Comparison of three risk scores to predict outcomes in upper gastrointestinal bleeding; modifying Glasgow-Blatchford with albumin

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Introduction. Management of upper gastrointestinal bleeding (UGIB) is of great importance. In this way, we aimed to evaluate the performance of three well known scoring systems of AIMS65, Glasgow-Blatchford Score (GBS) and Full Rockall Score (FRS) in predicting adverse outcomes in patients with UGIB as well as their ability in identifying low risk patients for outpatient management. We also aimed to assess whether changing albumin cutoff in AIMS65 and addition of albumin to GBS add predictive value to these scores.

Methods. This was a retrospective study on adult patients who were admitted to Razi hospital (Rasht, Iran) with diagnosis of upper gastrointestinal bleeding between March 21, 2013 and March 21, 2017. Patients who didn't undergo endoscopy or had incomplete medical data were excluded. Initially, we calculated three score systems of AIMS65, GBS and FRS for each patient by using initial Vital signs and lab data. Secondary, we modified AIMS65 and GBS by changing albumin threshold from <3.5 to <3.0 in AIMS65 and addition of albumin to GBS, respectively. Primary outcomes were defined as in hospital mortality, 30-day rebleeding, need for blood transfusion and endoscopic therapy. Secondary outcome was defined as composition of primary outcomes excluding need for blood transfusion. We used AUROC to assess predictive accuracy of risk scores in primary and secondary outcomes. For albumin-GBS model, the AUROC was only calculated for predicting mortality and secondary outcome. The negative predictive value for AIMS65, GBS and modified AIMS65 was then calculated.

Result. Of 563 patients, 3% died in hospital, 69.4% needed blood transfusion, 13.1% needed endoscopic therapy and 3% had 30-day rebleeding. The leading cause of UGIB was erosive disease. In predicting composite of adverse outcomes all scores had statistically significant accuracy with highest AUROC for albumin-GBS. However, in predicting in hospital mortality, only albumin-GBS, modified AIMS65 and AIMS65 had acceptable accuracy. Interestingly, albumin, alone, had higher predictive accuracy than other original risk scores. None of the four scores could predict 30-day rebleeding accurately; on the contrary, their accuracy in predicting need for blood transfusion was high enough. The negative predictive value for GBS was 96.6% in score of ≤ 2 and 85.7% and 90.2% in score of zero in AIMS65 and modified AIMS65, respectively.

Conclusion. Neither of risk scores was highly accurate as a prognostic factor in our population; however, modified AIMS65 and albumin-GBS may be optimal choice in evaluating risk of mortality and general assessment. In identifying patient for safe discharge, $GBS \leq 2$ seemed to be advisable choice.

Key words: upper gastrointestinal bleeding, scoring systems, risk assessment, Glasgow-Blatchford, Rockall, AIMS65, albumin.

INTRODUCTION

Upper gastrointestinal bleeding (UGIB) is considered as one of the most common emergency condition with more than 300,000 hospital admissions per year in the United States and mortality rates between 2% and 15% [1]. Despite the advances in the management and endoscopic therapy strategies, rate of mortality has not significantly improved [2].

Correspondingly, recent studies have found some risk factors independently predicting adverse

outcomes. These risk factors include: history of peptic ulcer [3], increase in BUN [4], hemodynamic instability, lower serum sodium, hemoglobin and platelet count [5, 6], combination of tumor and NSAIDs, liver cirrhosis and coagulopathy [7, 8], higher serum bilirubin, creatinine [9], lactate [10, 11] and lower serum albumin [12].

Conspicuously, the presence of numerous risk factors as well as the fact that patients with UGIB are often initially managed by junior doctors, necessitate the development of validated risk scoring

systems [2]. Therefore, multiple systems have been designed and recommended by international guidelines [13]. The most well-known systems are Rockall Score, Glasgow-Blatchford Score and recently developed system called AIMS65 [14]. Each of these systems was first designed to predict specific outcome. GBS was primarily developed to predict requirement for clinical intervention; while Rockall and AIMS65 were designed to predict mortality [1, 15, 16].

