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Review Article

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AIMS65 Outperforms Other Scoring Systems for Non-Variceal Upper Gastrointestinal Bleeding in Octogenarians: A Prospective Study

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Abstract

Background: *The incidence and adverse clinical outcomes of nonvariceal upper gastrointestinal bleeding (NVUGIB) increase significantly with advanced age. Among those over 80 years of age (octogenarians), this risk becomes markedly pronounced. Our study aimed to assess the predictive ability of four recognized scoring systems for clinical outcomes in octogenarians presenting with NVUGIB.*

Methods: *We compared the Clinical Rock all Score (CRS), Full Rockall Score (FRS), Glasgow Blatchford Score (GBS), and AIMS65 scores for their ability to forecast clinical outcomes. These outcomes encompassed: (1) the requirement for endoscopic intervention, (2) recurrence of bleeding, and (3) 30-day mortality.*

Results: *The study sample comprised 107 octogenarians, including 58 males (54.2%), with a median age of 86 (range 82-89). Ten patients (9.3%) experienced recurrent bleeding, while 19 (17.8%) succumbed within 30 days. The AIMS65 score predicted 30-day mortality with an optimal cutoff value of 2.5, demonstrating 63% sensitivity and 86% specificity. In patients categorized as high-risk by the AIMS65 criteria, a cutoff value of 2 predicted 30-day mortality with 75% sensitivity and 68% specificity.*

Conclusions: *The easily calculable pre-endoscopic AIMS65 score proves beneficial for predicting mortality among octogenarians with NVUGIB, thereby assisting clinical decision-making processes.*

Keywords: Nonvariceal Upper Gastrointestinal Bleeding, Recurrent Bleeding, Octogenarian, 30-Day Mortality.

Highlights

- Patient risk stratification plays a pivotal role in the clinical management of nonvariceal upper gastrointestinal bleeding.
- Several risk-scoring systems (Rockall Score, Glasgow Blatchford Score, and AIMS65 scores) have been developed to facilitate differentiation between low and high-risk patients.
- Advanced age, particularly in octogenarians, significantly escalates the risk of nonvariceal upper gastrointestinal bleeding and is often accompanied by adverse clinical outcomes, including rebleeding and mortality.
- The AIMS65, a newer scoring system, assesses five risk factors: albumin levels, prothrombin time, level of consciousness, systolic blood pressure, and age.
- The AIMS65 score demonstrated superior predictive value for mortality among octogenarians with upper gastrointestinal bleeding, offering a valuable tool for pre-endoscopic risk assessment.

1. Introduction

per gastrointestinal bleeding (UGIB) remains a significant global health challenge, contributing extensively to morbidity, mortality, and healthcare expenditures [1-3]. Annual incidence rates of

acute UGIB have been reported to vary between 48 and 160 cases per 100,000 population, with a conspicuous preponderance among males and the elderly. In the United States alone, the yearly hospitalization rate due to acute UGIB approximates 65 per 100,000 individuals [4,5]. Despite advances and increasing accessibility of endoscopic procedures, mortality rates associated with UGIB, reaching up to 12% in some studies, remain a significant concern for clinicians [6]. Interestingly, while UGIB prevalence has shown a declining trend, mortality rates have remained stagnant, a phenomenon possibly linked to an aging population with associated comorbidities like cardiovascular diseases, chronic renal failure, and increased use of antithrombotic [7-10].

Patient risk stratification plays a pivotal role in the clinical management of UGIB [1]. Several risk-scoring systems have been developed to facilitate differentiation between low and high-risk patients [11-13]. These include the Clinical Rock all Score (CRS), Full Rock all Score (FRS), Glasgow Blatchford Score (GBS), and AIMS65 scores (Table 1), all of which, with the exception of the FRS, are pre-endoscopic scores. Patients with a GBS of 0 or 1 present minimal risk of rebleeding or mortality and can be effectively managed in an outpatient setting [3,11]. Meanwhile, CRS and FRS were designed to predict rebleeding and mortality [12]. AIMS65 score has demonstrated utility in predicting mortality, but its sensitivity falls short of the Rock all score and GBS in the low-risk patient group [13,14].

