The use of prognostic scales in upper gastrointestinal tract bleeding

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Abstract

Introduction: In order to select high-risk patients, many prognostic scales have been invented. Among them, the Rockall, Glasgow-Blatchford and AIMS65 scales were considered the most useful.

Material and methods: Patients with non-variceal upper gastrointestinal (GI) tract bleeding, treated between 2017 and 2018, were retrospectively enrolled in the study. Every patient had a Rockall, Glasgow-Blatchford and AIMS65 score calculated retrospectively. Data on hospitalization – blood transfusions, length of hospital stay, rebleeding, intensive care unit (ICU) admission, mortality – were included in the database.

Results: Univariate logistic regression revealed that only the AIMS65 scale was a prognostic factor for in-hospital mortality (OR = 11.028; 95% CI: 2.271–53.563, p = 0.001). The AIMS65 score > 2 was the only factor predicting the need of > 4 blood units transfusion during hospitalization (OR = 3.977; 95% CI: 1.305–12.122, p = 0.015), whereas Glasgow-Blatchford scale > 5 was the only risk factor for the need of fresh frozen plasma transfusion (OR = 3.657; 95% CI: 1.010–13.242, p = 0.048). The area under the curve (AUC) in the ROC analysis revealed that the AIMS65 scale was the most accurate in mortality prediction (AUC = 0.859, p = 0.002), whereas the Rockall and Glasgow-Blatchford scores were not significant (AUC = 0.614, p = 0.093 and AUC = 0.504, p = 0.97, respectively).

Conclusions: Based on our results, we recommend using the AIMS65 scoring system. It is simple and requires few parameters to be counted. Also, it proved to be the most efficient in predicting in-hospital mortality.

Key words: gastrointestinal bleeding, prognostic scales, AIMS65, Glasgow-Blatchford, Rockall.

Introduction

Despite improvement in the medical treatment of peptic ulcer disease through the use of proton pump inhibitors (PPIs), the incidence of upper gastrointestinal (GI) bleeding remains high. Estimates of the incidence of upper GI bleeding range between 50 and 150 cases per 100,000 citizens annually, depending on geographic localization [1]. Moreover, the number of patients requiring anticoagulant and anti-platelet medications due to cardiac or vascular comorbidity continues to rise [2, 3]. These patients are also more commonly treated for concomitant diseases such as diabetes or chronic renal insufficiency, which may worsen the overall prognosis.

The overall mortality related to upper GI bleeding varies between 2 and 2.5% [4, 5].

In order to select high-risk patients, many prognostic scales have been invented. Among them, Rockall, Glasgow-Blatchford and AIMS65 scales were considered the most useful. The Rockall score assesses patient age, symptoms of shock, concomitant diseases and endoscopic findings [4], whereas the Glasgow-Blatchford scale is based on hemodynamic parameters, hemoglobin count, symptoms of GI tract bleeding and presence of cardiac and hepatic diseases [6]. A recently introduced score called AIMS65 takes into consideration albumin level, INR, blood pressure, mental status and age [7]. However, despite their value, none of these scales are widely used in clinical practice. There is a lack of data on which scale offers the most accurate risk stratification in patients with acute upper GI bleeding. Therefore, we designed a study comparing all three scales.

The aim of the study was to compare different scoring systems (Rockall score, Glasgow-Blatchford, AIMS65) as tools for mortality prediction in patients with non-variceal upper GI bleeding.

Material and methods

Patients with non-variceal upper GI tract bleeding, treated between January 2017 and December 2018 in the 2nd Department of General Surgery of the Jagiellonian University, were retrospectively enrolled in the study.

