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ORIGINAL ARTICLE **ÖZGÜN ARAŞTIRMA**

A COMPARISON OF FULL OUTLINE OF UNRESPONSIVENESS (FOUR) SCORE WITH GLASGOW COMA SCALE (GCS) IN PREDICTING OUTCOMES AMONG PATIENTS WITH ACUTE STROKE PATIENTS IN NEUROINTENSIVE CARE UNIT

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ABSTRACT

INTRODUCTION: Stroke patients treated with disorders of consciousness in the neurointensive care unit (NICU) can be assessed by evaluating the severity of unconsciousness and get an idea of the prognosis. The aim of this study was to determine the characteristics of stroke patients followed up in the NICU and the predictive power of GCS (Glasgow Coma Scale), FOUR score and NIHSS (National Institutes of Health Stroke Scale) on prognosis.
METHODS: A total of 59 patients admitted with a diagnosis of acute stroke and hospitalised in the NICU were included in the study. GCS and FOUR scores, and NIHSS scores on admission and at 72nd hours were calculated independently by two different neurology speciality students. Demographic information, presence of risk factors and neuroimaging results were recorded. Classification was made by dividing stroke into subtypes. Furthermore, the length of hospitalisation, discharge from the NICU, intubation during hospitalisation and within the first 30 days, and mortality were recorded for all patients, and the prognosis predictive power of GCS and FOUR score were compared using these parameters.
RESULTS: The mean age of the patients was 68.6 ± 13.4 years. 4 patients had haemorrhagic stroke and 55 patients had ischaemic stroke. The mean admission NIHSS was 13.1 and discharge NIHSS was 10. A statistically significant positive correlation (r=989) was found between the investigators in terms of GCS and FOUR score at arrival and 72nd hours. The GCS and FOUR score at 72nd hours of admission and hospitalisation, and the predictive power of mortality during hospitalisation and 30-day mortality were similar.
DISCUSSION AND CONCLUSION: The prognostic value of the FOUR score and its consistency between different investigators were found to be significantly high. We believe that GCS and FOUR score together are effective in the prognostic evaluation of stroke patients during admission and follow-up in the NICUs.
Keywords: Stroke, neurointensive care unit, GCS, FOUR score, NIHSS.

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NÖROYOĞUN BAKIM ÜNİTESİNDEKİ AKUT İNMELİ HASTALARDA SONUÇLARI TAHMİN ETMEDE FULL OUTLINE OF UNRESPONSIVENESS (FOUR) SKORUNUN GLASGOW KOMA SKALASI (GKS) İLE KARŞILAŞTIRILMASI

ÖZ

GİRİŞ ve AMAÇ: Nöroyoğun bakım ünitelerinde (NYBÜ) takip edilen ve bilinç bozukluğu eşlik eden inme hastalarında, bilinç kaybının şiddeti değerlendirilerek prognoz hakkında fikir edinebilir. Bu çalışmada NYBÜ'sinde takip edilen inme hastalarının özelliklerinin ve prognoz hakkında GKS (Glaskow Koma skalası), FOUR skoru ve NIHSS'in (National Institutes of Health Stroke Scale) kestirim gücünün belirlenmesi amaçlanmıştır.

