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Evaluation of the shock index and different scores in predicting the mortality in upper gastrointestinal bleeding

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Abstract

The upper gastrointestinal bleeding (UGIB) is one of the most common causes of the adult emergency admissions. In the UGIB, scoring systems are used to predict the need for clinical intervention or provide insight into prognosis. In this study, we investigated the potential of the shock index to predict 30 day-mortality in comparison with GBS, Rockall Score and AIMS65 score.

Material and methods: This is a retrospective and single-center study conducted in the emergency department. The study included the patients, who admitted to the emergency service due to GIS bleeding complaints, with confirmed diagnosis of upper bleeding, who had endoscopy. The data of the admissions between 01.01.2016 and 01.01.2020 have been used.

Results: There were a total of 141 patients with upper gastrointestinal bleeding. The number of women was 34 (24.1%) and man was 107 (75.9%). The median value of the shock index was 1.6 (1.5 to 1.8). Glasgow Blatchford score median value was 8.0 (6.0 to 11.0). Rockall score median value was 4.0 (2.0 to 5.0). The area under the curve of the receiver operating characteristic curve (AUC ROC) values of Glasgow Blatchford and Rockall score were 0.63, 0.79 (respectively) for short-term mortality.

Conclusion: We have found that the shock index failed to predict short-term mortality in patients with UGIB. Until more powerful new scoring systems are developed, the Glagow Blatchford and Rockall scoring systems are effective for UGIB patients.

Key words: Glasgow Blatchford bleeding score, Rockall score, AIMS65 score, shock index

Introduction

The upper gastrointestinal bleeding (UGIB) refers to the intraluminal bleeding between the upper esophageal sphincter and Treitz's ligament of proximal duodenum. It was reported to be responsible for 85% of upper GI bleeding and to have an annual incidence of approximately 67/100.000 [1]. Common causes of UGIB are peptic ulcer (55-74%), esophageal varices (5-14%), mallory-weis tears (2-7%), tumors (2-5%) and other malformations like arteriovenous (2-3%) [2]. Peptic ulcer disease including gastric, duodenal, esophageal and stomach ulcers is among the most common causes for the UGIB [3]. Acute upper gastrointestinal (GI) bleeding is one of the most common causes of the adult emergency admissions. Mainly, endoscopic and angiographic methods are used in diagnosis and treatment. It has high mortality rate [4]. This rate is 8% in patients below 60 years of age, while it is 13% in patients above 60 years of age. The admission and clinical course of the patients with upper gastrointestinal bleeding include various stages from a sub-clinical asymptomatic bleeding to abundant bleeding, from chronic anemia to acute hypovolemic shock. During the evaluation, the medical history search, physical examination, diagnosis and treatment options should be initiated concurrently, and according to the clinical data, the patient should be resuscitated and stabilized [5,6].

In the UGIB evaluation, scoring systems are used to predict the need for clinical intervention or provide insight into prognosis. The most commonly used scoring systems are Glasgow Blatchford Bleeding Score (GBS) and Rockall Score [7]. GBS is a scoring system applied by using the basic clinical and laboratory variables without use of any endoscopic data. It is evaluated to predict the need for clinical intervention [8]. Rockall score has pre-

endoscopic and endoscopic components and was developed to provide insight into mortality [9]. On the other hand, AIMS65 scoring system was developed to determine the prognosis of the patients with UGIB. Compared to the other scores, AIMS65 has the advantage of being simple to apply in case of an emergency [10,11].

The Shock Index was developed to predict blood transfusion and prognosis in the patients with trauma. Past studies have demonstrated that Shock Index predicted the need for endoscopic intervention [12]. It was suggested to include pre-shock index in the pre-endoscopic scoring systems [13].

In this study, we investigated the potential of the shock index to predict 30 day-mortality in comparison with GBS, Rockall Score and AIMS65 score.

Material and methods

This is a retrospective and single-center study conducted in the emergency department of the University of Health Sciences, İstanbul Şişli Hamidiye Etfal Training and Research Hospital. The data of the admissions between 01.01.2016 and 01.01.2020 have been used. Approval was taken from the Ethics Committee of the Hospital (no 191-02/12/2020).

