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Prospective validation of the Glasgow Blatchford scoring system in patients with upper gastrointestinal bleeding in the emergency department

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Background/aims: *This study aimed to allow decision-making about hospitalization or discharge using the Glasgow Blatchford Scoring system, a risk analysis performed using basic laboratory and clinical variables, in patients presenting to the Emergency Department with upper gastrointestinal system bleeding.* ***Materials and Methods:*** *This prospective, observational study conducted in the Emergency Department of a university hospital enrolled patients aged ≥18 years, who presented to the Emergency Department with upper gastrointestinal system bleeding between June 2009 and December 2010. For all patients, Glasgow Blatchford Scoring scores were calculated, and the patients were classified into two groups as high-risk and low-risk patients.* ***Results:*** *A total of 160 subjects with upper gastrointestinal system bleeding were enrolled in the study. Mean Glasgow Blatchford Scoring scores were 7.1±3.8 for 71 low-risk subjects and 11.7±2.9 for 89 high-risk subjects, and the difference between the two groups was statistically significant (p<0.001). When the performance of the Glasgow Blatchford Scoring system was evaluated in the determination of high risk, the sensitivity and specificity were 100% and 1.41%, respectively, for a cut-off value of Glasgow Blatchford Scoring >0, 100% and 16.9% for a cut-off value of Glasgow Blatchford Scoring >3, 96.63% and 36.62% for a cut-off value of Glasgow Blatchford Scoring >5, and 86.52% and 69.01% for a cut-off value of Glasgow Blatchford Scoring >8. In the receiver operating characteristic curve analysis, for Glasgow Blatchford Scoring in the high-risk estimation, the area under the curve was found to be 0.82 (95% CI: 0.75-0.88), and this value was statistically significant (p=0.0001).* ***Conclusions:*** *The Glasgow Blatchford Scoring system, which may be easily calculated based on laboratory and clinical variables, seems to be a useful scoring system for risk analysis of all patients with upper gastrointestinal system bleeding admitted to the Emergency Department.*

Key words: Upper gastrointestinal system bleeding, emergency department, Glasgow Blatchford Scoring system

Acil serviste üst gastrointestinal sistem kanamalı hastalarda Glasgow Blatchford skorlama sisteminin prospektif değerlendirilmesi

Amaç: *Bu çalışmanın amacı Acil Servise üst gastrointestinal sistem kanaması ile başvuran hastalarda, temel laboratuar ve klinik değişkenler kullanılarak yapılan bir risk analizi olan Glasgow Blatchford Skorlama sistemi kullanılarak; yatış ya da taburculuk kararının verilebilmesidir.* ***Gereç ve Yöntem:*** *Bir Üniversite hastanesi Acil Servisinde yürütülen bu prospektif gözlemsel çalışmada, Haziran 2009-Aralık 2010 tarihleri arasında üst gastrointestinal sistem kanaması ile Acil Servise başvuran 18 yaş üstü olgular çalışmaya alındı. Tüm olguların Glasgow Blatchford Skorlama değerleri hesaplandı. Ayrıca hastalar yüksek riskli ve düşük riskli olarak iki gruba ayrıldı.* ***Bulgular:*** *Çalışmaya üst gastrointestinal sistem kanamalı toplam 160 olgu alındı. Düşük riskli 71 olgunun ortalama Glasgow Blatchford Skorlama değeri 7.1±3.8 iken, yüksek riskli 89 olgunun ortalama Glasgow Blatchford Skorlama değeri 11.7±2.9 idi ve her iki grup arasında istatistiksel olarak anlamlı fark vardı (p<0.001). Yüksek riski belirlemede Glasgow Blatchford Skorlama sisteminin performansına bakıldığında; cut-off değeri Glasgow Blatchford Skorlama>0 için sensitivitesi %100 ve spesifitesi %1.41, Glasgow Blatchford Skorlama>3 için sensitivitesi %100 ve spesifitesi %16.9, Glasgow Blatchford Skorlama>5 için sensitivitesi %96.63 ve spesifitesi %36.62 ve Glasgow Blatchford Skorlama>8 için sensitivitesi %86.52 ve spesifitesi %69.01 olarak saptandı. ROC eğrisi analiziyle, yüksek riski tahmininde Glasgow Blatchford Skorlama için area under curve 0,82 (%95 CI 0,75-0,88) saptandı ve istatistiksel olarak anlamlı idi (p=0.0001).* ***Sonuç:*** *Laboratuvar ve klinik değişkenlere bakılarak kolaylıkla hesaplanabilen Glasgow Blatchford Skorlama sistemi Acil Servise başvuran tüm üst gastrointestinal sistem kanamalı hastaların risk analizinde kullanışlı bir skorlama gibi görünmektedir.*