Risk scoring system	Parameters
Clinical Rockall Score	Age, SBP, heart rate, comorbidity
Full Rockall Score	Age, SBP, heart rate, comorbidity, endoscopic findings, stigmata of recent hemorrhage
GBS	BUN, hemoglobin, SBP, heart rate, comorbidity
AIMS65	Albumin, PT (INR), mental status, SBP, age

GBS, Glasgow-Blatchford score; BUN, blood urea nitrogen; SBP, systolic blood pressure; PT, prothrombin time; INR, international normalized ratio.

Table 1: Risk Scoring Systems Parameters of Non-Variceal Upper Gastrointestinal Bleeding.

Gbs, Glasgow-Blatchford Score; Bun, Blood Urea Nitrogen; SBP, Systolic Blood Pressure; PT, Prothrombin Time; Inr, İnternational Normalized Ratio.

Advanced age, particularly in octogenarians, significantly escalates the risk of nonvariceal upper gastrointestinal bleeding (NVUGIB) and is often accompanied by adverse clinical outcomes, including rebleeding and mortality [15,16]. While risk scoring systems have been extensively studied across a wide age range, their effectiveness in the elderly population remains under-evaluated. The predictability of these systems may vary when applied to the elderly, as compared to the general population. Therefore, our study aims to assess the predictive value of these four recognized scoring systems for clinical outcomes in octogenarians presenting with NVUGIB.

2. Materials and Methods

2.1 Study Population

The present study encompasses octogenarian patients (aged ≥80) who were admitted to the tertiary referral center's emergency department with nonvariceal upper gastrointestinal bleeding (NVUGIB) between February 2019 and February 2020. Upper gastrointestinal endoscopy confirmed all NVUGIB cases. We excluded patients with variceal hemorrhage, those aged below 80, and individuals who did not undergo endoscopy due to refusal or deteriorating clinical course. All methodologies were conducted following the ethical guidelines outlined by the institutional research committee, the 1964 Helsinki Declaration, its subsequent amendments, or similar ethical standards. The institutional review board approved this study (E1/22/2951).

2.2 Management

Initial diagnoses of NVUGIB were based on symptoms such as coffee-ground vomiting, hematemesis, melena, or blood in nasogastric aspirate. Pre-endoscopic calculation of the Clinical Rockall Score (CRS), Glasgow Blatchford Score (GBS), and AIMS65 was performed by the gastroenterologist, with the Full Rockall Score (FRS) computed post-endoscopy. Immediate pantoprazole infusion (8mg/h following an 80mg bolus) was initiated for all patients presenting with NVUGIB. Erythrocyte suspension (ES) transfusion was given to those with hemoglobin levels below 9g/dL.

Endoscopic intervention was performed within the first 12 hours for patients exhibiting unstable hemodynamic conditions, ongoing bleeding, or decreased hematocrit despite transfusion. Clinically stable patients without significant bleeding underwent endoscopy within the first 24 to 48 hours. Endoscopic therapy involved thermal contact, mechanical methods, or adrenaline injection. Patients with unsuccessful endoscopic therapy were referred for interventional radiology or surgical intervention. The decision to discharge or hospitalize was made by the attending physician based on initial assessments and endoscopic findings. All patients were observed for a 30-day period.

2.3 Clinical Outcomes

The clinical outcomes under scrutiny were: requirement for endoscopic intervention, rebleeding, and 30-day mortality. Rebleeding was defined as a hemoglobin drop exceeding 2.0 g/dL accompanied by bleeding symptoms, as verified by a second look endoscopy. Mortality referred to any death within 30 days of the bleeding incident. The FRS was not evaluated for predicting endoscopic intervention need, as it incorporates endoscopic data [1-3].