Table 1 Rockall risk scoring system

Parameters	Score
A. Age	
≥ 80	2
60-79	1
< 60	0
B. Shock	
Hypotension, systolic blood pressure <100 mmHg	2
Tachycardia, systolic blood pressure ≥ 100 mmHg and heart rate > 100/min.	1
No shock, systolic blood pressure ≥ 100 mmHg and heart rate < 100/min.	0
C. Comorbid Disease	
Kidney failure, liver failure, common malignity	3
Cardiac failure, ischemic heart disease, other major comorbid disease	2
No major comorbid disease	0
D. Endoscopic Diagnosis	
Upper gastrointestinal cancer	2
All the other diagnoses	1
No lesion, no new bleeding finding, Mallory-Weiss lesion	0
E. Major New Bleeding Finding	
Upper gastrointestinal system bleeding, adherent clot, visibly or gushingly bleeding vein	2
Normal or only dark point lesion	0
Pre-endoscopy score: A+B+C. Total score: A+B+C+D+E. Minimum score: 0 Maximum score: 11	

Table 2 Glasgow-Blatchford scoring

Parameters	Score
A. Blood urea nitrogen(mg/dL)	
≥ 70	6
≥28- < 70	4
≥22,4- < 28	3
≥18,2- < 22,4	2
<18,2	0
B. Hemoglobin (g/dL)	
< 10 g/dL in male and female	6
10- < 12 male, only	3
10- < 12 female, 12- <13 male	1
≥ 12 female, ≥13 male	0
C. Systolic Blood Pressure (mmHg)	
<90	3
90-99	2
100-109	1
≥ 110	0
D. Other markers	
Cardiac failure	2
Liver disease	2
Presentation with Syncope	2
Presentation with Melena	1
Heart rate ≥ 100/min.	1
Total score: A+B+C+D Minimum score: 0 Maximum score: 23	

Table 3 AIMS65 scoring system

Risk factor	Score
Albumin<3.0 mg/dL	1
INR > 1.5	1
Mental status change	1
Systolik blood pressure < 90 mmHg	1
Age > 65	1
Minimum score:0 Maximum score:5	

The study included the patients, who admitted to the emergency service due to UGIB bleeding complaints, with confirmed diagnosis of upper bleeding, who had endoscopy. The patients who are below 18 years of age, pregnant, have lower upper GI bleeding and incomplete data were excluded.

The admission complaints, demographic characteristics, comorbid diseases, laboratory values of the patients, drugs used by them, their vital parameters and endoscopy results were searched through the hospital's electronic patient recording system. Based on the data obtained, shock index (heart rate divided by systolic blood pressure), Rockall (Table 1), Glasgow Blatchford (Table 2) and AIMS65 (Table 3) Scores were calculated. 30-day mortality results were taken from the hospital's electronic information system or national death notification system.

Table 4 Baseline characteristics of the enrolled patients and their comparison between the survivor and non-survivor groups