Following the introduction of these systems, numerous studies have been conducted to validate them [2] and the discrepancy in results led to the idea that variation in geographical region and health care system affects the accuracy of risk scores [17–19]. Although, many guidelines suggest that low risk patients can be managed as outpatient, In our hospital all patients with UGIB undergo endoscopy and the timing is mostly within the first 24 hours of admission [14, 20]. In this study our primary object was to compare AIMS65, Glasgow-Blatchford Score (GBS) and Full Rockall Score (FRS) to find out whether they have acceptable accuracy in our hospital and to find the best pre endoscopy score for identifying low risk patients.

Relatively, modifying these scoring systems by adding risk factors that independently predict adverse outcomes, have been investigated in several studies [10, 11]. As mentioned earlier, hypoalbuminemia is considered to be a risk factor for more adverse outcome [12]; However an optimal cut off for maximizing the predictive ability of albumin seems to be different in studies [21–23]. In this way, our second objective was to investigate whether changing albumin threshold from <3 to <3.5 can increase the accuracy of AIMS65 or not.

Moreover, since GBS is the preferred scoring system in predicting the need for clinical intervention [20, 24–26], our third objective was to assess whether addition of albumin to this system can increase its predictive accuracy in predicting mortality or not.

MATERIAL AND METHODS

Data collection

This was a retrospective study on patients who were admitted to Razi teaching hospital (Rasht, Iran) with diagnosis of UGIB between March 21, 2013 and March 21, 2017. Diagnosis of gastrointestinal

bleeding was made on presentation of hematemesis and melena confirmed by upper endoscopy. Patients were either admitted to emergency ward or referred to gastrointestinal ward from other hospitals or other wards of Razi hospital. Exclusion criteria were as follows: (1) age under 18; (2) patients who didn't undergo endoscopy; (3) didn't have sufficient lab data for at least one scoring system. Data required for three scoring systems of AIMS65, GBS and FRS were collected and are as follows: age, sex, altered mental state, systolic blood pressure, pulse rate, INR, albumin, hemoglobin, BUN, presence of syncope, melena and comorbidity, inpatient mortality, length of hospitalization, need for blood transfusion, endoscopic therapy and findings of first endoscopy. For patients who were admitted more than one time we obtained data of first admission of the study period. The study protocol was confirmed by the ethic institute of student research committee, Faculty of Medicine, Guilan University of Medical Science.

Measurement and outcomes

We calculated AIMS65, GBS and FRS for each patient. Criteria's of each scoring system are summarized in Table 1. We divided patients to high and low risk groups according to the cut off point that maximized the sum of sensitivity and specificity in inpatient mortality. As the next step, we compared primary outcomes and mean of hospital length of stay within high risk and low risk groups. Primary Outcomes were defined as follows: (1) inpatient mortality, related or nonrelated to UGIB; (2) rebleeding defined as any hemorrhage in gastrointestinal system occurred during 30 days after admission; (3) need for receiving blood transfusion; (4) endoscopic therapy defined as any intervention to stop bleeding or prevent rebleeding. Secondary outcome was defined as Composite of adverse outcomes excluding need for blood transfusion.

As the next step, we changed albumin threshold for AIMS65 from <3 to <3.5 and named it "modified AIMS65" to see whether its negative predictive value in identifying low risk patients and its accuracy in predicting inpatient mortality and adverse outcome is higher than original AIMS65 or not. The negative predictive value was then calculated for GBS in score of 0, 1, 2 and for AIMS65 and modified AIMS65 in score of 0.

