Original Article

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Comparison of Glasgow Blatchford and New Risk Scores to Predict Outcomes in Patients with Acute Upper GI Bleeding

Akut Üst GIS Kanaması Olan Hastalarda Sonuçları Öngörmede Glasgow Blatchford ve Yeni Risk Skorlarının Karşılaştırılması

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ABSTRACT

Objective: Upper gastrointestinal (GI) bleeding constitutes a significant number of admissions to the emergency department, and it has high rates of morbidity and mortality. In this study, the contribution of new scores, such as The International Bleeding Risk Score (ABC score) and the Horibe GI bleeding prediction score (HARBINGER), to clinical practice was investigated. Using scores that are easy to calculate and memorable when used in the emergency department enables a more efficient use of medical resources. In addition, it may contribute to solving the problems regarding determining the need for intensive care in patients with upper GI bleeding.

Methods: This study was conducted retrospectively on patients over the age of 18 who were admitted to the emergency department between September 1, 2018 and August 31, 2019. The HARBINGER and ABC scores and the Glasgow Blatchford score (GBS) were calculated for each patient. Following that, the need for intensive care, mortality, re-bleeding rate, and transfusion need were compared.

Results: This study included 184 patients. When predicting the need for intensive care, the ABC score had a higher AUC value than the GBS and HARBINGER score, even when there was a low cut-off value (cut-off value >4). (AUC =0.944, specificity =0.74, sensitivity =0.83).

Conclusion: This study found that the ABC score could be used to predict the need for intensive care in upper GI bleeding, and

ÖZ

Amaç: Üst gastrointestinal (Gİ) kanaması acil servise başvuruların önemli bir kısmını oluşturur. Yüksek oranda morbidite ve mortaliteye sahiptir. Bu hastaların prognoz tahmini için birçok skor kullanılmaktadır. Bu skorların çoğu düşük riskli hastalar için kullanışlı görünmektedir ve yoğun bakım tahmini konusunda performanları zayıf bulunmuştur. Bu çalışmada ABC ve HARBINGER gibi yeni skorların klinik pratiğe olan katkısı araştırılmıştır. Acil serviste kolay hesaplanan ve akılda kalıcı bu skorları kullanmak tıbbi kaynakların daha verimli kullanımına olanak tanır. Ayrıca üst Gİ kanamalı hastalarda yoğun bakım ihtiyacının belirlenmesinde yaşanan sorunların çözümüne katkı sağlayabilir.

Yöntem: Bu çalışma 1 Eylül 2018 ile 31 Ağustos 2019 tarihleri arasında acil servise başvuran 18 yaş üstü hastalar üzerinden geriye dönük olarak yapıldı. Her hasta için HARBINGER ve ABC skorları ile Glasgow Blatchford skoru (GBS) hesaplandı. Ardından yoğun bakım ihtiyacı, mortalite, tekrar kanama ve transfüzyon ihtiyacı karşılaştırıldı.

Bulgular: Bu çalışmaya 184 hasta dahil edildi. Yoğun bakım ihtiyacı konusunda kesme değeri düşük olmasına rağmen (cut-off değeri >4) ABC skoru GBS ve HARBINGER skorundan daha yüksek bir AUC değerine sahipti. (AUC =0,944, özgüllük =0,74, duyarlılık =0,83).

Sonuç: Bu çalışma ile ABC skorunun üst GİS kanamalarında yoğun bakım ihtiyacını öngörmede kullanılabileceğini ve diğer skorlara göre daha iyi performans gösterdiğini bulduk. Ayrıca parametreleri

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that it outperformed other scores. Additionally, we concluded that the HARBINGER score, which had a "shock index" among its parameters, was not effective in predicting in-hospital adverse events.

Keywords: ABC score, HARBİNGER, Glasgow Blatchford score, intensive care

arasında "şok indeksi" bulunan HARBINGER skorunun hastane içi advers olayları öngörmede etkili olmadığı sonucuna vardık.