Variables	Total n = 145	Survivor n = 99 (70%)	Non-Survivor n = 42 (30%)	P
Age (25th-75th percentiles)	56.0 (41.0 to71.0)	49.0 (34.5 to 65.5)	69.5 (57.5 to 81.8)	0.001
Gender				
Female (%)	34 (24.1)	21 (21.2)	13 (31.0)	0.307
Male (%)	107 (75.9)	78 (78.8)	29 (69.0)	
Symptoms				
Syncope (%)	5 (3.5)	2 (2.0)	3 (7.1)	0.314
Hematemesis (%)	31 (22.0)	16 (16.2)	15 (35.7)	0.019
Hematochezia (%)	3 (2.1)	2 (2.0)	1 (2.4)	1.000
Melena (%)	83 (58.9)	63 (63.6)	20 (47.6)	0.114
Other (%)	17 (12.1)	15 (15.2)	2 (4.8)	0.147
Comorbidities				
History of gastrointestinal bleeding (%)	9 (6.4)	5 (5.1)	4 (9.5)	0.537
Heart disease (%)	7 (5.0)	4 (4.0)	3 (7.1)	0.725
Malignancy (%)	3 (2.1)	2 (2.0)	1 (2.4)	1.000
Cirrhosis (%)	22 (15.6)	10 (10.1)	12 (28.6)	0.012
Hypertension (%)	28 (19.9)	17 (17.2)	11 (26.2)	0.319
Chronic obstructive pulmonary disease (%)	12 (8.5)	10 (10.1)	2 (4.8)	0.478
Diabetes mellitus (%)	22 (15.6)	13 (13.1)	9 (21.4)	0.323
Vital parameters				
Systolic blood pressure (mm/hg) (25th to 75th percentiles)	110.0 (95.0 to 120.0)	110.0 (99.5 to 120.0)	106.5 (90.2 to 121.5)	0.517
Diastolic blood pressure (mm/hg) (25th to 75th percentiles)	69.0 (60.0 to 80.0)	70.0 (60.0 to 80.0)	63.5 (53.2 to 75.2)	0.29
Pulse rate	91.0 (81.0 to 99.0)	88.0 (81.0 to 96.0)	92.5 (81.2 to 100.0)	0.279
Mean arterial pressure (mm/hg) (25th to 75th percentiles)	82.7 (70.0 to 91.7)	83.0 (73.3 to 90.8)	77.3 (67.4 to 92.5)	0.311
Laboratory parameters				
International Normalized Ratio (25th to 75th percentiles)	1.1 (1.1 to 1.3)	1.1 (1.0 to 1.2)	1.2 (1.1 to 1.4)	0.001
Hemoglobin (g/dL) (25th to 75th percentiles)	9.1 (7.6 to 11.0)	9.2 (8.0 to 11.0)	8.1 (7.2 to 9.8)	0.039
Albumin (g/dL) (25th to 75th percentiles)	3.3 (3.0 to 3.8)	3.5 (3.1 to 3.8)	3.0 (2.4 to 3.4)	0.001
Scores				
Glasgow-Blatchford Scoring (25th to 75th percentiles)	8.0 (6.0 to 11.0)	8.0 (4.5 to 9.5)	9.0 (6.2 to 12.8)	0.013
Rockall Scoring system (25th to 75th percentiles)	4.0 (2.0 to 5.0)	3.0 (1.5 to 4.0)	5.0 (5.0 to 6.8)	0.001
Aims65 Scoring system (25th to 75th percentiles)	1 (1.0 to 2.0)	1 (1.0 to 3.0)	1 (1.0 to 2.0)	0.829
Shock Index (25th to 75th percentiles)	1.6 (1.5 to 1.8)	1.6 (1.5 to 1.8)	1.6 (1.5 to 1.9)	0.551

Table 5 The area under the receiver operating characteristic curve values

Scores	Cut-off point	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	AUC
Rockall Scoring System	5	78.57%	75.76%	57.89%	89.29%	0.79
Glasgow-Blatchford Scoring	11	40.48%	80.81%	47.22%	76.19%	0.63
Aıms65 Scoring system	2	92.93%	14.29%	71.88%	46.15%	0.49
Shock index	1.6	49.49%	54.76%	72.06%	31.51%	0.47

Abbreviation; AUC: area under the curve; PPV: positive predictive value; NPV: negative predictive value.

In the statistical analysis, SPSS 22.0 for Windows program was used. Distribution of data was analyzed by Shapiro-Wilk test. Descriptive statistics using numbers and percentages were used for the categorical data. The mean, standard deviation, median were used for the numerical variables. Since they do not meet the normal distribution requirement, the Numerical variables were compared to Mann Whitney U Test. The parametric test requirement was not fulfilled between the numerical variables. Spearman Correlation Analysis was performed. Cut off value was investigated by receiver operating characteristic curve (ROC) Analysis. Statistical alpha significance level was accepted as $p<0,05$.

Results

Total 184 patients were evaluated in the study. 43 patients were excluded due to insufficient data. The final study included 141 patients. Among the patients, 24.1% were female and 75.9% were male. The mean age of the patients was 56 (41.0 to 71.0). In our study cohort, mortality was 30%. The bleeding causes of the patients in our study were due to varicose causes in 8 (5.6%) patients and non-varicose causes (peptic ulcer 113 (80.1 %), tumors 18 (12.7 %), mallory-weis tears 2 (1.4 %)) in 133 patients.

