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Original Contribution

Comparison of risk scoring systems in predicting clinical outcome at upper gastrointestinal bleeding patients in an emergency unit☆,☆☆

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Abstract

Background: Admission Rockall score (RS), full RS, and Glasgow-Blatchford Bleeding Score (GBS) can all be used to stratify the risk in patients presenting with upper gastrointestinal bleeding (UGIB) in the emergency department (ED). The aim of our study was to compare both admission and full RS and GBS in predicting outcomes at UGIB patients in a Romanian ED.

Patients and Methods: A total of 229 consecutive patients with UGIB were enrolled in the study. Patients were followed up 60 days after admission to ED because of UGIB episode to determine cases of rebleeding or death during this period. By using areas under the curve (AUCs), we compared the 3 scores in terms of identifying the most predictive score of unfavorable outcomes.

Results: Rebleeding rate was 40.2% (92 patients), and mortality rate was 18.7% (43 patients). For the prediction of mortality, full RS was superior to GBS (AUC, 0.825 vs 0.723; $P = .05$) and similar to admission RS (AUC, 0.792). Glasgow-Blatchford Bleeding Score had the highest accuracy in detecting patients who needed transfusion (AUC, 0.888) and was superior to both the admission RS and full RS (AUC, 0.693 and 0.750, respectively) ($P < .0001$). In predicting the need for intervention, the GBS was superior to both the admission RS and full RS (AUC, 0.868, 0.674, and 0.785, respectively) ($P < .0001$ and $P = .04$, respectively).

Conclusions: The GBS can be used to predict need for intervention and transfusion in patients with UGIB in our ED, whereas full RS can be successfully used to stratify the mortality risk in these patients.

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1. Introduction

Upper gastrointestinal bleeding (UGIB) can be a life-threatening condition and requires careful evaluation from the very first episode as an attempt to predict and reduce the risk of rebleeding or death. The incidence of UGIB is reported between 50 and 170 cases per 100 000 people per year [1-4] with different reported percentages of severity [1-3]. There are only a few inconsistent reports on the incidence and severity of UGIB in the emergency departments (EDs) in Romania [5].

Different risk scoring systems were developed in last few years to discriminate between severe cases requiring aggressive treatment and low-risk patients with UGIB who can be managed as outpatients [6]. An improvement of the overall survival of patients with UGIB when these scores were included in medical judgment has also been reported, based on the fact that a high score predicts with great probability the need for medical interventions and admission in intensive care units (ICUs) where patients can benefit from intensive medical care [7-10].

It is also known that the outcome of a patient with UGIB depends on first evaluation and resuscitation measures taken in the ED and that a clinically sensible tool to stratify the risk may safely reduce health care costs [10]. Admission Rockall score (RS) (pre-endoscopy RS), full RS (endoscopic findings included) [11], and Glasgow-Blatchford Bleeding Score (GBS) [12] can all be used for risk stratification in ED in patients presenting with UGIB. Numerous comparative retrospective and prospective studies published so far have demonstrated differently variable accuracy and use of these scoring systems [7-10].

The aim of this study was to compare these 3 scores and to identify the most accurate score used in predicting unfavorable outcomes, the need for intervention, and the risk stratification in patients with confirmed UGIB presented in a Romanian ED.

2. Methods

2.1. Patient variables and data collection

This prospective study enrolled patients presenting in the ED of Regional Institute of Gastroenterology and Hepatology Prof Dr. "O. Fodor," Cluj-Napoca (Romania), between January and June 2011 (5-month period). The ED of our institute receives approximately 13 000 patients per year, of which approximately 5% are patients presenting with UGIB. After Ethics committee approval and written, informed consent, all consecutive patients presenting with melena, hematemesis or hematochezia, coffee-ground emesis, and blood on the nasogastric aspirate in ED and had undergone esophagogastroduodenoscopy (EGD) as an emergency procedure confirming the diagnosis of hemorrhage in the upper gastrointestinal tract (the anatomic cutoff was considered the ligament of Treitz) were included in the study. The EGD was done in the first 24 hours after admission as an emergency procedure. Patients with absence of blood from nasogastric tube were excluded from the study.

Patients were enrolled in the ED by a registered nurse, and data were completed after visiting the patient on the ward during hospital stay. Information was added with blood transfusion records.

To identify different correlations between variables, we defined terms such as *rebleeding* as the recurrence of UGIB during hospitalization or readmission to the hospital within 60 days since first admission to ED due to UGIB episode; the *need for transfusion units* as patients receiving blood, fresh-frozen plasma, erythrocyte, or platelet concentrate (hemoglobin level <7 g/L or international normalized ratio >2.5); and *mortality* as death within the hospital stay or 60-day follow-up period. The term *need for intervention* was used to define patients who needed endoscopic hemostasis, transfusion, surgical intervention, rebleeding, or death during 60-day follow-up since admission to ED.