2.4 Data Collection

Data regarding bleeding-related symptoms, medical history, hemodynamic status, and laboratory and endoscopic results were collected prospectively. Hospitalization, blood transfusions, endoscopic intervention, interventional radiology or surgery, rebleeding, and 30-day mortality were tracked using the hospital's digital medical registration system. Patients discharged within 24 hours received follow-up appointments at outpatient clinics at the end of the first and fourth weeks.

2.5 Statistical Analysis

The Kolmogorov-Smirnov test assessed the distribution normality of continuous variables. Normally distributed continuous variables were reported as mean ± standard deviation (SD), and non-normally distributed continuous variables as median (interquartile range [IQR]). Categorical variables were expressed as frequency (percentage). Receiver operating characteristics (ROC) curves were used to evaluate the predictive capabilities of risk scoring systems for the defined outcomes. The results were presented as the area under the curve (AUC), 95% confidence interval (CI), specificity, sensitivity, and p-value. IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, N.Y., USA) was used for statistical analysis. A p-value <0.05 was deemed statistically significant.

3. Results

3.1 Patient Characteristics

Table 2 delineates patient characteristics, comorbidities, treatments, and clinical and laboratory data. The study included 107 octogenarians, 54.2% (n=58) of whom were men, with a median age of 86 years (IQR 82-89). Melena was the most common presenting symptom (65.4%, n=70). Cardiovascular diseases were the most common comorbidity (63.6%, n=68), followed by hypertension (62.6%, n=67). 15.9% (n=17) patients had experienced previous upper gastrointestinal hemorrhage. Approximately one-third of patients (31.8%, n=34) were on proton pump inhibitors (PPIs). 36.4% (n=39) of patients were taking acetylsalicylic acid, 1.9% (n=2) were on dual antiplatelet therapy, 6.5% (n=7) were on warfarin, and 17.8% (n=19) were on new oral anticoagulants.

	Aged ≥80 years (n=107)
Age, years	86 (82-89)
Gender, male, n (%)	58 (54.2%)
Presenting symptoms, n (%) Hematemesis Melena Hematochezia Hematemesis/Melena	 61 (57%) 70 (65.4%) 7 (6.5%) 99 (92.5%)
Comorbidities, n (%) Cardiovascular diseases (AF, CAD, CHF) CVD CRF HT CLD DM Malignancy	 68 (63.6%) 13 (12.1%) 23 (21.5%) 67 (62.6%) 3 (2.8%) 22 (20.6%) 11 (10.3%)
Previous episode of UGIB, n (%)	17 (15.9%)
Previous GIS surgery, n (%)	1 (0.9%)
Medication, n (%) PPI NSAIDs Antithrombotic Agents Aspirin DAPT Anticoagulants Warfarin NOAC	 34 (31.8%) 10 (9.3%) 39 (36.4%) 2 (1.9%) 7 (6.5%) 19 (17.8%)
Pulse, > 100 beats/min, n (%)	53 (49.5%)
Systolic blood pressure, < 90mmHg, n (%)	4 (3.7%)
Hemoglobin level on admission (g/dL)	9.36 ± 2.85

BUN level on admission (mg/dL)	49 (29.87-73.74)
INR on admission	1.2 (1.1-1.34)
Serum albumin level on admission (g/L)	34 (31-37)
Serum platelet level on admission (10^9/L)	272 (195-352)

[x] Results are expressed as: mean ± standard deviation, median (interquartile range), or frequency (%).

AF: Atrial fibrillation, CAD: Coronary artery disease, CHF: Congestive heart failure, CVD: Cerebrovascular disease, CRF: Chronic renal failure, HT: Hypertension, CLD: Chronic liver disease, DM: Diabetes mellitus, UGIB: Upper gastrointestinal bleeding, GIS: Gastrointestinal system, PPI: Proton Pump Inhibitors, NSAIDs: Non-steroidal anti-inflammatory drugs, DAPT: Dual antiplatelet therapy, NOAC: Novel oral anticoagulant drugs, BUN: Blood urea nitrogen, INR: International normalized ratio

Table 2: Patient Characteristics, Comorbidities, Medications, Clinical And Laboratory Data Of The Study Groupx.