The most common comorbidity was hypertension with the rate of 19.9%. It was followed by diabetes mellitus (15.6%) and liver cirrhosis (15.6%). There was no significant difference

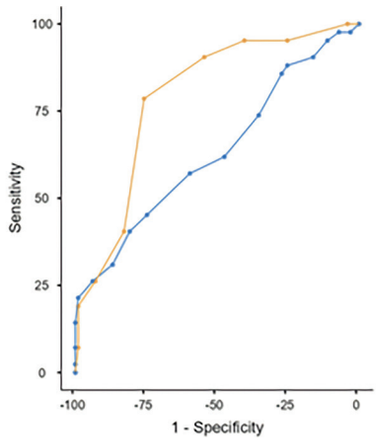

Figure 1 - The receiver operating characteristic curve of Glasgow Blatchford and Rockall

between the groups in comorbid diseases. In admissions, the most common symptom was observed to be melena with the rate of 58.9%. The second most common symptom was hematemesis (22.0%). Melena also did not cause a significant difference between the groups, but the hematemesis ratio was significantly higher in the survivor group (35.7%) (p= 0.019). Among the vital parameters, the systolic blood pressure median value was 110.0 mm/hg (95.0-120.0). Albumin (g/dL) values were significantly lower in the non-survivor group with 3.0 g/dL (2.4 to 3.4) (p=0.001). Glasgow Blatchford score median value was 8.0 (6.0 to 11.0). It was significantly higher in the non-survivor group with 9.0 (6.2 to 12.8) p= 0.013. Rockall score median value was 4.0 (2.0 to 5.0). It was 5.0 (5.0 to 6.8) in the non-survivor group, which was statistically significant (p=0.001). AIMS65 score median value was 1 (1.0-2.0). No significant difference was observed between the groups. Shock index median value was 1.6 (1.5 to 1.8) and it caused no significant difference between the groups (p=0.551). Baseline characteristics of the enrolled patients and their comparison between the survivor and non-survivor groups are presented in Table 4. The area under the curve of the receiver operating characteristic curve (AUC ROC) values of Glasgow Blatchford and Rockall score were 0.63, 0.79 (respectively) for short term mortality. The maximum Cut-off point of Glasgow Blatchford score in predicting prognosis was 11 points. The maximum Cut-off point of Rockall score in predicting prognosis was 5 and it had a sensitivity of 78.57%, 75.76% specificity, a positive predictive value of 57.89% and negative predictive value of 89.29% (Table 5).

Discussion

In our study, we investigated 145 patients who admitted to emergency department due to upper GI bleeding complaints, diagnosed with UGIB and had endoscopy. The relation between the short-term mortality and Glasgow Blatchford, Rockall, AIMS65 scores, shock index of the patients was investigated. Glasgow Blatchford and Rockall scores have significantly predicted the short-term mortality of the patients. No significant relation was observed between AIMS65, shock index and the short-term mortality of the patients.

The risk of mortality and recurrent bleeding is high in the UGIB [14]. Early diagnosis and triage of the patients increase the care effectivity and help the clinicians in taking the outcome decision (referring to service, taking into intensive care unit or discharge from emergency department) Besides, it is indicative for early discharge of low-risk patients and safe outpatient treatment. Any scoring to be used in the emergency department should be easily calculated and predict, with high accuracy, the result desired to be predicted or exclude it [15].

Glasgow-Blatchford score was provided in 1997 upon evaluation of the Scotch population. It is commonly used for the UGIB and has been validated by many studies. It uses medical history of the patient, Vital parameters and hemoglobin results [16]. It is not based on the endoscopy result. In a study carried out on 3012 patients, Stanlet at el reported that Glasgow Blatchford score has high accuracy in predicting hospital intervention and survey [17]. In our study, GBS significantly predicted mortality. GBS scores the patient's laboratory parameter and comorbid diseases. This is an advantage of this score because comorbid diseases are one of the most important factors that affect prognosis in the UGIB. The comorbid diseases are known to adversely affect tissue oxygenation, wound healing and coagulation mechanism [18]. The majority of deaths in patients over 60 years of age occur in those with serious comorbid diseases such as serious heart disease, cancer, kidney failure. Another important factor for monitoring, prognosis and treatment management of the patients who admitted due to UGIB symptoms is the hemoglobin value obtained from the tests during the first admission of the patient [19]. The severity of the bleeding, pre-bleeding anemia and prolongation of hospital admission have effect on the admission hemoglobin level [20]. Since GBS scores the hemoglobin value that has effect on comorbid diseases and mortality, we suggest to use it in the patients with UGIB.