Patients presenting with symptoms of GI bleeding, such as hematemesis, melena, coffee ground vomiting or blood in the nasogastric tube, were considered for endoscopic examination. The Forrest scale was used to classify severity of bleeding [8]. In case of active bleeding, injection of adrenaline with 10% saline solution was used to achieve hemostasis. Forrest Ia bleeding and Forrest IIa ulcers were additionally secured by an endoclip. Every patient has had constant 8 mg/h PPI infusion. All patients had basic biochemistry, CBC and vital parameters assessed. Blood transfusion was indicated when the hemoglobin count dropped below 7 g/dl, or the hematocrit level was below 21%, or signs of hemodynamic instability were present, despite fluid injection. Fresh frozen plasma was transfused in case of coagulation disorders (INR > 1.3, APTT > 36 s). Every patient had a clinical Rockall, Glasgow-Blatchford and AIMS65 score calculated retrospectively. Data on hospitalization – blood transfusions, length of hospital stay, rebleeding, intensive care unit (ICU) admission, mortality – were included in the database. The primary endpoint was in-hospital mortality. Secondary endpoints were bleeding recurrence, need for blood and fresh frozen plasma transfusion.

All procedures were performed in accordance with the ethical standards of the 1964 Declaration of Helsinki and its later amendments (Fortaleza 2013). The study was approved by the Local Ethics Committee of the Jagiellonian University Medical College (KBN no 122.6120.36.2016).

Statistical analysis

All data were analyzed with Statistica version 13.0 PL (StatSoft Inc., Tulsa, OK, USA). The results are presented as mean standard deviation (mean ± SD), median, and interquartile range (IQR). The study of categorical variables used the χ^2 test of independence. The Shapiro-Wilk test was used to check for normal distribution of data and the Student *t* test was used for normally distributed quantitative data. For non-normally distributed quantitative variables, the Mann-Whitney *U* test was used. A *p*-value < 0.05 was considered statistically significant. All considerable patient- and treatment-related factors were analyzed in univariate logistic regression models, then significant factors were analyzed in the multiple logistic regression model in search of independent risk factors for blood and fresh frozen plasma transfusion and rebleeding or in-hospital mortality. The results are presented as the odds ratio (OR) and confidence interval (CI). Receiver operating characteristic curves with area under curve (AUC) calculation were used to compare the scoring systems in terms of sensitivity and specificity. The Youden index was used to select cut-off points.

Results

137 patients were included in the analysis. Mean age was 64.13 ±16.04.

The median AIMS65 score was 1 (IQR: 1–2). There were 15 patients (10.95%) with high risk of in-hospital mortality. 118 (86.13%) patients had a Glasgow-Blatchford score > 6, which stratifies the risk of needing an intervention as > 50%. The median Glasgow-Blatchford score was 10 (IQR: 8–13). The median Rockall score was 5 (IQR: 3–6). There were 6 (4.38%) patients with high risk of mortality. The summary is included in Table I. Six (4.38%) patients died during hospitalization. Univariate logistic regression revealed that only the AIMS65 scale was a prognostic factor for in-hospital mortality (OR = 11.028; 95% CI: 2.271–53.563, $p = 0.001$).

The results of univariate logistic regression are shown in Table II. The area under the curve (AUC) in the ROC analysis revealed that the AIMS65 scale was the most accurate in mortality prediction (AUC = 0.859, $p = 0.002$), whereas Rockall and Glasgow-Blatchford scores were not significant (AUC = 0.614, $p = 0.093$ and AUC = 0.504, $p = 0.97$, respectively) (Figures 1, 2).

Table I. Analysis of gastrointestinal bleeding assessment scales in study group

Parameter	Data
Rockall Scale	
Median score in Rockall Scale (IQR)	5 (3–6)
Number of patients with intermediate risk of mortality	111 (81.02%)
Number of patients with high risk of mortality	6 (4.38%)
Number of patients with good prognosis	20 (14.60%)
Glasgow-Blatchford Score	
Median score in Glasgow-Blatchford (IQR)	10 (8–13)
Number of patients with >50% risk of needing of intervention	118 (86.13%)
AIMS65 Score	
Median AIMS65 score (IQR)	1 (1–2)
Number of patients with 1.2% in-hospital mortality risk	56 (40.88%)
Number of patients with 5.3% in-hospital mortality risk	48 (35.04%)
Number of patients with 10.3% in-hospital mortality risk	15 (10.95%)