Anahtar kelimeler: Üst gastroinestinal sitem kanaması, acil servis, Glasgow Blatchford Skorlama sistemi

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INTRODUCTION

Cases of gastrointestinal system (GIS) bleeding represent a group of diseases that commonly leads to presentation to emergency departments (EDs) of hospitals (1,2). Therefore, the evaluation of these patients is critical. GIS bleeding is a clinical problem with high mortality and diagnostic and therapeutic costs, and requires frequent hospitalization and intensive care. Rarely, it leads to difficulties in the diagnosis and differential diagnosis and may require a multidisciplinary study.

Upper gastrointestinal (UGI) system bleeding, which accounts for 85% of all gastrointestinal bleeding cases and originates from the proximity of the Treitz ligament, represents an important clinical and economic problem. While the incidence of UGI system bleeding is 50-172/100,000, its mortality is approximately 11-14% (1,3-6). The patients present to the ED due to clinical manifestations of varying grades. However, the majority of the patients do not have indications for emergent endoscopic intervention, blood transfusion or hospitalization (3). In the patients who present to the ED with UGI system bleeding, the risk determination, location of the therapeutic endoscopy, and the medical and surgical therapeutic indications remain conflicting, and therefore, there is no consensus concerning the approach to be adopted in these patients. In addition, although endoscopy has an important place in the evaluation of these patients, centers with 24/7 accessibility to endoscopy are limited in our country. Therefore, the patients at risk should be differentiated using a simple scoring system, without a need for endoscopy.

Various scoring systems are used to classify the high-risk patients and distinguish the low-risk patients. Among these, the most commonly used scoring systems are Glasgow Blatchford Scoring (GBS) and Rockall Scoring systems. In contrast to the Rockall Scoring system, the GBS system provides a scoring based only on clinical and laboratory findings, without the use of endoscopic data (Table 1). The clinical applicability of the GBS system is easier and it seems to be a more suitable scoring system to decide whether blood transfusion, endoscopy or surgery is required (7).

As a standard approach, the majority of the patients with UGI bleeding are monitored for a period of time (4). The patients with a lower risk for bleeding and those who are hemodynamically stable may be discharged, but there is no objective criteria to make a precise decision about which patients may be discharged (8,9). Most clinicians discharge their patients according to the results of the clinical examinations (10).

Low-risk UGI system bleeding patients, who do not need a medical intervention based on the GBS system, may be distinguished and monitored as outpatients (7). An ideal scoring system should have both a good sensitivity and a high specificity in the determination of the patients with high-risk UGI system bleeding (10).

This study aimed to allow decision-making about medical or surgical therapy and hospitalization or discharge using the GBS system, which is a risk analysis performed using basic laboratory and clinical variables, in patients who present to the ED with UGI system bleeding. This would help to avoid the additional burden caused by both waste of time and health expenditures resulting from unnecessary examinations and hospitalization.

MATERIALS AND METHODS

This prospective observational study was conducted in a single center, Uludag University, Faculty of Medicine Hospital, Emergency Department, Bursa, Turkey. The study was approved by the Uludag University, Faculty of Medicine, Ethics Committee (2009-10/21).

Table 1. Glasgow Blatchford Scoring system

Admission risk marker		Score
BUN (mmol/L)		
6.5-8.0		2
8.0-10.0		3
10.0-25.0		4
>25		6
Hb (g/L), male	**Hb (g/L), female**	
120-130	100-120	1
100-120		3
<100	<100	6
Systolic blood pressure (mmHg)		
100-109		1
90-99		2
<90		3
Other markers		
Pulse ≥100 beats/min		1
Melena		1
Syncope		2
Liver disease		2
Cardiac failure		2

BUN: Blood urea nitrogen. Hb: Hemoglobin.

We obtained data from all patients presenting with acute UGI system bleeding to the ED over an 18-month period (June 2009-December 2010). We included all patients aged ≥18 years with UGI system bleeding. Acute UGI system bleeding was defined as observed hematemesis, melena or nasogastric aspirate containing blood or a recent history of hematemesis or melena. We excluded pregnant patients and traumatic patients.