3.2 Clinical Outcomes and Risk Scores

Table 3 summarizes the clinical outcomes and risk scores of the patients. Around two-thirds (65.4%, n=70) of patients underwent endoscopy within the first 12 hours of admission, with a quarter (26.2%, n=28) discharged within 24 hours. Hospitalization was necessary for 45.8% (n=49) of patients, with 28% (n=30) requiring critical care. The median hospital stay was 5 days (IQR 0-12). 20.5% (n=22) of patients required endoscopic intervention, with hemoclips being the most common method (13.1%, n=14). Rebleeding occurred in 9.3% (n=10) of patients within 30 days, and the mortality rate was 17.8% (n=19). The median Clinical Rock all Score was 4 (IQR 4-5), Full Rock all Score was 6 (IQR 5-7), Glasgow-Blatchford Score was 11 (IQR 8-13), and AIMS65 score was 12 (IQR 14-16).

	Aged ≥80 years (n=107)
Endoscopy time, n (%) <12 hours 12-24 hours 24-48 hours	 70 (65.4%) 21 (19.6%) 16 (15%)
Discharged within 24 hours, n (%)	28 (26.2%)
Hospitalization, n (%) Clinical ICU	 49 (45.8%) 30 (28%)
Length of hospital stay, days	5 (0-12)
Need for endoscopic intervention, n (%) Heater coagulation Argon plasma coagulation Hemoclips	22 (20.5%) 4 (3.7) 4 (3.7) 14 (13.1)
Need for surgical/radiological intervention, n (%)	3 (2.8%)
Need for transfusion, n (%)	72 (67.3%)
Rebleeding (during hospital stay), n (%)	10 (9.3%)
30-day mortality, n (%)	19 (17.8%)
Clinical Rockall score	4 (4-5)
Full Rockall score	6 (5-7)
Glasgow-Blatchford score	11 (8-13)
AIMS65 score	2 (1-2)

[x] Results are expressed as: median (interquartile range), or frequency (%).

ICU: Intensive care unit.

Table 3: Patients' Clinical Outcomes and Risk Scoresx

3.3 Predictive Ability of Scoring Systems

Table 4 demonstrates the ability of risk scoring systems to predict clinical outcomes. No significant difference was found in the need for endoscopic intervention across the three scoring systems (CRS, GBS, AIMS65). All four scoring systems performed comparably in predicting rebleeding, with no significant statistical difference (p>0.05). The AIMS65 score predicted 30-day mortality at a threshold of 2.5, with 63% sensitivity and 86% specificity (AUC: 0.784, 95% CI: 0.663-0.905, p< 0.001). Figures 1-2 depict the ROC curves of the scoring systems in predicting clinical outcomes.

		AUC	95 % CI	P	Cut-off	Sensitivity	Specificity
Need for endoscopic intervention							
	Clinical Rockall score	0.595	0.459-0.730	0.171	5.5	0.318	0.882
	Glasgow-Blatchford score	0.534	0.405-0.663	0.625	5.5	0.955	0.165
	AIMS65 score	0.497	0.367-0.627	0.963	1.5	0.545	0.506
Rebleeding (during hospital stay)							
	Clinical Rockall score	0.380	0.209-0.551	0.214	8	-	1
	Full Rockall score	0.551	0.373-0.728	0.600	6.5	0.500	0.639
	Glasgow-Blatchford score	0.610	0.459-0.761	0.254	10.5	0.800	0.464
	AIMS65 score	0.586	0.389-0.782	0.374	2.5	0.400	0.794
30-day mortality							
	Clinical Rockall score	0.566	0.414-0.718	0.368	4.5	0.474	0.716
	Full Rockall score	0.620	0.460-0.780	0.102	7.5	0.368	0.898
	Glasgow-Blatchford score	0.514	0.384-0.644	0.848	8.5	0.895	0.318
	AIMS65 score	0.784	0.663-0.905	<0.001	2.5	0.632	0.864

Significant P values are in bold.
AUC: Area under curve, CI: Confidence interval.