Anahtar Sözcükler: ABC skoru, HARBİNGER, Glasgow Blatchford skoru, yoğun bakım

Introduction

Upper gastrointestinal (GI) bleeding constitutes a significant number of admissions to the emergency department, and it has high rates of morbidity and mortality. Despite recent improvements regarding its management, the mortality rate remains at approximately 10% (1). Its estimated incidence is around 67-103/100,000 per year (1,2). Patients may present with chronic anemia because of the occult bleeding or hypovolemic shock due to the excessive bleeding (3). Therefore, the patients that need to be prioritized for emergency treatment must be determined. As the current guidelines recommend the use of prognostic risk scores in the management of upper GI bleeding (4), many risk scores have been developed. The most common scores include the Rockall score and the Glasgow Blatchford score (GBS). Although these scores have many positive aspects, their effectiveness is limited, especially in intensive care estimations. Moreover, many parameters must be calculated, and this is not memorable. For this reason, they are not used routinely in emergency services. It is important to use non-invasive, low-cost scores that can be evaluated alongside routine blood parameters to predict the bleeding severity and prognosis in non-varicose upper GI bleeding (5).

The Horibe GI bleeding prediction score (HARBINGER) has been recently developed, which is a simple score that can be easily calculated. This score comprises the following three parameters: not using proton pump inhibitors (PPIs) in the week before admission; the shock index and blood urea nitrogen/creatinine of <30. Although the ABC score has been recently developed, studies have shown that it performs better than the other scores in predicting mortality. In the ABC score, the age, blood test, and comorbidities of the patients are evaluated (Table 1) (6,7).

Although many risk scores have been developed regarding the evaluation of patients with GI bleeding, there is no widely accepted risk score in clinical practice. In this study, the contribution of new scores, such as ABC and HARBINGER, to clinical practice will be evaluated. Using scores that are easily calculated and memorable when used in the emergency department enables a more efficient use of medical resources. In addition, it may contribute to solving the problems regarding determining the need for intensive care in patients with upper GI bleeding.

Methods

This study was conducted retrospectively between September 1, 2018 and August 31, 2019 on patients over the age of 18 who were admitted to the emergency department. Information about the patients was obtained from emergency service forms and hospital records. The data were analyzed using the International Classification of Diseases-10 diagnostic codes. Patients with varicose bleeding, those who did not undergo an endoscopy, those who did not have upper GI bleeding revealed in an endoscopy, trauma patients, and patients with incomplete data were excluded from the study (Figure 1).

The patients' age, gender, chronic diseases, admission complaints, drug use (oral or intravenous PPI), symptoms (hematochezia, hematemesis, melena, syncope), vital findings, level of consciousness, rectal examination findings, laboratory results (renal function, coagulation, hemoglobin, hematocrit, thrombocyte, albumin), endoscopy findings, blood transfusion, re-bleeding incidence, duration of hospital stay, and outcomes were recorded.

The HARBINGER and ABC scores and the GBS were calculated separately for each patient. The score ranges were 0-3 points for the HARBINGER score, 0-18 points for the ABC score, and 0-29 points for the GBS. Hemodynamic instability that developed in the patients' follow-ups was accepted as re-bleeding. The transfusion need, re-bleeding, mortality, and intensive care follow-up were regarded as in-hospital adverse events. The receiver operator characteristics (ROC) curve analysis was used to find the cut-off values of the categorical variables based on numerical values.

Outcomes

The primary outcome was to predict the need for intensive care in patients with upper GI bleeding, as confirmed by an endoscopy. The secondary outcomes were to evaluate in-hospital adverse events, such as mortality, re-bleeding, and the need for blood transfusion.

Determination of Variables

The patients' clinical history, use of PPIs, and laboratory tests were evaluated, and their vital signs, shock index (heart rate, systolic blood pressure), and whether there was an altered mental state were documented.