Table 1

AIMS65 Score, Glasgow-Blatchford Score, Full Rockall Score

AIMS65					
Risk factor		Score			
Albumin < 3.0 g/DL		1			
INR > 1.5		1			
Altered mental status		1			
SBP < 90 mm Hg		1			
Age > 65 years		1			
Glasgow-Blatchford Score					
Risk facto		Score			
	1	2	3	4	5
Blood urea nitrogen, mg/DL	≥18.2 to <22.4		≥22.4 to <28	≥28 to <70	≥70
Hemoglobin, men, g/Dl	≥12 to <13		≥10 to <12		<10
Hemoglobin, women, g/Dl	≥10 to <12		<10		
SBP, mm Hg	100–109		90–99	<90	
Other markers	Heart rate ≥ 100 bpm, Melena		Syncope, Hepatic disease, Heart failure		
Full Rockall Score					
Risk factor		Score			
	0	1	2	3	
Age, year	<60		60–70	≥80	
Shock	No shock: SBP≥100, Pulse<100		Tachycardia:SBP≥100, Pulse≥100	Hypotension :SBP<100	
Comorbidity	No major comorbidity		Cardiac failure, IHD, any major comorbidity		Renal failure, Liver failure, Disseminated malignancy
Diagnosis	Mallory-Weiss tear, No lesion identified and No SRH		All other diagnoses	Malignancy of upper GI tract	
Major SRH	None or dark spot only		Blood in upper GI tract, adherent clot, visible or spurting vessel		

Using the area under the receiver-operating characteristic curve (AUROC), the accuracy of AIMS65, GBS, FRS and modified AIMS65 in predicting inpatient mortality, rebleeding, need for blood transfusion, endoscopic therapy and composite of adverse outcomes was then calculated.

Further, we evaluated the accuracy of albumin in predicting inpatient mortality independently and developed a combined model of albumin and GBS and assessed its accuracy in predicting mortality and composite of adverse outcomes.

predictive accuracy of each score and albumin in inpatient mortality, rebleeding, need for blood transfusion and endoscopic therapy. Binary regression analysis was used to develop the combined model of albumin-GBS. Negative predictive value was calculated using the standard formula. The Mann-Whitney U test was used for analysis of non-parametrical data.

RESULTS

Statistical analysis

All data were analyzed using IBM SPSS, Version 24.0. (Armonk, NY: IBM Corp.). CHI Square test was used to compare primary outcomes within high risk and low risk group for AIMS65, GBS and FRS. For comparing mean of hospital length of stay among high risk and low risk group, the T-test was used. AUROC was used to calculate

Patient characteristic

Of 810 patients who underwent endoscopy and diagnosed with UGIB, 563 patients offered sufficient data and were included in the study. The mean age was 60.53 ± 18.62 (range of 18 to 94). 61.3% of patients were male. The leading cause of UGIB was erosive disease (38.4%) (Table 2). Patient characteristics are shown in Table 3.

Table 2

Endoscopic findings

Etiology of upper GI bleeding	
Erosive disease	216 [38.4]
Peptic ulcer	211 [37.5]
Malignancy of upper GI	39 [6.9]
Varices	19 [3.4]
No lesion identified	71 [12.6]
Other	7 [1.2]

Data are presented as number [%].

Table 3

Patient characteristics

Characteristic	Value
Age, year	60.53 ± 18.62
Sex	
Male	345 [61.3]
Female	218 [38.7]
Comorbidity	
Disseminated malignancy	15 [2.6]
Malignancy of upper GI	11 [1.9]
Liver failure	15 [2.6]
Renal failure	18 [3.1]
Heart failure	29 [5.1]
Other cardiac disease[e.g. Ischemic heart disease]	91 [16.1]
Other renal disease	9 [1.5]
Other	13 [2.3]
Laboratory variables	
INR	1.28 ± 1.05
Albumin	3.54 ± 0.61
BUN	33.38 ± 26.04
Hemoglobin	8.92 ± 2.84
Clinical variables	
Systolic blood pressure	114.43 ± 21.44
Pulse Rate	84.50 ± 27.53
Altered mental status	21 [3.7]
Melena	408 [72.4]
Syncope	4 [0.7]
Outcome	
Inpatient mortality	17 [3]
30-day Rebleeding	17 [3]
Hospital length of stay, day	5.99 ± 3.96
Blood transfusion requirement	391 [69.4]
Endoscopic intervention	74 [13.1]
Time to endoscopy, day	1.47 ± 1.93

Data are presented as mean±SD or number [%].