2.2. Score calculation

Admission RS, full RS, and GBS were calculated according to their clinical and laboratory variables obtained during patient's ED assessment, as defined by Rockall et al [11] and Blatchford et al [12]. Initial heart rate, systolic blood pressure, presentation with melena or syncope, level of hemoglobin, blood urea nitrogen, coexistent hepatic disease, heart failure or other significant comorbidities, and age were variables used to calculate all 3 scores accordingly. The result of endoscopic examination was added for full RS calculation. Other information available from the patient's records and used to predict need for intervention or rebleeding were clinical characteristics and demographic data, number of transfusion units, current medication at the time of admission, UGIB treatment method, and length of hospital stay.

We have calculated all 3 scores after EGD confirmed UGIB to identify the most accurate score in predicting need for intervention, patients' risk, and unfavorable outcome. This allowed us a more efficient admission of patients in ICU, regular ward, or ambulatory management of these patients.

2.3. Data analysis

The statistical analysis was performed with GraphPad Prism 5 (San Diego, CA) and MedCalc 12 (Mariakerke, Belgium). Categorical variables were tested for significance by using Fisher's exact test. The significance level was chosen at $\alpha = .05$. The accuracy of the scoring systems in detecting patients who rebled, needed clinical intervention, transfusion units, or died was assessed by plotting receiver-

operating characteristic curves and was calculated for GBS, admission, and full RS with 95% confidence interval (CI).

3. Results

A total of 282 patients presented with UGIB during the study period. We excluded patients who developed an UGIB while hospitalized for unrelated disease; patients hospitalized in other clinics and presented just for EGD examination (47 patients); those who had significant comorbidities such as acute myocardial infarction, otorhinolaryngologic cancer, or leukemia with hemorrhagic syndrome (4 patients); and those who refused to participate (2 patients). A total number of 229 patients were included in the study, as it can be seen in Fig. 1. Forty-two patients from the enrolled ones were admitted in ICU, whereas 180 cases were admitted on a regular ward. Seven patients have been treated as ambulatory cases.

Clinical characteristics and demographic data of the study group are shown in Table 1. As can be seen in Table 1, median age in study group was 63 years (range, 23-98 years); 33% of patients were older than 70 years. Melena was the main symptom of patients with UGIB (70.7% of patients), and 80 patients (34.9%) were hypotensive at the time of presentation (systolic blood pressure <100 mm Hg or heart rate >100 per minute). The mean level of hemoglobin was 9.9 g/L ± 3.2 (range, 2.8-17.9). Patients with cardiac disease and nonsteroidal anti-inflammatory drugs or anticoagulant treatment had usually more than 1endoscopic diagnosis, the most common association being esophagitis-peptic ulcer (9.6% of total patients).

Table 1 Demographic data and clinical characteristics in the study group

Characteristics	n (%) of patients (N = 229)
Mean age (SD)	64 ± 13
Male	152 (66.3)
Medical history	
Liver cirrhosis	77 (33.6)
Renal failure	27 (11.7)
Cardiac failure, ischemic heart disease, arterial hypertension	133 (58.1)
Diabetes	52 (22.7)
Previous gastrointestinal problems/surgery digestive tract	75 (32.7)
Previous esophageal varices	40 (17.4)
Home treatment	
NSAIDs	87 (37.9)
Anticoagulants	37 (16.1)
Symptoms	
Melena	162 (70.7)
Melena + hematemesis	105 (45.8)
Evolution	
Need for intervention	179 (78.2)
Need for transfusion	121 (52.8)
Rebleeding	92 (40.2)
Deaths	43 (18.7)

NSAID indicates nonsteroidal anti-inflammatory drug.