Table 4: The Ability of Risk Scoring Systems to Predict Clinical Outcomes.

Table 5 presents the effectiveness of scoring systems in predicting clinical outcomes in patients categorized as low-high risk based on their criteria. The AIMS65 scoring system predicted thirty-day mortality in high-risk patients at a cut-off value of 2, with 75% sensitivity and 68% specificity (AUC: 0.717, 95% CI: 0.566-0.868, p= 0.012). Other analyses did not show statistically significant differences (p>0.005 for all parameters).

	Patients classified as low risk*				Patients classified as high risk*			
	Clinical Rockall score = 0 (n=0)	Full Rockall score ≤ 2 (n=0)	Glasgow-Blatchford score ≤ 1 (n=1)	AIMS65 score = 0 (n=0)	Clinical Rockall score ≥3 (n=94)	Full Rockall score ≥ 8 (n=16)	Glasgow-Blatchford score ≥ 7 (n=88)	AIMS65 score ≥ 2 (n=54)
Need for endoscopic								
intervention								
Patients, n (%)	-	-	-	-	21 (22.3)		20 (22.8)	12 (22.2)
AUC	-	-	-	-	0.557		0.471	0.393
95 % CI	-	-	-	-	0.408-0.706		0.324-0.618	0.207-0.579
P	-	-	-	-	0.424		0.690	0.261
Sensitivity	-	-	-	-	1		0.900	0.250
Specificity	-	-	-	-	0.027		0.015	0.500

Rebleeding (During hospitalization)								
Patients, n (%)	-	-	-	-	8 (8.5)	1 (6.3)	10 (11.4)	6 (11.1)
AUC	-	-	-	-	0.392	0.600	0.515	0.611
95 % CI	-	-	-	-	0.205-0.580	0.159-1	0.333-0.696	0.383-0.839
P	-	-	-	-	0.316	0.745	0.880	0.378
Sensitivity	-	-	-	-	1	1	1	0.667
Specificity	-	-	-	-	0.023	0.267	0.038	0.583
30-day mortality								
Patients, n (%)	-	-	-	-	16 (17)	7 (43.8)	17 (19.3)	16 (29.6)
AUC	-	-	-	-	0.618	0.310	0.454	0.717
95 % CI	-	-	-	-	0.469-0.768	0.040-0.579	0.309-0.599	0.566-0.868
P	-	-	-	-	0.138	0.204	0.557	0.012
Sensitivity	-	-	-	-	1	0.571	1	0.750
Specificity	-	-	-	-	0.026	0.111	0.042	0.684

*Classification as low risk and high risk was made according to the risk scoring systems.
Significant P values are in bold.
AUC: Area under curve, CI: Confidence interval.

Table 5: The Ability of Risk Scoring Systems to İdentify Low-Risk and High-Risk Patients and to Predict Clinical Outcomes.

4. Discussion

Upper gastrointestinal bleeding (UGIB) poses a significant threat to older adults, with patients aged over 60 accounting for 35% to 45% of acute UGIB cases [17]. Hospitalizations due to UGIB have been on the rise among elderly patients [9, 17, 18]. and despite PPI use, rates of gastric and duodenal ulcer hemorrhage have also escalated in this demographic [9, 18]. UGIB continues to be a pressing clinical concern in older adults, who face higher rates of in-hospital complications and mortality compared to younger patients [8, 10, 19, 20].

In our study, 20.5% (n=22) of patients required endoscopic intervention, 9.3% (n=10) experienced rebleeding, and 17.8% (n=19) faced mortality. The three scoring systems (CRS, GBS, AIMS65) similarly predicted the need for endoscopic intervention, while all four (including FRS) predicted rebleeding. However, in the octogenarian population, the AIMS65 system was the most efficient in predicting 30-day mortality. Based on the cutoff values evaluated as high risk according to the risk scoring systems, when the AIMS65 score was two and above, it was the most sensitive and specific scoring system in detecting 30-day mortality.