RS is commonly used in scoring the patients with upper GI bleeding. RS needs endoscopic data for calculation [21]. This is a disadvantage of this score. Taslıdere et al suggested quick SOFA scoring instead of RS since RS predicts the patient's survey, but there is no endoscopy intervention in some emergency departments [22]. In our study, we detected that RS significantly predicted short term mortality. Considering the necessity of endoscopy results in calculation of the score, we note that this makes it difficult to use this score in emergency departments.

Shock index is a good indicator of the fluid loss and left ventricular dysfunction [23]. It is recommended in critical patient monitoring. Saffouri et al reported that Shock Index had low accuracy in predicting the AUC ROC value, post UGIB major clinical end points compared to the existing pre-endoscopy scores. They concluded that Shock Index was not clinically useful in predicting the results in UGIB [13]. In our study, shock index failed to predict survey of the patients as well. We believe that this is associated with the partially good heart rate and systolic blood pressure results, which are among the vital parameters, of the patients during admission. In the upper GI bleeding admissions, the most common complaint is melena. Since the patients immediately admitted to hospital after occurrence of melena, many patients have vitals intact at the time of admission. Since the change in vitals will occur not at the time of admission, but after continuity of bleeding for some time, we believe that the shock index and mean arterial pressure (MAP) at the time of admission will not predict mortality with sufficient accuracy.

AIMS65 was developed to predict the hospitalization time, survey, and cost for the patients with acute UGIB. It is based on the age of the patient, the systolic blood pressure, mental status and laboratory data [24]. Various studies have shown that AIMS65 predicts the mortality in UGIB. However, in our study, it did not achieve this. This may be associated with the fact that at the time of admission, the blood parameters such as INR and albumin and the systolic blood pressure values did not change to an extent to predict the mortality.

In our study, we detected the mortality rate as (n=42) 29.8%. Despite the developments in medical and endoscopic

treatments, the mortality rate in UGIB is 5-15%. The mortality rate was reported as 1.8% in a study carried out by Bryant et al, as 4.8% in a study conducted by Stanley et al, while Dicu et al reported the mortality rate as 18.7% in a study they carried out [25–27]. In our study, we calculated the mortality rate higher than those in the studies of Bryant et al, Stanley et al and Dicu et al. The high mortality rate may be associated with the fact that our patient group had a low hemoglobin level according to literature studies [28]. This patient group represents the group that has high value in scoring of upper GI bleeding and is predicted to have higher mortality compared to the other groups. Moreover, we believe that the other factor that affect this result is the analysis of a smaller number of patients than the other studies [25–27].

Limitation

The limitation of our study is that it is a retrospective, single-center study and the number of the patients included in the study is low. One of the reasons of this is that the albumin test request calculated under AIMS65 score is not among the routine tests requested in the emergency department. The second disadvantage is that our patient cohort consisted of the patients that had endoscopy. This patient group is known to have high mortality in upper GI bleeding. Additionally, our patients had a high rate of comorbid diseases. In our opinion, we concluded mortality rates higher than those in the literature for this reason.

Conclusion

In our study, we found that the shock index and AIMS65 failed to predict short-term mortality in patients with UGIB. Until new scoring systems that are more useful are developed, the Glagow Blatchford and Rockall scoring systems are effective for UGIB patients.