Statistical Analysis

The behaviors of the quantitative variables were expressed using centralization and variance measures with the mean ± standard deviation. To show the behavioral differences between the group mean values, the ANOVA t-test was used when the normality and uniformity assumptions were met, and the Mann-Whitney U test (number of groups =2), which was a non-parametric method, was used for the remaining cases. The diagnostic performance of the parameters was assessed using an ROC analysis. A statistical significance was accepted when the two-sided p-value was lower than 0.05. The statistical analysis was performed using the MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2013). The area under the ROC curves (AUROCs) was calculated using 95% confidence intervals and compared based on the method described by Delong et al.

Missing Data

The prevalence and patterns of the missing data were evaluated and found to be randomly missing (Little's test: p=0.085>0.05). The missing data in the main cohort was handled by excluding these patients, who comprised 39% of the overall sample.

Ethical Approval

The approval with the number 2021/170 and date April 27, 2021 was obtained from the University Ethics Committee to allow the study to be conducted.

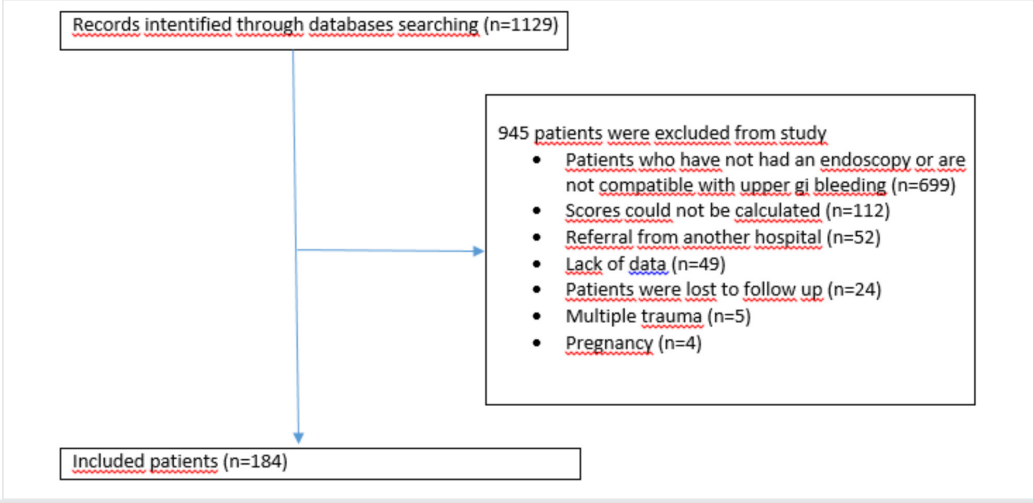

Figure 1. Flowchart of patient selection

Table 1. Characteristics of scoring systems

ABC score		GBS		HARBINGER	
Parameters	Point	Parameters	Point	Parameters	Point
Age Years	1 (60-74) 2 (>75)	Systolic BP mmHg	1 (100-109) 2 (90-99) 3 (<90)	Shock index	1 (≥1)
Urea mmol/L	1 (>10)	Urea mmol/L	2 (6.5-8) 3 (8-10) 4 (10-25) 6 (>25)	Urea/creatinine	1 (≥140)
Creatinine µmol/L	1 (100-150) 2 (>150)	Hemoglobin gr/dL	1 (12-12.9) 3 (10-11.9) 6 (<10)	PPI use (in a week)	1
Albumin	1 (<30 g/L)	Heart rate	1 (≥100)		
Mental status	2 (altered)	Syncope	2		
Cirrhosis	2	Hepatic disease	2		
Malignancy	4	Melena	1		
ASA	1 (score 1-3) 3 (score ≥4)	Cardiac failure	2		

ABC: The International Bleeding Risk Score, ASA: American Society of Anesthesiologists score, GBS: Glasgow-Blatchford score, HARBINGER: Horibe GI bleeding prediction score, Shock index: Heart rate/systolic blood pressure, PPI: Proton pump inhibitör