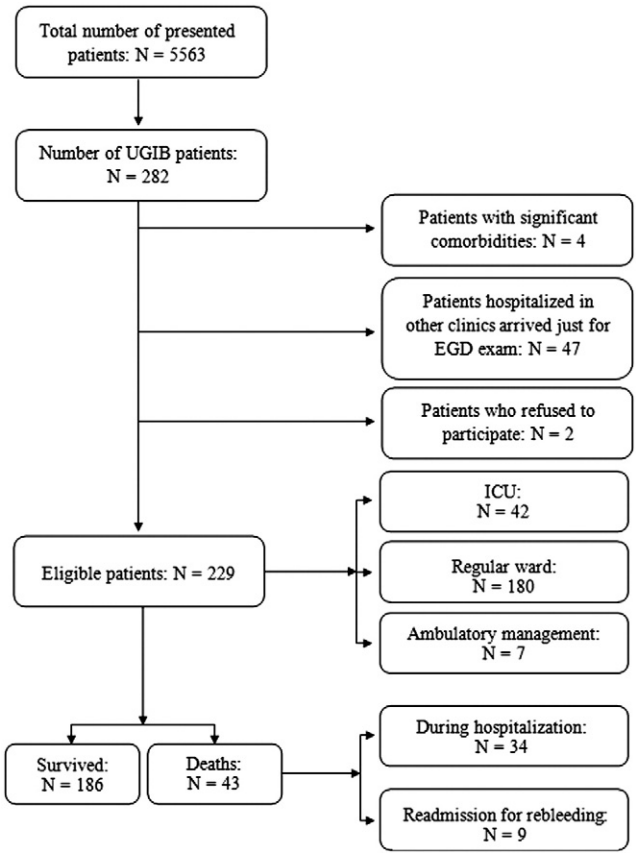

Fig. 1 Patients' flowchart.

In our ED, 70% of patients diagnosed with peptic ulcer received pharmacologic treatment: proton-pump inhibitors or H_2-receptor antagonists. Five patients with esophageal varices were started treatment with octreotide (somatostatin) on continuous infusion. The endoscopic treatment consisted of either injection therapy (epinephrine 1:10.000 in 30% of cases or absolute alcohol in 21% of cases), argon plasma coagulation (9 cases), bands (50 cases of esophageal varices), or endoclips (cases of bleeding ulcers—Forrest Ia or Dieulafoy lesion). Fourteen patients needed surgical treatment to stop the bleeding. Six of these had gastric carcinoma, and 5 had peptic ulcer. We also had a patient with duodenal cancer, 1 with hemorrhagic gastritis, and a case of aortoenteric fistula that needed haemostatic surgery (Table 2).

Rebleeding rate was 40.2% (92 patients), and mortality rate was 18.7% (43 patients). The difference between mortality rate in patients who rebled and those who did not was significantly higher (45.7% vs 0.7%, $P < .0001$).

For the prediction of mortality, full RS (area under the curve [AUC], 0.825; 95% CI, 0.769-0.872) was superior to GBS (AUC, 0.723; 95% CI, 0.661-0.780), $P = .05$, and quite

Table 2 Endoscopic diagnosis and treatment in the study group

Characteristics	n (%) of patients
Endoscopic results	
Esophageal varices	64 (27.9)
Esophagitis	51 (22.2)
Mallory-Weiss tears	10 (4.3)
Gastritis	17 (7.4)
Gastric/duodenal ulcers	95 (41.4)
Carcinoma	6 (2.6)
Dieulafoy lesion	4 (1.7)
Other	79 (34.4)
Endoscopic treatment	
Injection therapy	
Epinephrine 1:10.000	69 (30.1)
Absolute alcohol	49 (21.4)
Argon plasma coagulation	9 (4)
Bands	50 (22)
Endoclips	13 (5.6)
Surgical treatment	14 (6.1)
Gastric carcinoma	6 (2.6)
Peptic ulcer	5(2.1)
Duodenal cancer	1 (0.4)
Hemorrhagic gastritis	1 (0.4)
Aortoenteric fistula	1 (0.4)

similar to admission RS (AUC, 0.792; 95% CI, 0.733-0.842), $P = .21$ (Fig. 2).

For prediction of rebleeding, similar AUCs were obtained for GBS (0.732; 95% CI, 0.670-0.789), admission RS (0.705; 95% CI, 0.642-0.764), and full RS (0.733; 95% CI, 0.671-0.789). There were no statistically significant differences between the AUCs of the 3 scoring systems ($P > .05$) (Fig. 3).

The GBS had a higher accuracy in detecting patients who needed transfusion units (AUC, 0.888; 95% CI, 0.839-0.926) and was superior to both the admission RS (AUC, 0.693; 95% CI, 0.629-0.752), $P < .0001$, and full RS (AUC, 0.750; 95% CI, 0.689-0.805), $P < .0001$. A statistically significant difference was obtained also between the AUCs for admission RS and full RS ($P = .008$) (Fig. 4).