YÖNTEM ve GEREÇLER: Akut inme tanısı ile başvuran ve NYBÜ'de yatırılan 59 hasta çalışmaya dahil edilmiştir. İki farklı nöroloji uzmanlık öğrencisi tarafından, birbirinden bağımsız olarak ilk başvuru sırasında ve 72. saatinde GKS ve FOUR skoru, geliş ve çıkış NIHSS skorları hesaplanmıştır. Demografik bilgileri, risk faktörlerinin varlığı ve nörogörüntüleme sonuçları kaydedildi. İnme subtiplere ayrılarak sınıflandırma yapıldı. Ayrıca tüm hastaların yatış süreleri, NYBÜ'den taburculuk, yatış sırasında ve ilk 30 gün içinde entübasyon ve mortalite kaydedildi ve bu parametreleri kullanarak GKS ve FOUR skoru prognoz kestirim güçleri karşılaştırıldı.
BULGULAR: Hastaların yaş ortalaması 68,6 ± 13,4 yıl olup 4 hastada hemorajik inme, 55 hastada iskemik inme saptandı. Ortalama geliş NIHSS 13,1 ve çıkış NIHSS 10 idi. Araştırmacılar arasında, geliş ve 72.saatteki GKS ve FOUR skoru açısından istatistiksel olarak anlamlı pozitif yönlü yüksek derecede korelasyon (r=989) saptandı. Geliş ve yatışın 72. saatindeki GKS ve FOUR skoru, hastanede yatış sırasındaki ve 30 günlük mortalite kestirim güçleri benzer bulundu.
TARTIŞMA ve SONUÇ: FOUR skorunun prognostik değeri ve farklı araştırmacılar arasındaki tutarlılığı anlamlı derecede yüksek bulundu. İnme hastalarının başvuruları ve NYBÜ'lerinde takipleri sırasında GKS ve FOUR skorunun birlikte progozu değerlendirmede etkin olduğu kanaatindeyiz.

Anahtar Sözcükler: İnme, nöroyoğun bakım ünitesi, GKS, FOUR skoru, NIHSS.

INTRODUCTION

Stroke is the second most common cause of death worldwide and is a common cause of adult disability in developed countries (1). In order to ensure effective management of stroke patients in Neurointensive care units (NICU), it is important to establish common guidelines and ensure their applicability to all patients. Such rules will lead to rapid and effective hospitalisation of stroke patients in the NICU. Therefore, basic care can be provided with reduced morbidity and mortality (2). In the NICU, scoring systems, which are frequently used to evaluate and monitor the neurological status of patients with neurological and metabolic problems, are of greater importance. Coma scales were developed to standardise the language used to assess disorders of consciousness among healthcare professionals. The use of these scoring systems can contribute to providing prognostic data, optimising treatment and managing costs more rationally. The ideal scoring system should be easily applicable, give rapid results, be used in the majority of patients, evaluate the level of consciousness accurately and predict morbidity (3).

The most widely used coma score to date and on which the most research has been conducted is the Glasgow Coma Scale (GCS) (4). However, it is insufficient in grading and monitoring of coma resulting from neurological diseases because patients presenting with aphasia and followed up as intubated cannot get the scores they deserve and brain stem dysfunction stages cannot be monitored (5). For these reasons, the Full Outline UnResponsiveness (FOUR) coma score was developed by Widjicks et al. in 2005 (6). This new score consists of four parts: ocular response, motor response, brainstem reflexes and respiratory pattern. In addition, the Turkish validity and reliability of the scale was published by Örken et al. in 2010 (3). Although GCS and FOUR score are widely used in traumatic brain injury, there are few studies evaluating their use in stroke patients.

The National Institutes of Health Stroke Scale (NIHSS) is considered the most reliable and valid scale among the scales developed in recent years to evaluate the neurological picture of stroke patients. Additionally, it plays an important role in

acute stroke treatments, treatment decision-making and post-treatment response evaluation. Monitoring the clinical findings of patients with a stroke using a validated scale is a common basis for research or prospective studies. NIHSS has been demonstrated to have near-perfect specificity and sensitivity in prognosis assessment (6). Although it has gained widespread use in ischaemic stroke cases, its use in haemorrhagic stroke cases is more limited. In addition, it has been reported in different studies that its content is complex and may be insufficient in the evaluation of the posterior system (brainstem) (7,8).

The objective of our study is to determine the predictive power of GCS, FOUR score and NIHSS to evaluate the characteristics and prognosis of stroke patients followed up in the NICU.

METHODS

Patients aged ≥18 years who were admitted to Bakırköy Dr. Sadi Konuk Education and Research Hospital with a diagnosis of acute stroke and hospitalised in our neurology intensive care unit between June 2016 and December 2016 were included in this prospective study. Patients receiving sedation or neuromuscular blockers during the first 72nd hours were excluded from the study. GCS, FOUR score and NIHSS were performed independently by two different neurologists.