Inpatient mortality

The overall inpatient mortality was 3%. In predicting inpatient mortality, albumin-GBS, modified AIMS65 and AIMS65 had enough accuracy with AUROC of 0.75, 0.72 and 0.67, respectively ($p < 0.05$). GBS and FRS acted poorly with AUROC of 0.58 ($p > 0.05$) (Figure 1). The cutoff point that maximized the sum of sensitivity and specificity was 2 for AIMS65 (sensitivity, 47.1; specificity, 79.5), 8 for GBS (sensitivity, 76.5;

specificity, 39.7) and 6 for FRS (sensitivity, 29.4; specificity, 91). Comparing inpatient mortality in high risk and low risk group within AIMS65, GBS and FRS, high risk group had higher mortality rate; however, this difference wasn't significant in GBS. (AIMS65 : (6.66% vs 2.03%, $p = 0.008$), FRS : (9.25% vs 2.35%, $p = 0.005$), GBS : (3.8% vs 1.8%, $p = 0.178$)) (Table 4). No patient had inpatient mortality in GBS ≤ 2 and FRS = 0; while mortality rate was 1.29% and 0.5% in score of 0 in AIMS65 and modified AIMS65, respectively.

Figure 1. Receiver-operating characteristic curves (AUROCs) for the AIMS65, GBS, FRS, Modified AIMS65 and albumin-GBS in predicting in-hospital mortality, need for transfusion, endoscopic therapy, 30-day rebleeding and Composite of adverse outcome. For albumin-GBS, the AUROC is only calculated for predicting in-hospital mortality and composite of adverse outcome.

Table 4

Comparison of outcomes within high risk and low risk group

	High risk [%]	Low risk [%]	P value
Inpatient mortality			
AIMS65	6.6	2.03	0.008
GBS	3.8	1.8	0.178
FRS	9.25	2.35	0.005
Blood transfusion requirement			
AIMS65	90.00	63.88	0.0001
GBS	77.77	56.56	0.0001
FRS	87.03	67.58	0.003
Endoscopic intervention			
AIMS65	22.5	10.6	0.001
GBS	15.78	9.04	0.021
FRS	24.07	11.98	0.012
30-day rebleeding			
AIMS65	0.35	3.38	0.329
GBS	3.21	2.71	0.734
FRS	1.85	3.14	0.598
Mean of length of hospital stay, day			
AIMS65	6.87 ± 3.94	5.75 ± 3.94	0.006
GBS	6.30 ± 3.99	5.51 ± 3.87	0.02
FRS	5.88 ± 3.88	7.04 ± 4.56	0.04

Cut off point that maximized the sum of sensitivity and specificity in inpatient mortality is used to classify patients in to high risk and low risk group. Patients are considered to be in low risk group for each score if they fall below the cut off point or in the high risk group.

Serum albumin as a predictor for mortality

Using albumin as an independent risk factor, the AUROC for predicting mortality was 0.74. Addition albumin to GBS increased its predictive accuracy from 0.58 to 0.75 (Figure 1). Patient with inpatient mortality had lower mean of albumin comparing to survival group (3.0 Vs 3.5 $P < 0.0001$). 41.17% of non-survival group had albumin ranging between 3 to 3.5. Of this, 85.71% of patients were considered as low risk group according to AIMS65. Changing albumin threshold from 3 to 3.5 in AIMS65 increased its predictive accuracy from 0.67 to 0.72.