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References

1. Lanas A, Dumonceau J-M, Hunt RH, Fujishiro M, Scheiman JM, Gralnek IM, et al. Non-variceal upper gastrointestinal bleeding. *Nat Rev Dis Primers*. 2018;4:18020. https://doi.org/10.1038/nrdp.2018.20
2. Lee EW, Laberge JM. Differential Diagnosis of Gastrointestinal Bleeding. *Techniques in Vascular and Interventional Radiology* 2004;7:112–22. https://doi.org/10.1053/j.tvir.2004.12.001
3. Hajiagha Mohammadi AA, Reza Azizi M. Prognostic factors in patients with active non-variceal upper gastrointestinal bleeding. *Arab Journal of Gastroenterology.* 2019;20:23–7. https://doi.org/10.1016/j.ajg.2019.01.001
4. Stolow E, Moreau C, Sayana H, Patel S. Management of Non-Variceal Upper GI Bleeding in the Geriatric Population: An Update. *Curr Gastroenterol Rep*. 2021;23:5. https://doi.org/10.1007/s11894-021-00805-6
5. Kim JS, Kim B-W, Kim DH, Park CH, Lee H, Joo MK, et al. Guidelines for Non-variceal Upper Gastrointestinal Bleeding.. *Korean J Gastroenterol*. 2020;75:322–32. https://doi.org/10.4166/kjg.2020.75.6.322
6. Erten M, Sevîmlî H, Algin A, Özdemîr S, Eroğlu SE, Akça HŞ. A Rare Cause of Gastrointestinal Hemorrhage: Secondary Aortoenteric Fistula. *Abantmedj*. 2020;9:65–8. https://doi.org/10.47493/abantmedj.2020.12
7. Lakatos L, Gonczi L, Lontai L, Izbeki F, Patai A, Racz I, et al. Incidence, Predictive Factors, Clinical Characteristics and Outcome of Non-variceal Upper Gastrointestinal Bleeding - A Prospective Population-based Study from Hungary. *J Gastrointestin Liver Dis.* 2021;30:327–33. https://doi.org/10.15403/jgld-3495
8. Wilkins T, Wheeler B, Carpenter M. Upper Gastrointestinal Bleeding in Adults: Evaluation and Management. *Afp*. 2020;101:294–300.
9. Custovic N, Husic-Selimovic A, Srsen N, Prohic D. Comparison of Glasgow-Blatchford Score and Rockall Score in Patients with Upper Gastrointestinal Bleeding. *Med Arch*. 2020;74:270–4. https://doi.org/10.5455/medarh.2020.74.270-274
10. Ak R, Hökenek NM. Comparison of AIMS65 and Glasgow Blatchford scores in predicting mortality in patients with upper gastrointestinal bleeding. *Rev Assoc Med Bras.* 2021;67:766–70. https://doi.org/10.1590/1806-9282.20210580
11. Yönak H, Özdemîr S, Kokulu K, Akça Hş, Islam Mm, Algin A, et al. Are AIMS65 and glasgow-blatchford scores useful in predicting health costs in patients admitted to emergency department with acute upper gastrointestinal bleeding: a prospective and observational study. *JECM*. 2021;38:326–30. https://doi.org/10.52142/omujecm.38.3.23
12. Horibe M, Kaneko T, Yokogawa N, Yokota T, Okawa O, Nakatani Y, et al. A simple scoring system to assess the need for an endoscopic intervention in suspected upper gastrointestinal bleeding: A prospective cohort study. *Dig Liver Dis*. 2016;48:1180–6. https://doi.org/10.1016/j.dld.2016.07.009
13. Saffouri E, Blackwell C, Laursen SB, Laine L, Dalton HR, Ngu J, et al. The Shock Index is not accurate at predicting outcomes in patients with upper gastrointestinal bleeding. *Aliment Pharmacol Ther*. 2020;51:253–60. https://doi.org/10.1111/apt.15541
14. 14. Chiu PWY. Second look endoscopy in acute non-variceal upper gastrointestinal bleeding. *Best Pract Res Clin Gastroenterol*. 2013;27:905–11. https://doi.org/10.1016/j.bpg.2013.09.009
15. Bein T, Taeger K. Score systems in emergency medicine. *Anasthesiol Intensivmed Notfallmed Schmerzther*. 1993;28:222–7. https://doi.org/10.1055/s-2007-998911
16. Barkun AN, Almadi M, Kuipers EJ, Laine L, Sung J, Tse F, et al. Management of Nonvariceal Upper Gastrointestinal Bleeding: Guideline Recommendations From the International Consensus Group. *Ann Intern Med.* 2019;171:805–22. https://doi.org/10.7326/M19-1795
17. Stanley AJ, Laine L, Dalton HR, Ngu JH, Schultz M, Abazi R, et al. Comparison of risk scoring systems for patients presenting with upper gastrointestinal bleeding: international multicentre prospective study. *BMJ*. 2017;356:i6432. https://doi.org/10.1136/bmj.i6432
18. Eming SA, Hammerschmidt M, Krieg T, Roers A. Interrelation of immunity and tissue repair or regeneration. *Semin Cell Dev Biol.* 2009;20:517–27. https://doi.org/10.1016/j.semcdb.2009.04.009