GCS and FOUR score were performed at the bedside on admission and at 72nd hours. The severity of stroke on admission and discharge was assessed using the NIHSS for each patient.

Demographic information (age, gender), clinical history (ischaemic or haemorrhagic stroke) and presence of vascular (haemorrhagic and ischaemic) risk factors were recorded. Vascular risk factors included hypertension, diabetes mellitus, hyperlipidaemia, previous cerebrovascular disease, atrial fibrillation, coronary artery disease (CAD) and congestive heart failure (CHF).

The neuroimaging (cranial MR, cranial CT, cranial MR/CT angiography (MRA/CTA)) findings of the patients at the time of initial hospital admission were recorded. Additionally, patients who underwent IV thrombolytic therapy (TPA) or endovascular treatment on admission were recorded. In addition, the duration of hospitalisation, discharge from the NICU (to the ward or 2nd level ICU), intubation during hospitalisation and within the first 30 days, and deaths of all patients were recorded.

This study was approved by the Ethics Committee of T.R. Ministry of Health Bakırköy Dr. Sadi Konuk Training and Research Hospital on 29/06/2016 with the decision number 2016/08/20 and carried out in accordance with the Ethical Standards of the Helsinki Declaration. Informed consent was signed by all cases.

Statistical Analysis: Mean, standard deviation, median, 1st-3rd quartiles were used as descriptive statistics to show the distribution of numerical variables. Frequency (n) and percentage (%) were used for categorical variables. In the evaluation of the consistency between the observers, inter-observer exact consistency and intraclass correlation coefficient (Cronbach's alpha) analyses were performed. One-way random model was used in the intraclass correlation analysis. Fisher's exact chi-square test was used to analyse categorical variables and Mann-Whitney U test was used to analyse continuous variables between stroke groups. ROC curve analysis was used for mortality prediction of GCS and FOUR score measurements. In the comparison of the area under the ROC curves of GCS and FOUR score, the method of De Long et al. was used (9). A 95% confidence interval was used to compare the area under the ROC curves. The ideal cut-off point was determined by using Youden index to determine the predictive power of GCS and FOUR score values for mortality. Sensitivity and specificity values were calculated according to the determined ideal cut-off point. SPSS version 21.0 statistical package software was used for data analysis and MedCalc version 16.0 software was used for ROC curve analysis. $p<0.05$ was determined as the statistical significance limit.

RESULTS

Sociodemographic and Clinical Characteristics of the Patient Population: The mean age of 59 patients included in this study was 68.6±13.4 years and 24 (57.6%) of the patients were male. 55 (93.2%) patients had ischaemic stroke and 4 (6.8%) had haemorrhagic stroke. The etiology of ischaemic stroke included 31 (56.4%) large artery atherosclerosis and 14 (25.5%) cardioembolism (Table 1).

Table 1. Sociodemographic and clinical characteristics of the patients.

Specifications	n = 59	%
Age		
<65 years	21	35.6
65-74 years	16	27.1
75-84 years	17	28.8
85 years or older	5	8.5
Gender		
Male	24	57.6
Female	35	42.4
Type of Stroke		
Ischaemic	55	93.2
Haemorrhagic	4	6.8
Classification of Ischaemic Stroke (TOAST)		
Large artery atherosclerosis	31	56.4
Cardioembolism	14	25.5
Small vessel occlusion	1	1.8
Other identifiable causes	7	12.7
Unidentified cause	2	3.6
Hemorrhagic Stroke Classification		
Putaminal	1	25.0
Thalamic	1	25.0
Cerebellum	1	25.0
Subarachnoid	1	25.0

Twenty (33.9%) patients had diabetes mellitus, 11 (18.6%) had coronary artery disease, 38 (64.4%) had hypertension, 10 (16.9%) had ischaemic stroke, 2 (3.4%) had transient ischaemic attack and 3 (5.1%) had hyperlipidaemia. Eighteen (30.5%) of the patients were hospitalised in the NICU for less than 5 days and 16 (27.1%) for 15 days or more. The mean duration of hospitalisation was 14.3±15.6 days. Eleven (18.6%) of the patients were intubated. Of 55 patients with ischaemic stroke, 26 (47.3%) received IV-TPA and 12 (21.8%) underwent mechanical thrombectomy (Table 2).