To compare our results with those presented by Blatchford et al [12], we calculated the AUCs for predicting the need for intervention. For this outcome, the GBS (AUC, 0.868; 95% CI, 0.817-0.909) was superior to both the admission RS (AUC, 0.674; 95% CI, 0.609-0.734), $P < .0001$, and full RS (AUC, 0.785; 95% CI, 0.726-0.836), $P = .04$. A statistically significant difference was obtained also between the AUCs for the presented 2 versions of RS ($P < .0001$) (Fig. 5).

4. Discussions

There are only a few reports on validation of GBS, preadmission, and full RS risk scores in patients with UGIB in an ED [10-15] and no such studies in Romanian patients. As compared with other studies that used hospital mortality or 30-day follow-up period [10,11,13], we extended this period to 60 days for a better identification and evaluation of the rebleeding episodes taking in consideration the frequency of this outcome in our patients. To our knowledge, this is the first study to use such a long time interval for follow-up of patients with UGIB.

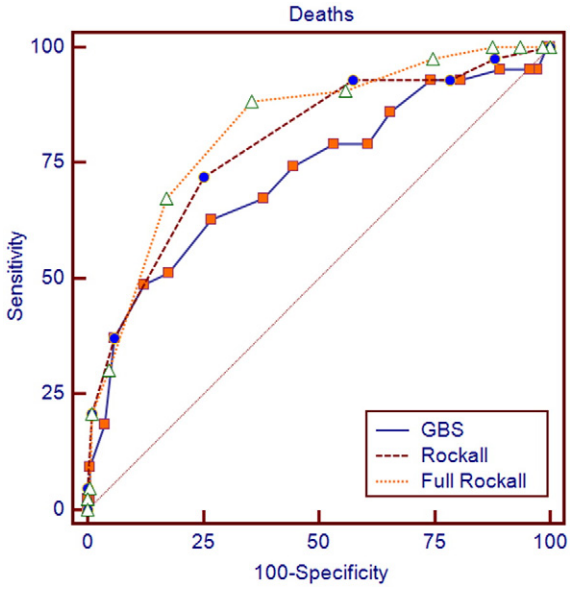

Fig. 2 Comparison of the GBS, admission, and full RS with AUC figures for the prediction of death (GBS, 0.723; admission RS, 0.792; and full RS, 0.825).

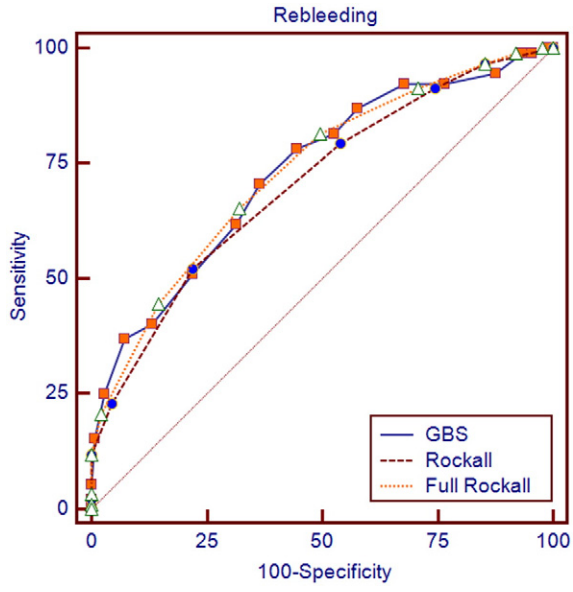

Fig. 3 Comparison of the GBS, admission, and full RS with AUC figures for the prediction of rebleeding (GBS, 0.732; admission RS, 0.705; and full RS, 0.733).

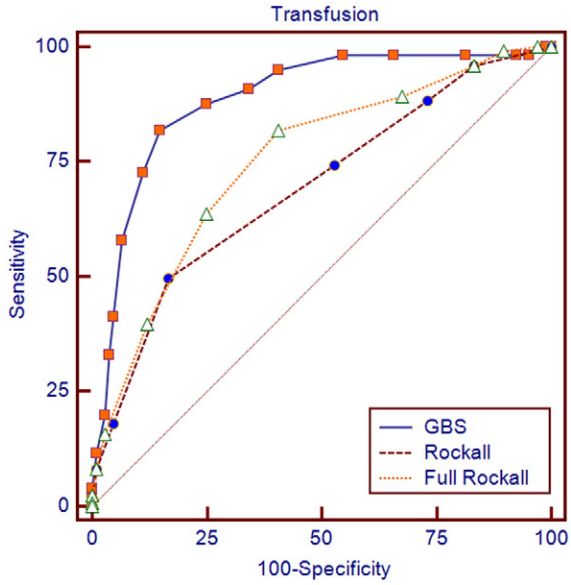

Fig. 4 Comparison of the GBS, admission, and full RS with AUC figures for the prediction of need for transfusion (GBS, 0.888; admission RS, 0.693; and full RS, 0.750).