19. Shrestha UK, Sapkota S. Etiology and Adverse Outcome Predictors of Upper Gastrointestinal Bleeding in 589 Patients in Nepal. *Dig Dis Sci.* 2014;59:814–22. https://doi.org/10.1007/s10620-013-2946-9
20. Marmo R, Soncini M, de Franchis R, GISED – Gruppo Italiano per lo Studio dell'Emorragia Digestiva. Patient's performance status should dictate transfusion strategy in nonvariceal acute upper gastrointestinal bleeding NV-AUGIB.: A prospective multicenter cohort study: Transfusion strategy in NV-AUGIB. *Dig Liver Dis.* 2020;52:1156–63. https://doi.org/10.1016/j.dld.2020.07.018
21. Wang C-Y, Qin J, Wang J, Sun C-Y, Cao T, Zhu D-D. Rockall score in predicting outcomes of elderly patients with acute upper gastrointestinal bleeding. *World J Gastroenterol*. 2013;19:3466–72. https://doi.org/10.3748/wjg.v19.i22.3466
22. Taslidere B, Sonmez E, Özcan AB, Mehmetaj L, Keskin EB, Gulen B. Comparison of the quick SOFA score with Glasgow-Blatchford and Rockall scores in predicting severity in patients with upper gastrointestinal bleeding. *Am J Emerg Med.* 2021;45:29–36. https://doi.org/10.1016/j.ajem.2021.02.016
23. Ushida T, Kotani T, Imai K, Nakano-Kobayashi T, Nakamura N, Moriyama Y, et al. Shock Index and Postpartum Hemorrhage in Vaginal Deliveries: A Multicenter Retrospective Study. *Shock.* 2021;55:332–7. https://doi.org/10.1097/SHK.0000000000001634
24. Oakland K. Risk stratification in upper and upper and lower GI bleeding: Which scores should we use? *Best Pract Res Clin Gastroenterol.* 2019;42–43:101613. https://doi.org/10.1016/j.bpg.2019.04.006
25. Dicu D, Pop F, Ionescu D, Dicu T. Comparison of risk scoring systems in predicting clinical outcome at upper gastrointestinal bleeding patients in an emergency unit. *Am J Emerg Med*. 2013;31:94–9. https://doi.org/10.1016/j.ajem.2012.06.009
26. Stanley AJ, Dalton HR, Blatchford O, Ashley D, Mowat C, Cahill A, et al. Multicentre comparison of the Glasgow Blatchford and Rockall Scores in the prediction of clinical end-points after upper gastrointestinal haemorrhage. *Aliment Pharmacol Ther.* 2011;34:470–5. https://doi.org/10.1111/j.1365-2036.2011.04747.x
27. Bryant RV, Kuo P, Williamson K, Yam C, Schoeman MN, Holloway RH, et al. Performance of the Glasgow-Blatchford score in predicting clinical outcomes and intervention in hospitalized patients with upper GI bleeding. *Gastrointest Endosc*. 2013;78:576–83. https://doi.org/10.1016/j.gie.2013.05.003
28. Sasaki Y, Abe T, Kawamura N, Keitoku T, Shibata I, Ohno S, et al. Prediction of the need for emergency endoscopic treatment for upper gastrointestinal bleeding and new score model: a retrospective study. *BMC Gastroenterol.* 2022;22:337. https://doi.org/10.1186/s12876-022-02413-8