Table 2. Duration of hospitalisation, intubation and treatment characteristics of the patients.

	n = 59	%
Duration of hospitalisation (n=59)		
Less than 5 days	18	30.5
5-9 days	15	25.4
10-14 days	10	16.9
15 days or more	16	27.1
Intubation (n=59)		
Performed	11	18.6
Not performed	48	81.4
Thrombolytic therapy (n=55)*		
Not given	17	30.9
IV thrombolytic	26	47.3
Thrombectomy	12	21.8

*Percentages are based on 55 patients with ischaemic stroke.

Analysis of the results of GCS, FOUR and NIHSS scores: The mean admission NIHSS score was 13.1±6.3 and discharge score was 10±6.5. The mean GCS of the patients included in the study was 12.2±3.3 at admission and 12.9±2.7 at 72nd hours. The mean FOUR score at admission was 14.0±2.9, and the mean FOUR score at 72nd hours was 14.5±2.4 (Table 3).

Table 3. GCS, FOUR score results at admission and 72nd hours, NIHSS score results at admission and discharge.

	Average	SD	Median
GCS arrival (n=59)	12.2	3.3	14.0
GCS 72nd hours (n=59)	12.9	2.7	15.0
FOUR admission (n=57) *	14.0	2.9	15.0
FOUR 72nd hour (n=57) *	14.5	2.4	15.5
NIHSS admission (n=59)	13.1	6.3	16.5
NIHSS discharge (n=57)	10	6.5	11.0

*Since two patients died within the first 2 days, 72nd-hour FOUR and GCS measurements could not be performed.

In the GCS measurements performed at the time of admission, the measurements of 46 patients were found to be the same by two investigators, while 13 patients had different results; the consistency was found to be 78% and the inter-investigator correlation coefficient evaluating the relative consistency was 0.989. In other words, there is a statistically significant positive correlation between the measurements of both researchers ($p<0.001$). When the GCS measurements were repeated at 72nd hours, the exact consistency rate between the investigators increased to 96.5% and the relative consistency at 72nd hours was found to be significant at 98.7% ($p<0.001$). While the absolute consistency of the FOUR score measurement at the time of admission was 86.4%, the relative consistency was statistically significantly 99.7% ($p<0.001$). Similar to the GCS, in the FOUR score measurements repeated at 72nd hours, the absolute consistency between the investigators increased to 91.2% and the relative consistency was found to be 99.4%, which was statistically significant ($p<0.001$) (Table 4).

Prediction of Prognosis of Stroke Patients and Evaluation of Affecting Factors: Intubation was required in 10 patients (18.2%) with ischaemic stroke and 1 patient (25.0%) with haemorrhagic stroke. Three (5.1%) of the 59 patients included in the study died during hospitalisation and 4 (6.8%)

died within 30 days. There was no statistically significant difference between stroke types regarding the need for intubation and mortality (Table 5).

Table 4. Consistency and correlation analysis between researchers.

	Inter-researcher consistency	ICC	GA (95%)	P
GCS at admission (n=59)	78.0%	0.989	0.982-0.994	<0.001
GCS measurement at 72nd hours (n=59)	96.5%	0.987	0.979-0.992	<0.001
Application FOUR score (n=57)*	%86.4	0.997	0.995-0.998	<0.001
FOUR score at 72nd hours (n=57)*	91.2%	0.994	0.989-0.996	<0.001

ICC: Intraclass Correlation Coefficient.
*Since two patients died within the first 2 days, 72nd-hour FOUR and GCS measurements could not be performed.

Table 5. Intubation requirement and mortality rates according to stroke types.