Results

Of the 184 patients included in the study, 61.4% were men (n=113), 38.6% were women (n=71), and the general mean age was 62.4±18.8 (21-91) years. The mean ages of the men and women were 58.3±17.8 years and 69.1±14.6 years, respectively (p=0.02). The patients' complaints at admission included dyspepsia and heartburn (n=80, 43.5%), abdominal pain (n=47, 25.5%), nausea/vomiting (n=45, 24.5%), dizziness (n=6, 3.3%), and syncope (n=6, 3.3%). The bleeding types were melena (n=132, 71.7%), hematemesis (n=29, 15.8%), hematothesis (n=18, 9.8%), and active bleeding and other (n=5, 2.7%). Out of the patients, 135 (73.4%) had no history of bleeding, and 61 patients (33.2%) were not using any medication. Forty-one (22.3%) patients were taking antiplatelet agents, 23 (12.5%) anticoagulants, 15 (8.2%) new generation anticoagulants, 10 (5.4%) non-steroidal anti-inflammatory drugs, and 34 other drugs (18.5%).

The chronic diseases of the patients were as follows: hypertension (n=76, 41.3%), diabetes mellitus (n=49, 26.6%), coronary artery disease (n=41, 22.3%), heart failure (n=21, 11.4%), renal disease (n=16, 8.7%), liver disease (n=16, 8.7%), malignancy (n=13, 7.1%), and cerebrovascular events (n=10, 5.4%). A change in consciousness was not detected in 166 of the patients (95.7%). The vital parameters and laboratory results of the patients at the time of admission are given in Table 2. The hemoglobin level was 9.26+1.88 g/dL, the hematocrit was 28.7%+5.76, and the mean corpuscular volume was 82.2+8.02 fL. Albumin levels were 2.35±0.489 g/dL in 21 patients during the intensive care follow-up, 3.42±0.597 g/dL in 163 patients outside the intensive care follow-up, and 3.31±0.675 g/dL in a total of 184 patients (Table 3). The rectal examination findings of the patients showed melena or hematochezia in 124 patients (67.4%). The number of patients who required transfusion was 98 (53.3%), and 15

Table 2. Vital signs and score averages

	Units	Mean ± SD	Median (IQR25-75)
Systolic blood pressure	mmHg	110.5±14.8	110 (100-115)
Diastolic blood pressure	mmHg	64.03±12.1	65 (56-73)
Respiratory rate	/min	10.4±9.6	18 (0-20)
Heart rate	Bpm	93.9±19.2	91 (80-107)
Hospitalization	Hour	103.2±136.7	72 (24-72)
Blood transfusion	Number	1.4±1.8	1 (0-2)
ABC	Score	3.8±2.5	3 (2-5)
GBS	Score	7.9±4.4	8 (4-11)
HARBINGER	Score	1.5±0.7	1 (1-2)

ABC: The International Bleeding Risk Score, GBS: Glasgow-Blatchford score, HARBINGER: Horibe GI bleeding prediction score

Table 3. Clinical characteristics and laboratory values of the study patients

	Units	Number (n)	Percent number (% n)
Sex	Male	113	61.4
	Female	71	38.6
		Mean ± SD	Median (IQR25-75)
Age	Years	62.4+18.8	66.5 (51-76)
WBC	10^3/µL	8.92+3.5	8.6 (6.12-11)
BUN	mg/dL	29.1+21.3	24.5 (17-32)
BUN/Cre	%	29+11.7	25 (19.2-36)
Creatinine	mg/dL	1.1+0.8	0.9 (0.7-1.5)
Prothrombin time	Sec.	15.7+2.2	15.2 (14.8-16.1)
INR	Ratio	1.7+2.2	1.2 (1.1-1.36)
LDH	U/L	202+68.7	184 (155-234.5)
Sodium	mmol/L	137.7+3.04	138 (155-234.5)
Potassium	mmol/L	4.17+0.4	4.1 (3.9-4.3)
Hemoglobin	g/dL	9.2+1.8	9.2 (8.2-10)
Hematocrit	%	28.7+5.7	29 (25.5-32.6)
MCV	fL	82.2+8	29 (25.5-32.6)
Platelet	10^3/µL	256.3+99.8	247 (204-305.5)
Albumin	g/dL	3.3+0.6	3.3 (2.9-3.8)

WBC: White blood cell, LDH: Lactate dehydrogenase, BCR: Blood urea nitrogen/creatinine ratio, INR: International Normalized Ratio, MCV: Mean corpuscular volüme, BUN: Blood urea nitrogen

patients had re-bleeding (8.2%). Eight people died in total, and the in-hospital mortality rate was 4.3%. The number of patients who were placed into intensive care was 21 (11.4%), and the total number of patients who were hospitalized was 148 (80.4%).