The study form, developed specifically for this study, contained basic laboratory and clinical parameters and information about the patient, and was completed by the doctor who examined the patient. The following data were then obtained from identified patients and recorded: age, sex, symptoms (hematemesis, melena, hematochezia, and syncope), drug use (non-steroid anti-inflammatory drugs, salicylate, steroid), alcohol use, past medical history (congestive heart failure, liver failure/cirrhosis etc.), vital signs, Tilt test, need for blood transfusion, examination findings on presentation, laboratory studies (blood urea, hemoglobin (Hb), prothrombin time (PT), activated partial thromboplastin time (aPTT), and international normalized ratio (INR) levels), endoscopic findings, endoscopic therapy, and outcomes. A GBS was calculated for each patient based on clinical or laboratory variables at the time of presentation. Moreover, the patients were classified in two groups as high-risk (patients who received blood transfusion, required endoscopic intervention or operation, or died) and low-risk patients (patients who do not show any of the high-risk criteria). High-risk criteria were determined in the light of the previous studies (2,11,12). It was presumed that low-risk patients did not need emergent endoscopy.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) ver. 16.0 software. In the comparison of two independent groups, Mann-Whitney U test was used. More than two independent groups were compared using Kruskal-Wallis test, and dual comparisons of the variables that were found to be significant were performed using Mann-Whitney U test. Categorical variables were compared using Pearson chi-square test and Fisher's exact chi-square test. Correlations between the variables were examined using Spearman correlation analysis. The area under the receiver operating characteristic (ROC) curve (AUC) was calculated using ROC analysis. All tests were two-tailed, and a p value of <0.05 was deemed significant.

RESULTS

A total of 160 patients presented to the ED with suitable inclusion criteria for this study. The mean age was 57.76±15.46 years. Of the patients, 30.6% were female and 69.4% were male. Given the distribution of the subjects according to their age groups, 51.9% of the patients were <60 years old, 41.3% were 60-79 years old and 6.9% were ≥80 years old. 61.3% of the patients were hospitalized, 27.5% were discharged and 10% were referred. Only 1 subject died, and 1 subject refused the therapy (Figure 1). While the mean GBS score of the subjects hospitalized and referred was 10.81±3.48, the mean GBS score of the subjects discharged was 6.70±3.9, and the difference between the two groups was statistically significant (p<0.001).

A consultation was requested for 98.1% of the subjects examined in emergency service. While a gastroenterology consultation was sought in 96.3%, a combined gastroenterology and general surgery consultation was sought for 2 subjects. In 1 subject, only the general surgery consultation was requested. Of the subjects, 70% underwent endoscopy in the ED, and only 2 showed normal results in endoscopy. Of the subjects who underwent endoscopy, 30% were in the low-risk group and 40% were in the high-risk group. During the endoscopy, 20% of the subjects underwent endoscopic intervention (sclerotherapy, band ligation, etc.); no statistically significant difference was found between the subjects that did or did not undergo endoscopic interventional therapy in terms of mean GBS scores (p>0.05).

Among the subjects with UGI system bleeding included in the study, the etiology was esophageal variceal bleeding in 30.6% and non-variceal UGI system bleeding in 69.4%. Of the subjects, 45.6% re-

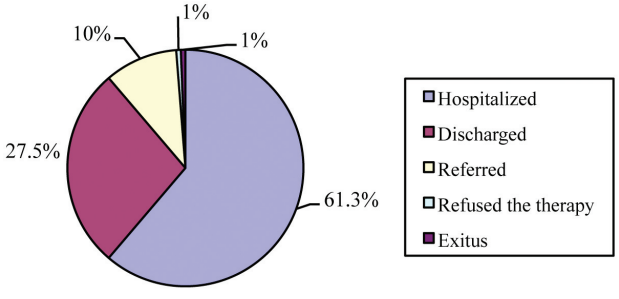

Figure 1. Outcomes of the patients.

ceived blood transfusion in the ED. The mean GBS score of the subjects that received blood transfusion was 12.10±2.65 versus 7.66±4.00 in the 54.4% that did not receive blood transfusion; when these two groups were compared, the subjects that received blood transfusion showed significantly higher mean GBS scores ($p<0.001$). Similarly, with an increasing number of blood transfusions, the increase observed in the GBS score became significant ($p<0.001$).