Disease	Type of Stroke				X2*	P
	Ischaemic		Haemorrhagic			
	n	%	n	%		
Intubation requirement					0.114	0.572
with	10	18.2	1	25.0		
without	45	81.8	3	75.0		
In-hospital mortality					0.230	1.000
deceased	3	5.5	0	0.0		
not deceased	52	94.5	4	100.0		
30-day mortality					0.312	1.000
deceased	4	7.3	0	0.0		
not deceased	51	92.7	4	100.0		

*Fisher's exact chi-square test was performed.

The mean duration of hospitalisation was 14.2±15.7 days for ischemic stroke patients and 15.0±15.3 days for haemorrhagic stroke patients. There was no statistically significant difference between ischaemic and haemorrhagic stroke patients in terms of length of hospitalisation (p=0.809).

No statistically significant difference was found between the mean GCS and FOUR values of ischaemic and haemorrhagic stroke patients during hospitalisation and at 72nd hours (p>0.05) (Table 6).

The findings related to the prediction of in-hospital mortality and 30-day mortality by GCS and FOUR score measurements at the time of hospitalisation and at 72nd hours were evaluated: Figure 1 shows the ROC curves of the GCS and FOUR scale at the time of arrival (A) and 72nd hours of hospitalisation (B) for predicting the mortality of patients during hospitalisation. In the prediction of mortality during hospitalisation, the area under the ROC curve (AUC) of the GCS at admission was 0.780, while the ROC AUC of the FOUR score was 0.699. There was no statistically significant difference between GCS and FOUR scale AUCs at admission (p=0.377). In other words, the predictive power of GCS and FOUR scores at admission for mortality during hospitalisation is similar. The GCS ROC AUC at the 72nd hour of hospitalisation was 0.982, while the FOUR scale ROC AUC was 0.991. In general, no statistically significant difference was found between GCS and FOUR score AUCs at the 72nd hour (p=0.479). Similarly, GCS and FOUR score values at the 72nd hour of hospitalisation have similar predictive power for mortality during hospitalisation.

Table 6. GCS and FOUR values during hospitalisation and at 72nd hours according to stroke types.

	Average	S.S.	Median	1st-3rd Quartiles	p*
	GCS value during hospitalisation				
Ischaemic Stroke	12.1	3.3	14.0	9.5-15.0	0.399
Haemorrhagic Stroke	13.8	1.9	14.5	11.8-15.0	
	FOUR score value during hospitalisation				
Ischaemic Stroke	13.9	2.9	15.0	13.0-16.0	0.373
Haemorrhagic Stroke	14.4	2.4	15.0	14.0-16.0	
	GCS value at the 72nd hour of hospitalisation				
Ischaemic Stroke	12.8	2.8	14.0	10.0-15.0	0.507
Haemorrhagic Stroke	14.0	2.0	15.0	12.0-15.0	
	FOUR score value at the 72nd hour of hospitalisation				
Ischaemic Stroke	14.4	2.4	15.0	14.0-16.0	0.325
Haemorrhagic Stroke	15.5	1.0	16.0	14.5-16.0	

Mean: Average, SD: Standard deviation
* Mann Whitney U test was performed.