Despite their lack of efficacy in low-risk octogenarian patients, scoring systems play a critical role in facilitating clinicians' identification of high-risk UGIB patients who require intensive care or outpatient management [21]. Risk scores like CRS, GBS, and AIMS65, which only incorporate clinical variables, can assist in determining the necessity of early endoscopy, hospitalization, the likelihood of rebleeding, and mortality. The FRS includes both clinical and endoscopic variables [22,23]. The predictivity of risk scoring systems in elderly patients may be variable. The significant increase in NVUGIB-related poor clinical outcomes, especially in octogenarians, may be beneficial in optimizing risk scores in this patient population [15,16].

The AIMS65, a newer scoring system, assesses five risk factors: albumin levels, prothrombin time, level of consciousness, systolic blood pressure, and age. According to AIMS65, the mortality rate is 0.3% for 0 points, 4% for 2 points, and 22.5% for 4 points. Given that our study primarily included high-risk patients, the scoring systems showed considerable potential for mortality prediction. If at least two AIMS65 components are present, the patient is considered high-risk for mortality. Multiple studies have demonstrated the superiority of the AIMS65 score over the GBS score in predicting inpatient mortality [13, 21]. In our AUROC analysis, AIMS65 was the best predictor of the 30-day mortality rate.

Increased age is a standalone risk factor for adverse clinical outcomes in NVUGIB patients, and current scoring systems are not adequately equipped to predict low-risk patients in this demographic. As such, a scoring system that can effectively identify low-risk patients in the octogenarian population is needed. According to the latest European Society of Gastrointestinal Endoscopy guideline, GBS should be used to determine the necessity of endoscopic treatment in NVUGIB patients [22]. However, GBS does not include age-related parameters, so elderly patients presenting with

NVUGIB are often categorized as high-risk, potentially explaining the GBS score's inadequacy in predicting the need for intervention and rebleeding in older patients [11, 23, 24].

Stanley et al. reported NVUGIB mortality as 4.8% all age groups. In the study of Nahon et al. the NVUGIB mortality after rebleeding and hospitalization in patients aged ≥75 years increased to 11.8% and 8.9%, respectively. In the present study, the rebleeding rate was 9.3%, and the 30-day mortality rate was as high as 17.8%. The possible explanation for this may be that we evaluated mortality as 30-day mortality rather than during hospitalization, and our patient population was older, being ≥80 years [16,24].

There were two main limitations to the study. First limitation was our small sample size and scarcity of low-risk patients and the second was the absence of Helicobacter assessment.

5. Conclusion

In conclusion, the AIMS65 score demonstrated superior predictive value for mortality among octogenarians with UGIB, offering a valuable tool for pre-endoscopic risk assessment. However, existing scoring systems failed to reliably identify low-risk patients within this demographic. Further research is needed to refine these systems and develop more accurate risk stratification methods for older patients with UGIB.

Author Contributions

Muhammed Bahaddin Durak: Investigation, data collection, writing-original draft preparation, reviewing and editing, visualization. Cem Simsek: Writing-original draft preparation, reviewing and editing. Yavuz Cagir: Investigation, data collection, statistics. Ilhami Yuksel: Conceptualization, Methodology, Investigation, Supervision, writing- reviewing and editing

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None

Conflicts of Interest

None

Disclosure of Financial Arrangements

None

Data Availability Statements

The data underlying this article will be shared on reasonable request to the corresponding author.