Given the hemodynamic conditions of the subjects, a significant difference was found between the subjects with a systolic blood pressure (SBP) ≥100 mmHg and those with a SBP <100 mmHg in terms of mean GBS scores ($p<0.001$). Similarly, a significant difference was found between the subjects with a pulse rate (PR) ≥100/min and the subjects with a PR <100/min in terms of mean GBS scores ($p<0.001$). The tilt test was positive in 27 subjects and negative in 133 subjects, and when mean GBS scores of the subjects with positive and negative tilt test results were compared, a statistically significant difference was found ($p<0.001$). While electrocardiogram (ECG) revealed ischemic findings in 26 subjects, it did not reveal ischemic findings in 134 subjects; when the mean GBS scores of the two groups were compared, no statistically significant difference was found ($p>0.05$).

While the most commonly used drugs that may account for the etiology in the study subjects were non-steroid anti-inflammatory drugs (NSAIDs), the use of other drugs is given in Figure 2. Only 11% of the subjects were positive for alcohol intake, and the mean GBS scores of these subjects were not found to be significantly different compared to mean GBS scores obtained in the subjects with no alcohol intake. While 26.3% of the subjects had no concomitant disease, 73.7% had a concomitant disease, among which hepatic diseases were the most common. Mean GBS scores were statistically significantly higher in the subjects with a concomitant disease compared to those without a concomitant disease ($p<0.001$). Similarly, mean GBS scores of the subjects with a hepatic disease and of those with heart failure were statistically significant compared to those without a concomitant disease ($p<0.001$ and $p<0.05$, respectively). However, when mean GBS scores were compared between the subjects with hepatic diseases and those with heart failure as a concomitant disease, no statistically significant difference was found ($p>0.05$).

According to the distribution frequency of the findings observed in the subjects, melena was the most common, followed by hematemesis. One hundred twenty-five subjects underwent nasogastric aspiration, and 48 subjects showed fresh blood in the nasogastric aspirate. While 115 subjects sho-

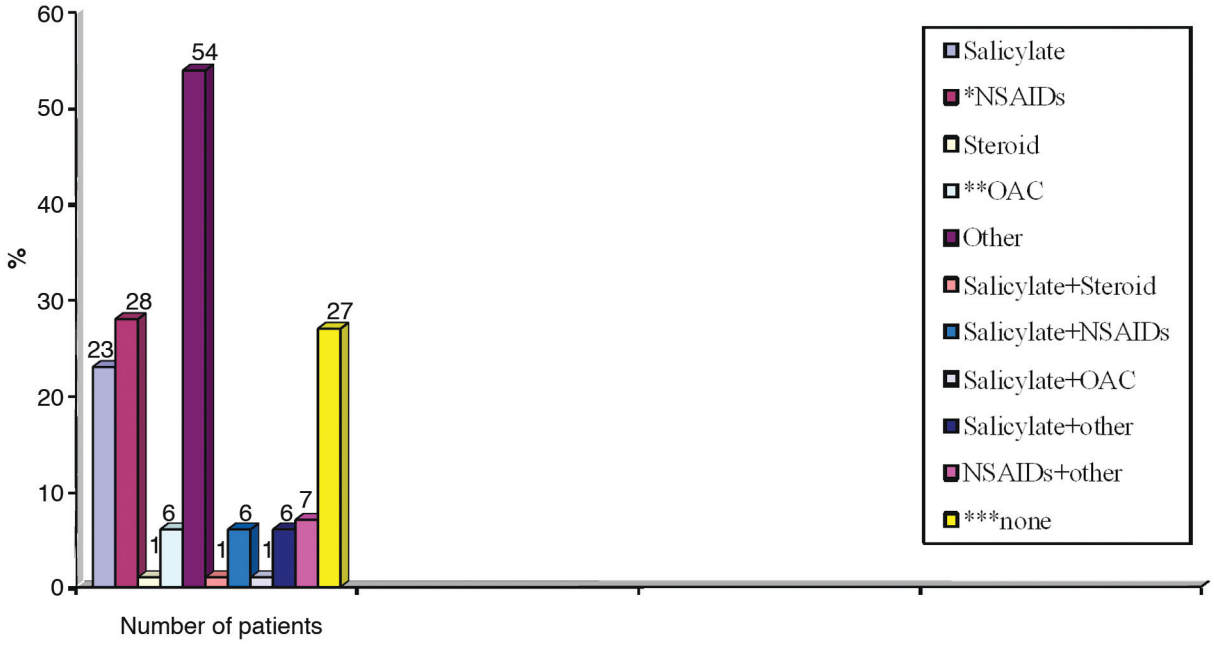

Figure 2. Distribution of the use of medications by the patients.