Predicting rebleeding, need for blood transfusion or for endoscopic therapy

Remarkably, 69.4% of patients needed blood transfusion. All scores had significant predictive accuracy for predicting need for blood transfusion with AUROC of 0.70 for modified AIMS65, 0.67 for AIMS65 and GBS and 0.65 for FRS. ($P < 0.0001$). For predicting need for endoscopic therapy modified AIMS65, GBS and FRS had enough accuracy with AUROC of 0.59, 0.58 and 0.58, respectively; but AIMS65 didn't have statistically significant accuracy (AUROC = 0.56 $p > 0.05$). In predicting rebleeding,

modified AIMS65, FRS, AIMS65 and GBS had predictive accuracy of 0.53, 0.51, 0.49, and 0.48, respectively. Neither of them was statistically significant (Table 5).

Composite of adverse outcomes

Correspondingly, 17.4% of patients suffered from at least one component of adverse outcomes including mortality, rebleeding and need for endoscopic therapy. Using AUROC to predict composite of adverse outcome, albumin-GBS, modified AIMS65, AIMS65, FRS and GBS had predictive accuracy of 0.66, 0.60, 0.57, 0.57, 0.56, respectively (Table 5). The negative predictive value for GBS in score of 0 was 100% and up to 96.6% in score ≤ 2 . AIMS65 and modified AIMS65 had negative predictive value of 85.7% and 90.2%, respectively.

Hospital length of stay

Mean of hospital length of stay was higher in high risk group comparing to low risk group in AIMS65 (6.87 ± 3.94 Vs 5.75 ± 3.94 , $P = 0.006$), Glasgow Blatchford (6.30 ± 3.99 Vs 5.51 ± 3.87 $p = 0.02$) and Full Rockall (5.88 ± 3.88 Vs 7.04 ± 4.56 , $P = 0.04$).

Table 5
Accuracy of scoring systems for predicting outcomes

AUROC [95% CI] p-value		
Inpatient mortality		
AIMS65	0.675 [0.545–0.806]	0.014
GBS	0.588 [0.454–0.721]	0.217
FRS	0.588 [0.446–0.730]	0.215
Modified AIMS65	0.722 [0.614–0.830]	0.002
Albumin-GBS	0.758 [0.670–0.846]	<0.0001
Blood transfusion requirement		
AIMS65	0.674 [0.628–0.721]	<0.0001
GBS	0.671 [0.622–0.721]	<0.0001
FRS	0.654 [0.605–0.704]	<0.0001
Modified AIMS65	0.707 [0.662–0.752]	<0.0001
Endoscopic intervention		
AIMS65	0.562 [0.487–0.637]	0.087
GBS	0.582 [0.516–0.647]	0.023
FRS	0.586 [0.515–0.657]	0.017
Modified AIMS65	0.594 [0.527–0.661]	0.009
30-day rebleeding		
AIMS65	0.491 [0.369–0.614]	0.904
GBS	0.481 [0.366–0.596]	0.791
FRS	0.513 [0.387–0.638]	0.858
Modified AIMS65	0.538 [0.410–0.667]	0.589
Composite of adverse outcome		
AIMS65	0.571 [0.507–0.634]	0.028
GBS	0.565 [0.507–0.624]	0.041
FRS	0.579 [0.517–0.641]	0.014
Modified AIMS65	0.604 [0.545–0.663]	0.001
Albumin-GBS	0.661 [0.604–0.718]	<0.0001

GBS, Glasgow-Blatchford Score; FRS, Full Rockall Score. Pvalue of <0.05 indicates statistical significance of the tests.

Missing values

247 out of 810 patients didn't have sufficient lab data or other values required for calculation of the risk scores and were ruled out. Values were missing for AIMS65 score (n = 228), GBS (n = 88) and FRS (n = 19), albumin (n = 191), INR (n = 95), BUN (n = 62), hemoglobin (n = 59), pulse rate (n = 16), systolic blood pressure (n = 14), report of endoscopy (n = 8), need for endoscopic therapy (n = 7), length of hospital stay (n = 2), transfusion (n = 1) and mental status (n = 1). 18 patients had inpatient mortality (7.3%), 19 patients had 30 day rebleeding (7.7%), 169 patients needed blood transfusion (68.4%) and 34 patients needed endoscopic therapy (13.8%). Etiology of upper GI bleeding, comorbidities and mean of laboratory values are summarized in Table 6.