The mortality rate for our patients with UGIB is higher compared with the study of Vreeburg et al [13] (18.7% vs 14%); this is probably because of our 60-day follow-up period in which 9 of the enrolled patients returned with rebleeding and died after admission to ED, whereas in the other study the authors used only hospital mortality.

Our results showed that full RS can successfully stratify patients with UGIB into high- and low-risk categories for mortality and is the most useful tool in identifying patients who need intensive care to improve their outcome. Similar results have been reported by Stanley et al [8] and Enns et al [14]. These studies reported the AUCs for full RS of 0.79 and 0.73, respectively.

Rebleeding affects UGIB patients' outcome and is considered the most important risk factor for mortality [11,15]. Therefore, it is important to predict this complication as accurately as possible. In our study, all 3 scores had similar AUCs in predicting rebleeding, none of them being considered a reasonable tool to predict this outcome. As regarding RS's capacity to predict rebleeding, our results are similar with those of other studies where the general conclusion was that this score was originally developed for the prediction of mortality and not for the prediction of rebleeding for which the accuracy is low [7,13,14,16]. However, in some categories of patients, the accuracy may be higher; thus, Church and Palmer [17] reported a satisfactory accuracy of this score in predicting rebleeding in patients treated by endoscopic haemostasis for bleeding peptic lesion.

The GBS proved to be the most efficient score in detecting patients who needed clinical intervention (in terms of clinical intervention, we included all interventions that stopped the bleeding—endoscopic and surgical procedures or the unfavorable outcome such as rebleeding or death, just like in the study of Blatchford et al [12]). Similar results have been reported in other studies [9,10,18-21] demonstrating that GBS can successfully make an early triage of patients with UGIB into high- and low-risk groups for clinical intervention and can also be helpful in cost-effective use of medical resources.

There are several limitations of this study. First, our study included a single center. However, our ED receives many critical cases of UGIB from the neighbored counties. Moreover, most patients discharged from our institute would return to their gastroenterologist if the UGIB episode would repeat, thus allowing more accurate records. Another limitation is that our analysis was made independently of intravenous proton-pump inhibitor therapy before EGD; in addition, none of our patients received erythromycin. Both interventions were proven to facilitate endoscopic examination and reduce costs, length of endoscopic examination, or the necessity of another endoscopic examination in different studies made in patients with UGIB [22-26]. Similar to others, our analysis included all patients with UGIB, independently of the source of bleeding, and we did not calculate scores for separate subgroups of patients with different sources of bleeding [13,27,28]. We also have calculated all 3 scores only in patients having EGD as an emergency procedure confirming the UGIB diagnosis, similar to Camellini et al [7]. Thus, the accuracy of these scores in our study may be higher as compared with the one calculated in all patients with suspected UGIB. This approach was chosen because our main goal was to compare the accuracy of these scores in patients with confirmed UGIB to discriminate between patients who may benefit from ICU

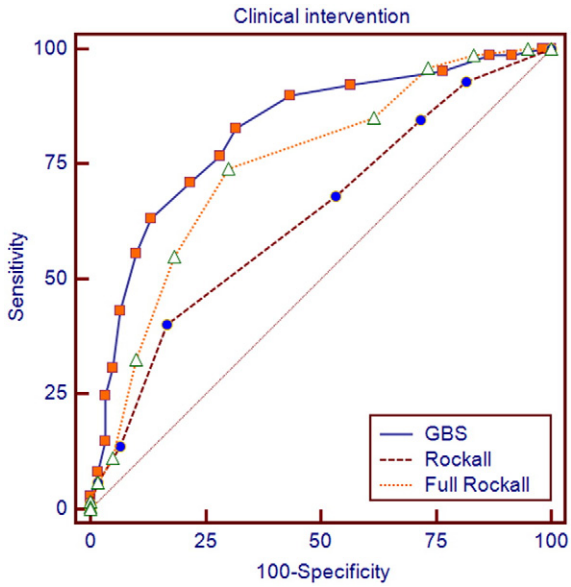

Fig. 5 Comparison of the GBS, admission, and full RS with AUC figures for the prediction of need for intervention (GBS, 0.868; admission RS, 0.674; and full RS, 0.785).

or general ward admission or that may be treated on ambulatory bases.

In conclusion, our study showed that GBS can be used to predict need for intervention and transfusion in patients with UGIB, whereas full RS can be used for identifying high-risk patients for mortality, but it cannot be used for the accurate evaluation of the possibility of rebleeding.

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