The mean ABC score was 3.8±2.5 (2-5), the mean GBS was 7.9±4.4 (4-11), and the mean HARBINGER score was 1.5±0.7 (1-2) (Table 3). The intensive care statistics for the scores are as follows: the ABC score (AUC =0.944, cut-off value >4, specificity (Spe) =0.74, sensitivity (Sen) =0.83), the GBS (AUC =0.789, cut-off value >11, Spe =0.82, Sen =0.66), and the HARBINGER score (AUC =0.511, cut-off value ≤2, Spe =0.11, Sen =0.95) (Figure 2). The mortality statistics for the scores are as follows: the ABC score (AUC =0.951, cut-off value >5, Spe =0.79, Sen =0.100), the GBS (AUC =0.781, cut-off value >12, Spe =0.87, Sen =0.75), and the HARBINGER score (AUC =0.633, cut-off >1, Spe =0.52, Sen =0.75) (Figure 3). The median value of the scores, AUC, cut-off value, and the Spe and Sen values in terms of the need for transfusion and re-bleeding are shown in Figures 4 and 5 (Table 4).

Discussion

This study found that the ABC score could be used to predict the need for intensive care in upper GI bleeding, and it outperformed other scores. The scores that are used in upper GI bleeding are generally used to identify low-risk patients. However, there is a need to develop tools that can correctly classify high-risk patients because the clinical evaluation process for potential high-risk patients is important. In previous studies, this process was managed by "good care overall" in only 44% of the patients. The first approach toward patient management is to evaluate the severity of the bleeding. Systemic arterial hypotension often develops in patients with severe bleeding, especially in massive bleeding, in which 20-25% of the intravascular volume is lost and the patient goes into hypovolemic shock (8,9). One of the most common causes of hypovolemic shock is GI bleeding (10). The use of the shock index (heart rate/systolic blood pressure) could be considered a predictor of hypovolemia in predicting the prognosis of these patients because the shock index is a sensitive blood loss

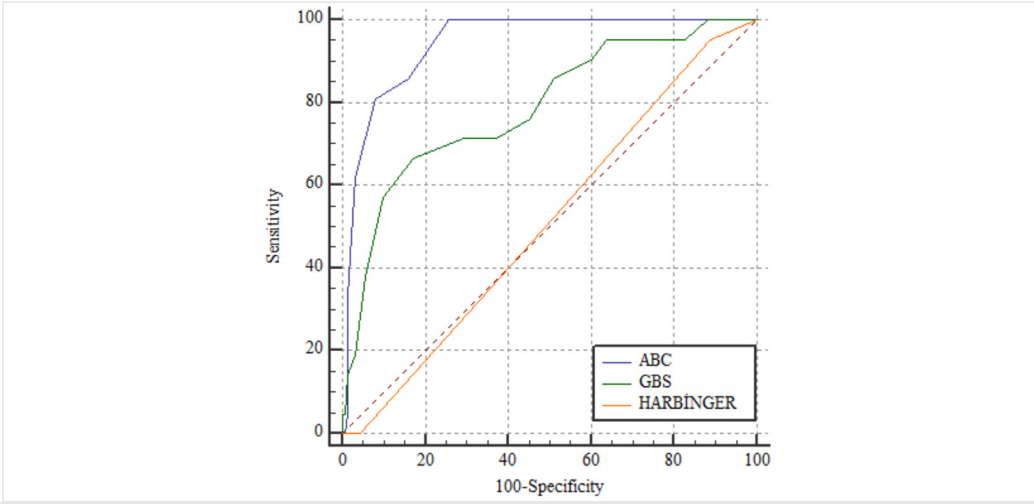

Figure 2. Prediction of intensive care

ABC: The International Bleeding Risk Score, GBS: Glasgow-Blatchford score, HARBINGER: Horibe GI bleeding prediction score