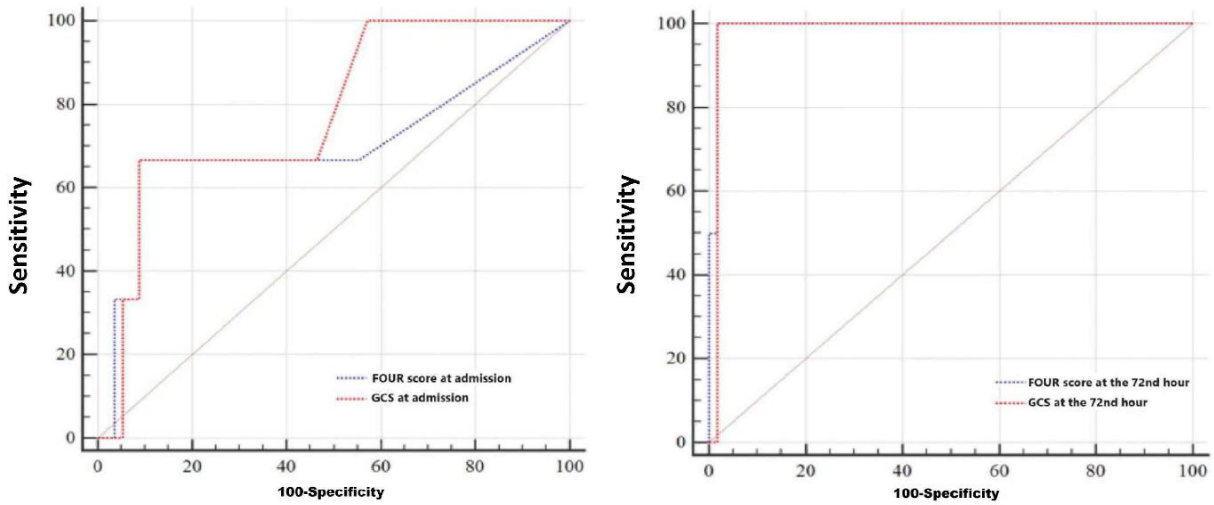

Figure 1. Comparison of the areas under the ROC curves of GCS and FOUR score at the time of arrival (A) and at the 72nd hour of hospitalisation (B) for the prediction of mortality during hospitalisation.

Another striking finding was that GCS and FOUR score measurements at the 72nd hour of hospitalisation were more predictive of mortality during hospitalisation than GCS and FOUR score measurements at admission (Table 7). Figure 2 shows the ROC curves of GCS and FOUR score at the time of admission (A) and at the 72nd hour of hospitalisation (B) for the prediction of 30-day mortality.

Table 7. Prediction of mortality during hospitalisation according to ROC curves of GCS and FOUR score at the time of arrival (A) and 72nd hours of hospitalisation (B).

Measurement	Youden's index	Cut point	Sensitivity (%)	Specificity (%)
GCS at the time of application	0.577	7.5	66.7	91.1
GCS at the 72nd hour	0.982	7.0	100.0	98.2
FOUR at the time of application	0.577	9.5	66.7	91.1
FOUR at the 72nd hour	0.982	9.0	100.0	98.2

In the prediction of 30-day mortality, the ROC AUC for GCS at admission was 0.72nd5, while the ROC AUC for FOUR score was 0.659. There was no statistically significant difference between GCS and FOUR score AUCs at admission (p=0.336). For the prediction of 30-day mortality, the AUC under the GCS and FOUR ROC curve at 72nd hours of hospitalisation was 0.741. There was no statistically significant difference between GCS and FOUR score AUCs at admission (p=1,000) (Table 8).

Table 8. Comparison of the areas under the ROC curves of GCS and FOUR score at the time of arrival (A) and 72nd hours of hospitalisation (B) for prediction of 30-day mortality.

	EAA	ROC 95% G.A.	*p*
At the time of application			0.336
GCS	0.72nd5	0.593-0.833	
FOUR	0.659	0.524-0.778	
At the 72nd hour of admission			1.000
GCS	0.741	0.608-0.848	
FOUR	0.741	0.608-0.848	

AUC: Area under the curve, G.A.: Confidence interval.

In the prediction of 30-day mortality of the patients, the ROC curve Youden index for GCS at admission was 0.436, the ideal cut-off point was found to be 14.0, and the sensitivity and specificity for predicting 30-day mortality for this cut-off point were found to be 100.0% and 43.6%, respectively. Similarly, the Youden's index of the ROC curve for GCS at 72nd hours was 0.648 and the ideal cut-off point was 7.0. For this cut-off point, the sensitivity and specificity for predicting 30-day mortality were 66.7% and 98.2%, respectively.