*NSAIDs: Non-steroid anti-inflammatory drug. **OAC: Oral anticoagulant. ***None: No drug usage.

wed melena in the rectal examination, 6 subjects showed hematochezia. When mean GBS scores were compared between the subjects that showed melena and hematochezia in the rectal examination versus those that showed normal results, a statistically significant difference was found (p<0.001).

Women and men were evaluated separately according to their Hb values. When mean GBS scores were compared between the subjects with Hb value <10 g/dl and those with Hb value ≥10 g/dl, a statistically significant difference was found (p<0.001). Clinical and laboratory characteristics of all the patients enrolled in the study are summarized in Table 2.

Finally, the subjects were classified in two groups, as low- and high-risk subjects, according to risk classification. While the subjects that were classified as high-risk subjects included those that received blood transfusion, required endoscopic or surgical intervention or died in the ED, the subjects that did not meet these criteria were classified as low-risk subjects. Accordingly, mean GBS scores were 7.1±3.8 for 71 low-risk subjects and 11.7±2.9 for 89 high-risk subjects, and the difference between the two groups was statistically significant (p<0.001). The mean age was 55.7±14.9 in the low-risk group and 59.3±15.8 in the high-risk group, and there was no statistically significant difference between the two groups (p>0.05). Similarly, there was no difference between the two groups in terms of the gender distribution (p>0.05). Figure 3 shows the distribution of mean GBS scores for high- and low-risk subjects, and Table 3 shows the distribution of endoscopic results obtained for the subjects in the high- and low-risk groups.

When the performance of the GBS system was evaluated in the determination of high risk, the sensitivity and specificity were 100% and 1.41%, respectively, for a cut-off value of GBS >0, 100% and 16.9% for a cut-off value of GBS >3, 96.63% and 36.62% for a cut-off value of GBS >5, and 86.52% and 69.01% for a cut-off value of GBS >8 (Table 4). In the ROC curve analysis, for GBS in the high-risk estimation, AUC was found to be 0.82 (95% confidence interval [CI]: 0.75-0.88) (Figure 4), and this value was statistically significant (p=0.0001).

DISCUSSION

Risk scoring systems are not used commonly in daily practice in the ED for the patients with UGI system bleeding, and the patients are evaluated

Table 2. Clinical and laboratory characteristics of the patients

Patient characteristics	Data (number or mean)
Mean age (year)	57.76±15.46
Gender	
Males	111
Females	49
Concomitant disease	
Hepatic disease	48
CHF	6
Other	64
Use of medication	
Aspirin	23
NSAIDs	28
OAC	6
Combined	22
Other	54
Symptom	
Hematemesis	43
Melena	74
Hematochezia	3
Syncope	2
Combined	38
Clinical results	
Systolic blood pressure <100 mmHg	26
Pulse rate >100/min	52
Tilt test (+)	27
Blood in NA (+)	48
Melena in RE (+)	115
Laboratory findings	
Hemoglobin <10 g/dl	93
Platelet <140,000	49
INR >1.3	48
Urea >90 mg/dl	43
Mean GBS	9.68±4.09
Number of blood transfusions	
>5	0
3-5	28
1-2	45
0	87
Variceal bleeding	49
Non-variceal bleeding	111
Endoscopic intervention	32
Consequence	
Discharged	44
Hospitalized	98
Referred	16
Refused the therapy	1
Exitus	1

CHF: Congestive heart failure. NSAID: Non-steroid anti-inflammatory drug. OAC: Oral anticoagulant. NA: Nasogastric aspiration. RE: Rectal examination.