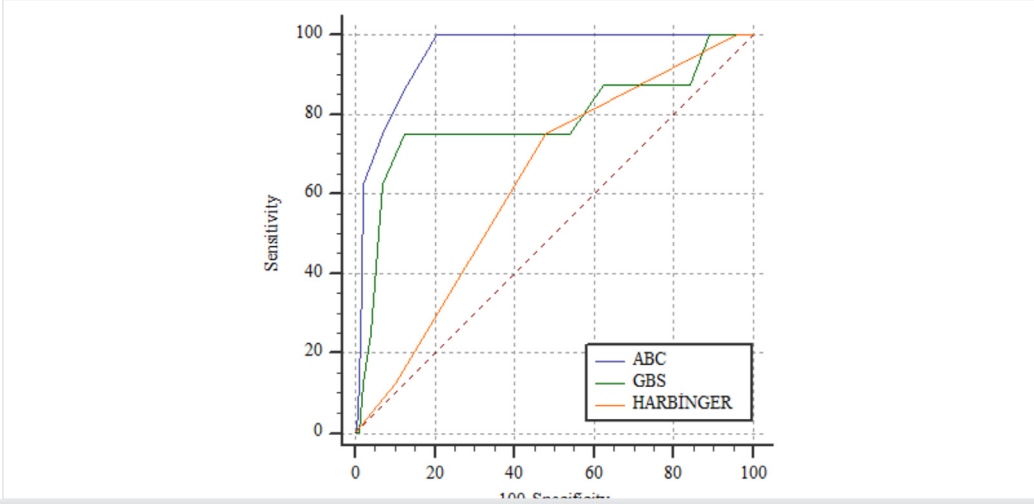

Figure 3. Prediction of mortality

ABC: The International Bleeding Risk Score, GBS: Glasgow-Blatchford score, HARBINGER: Horibe GI bleeding prediction score

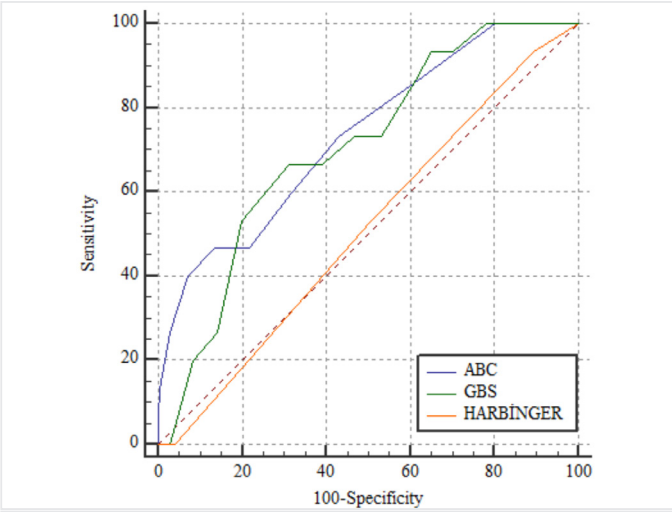

Figure 4. Prediction of re-bleeding

ABC: The International Bleeding Risk Score, GBS: Glasgow-Blatchford score, HARBINGER: Horibe GI bleeding prediction score