DISCUSSION

Several studies have been conducted to assess accuracy of risk scoring systems in predicting outcomes of UGIB; however the results have been

widely variant [2]. In this study, comparing the original scores, AIMS65 performed better than GBS and FRS in predicting inpatient mortality. This finding is consistent with other studies and introduces AIMS65 as a simple and applicable tool for predicting inpatient mortality [27–29]. However, these scores' accuracy wasn't high enough. In this way, we modified AIMS65 and GBS with albumin and interestingly, the combined model of albumin-GBS and modified AIMS65 predicted mortality better than their original version.

In our study, in predicting need for blood transfusion, all scores performed well, but modified AIMS65 had slightly better accuracy; however, in predicting need for endoscopic intervention, only modified AIMS65, GBS and FRS had meaningful accuracy ($p < 0.05$). Although, outperformance of GBS in assessment of need for clinical intervention has been shown in other studies [20, 24–26], we found modified AIMS65 as a good fit alternative.

Studies have used risk scores in predicting rebleeding and it has been shown that Patients with high Rockall score are in greater risk of rebleeding [30, 31], but in our study no risk scores could accurately predict 30-day rebleeding. Same result

have been shown in some other studies too [32, 33]. However, one study that followed patients with Rockall score ≥ 6 for 3.5 year found that these patients

were at risk of long term recurrent peptic ulcer bleeding [34]; therefore, in our study increasing length of follow up may lead to a different result.

Table 6

Patient characteristics in missing value group

Characteristic	Value
Age, year	60.47 $\pm$ 18.77
Sex	
Male	148 [59.9]
Female	99 [40.1]
Comorbidity	
Disseminated malignancy	10 [4]
Malignancy of upper GI	28 [11.3]
Liver failure	10 [4]
Renal failure	10 [4]
Heart failure	13 [5.3]
Other cardiac disease [e.g. Ischemic heart disease]	33 [13.4]
Other renal disease	8 [3.2]
Other	17 [6.9]
Laboratory variables	
INR	1.17 $\pm$ 0.52
Albumin	3.54 $\pm$ 0.56
BUN	34.80 $\pm$ 28.0
Hemoglobin	9.19 $\pm$ 3.01
Etiology of upper GI bleeding	
Erosive disease	88 [36.8]
Peptic ulcer	84 [35.1]
Malignancy of upper GI	24 [10]
Varices	9 [3.8]
No lesion identified	8 [3.3]
other	24 [10]

Data are presented as mean $\pm$ SD or number [%].

Aiming to find a preferred risk score for general assessment of patients, we defined composite of adverse outcomes as a new endpoint and evaluated the ability of risk scores in predicting this endpoint. Although, all scores had statistically significance accuracy, their performance was not remarkable. Nevertheless, it is worth noting that by adding albumin to GBS, this score's accuracy in predicting composite of adverse outcomes increased from 0.57 to 0.66 and made it more accurate than other scores.

Hypoalbuminemia is common in patients with non variceal UGIB and some studies have introduced it as an independent factor in predicting inpatient mortality and other adverse outcome. This can be due to higher frequency of hypoalbuminemia in patients with malnutrition and some chronic diseases (e.g. renal disease, cardiovascular disease and diabetes) [12, 21, 22, 35]. In our study, the mean of serum albumin was lower in non-survival group comparing to survival group and the mean of total population was 3.54 which was lower than normal population. Interestingly, in our study albumin

could independently predict mortality with AUROC of 0.74 ($p < 0.001$). This predicting accuracy was even higher than other original scores and may lead to this conclusion that albumin is the simple and easy tool for triaging patients in emergency wards. However, this finding needs further studies to compare albumin with other risk scores in predicting mortality. We assume that the better performance of AIMS65 in predicting mortality may also be related to albumin, since neither GBS nor FRS includes albumin as a risk factor. Supporting this theory, we added albumin to GBS and showed that the combined model had the highest accuracy among risk scores in predicting inpatient mortality.