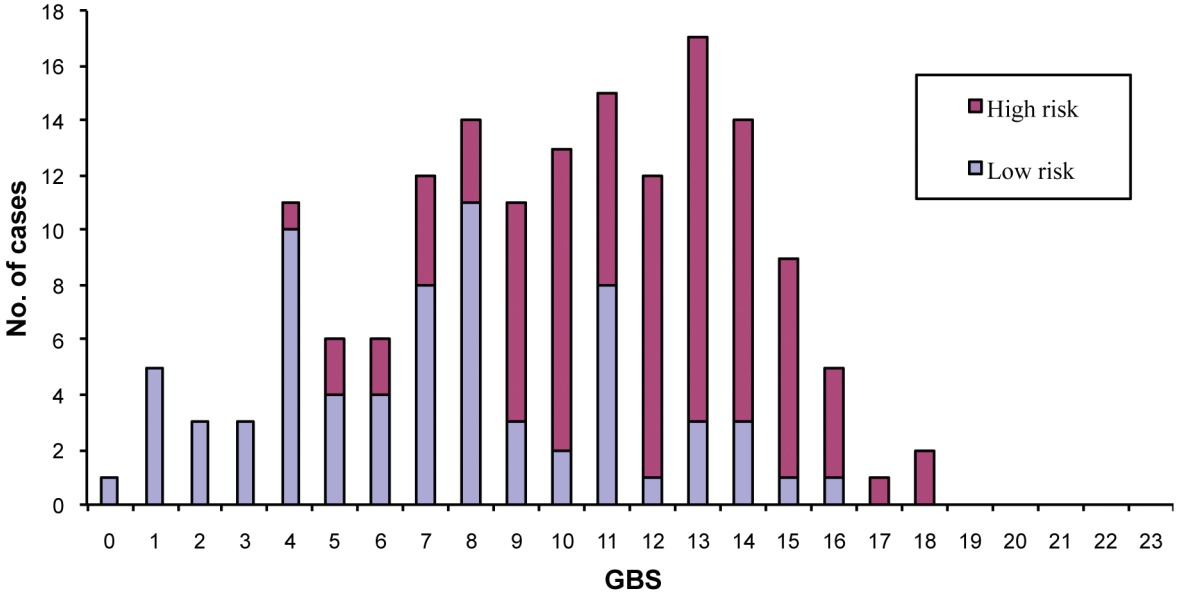

Figure 3. Number of low- and high-risk patients identified using GBS.

Table 3. Endoscopic results in the low- and high-risk groups of patients

Endoscopic results	Low-risk (n)	High-risk (n)
Varices	14 (8.8%)	23 (14.4%)
Ulcer (Gastric+Duodenal)	9 (4.6%)	15 (9.4%)
Malignancy	4 (2.5%)	6 (3.7%)
Esophagitis / Gastritis / Bulbitis	12 (6.5%)	13 (8%)
Esophagitis+Gastric ulcus+Duodenal erosion	5 (3.1%)	1 (0.6%)
Mallory Weiss tear	2 (1.3%)	5 (3.1%)
Normal	2 (1.3%)	1 (0.6%)
Endoscopy not performed	23 (14.4%)	25 (15.6%)
Total	**71 (44.4%)**	**89 (55.6%)**

mostly based on the clinical decision of the emergency physician. However, in patients with UGI system bleeding, more objective criteria are warranted for deciding discharge/hospitalization of the patient, the use of blood transfusion and the necessity of emergent endoscopy. In this regard, as GBS scores may be calculated easily based only on clinical and laboratory variables, this system seems to be suitable for use in the ED.

In the retrospective study performed by Chen et al. (12) in patients with non-variceal UGI system bleeding, GBS and Rockall scoring systems were compared, and the sensitivity of the GBS system in the differentiation of high-risk patients for a cut-off value of GBS >0 was found to be higher (99.6%). Similarly, in our prospective study, which included the patients with both variceal and non-variceal bleeding, the sensitivity of the GBS system was found to be high (100%) in the differentiation of high-risk patients for a cut-off value of GBS >3. In our study, the number of the subjects with UGI system bleeding with a GBS score ≤3 was 12/160 (7.5%) and, in this group of patients, none of the subjects that underwent endoscopy showed a serious pathology or required an intervention during the endoscopy. Thus, in our study, it was demonstrated that the patients with UGI system bleeding, who had a GBS score ≤3, did not require clinical and endoscopic intervention and could be safely discharged from the ED. While the retrospective study performed by Srirajaskanthan et al. (10) revealed a cut-off value of GBS ≤2 in the differentiation of low-risk patients among the patients with UGI system bleeding, other studies (2,7,12) used GBS=0 in the differentiation of the low-risk patients.

Table 4. Sensitivity and specificity for identifying high risk at various GBS cut-off values

Cut-off	Patient (%)	Accuracy (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
GBS >3	92.5	63	100.0	16.9	60.1	100.0
GBS >5	81.9	70	96.6	36.6	65.6	89.7
GBS >8	61.9	78	86.5	69.0	77.8	80.3

PPV: Positive predictive value. NPV: Negative predictive value.