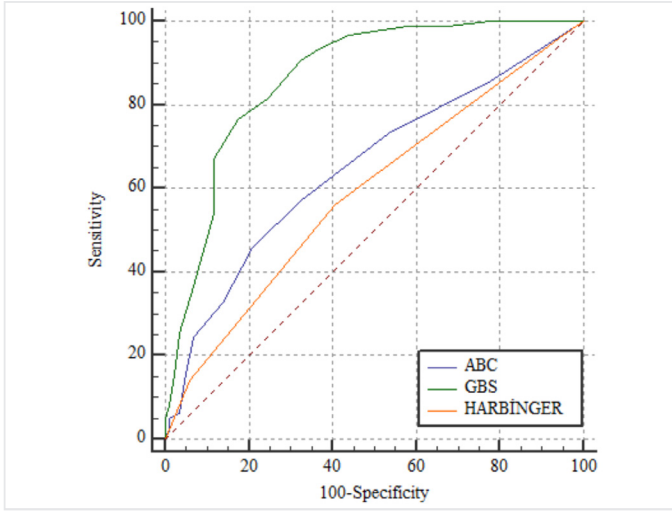

Figure 5. Prediction of need for transfusion

ABC: The International Bleeding Risk Score, GBS: Glasgow-Blatchford score, HARBINGER: Horibe GI bleeding prediction score

Table 4. ROC values of all risk scores for prediction of clinical outcomes

		ABC	GBS	HARBINGER	p[1]	p[2]	p[3]
Mortality	AUC	0.951	0.781	0.633	0.103	<0.001	0.109
	p[4]	<0.001	0.009	0.138			
	Cut-off	>5	>12	>1			
	Sensivitiy (95% CI)	100 63.1-100	75 34.9-96.8	75 34.9-96.8			
	Specificity (95% CI)	79.5 72.8-85.2	87.5 81.7-92	52.2 44.6-59.8			
Intensive care	AUC	0.944	0.789	0.511	0.005	<0.001	<0.001
	p[4]	<0.001	<0.001	0.863			
	Cut-off	>4	>11	<2			
	Sensivitiy (95% CI)	100 83.9-100	66.6 43-85.4	95.2 76.2-99.9			
	Specificity (95% CI)	74.23 66.8-80.8	82.8 76.1-88.3	11.04 6.7-16.9			
Re-bleeding	AUC	0.733	0.704	0.510	0.698	0.013	0.014
	p[4]	<0.001	0.001	0.073			
	Cut-off	>6	>10	<0			
	Sensivitiy (95% CI)	46.6 21.3-73.4	66.6 38.4-88.2	0 0-21.8			
	Specificity (95% CI)	86.3 80.3-91.2	68.6 61.1-75.5	95.8 91.7-98.3			
Need for transfusion	AUC	0.651	0.867	0.591	<0.001	0.271	<0.001
	p[4]	<0.001	<0.001	0.029			
	Cut-off	>4	>8	>1			
	Sensivitiy (95% CI)	45.92 35.8-56.3	76.5 66.9-84.5	56.1 45.7-66.1			
	Specificity (95% CI)	79.07 69-87.1	82.56 72.9-89.9	59.3 48.2-69.8			

[1]Between ABC and GBS, [2]Between ABC and HARBINGER, [3]Between GBS and HARBINGER (Comparison of AUC), [4]Significance of AUC, AUC: Area Under The Curve

indicator that is obtained by dividing the heart rate by the systolic blood pressure. Moreover, it is the most important parameter of the HARBINGER score. Some studies have shown that the shock index is not clinically useful in predicting outcomes in upper GI bleeding (1,11), as it can only predict short-term negative results (12). In a study conducted by Horibe et al. (13), it was concluded that this score performed well in low-risk patients. This study showed that the shock index was not effective in predicting in-hospital adverse events in patients with upper GI bleeding using the HARBINGER score. It was found to be behind both the ABC score and the GBS in predicting the need for intensive care (AUC <0.511) (p<0.001).This can be due to the fact that patients with upper GI bleeding are often elderly people who suffer from chronic diseases (14). The mean age in our study was 62.4+18.8 years, which was similar to other studies. Moreover, 66.8% of the patients were taking medication to manage their chronic diseases. In similar studies, the most common chronic disease was hypertension, and in our study, it was present in 41.3% of the patients (15). Antihypertensives are known to mask the pulse and blood pressure (16,17), which affects the shock index, and therefore, the results. It is worth noting that the GBS and the HARBINGER score include hemodynamic parameters, such as heart rate and blood pressure.