Of 810 patients in our study, 247 patients didn't have sufficient data and the most missing data was Albumin. The same finding was reported by Stanley, J. et al., in the largest prospective comparison of the risk scores [27]. This finding raises this concern that the importance of measuring serum albumin in UGIB is underrated in our hospital.

Conspicuously, classifying patients in to high risk and low risk group is crucial and yet a challenging step for management of UGIB. One of the barriers is finding an optimal cut off point for risk scores [24]. In our study we used the cutoff point that maximized the sum of the sensitivity and the specificity in mortality to stratify patients in to high risk and low risk group. This cut off was 2 for AIMS65, 8 for GBS and 6 for FRS and we found that all adverse outcomes excluding rebleeding were higher in high risk group ($p < 0.05$).

International consensus suggests that low risk groups can be managed as outpatient [13]. This concept is very attractive as the majority of costs associated with UGIB are due to inpatient hospital bed days and outpatient management of these patients could potentially lead to significant savings in cost and resources [2, 14, 36]. In a prospective study, Girardin, M. *et al.*, showed that discharging low risk patients decreased management cost significantly versus inpatient management [36].

A systematic review conducted by Ramaekers, R. *et al.* comparing different scoring systems suggested that GBS with a cutoff point of 0 was superior over other cut off points and risk scores for identifying low risk patient [37]. This cut off was increased to ≤ 1 in the prospective study conducted by Stanley, J. *et al.* and except one, none of the patients required intervention nor transfusion [27]. This cut off has also been extended safely to ≤ 2 in some studies [2, 24, 25]. Increasing the cutoff point acts as two edged sword. Higher cut off can identify more low risk patient leading to even more reduction in cost; while, in the meantime, the risk of adverse outcome increases [2, 14, 24, 38]. In our study no patients died within $GBS \leq 2$ and 3.39% had adverse outcome of 30-day rebleeding and need for endoscopic therapy while in $AIMS65 = 0$, 14.28% had adverse outcome and 1.29 % (3 patients) had mortality. Comparing negative predictive value of these two risk scores, GBS was better than AIMS65 for safe discharge (96.61 vs 85.71).

Although patients with $GBS = 0$ are considered safe for discharge, care must be taken with patients with some comorbidities and history of peptic ulcer since these factors have been shown to act as an independent risk factor for mortality and endoscopic intervention [3, 8]. Since hypoalbuminemia is associated with several comorbidities, we assume using a combined model of Albumin-GBS may help clinician in their judgement for safer discharge.

In order to increase the ability of AIMS65 in identifying high risk groups, we changed the threshold

for albumin from <3 to <3.5 . Consequently, the negative predictive value for predicting adverse outcome in $score = 0$ increased from 85.71% to 90.22%. Supporting this modification, we found that 41.17% of non-survival group had Albumin ranging between 3 to 3.5. of them, 85.71% were considered as low risk group. As mentioned earlier, the resultant predictive accuracy in mortality was also slightly higher than the original version of AIMS65 (0.72 vs 0.67). Although different levels have been proposed for Albumin as a prognostic factor [21–23], we found that increasing the threshold may increase the likelihood of identifying high risk patients and safer discharge of low risk groups. In addition to lower cost resulting from discharging low risk patients, identifying high risk patients and performing urgent endoscopy (<8 hours) may also be related to reduced hospitalization periods and potentially lower costs [39].