For the prediction of 30-day mortality, the ROC curve Youden index for the FOUR score at

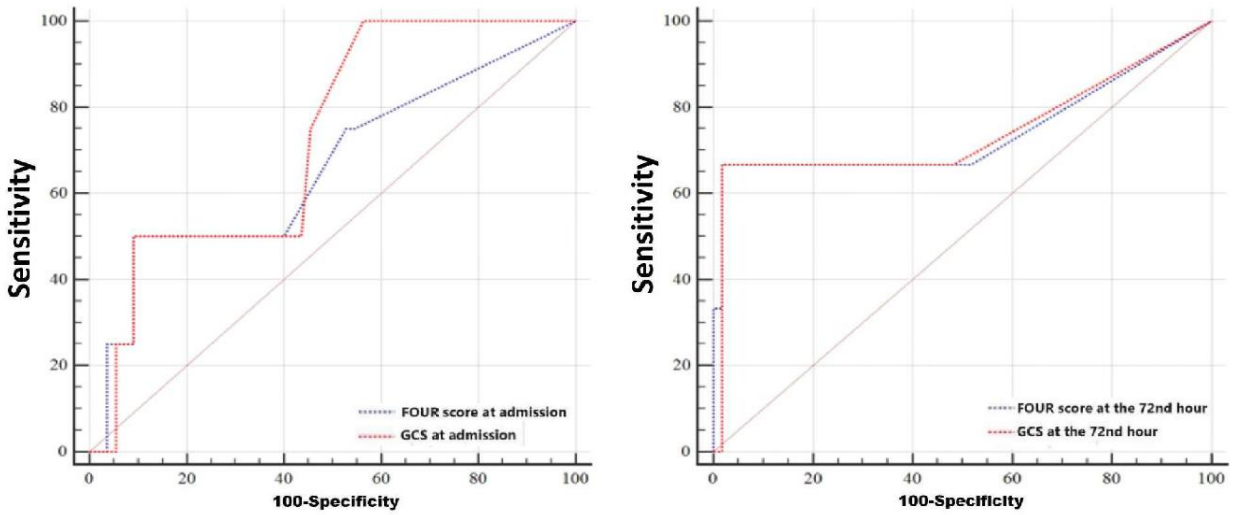

Figure 2. ROC curves of GCS and FOUR score at the time of arrival (A) and 72nd hours of hospitalisation (B) for prediction of 30-day mortality.

admission was 0.409, the ideal cut-off point was 9.5, and the sensitivity and specificity for predicting mortality during hospitalisation for this cut-off point were 50.0% and 90.9%, respectively. Again, the Youden's index of the ROC curve for the FOUR score at the 72nd hour was 0.648 and the ideal cut-off point was found to be 9.0. For this cut-off point, sensitivity and specificity for predicting 30-day mortality were 66.7% and 98.2%, respectively (Table 9).

Table 9. ROC curves values of GCS and FOUR score at the time of arrival (A) and at the 72nd hour of hospitalisation (B) for predicting 30-day mortality of patients.

Measurement	Youden's index	Cut point	Sensitivity (%)	Specificity (%)
GCS at the time of application	0.436	14.0	100.0	43.6
GCS at the 72nd hour	0.648	7.0	66.7	98.2
FOUR at the time of application	0.409	9.5	50.0	90.9
FOUR at the 72nd hour	0.648	9.0	66.7	98.2

DISCUSSION AND CONCLUSION

The need for hospitalisation in the NICU during the first hospital admission of stroke patients may give an idea about the long-term prognosis. There is no evidence-based information that hospitalisation in the NICU has a positive effect on the prognosis of ischaemic stroke (10, 11). The reason for this is thought to be related to the heterogeneity of the care provided in NICUs and the indications for hospitalisation among different centres. There are studies showing that approximately 30% of all stroke patients require NICU hospitalisation and describing the characteristics of these patients, most of whom have ischaemic stroke (12-14). When the general characteristics of the patient population included in this study are considered, similar to other studies, the mean age was 68.6 years and ischaemic stroke accounted for 93.2% of all patients. When the risk factors associated with stroke were evaluated, DM in 33.9%, HT in 64.4%, and CAD in 18.6% of all patients were the most common factors. Mechanical ventilation requirement, development of systemic complications and craniectomy are the most important reasons requiring follow-up in the NICU in stroke patients. In our study, mechanical ventilation requirement was found in 18.6% of all patients.