Although age is not used as a parameter in either score, many studies have shown that an advanced age increases the length of stay in the intensive care unit and the risk of mortality (18). In the ABC score, age is evaluated over two points. In our study, while the cut-off value of the ABC score was >4 in predicting the need for intensive care, the AUC was 0.944. Moreover, while the same values had a cut-off value of >11 in the GBS, the AUC was 0.789, and there was a statistically significant difference between them (p=0.005). The cut-off value of the newly used ABC score in terms of the need for intensive care was previously not specified in any study. Compared to the GBS, higher AUC values, even at lower cut-off values, show how effective the ABC score is in predicting the need for intensive care.

One important parameter of the ABC score is albumin. One of the main causes of hypoalbuminemia is an increased blood loss from the GI tract (19). One of the physiological effects of albumin is the regulation of colloid osmotic pressure (20). Studies have reported that low serum albumin levels, which are common in critically ill patients, are associated with worse results (20,21). In this study, the mean albumin level of the patients in the intensive care group was 2.35±0.489 g/dL. In a meta-analysis, hypoalbuminemia was found as a prognostic biomarker (19).

Another important parameter in the ABC score is the American Society of Anesthesiologists score (ASA) classification, which evaluates patients according to their "physical health status" (22). It is valuable for showing how additional diseases are reflected in the prognosis. The absence of a chronic disease inquiry in the HARBINGER score may be the reason for the failure of this score to predict in-hospital adverse events. Upper GI bleeding, which mostly affects patients with chronic diseases and elderly patients, may present with hypovolemic shock. This situation, which concerns many systems, cannot be evaluated using a few blood parameters. The doctor's opinion of the patient is important. From this perspective, the ASA classification is a subjective system that allows the doctor to objectively evaluate the patient.

The ABC score may be more successful because it enables a subjective assessment. The ABC score and GBS were found to be effective in predicting mortality in upper GI bleeding and did not have a statistically significant difference. However, the ABC score had a higher AUC score (0.951) at a lower cut-off value (>5), whereas the HARBINGER score did not have a significant AUC level in terms of predicting mortality. The ABC score and the GBS were effective in predicting re-bleeding in terms of values under the curve, and there was no statistically significant difference between them (p=0.698). The GBS was the best predictor of the need for a blood transfusion and had a higher AUC (0.867) area (p1<0.001). In terms of in-hospital adverse events, the HARBINGER score was only effective in predicting blood transfusion (AUC =0.591 and p^4<0.05).

Stufy Limitations

The variability of the parameters among the scores makes one-on-one comparisons of the scoring systems difficult. Comparing scores with few parameters to scores with many parameters is not a fair comparison. Additionally, conducting the study retrospectively in a single center is a limitation. Patients who have hemorrhagic shock require emergency treatment faster because they are noticed earlier. Knowing which patients should be prioritized would provide us with more reliable information about the shock index.

Conclusion

This study found that the ABC score could be used to predict the need for intensive care in upper GI bleeding, and it performed better than the other scores. In addition, we concluded that using the shock index in the HARBINGER was not effective in terms of predicting in-hospital adverse events.

Ethics

Ethics Committee Approval: The approval with the number 2021/170 and date April 27, 2021 was obtained from the University Ethics Committee to allow the study to be conducted.

Informed Consent: Obtained.

Peer-review: Externally peer reviewed.

Authorship Contributions

Concept: B.D., E.B.K., S.Ö., A.A., E.S., Design: B.D., E.B.K., S.Ö., A.A., E.S., Data Collection or Processing: B.D., E.B.K., S.Ö., A.A., E.S., Analysis or Interpretation: B.D., E.B.K., S.Ö., A.A., E.S., Literature Search: B.D., E.B.K., S.Ö., A.A., E.S., Writing: B.D., E.B.K., S.Ö., A.A., E.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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