Variceal UGIB (VUGIB) is a severe complication of liver cirrhosis and results in more hospital complications and units of blood transfusion compared to non variceal UGIB [5]. 2.3% of patients had VUGIB in our study. Several studies have compared the effectiveness of risk scores exclusively in VUGIB and confirmed that AIMS65 predicts mortality more accurate than other risk scores including MELD and CHILD which were designed specifically for patients with liver failure [40, 41]. This can be explained by two factors of INR and albumin in AIMS65 as they are independent factors for liver state.

Despite the fact that use of risk scores in management of UGIB is recommended in several studies and guidelines [2, 13, 14], its role in actual clinical decisions and hospital guidelines is still unclear [17]. Although, some studies proved that risk scores are a stronger predictor than clinical decision, others believe the opposite [2, 18, 19]. This controversy may originate from variations in hospital characteristic; however, in our hospital, as patients are initially assessed by junior doctors, using risk scores seems to be preferred approach.

There are some limitations in our study. First, our study only included patient who underwent upper endoscopy, this can lead to exclusion of unstable patients; therefore, the applicability of scoring systems in identifying high risk group is still questioned in our study. Second, our study was retrospective and some patients were excluded due to lack of required data. Third, our center is a teaching hospital and patients are initially evaluated by junior doctors and this may lead to misdiagnosis of some subjective data (e.g. mental status and syncope). Lastly, our

study was single center and the results may not be applicable to other medical centers.

CONCLUSION

We concluded that although neither of risk scores were highly accurate as a prognostic factor

in our population, modified AIMS65 and albumin-GBS may be optimal choice in evaluating risk of inpatient mortality and general assessment. Further prospective studies comparing albumin with other risk scores and also validating our modified models and their applicability in clinical practice are suggested. In identifying patient for safe discharge, $GBS \leq 2$ seemed to be an advisable choice.

Introducere. Managementul hemoragiei digestive superioare (HDS) este foarte important. Scopul studiului a fost de a evalua performanța a trei scoruri (AIMS65, Glasgow-Blatchford Score (GBS) și Full Rockall Score (FRS)) pentru a prezice efectele negative ale HDS, precum și capacitatea lor de a identifica pacienții cu riscul cel mai mic. Totodată s-a dorit să se afle dacă schimbarea valorii prag pentru albumina din scorul AIMS65 sau adăugarea albuminei la scorul GBS adaugă valoare predictivă.

Materiale și metode. A fost realizat un studiu retrospectiv în care au fost incluși pacienții cu HDS internați într-o clinică din Iran în perioada 21 martie 2013–21 martie 2017. Pacienții cu date insuficiente au fost excluși. Au fost calculate scorurile AIMS65, GBS sau FRS. Efectele primare analizate au fost mortalitatea intraspitalicească, rata resângerărilor la 30 de zile, necesitatea transfuziilor, precum și aplicarea terapiei endoscopice. Efectul secundar a fost reprezentat de un efect compozit ce a inclus efectele primare.

Rezultate. Din cei 563 de pacienți, 3% au decedat în spital, 69,4% au necesitat transfuzii de sânge, 13,1% au necesitat terapie endoscopică și 3% au avut resângerare în decurs de 30 de zile. Cea mai frecventă cauză a HDS a fost boala erozivă. Cea mai bună capacitate predictivă pentru predicția efectului compozit a avut-o scorul albumină-GBS. Pentru predicția mortalității intraspitalicești numai albumina-GBS, scorul AIMS65 modificat și scorul AIMS65 au avut valori acceptabile. Albumina a avut o capacitate predictivă superioară față de celelalte scoruri. Niciun scor nu a prezis riscul de resângerare la 30 de zile.

Concluzii. Niciun scor nu a avut capacitate predictivă foarte bună. Totuși, scorul AIMS65 modificat și scorul albumină-GBS par a fi o opțiune pentru evaluarea pacienților cu HDS. Scorul $GBS \leq 2$ este o valoare prag acceptată pentru a externa în siguranță pacientul.

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