Table II. Risk factors for need of transfusion > 4 units of PRBC v1.0

Parameter	OR	95% CI	*P*-value
Univariate analysis			
Male	0.895	0.367–2.179	0.806
Every year of age	0.988	0.963–1.014	0.356
Cardiovascular disease	0.678	0.251–1.830	0.443
Pulmonary disease	1.665	0.403–6.885	0.482
Metabolic disease	3.296	0.825–13.174	0.092
Liver disease	1.759	0.704–4.394	0.227
Alcohol abuse	3.006	0.878–10.294	0.080
Kidney failure	1.676	0.649–4.326	0.286
Rockall Score > 8 points (high risk of mortality)	1.926	0.335–11.0076	0.463
Glasgow-Blatchford Score > 5 points (> 50% risk of needing of intervention)	5.600	0.715–43.845	0.101
AIMS65 Score > 2 points (10.3% In-hospital risk of mortality)	3.977	1.305–12.122	0.015

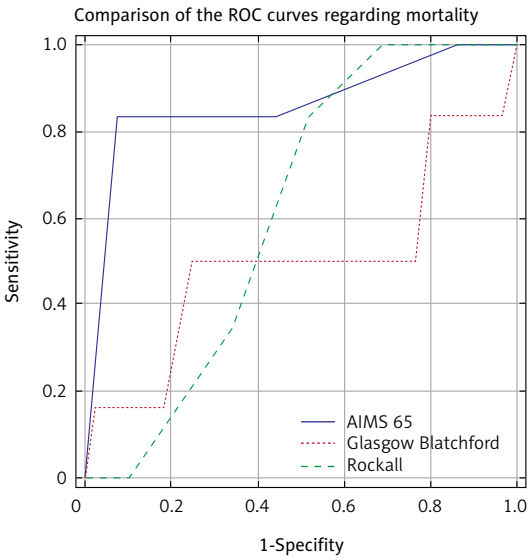

Figure 1. Reciever operative curves for mortality rate

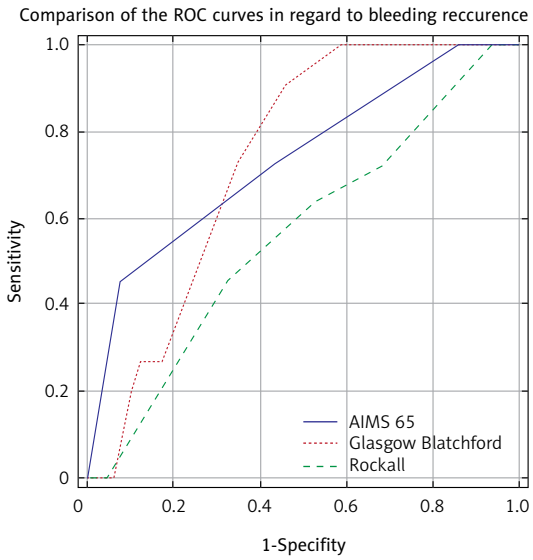

Figure 2. Reciever operative curves for bleeding reccurence

Table III. Baseline characteristics of study group

Parameter	Data
Number of patients	137
Number of females	40 (29.20%)
Mean patients' age ± SD [years]	64.13 ±16.04
Cause of the bleeding	
Duodenal ulcer	85 (62%)
Gastric ulcer	43 (31%)
Mallory-Weiss syndrome	7 (5%)
Dieulafoy malformation	2 (2%)
Forrest classification of bleeding from ulcer	
Ia	25 (18%)
Ib	85 (62%)
IIa	14 (10%)
IIb	11 (8%)
IIc	2 (2%)
III	0 (0%)
Median HR at admission (IQR) [bpm]	109 (95–119)
Median systolic blood pressure at admission (IQR) [mm Hg]	92 (86–97)
Number of patients needing PRBC transfusion	102 (74.45%)
Number of patients needing > 4 units of PRBC transfusion	29 (21.67%)
Median number of PRBC units transfused (IQR)	2 (0–4)
Number of patients needing FFP transfusion	51 (37.23%)
Mean hemoglobin level at admission ± SD [g/dl]	8.62 ±2.52
Median INR value at admission (IQR)	1.33 (1.14–1.89)

