0.

Meanwhile, based on the ROC curve in Figure 5. In above, it indicates that both GCS and four score have good predictive validity in assessing the mortality of critical patients. Whereas in this study, GCS has the value of area under the curve of 0.819. While the four score has value of 0.848. Another research in line with this research

was the study conducted by Mercy et al, discovered that the value of area under the GCS curve was 0.76.<sup>11</sup> Whereas the value of area under the curve on the Four Score was 0.8. Meanwhile, the study of Khanal et al, represented that the value of area under GCS curve of 0.79 and Four Score curve of 0.82.<sup>12</sup> Based on the results above, it indicates that four scores are better measuring scale of assessment in predicting mortality than GCS.

Based on the above descriptions, it can be concluded that four scores have better sensitivity, specificity, and outcome predictive ability in ETT-intubated patients compared with GCS. The proper use of measurement scale in assessment of patients' consciousness status is not only necessary to assess the patient's prognosis but also as a basis for decision-making especially by doctors and nurses.

## CONCLUSION

Based on the research results, four score have better sensitivity and specificity than GCS. Further research is needed with different samples in different clinical settings.

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