In addition to patients who develop stroke complications, patients who have undergone IV-TPA or endovascular treatment are also followed up in NICUs or stroke units (14). In our study, the majority of patients with ischaemic stroke underwent IV-TPA or endovascular treatment (47.3% IV-TPA; 21.8% endovascular). The mean duration of hospitalisation was less than 5 days

(30.5%) in patients undergoing IV-TPA and longer in patients undergoing endovascular treatment. Hospital (5.5%) and 30-day (7.3%) mortality rates were lower in patients with ischaemic stroke compared to other studies. Although it can be argued that this may be due to factors such as lower initial scores of patients admitted to the NICU, less development of complications, and perhaps better care, we think that the majority of the patient population is related to the patients undergoing IV-TPA and endovascular treatment.

The presence of vigilance deficit in the assessment of stroke severity makes the assessment more complex. The presence of risk factors, anatomical location of ischaemia or haemorrhage, the need for intubation and the indication for hospitalisation in the NICU, the duration of hospitalisation and the prognosis relationship can be determined independently of the vigilance defect (14). In studies related with ischaemic stroke, the incidence of impaired consciousness varies between 46% and 80%, and mortality rates were found to be 71% in comatose patients, 45% in stuporous patients, 27% in somnolent patients and 11% in patients with unaffected consciousness (15,16). In our study, the prevalence of impaired consciousness was 28.8% in all strokes (coma: 3%; stupor: 10%; somnolence: 15%).

The NIHSS is recognised as the most reliable and validated scale for the assessment of neurological clinical pictures. The NIHSS was found to have near-perfect specificity and sensitivity for prognosis assessment. There are studies showing that it is safe especially in determining morbidity and mortality, comparing it with different scales and recommending a modified version (17, 18). In our study, NIHSS was evaluated during the first admission and discharge to the NICU.The mean admission NIHSS was 13.1 and the mean discharge NIHSS was 10. ROC analysis showed no significant difference between the two researchers who performed the evaluation.

Although the validity of the FOUR score has been proven in neurological patients in NICUs, there are few studies on its use in stroke patients (19-22). Since it is a relatively new scale, the first studies aimed to compare the scale with the GCS and to investigate the ease of application in different languages. There is a lack of large-scale studies evaluating the ease of use of the Turkish version of the FOUR score and its validity in the assessment of consciousness in neurological patients other than TBI. Bayraktar et al. When FOUR scores were compared with GCS scores regarding the mortality of patients followed up in the ICU, it was reported that FOUR score was more effective than GCS in predicting mortality (23). In our study, a high positive correlation (r=0.989) was found between researchers in the evaluation of stroke patients. In addition, the predictive power of the GCS and FOUR score values at admission and 72nd hours during hospitalisation and 30-day mortality was found to be similar between the investigators. In addition, no significant difference was found in the evaluation of haemorrhagic and ischaemic stroke cases in subgroup analysis. In addition, GCS and FOUR score measurements at the 72nd hour of hospitalisation were more predictive of mortality during hospitalisation than GCS and FOUR score measurements at admission.

In our country, GCS is frequently used in NICUs to evaluate the consciousness and general condition of patients. We think that the evaluation difficulties arising from features such as aphasia, brain stem involvement and intubation, which are common in stroke patients, can be overcome by using the FOUR score. Apart from these features of the FOUR score, it has the features of fast and easy implementation and interpersonal adaptability. Nevertheless, the role of NIHSS is very important in the detailed evaluation of neurological deficits, disability and prognosis of stroke patients who are candidates for IV-TPA or endocascular therapy. In the future, there is a need for an additional scale for stroke patients that includes the common features of the FOUR and NIHSS assessment spectra but is faster, interpersonally compatible and easier to administer.

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Ethics

Ethics Committee Approval: The study was approved by Ethical Committee T.R. Ministry of Health Bakırköy Dr. Sadi Konuk Training and Research Hospital (Date: 29.06.2016, No: 2016/08/20).

Informed Consent: The author declared that informed consent was signed by all cases.

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