Table IV. Risk factors for need of transfusion FFP v1.0

Parameter	OR	95% CI	*P*-value
Univariate analysis			
Male	0.984	0.459–2.106	0.966
Every year of age	1.007	0.985–1.029	0.549
Cardiovascular disease	1.509	0.695–3.273	0.298
Pulmonary disease	0.705	0.174–2.858	0.625
Metabolic disease	2.228	0.570–8.712	0.249
Liver disease	1.823	0.810–4.102	0.147
Alcohol abuse	1.227	0.368–4.089	0.739
Kidney failure	1.346	0.578–3.133	0.490
Rockall Score > 8 points (high risk of mortality)	0.837	0.148–4.738	0.830
Glasgow-Blatchford Score > 5 points (> 50% risk of needing of intervention)	3.657	1.010–13.242	0.048
AMIDS65 Score > 2 points (10.3% In-hospital risk of mortality)	2.857	0.953–8.570	0.061

There were 11 patients with bleeding recurrence during their hospitalization. ROC analysis revealed that the AIMS65 and Glasgow-Blatchford score were comparable in rebleeding prediction (AUC = 0.735; p = 0.004 and AUC = 0.737; p = 0.001 respectively). The Rockall score had lower accuracy (AUC = 0.56; p = 0.451).

102 patients required blood transfusions during hospitalization and 29 patients required more than 4 units of packed red blood cells. 51 patients required fresh frozen plasma transfusions. The data are summarized in Table III.

The AIMS65 score > 2 was the only factor predicting the need of >4 blood units transfusion during hospitalization (OR = 3.977; 95% CI: 1.305–12.122, p = 0.015), whereas Glasgow-Blatchford scale > 5 was the only risk factor for the need of fresh frozen plasma transfusion (OR = 3.657; 95% CI: 1.010–13.242, p = 0.048). The results are summarized in Table IV.

Discussion

This study has demonstrated the value of the AIMS65 scoring system, which proved to be most accurate in mortality prediction and need of blood transfusion in patients with upper GI tract bleeding.

The AIMS65 scoring system's main objective is to stratify patients with a high risk of in-hospital mortality [7]. In our study, it was the only scoring system that helped to accurately predict in-hospital death [8]. It is in line with the study by Robertson *et al*., who showed superiority of this scoring system in comparison to Glasgow-Blatchford and Rockall scales [9]. A Japanese study also revealed superiority of the AIMS65 score [10]. In addition to its high accuracy, the AIMS65 system is simple and based on basic parameters [11]. In contrast, Choe *et al*. suggested that both Rockall and Glasgow-Blatchford scales are more accurate in predicting the need of blood transfusion and endoscopic intervention [12]. Stanley *et al*., using data from six hospitals in Europe, North America, Asia and Oceania, found superiority of AIMS65 for mortality prediction, but the authors still recommended the Glasgow-Blatchford scale as most accurate in general risk stratification [13]. Shafaghi *et al*. proposed a modified Glasgow-Blatchford scoring system, taking the albumin level into account, as more accurate in the Central European population [14].

AIMS65 and Glasgow-Blatchford scales were comparable in prediction of rebleeding. The same findings were revealed in a study by Rout *et al*. [15]. However, as the author pointed out, the AIMS65 scale was originally invented for risk stratification of non-variceal upper GI bleeding [16].

In our study, the AIMS65 score was also superior to the others in predicting the need for blood transfusion. Conversely, Hyett *et al*. underlined the superiority of the Glasgow-Blatchford scale [11]. One possible explanation for this discrepancy is the frequent use of oral anticoagulants in central Europe, which elevates the INR level, one of the components of the AIMS65 scale. However, in our study the Glasgow-Blatchford scale was the only one that helped with predicting the need for plasma transfusion.

Our study has some limitations, which may affect the final results. First, the study is designed as a retrospective analysis of data, and therefore some important data might have been missed in the medical records. Secondly, the study group is middle-sized, which may have an impact on the final results. Lastly, we did not perform a multivariate-analysis of logistic regression, because in all cases there was only one significant factor in the univariate analysi**s.**

In conclusion, we recommend using the AIMS65 scoring system. It is simple and requires few parameters to be counted. Also, it proved to be the most efficient in predicting in-hospital mortality.

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Conflict of interest

The authors declare no conflict of interest.

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