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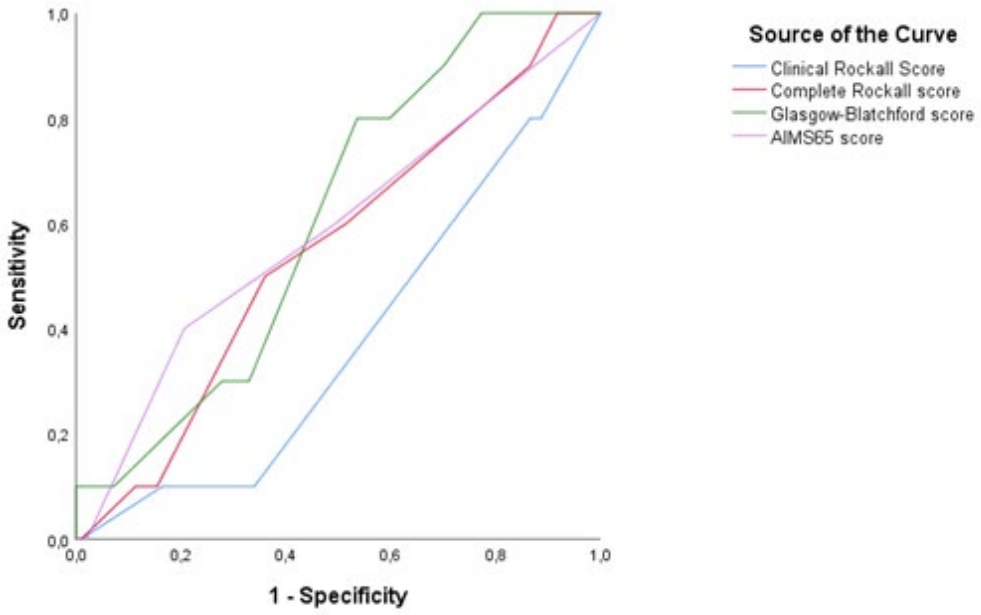

Figure 1: Receiver Operating Characteristic (ROC) Curves of the Scoring Systems for Predicting Rebleeding During Hospitalization in Nonvariceal Upper Gastrointestinal Bleeding.

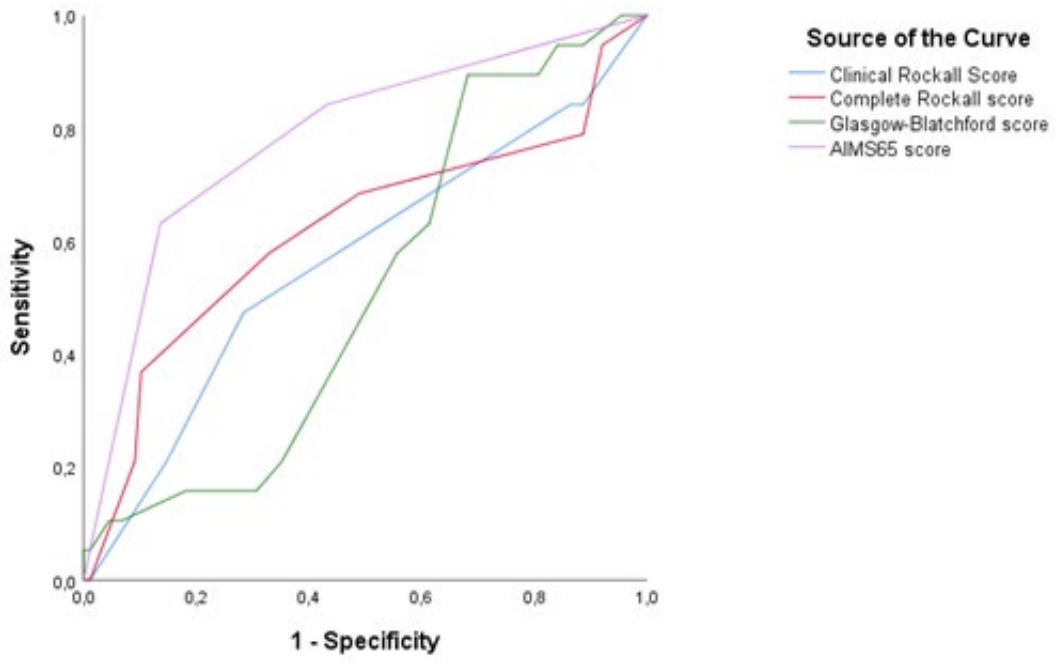

Figure 2: Receiver Operating Characteristic (ROC) Curves of the Scoring Systems for Predicting 30-day Mortality in Nonvariceal Upper Gastrointestinal Bleeding.