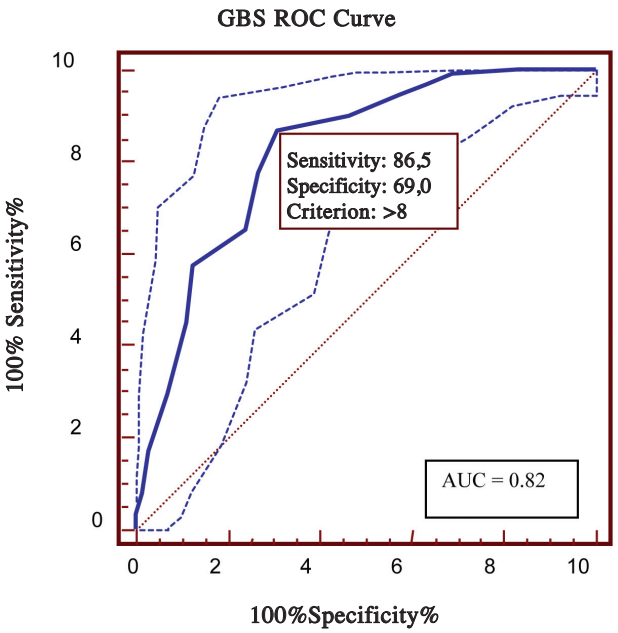

Figure 4. ROC curve GBS prediction of high risk.
AUC: Area under the curve.

An ideal scoring system should have both a good sensitivity and high specificity. However, in the studies conducted, the sensitivity and specificity of the GBS system vary among high-risk patients with UGI system bleeding (10,12,13). In our study, the sensitivity and specificity were 100% and 1.41% for a cut-off value of GBS >0, 100% and 16.9% for a cut-off value of GBS >3, 96.63% and 36.62% for a cut-off value of GBS >5, and 86.52% and 69.01% for a cut-off value of GBS >8. In the study performed by Chen et al. (12), positive predictive value (PPV) and negative predictive value (NPV) for GBS >0 were 75.2% and 96.4%, respectively. In the study conducted by Farooq et al. (13), PPV and NPV were 37% and 100%, respectively for GBS >0 and 42% and 82% for GBS >5. In our study, PPV and NPV were 56% and 100% for GBS >0 and 65.6% and 89.7% for GBS >5, respectively.

In the study performed by Hsu et al. (14) in cirrhotic patients with UGI system bleeding, six prognostic factors were determined: male gender, hepatocellular carcinoma, non-hepatocellular carcinoma, hypoxemia, serum bilirubin level, and PT. The investigators reported that these six clinical parameters might be easily obtained in the ED and be valuable in the early risk determination in cirrhotic patients with acute UGI system bleeding. For the model used in the aforementioned study, the sensitivity was 22.73% and the specificity was 99.8%. In our study, which did not enroll only cirrhotic patients with UGI system bleeding, but instead all patients with UGI system bleeding and in whom the GBS system was used, the sensitivity and the specificity were 86.52% and 69.0%, respectively, for GBS>8, and thereby, GBS seemed more sensitive.

Although in the literature, there has been no consensus on the best scoring system in various studies performed using the Rockall scoring system and/or the GBS system (3,10,12-17), the GBS system seems to be more useful, especially in patients with non-variceal UGI system bleeding. In our study, which included all the patients with variceal and non-variceal UGI system bleeding, we used the GBS system, and found it useful in the differentiation of high-risk patients.

The limitations of this study include the single-centered design, small number of patients, the fact that all the patients did not undergo an endoscopy, and the enrollment of the patients to the follow-up based only on their conclusions in the ED.

In light of the data obtained from this study, we can state that the patients with UGI system bleeding who have a GBS score ≤3 may be safely discharged from the ED and referred to the polyclinic to undergo an endoscopy.

In conclusion, GBS is a scoring system that allows calculation of the scores using only clinical and laboratory variables, without a need for endoscopy, and thereby, it can be easily used in the risk analysis of patients under emergency conditions. To support the results obtained from this study, future studies that contain more patients, are multi-centered, and that follow the patients after discharge from the ED are warranted.

Author's contributions: *O.K. contributed to the study design, writing of the manuscript and data analysis; G.O. and F.O. contributed to data collection; T.A. contributed to data analysis; and S.A. and E.A. contributed to the revision of the manuscript.*

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