RJNMSR
Review Journal of Neurological & Medical Sciences Review
Volume 3, Issue 1, 2025

ACCURACY OF GLASGOW-BLATCHFORD SCORE AND ROCK ALL IN PREDICTING CLINICAL OUTCOMES IN UPPER GASTROINTESTINAL BLEED

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DOI: https://doi.org/10.5281/zenodo.16946500

Received	Accepted	Published
01 March , 2025	02 May, 2025	27 May , 2025

ABSTRACT

Background: *Upper gastrointestinal bleeding (UGIB) is a prevalent medical emergency associated with considerable mortality. The Glasgow Blatchford Score (GBS) and Rockall Score are recognised risk stratification instruments; nevertheless, their relative diagnostic accuracy for predicting the in-hospital mortality within specific populations is uncertain. This study sought to assess and evaluate the precision of the GBS and Rockall Score in forecasting in-hospital mortality in patients with UGIB.*

Methods: *A cross-sectional validation study was conducted at the Department of Medicine, Fauji Foundation Hospital, Rawalpindi, from August 2024 to March 2025. A total of 441 consecutive adult patients with UGIB were enrolled. The GBS and Rockall scores were calculated at admission and after endoscopy, respectively. The primary outcome was in-hospital mortality. Diagnostic accuracy parameters (sensitivity, specificity, predictive values, likelihood ratios) were calculated against this clinical outcome which was in-hospital death. Stratification was done on the basis of age, gender, and BMI.*

Results: *The mean age of the study population was 51.58±11.26 years, with a female predominance (61.5%). The actual mortality rate was 8.8%. The GBS demonstrated marginally higher sensitivity (71.8% vs. 64.1%) but similar specificity (51.2% vs. 51.0%) compared to the Rockall Score. Both scores had low positive predictive values (GBS: 12.5%, Rockall: 11.3%) but high negative predictive values (GBS: 94.9%, Rockall: 93.6%). Stratification revealed significant performance variations: scores were more accurate in males and patients ≤55 years but demonstrated catastrophically low specificity in patients of >55 years of age.*

Conclusion: *The GBS and Rockall scores are effective instruments for excluding mortality in UGIB patients, as demonstrated by their elevated NPVs. Nonetheless, their limited overall accuracy*

and poor positive predictive values contribute to a considerable incidence of false positives, culminating in a substantial overestimation of risk, especially among the elderly. The GBS shown a little superiority over the Rockall Score. Clinicians ought to employ these ratings judiciously for risk classification, particularly in elderly patients, and should contemplate their integration with clinical judgement to prevent superfluous procedures.

Keywords: *Upper Gastrointestinal Bleeding; Glasgow Blatchford Score; Rockall Score; Risk Stratification; Mortality; Diagnostic Accuracy..*

INTRODUCTION

UGIB is a common and potentially life-threatening condition. Defined as bleeding originating proximal to the ligament of Trietz; bleeding from the esophagus, stomach, or duodenum can present as hematemesis, melaena; or, in the context of severe bleeding and rapid intestinal transit, hematochezia. UGIB accounts for 75% of all acute gastrointestinal (GI) bleeding cases. The incidence of upper gastrointestinal bleed is reported to be ranging from 50 to 160 cases per 100,000 adults per year and mortality rate stable at 6-14% in most studies. Common risk factors for upper GI bleeding include prior upper GI bleeding, anticoagulant use, high-dose nonsteroidal anti-inflammatory drug use, helicobacter pylori infection, smoking, history of liver disease and older age. Causes of upper GI bleeding include peptic ulcer bleeding, gastritis, esophagitis, variceal bleeding, Mallory-Weiss syndrome, and cancer. Signs and symptoms of upper GI bleeding may include abdominal pain, lightheadedness, dizziness, syncope, hematemesis, and melena.

For upper gastrointestinal bleeding, risk assessment scoring systems have been developed to determine which patients are low risk and can be safely discharged and managed as outpatients, thereby lowering health care costs, and which patients are at high risk of mortality, rebleeding, the need for blood transfusion or immediate intervention.' The scoring system with the greatest acceptance is the Rockall score, which takes into account endoscopic results, age, medical comorbidities, and the presence of shock. It works well for both variceal and non-variceal bleeding, and it is easy to calculate. It is not possible to determine the Rockall score until after endoscopy has been performed. The GBS does not require endoscopic data; instead, it is based on straightforward clinical observations, blood urea and hemoglobin values. One benefit of the GBS is that it can be used to forecast the need for immediate care and can be calculated soon after hospital admission. Both the scoring systems have their own benefits but clinical effectiveness of all the scores remains unclear as well as accuracy and generalizability of these scores with an optimum cut-off value is still debatable.

Besides, early diagnosis, accurate stratification of patients with higher mortality risk, may significantly increase the efficiency of medical treatment since these data can be used by emergency physicians when making final decisions. Both GBS and Rockall scoring systems are routinely used in our population for the risk stratification, however no study has done to date that determined and compared the accuracy of both these scoring system in predicting the mortality among our patient presenting with UGIB. So, the goal of present study is to fill this research gap. Our findings would not only give us an idea of the ability of either score in predicating the mortality of UGIB but our study would also help to identify the score with better sensitivity and specificity (accuracy). On the basis of these findings, the score with better predicting abilities will be preferred in future in our setting for risk stratification among patients with UGIB.

MATERIALS AND METHODS

This study applied a cross-sectional validation design to assess the diagnostic accuracy of two established risk stratification tools, the GBS and the Rockall Score, in predicting in-hospital mortality among patients with UGIB. The investigation was carried out in the Department of Medicine at Fauji Foundation Hospital, Rawalpindi, from 15 August 2024 to 15 March 2025 subsequent to obtaining formal ethical

permission. A diagnosis of UGIB was clinically established upon hospital admission and corroborated by the occurrence of haematemesis, melena, coffee-ground emesis, or a positive faecal occult blood test, in line with the criteria of the International Classification of Diseases, Ninth Revision (ICD-9). The principal clinical outcome, in-hospital mortality, was defined as death from any cause occurring during the hospitalisation subsequent to the UGIB episode. For analytical purposes, a GBS value of ≥9.5 and a Rockall Score of ≥4.5 were predetermined as the high-risk thresholds indicative of mortality. Standard diagnostic definitions were utilised: a True Positive indicated a high-risk score accompanied by subsequent mortality; a True Negative denoted a low-risk score with patient survival; a False Positive represented a high-risk score in a patient who survived; and a False Negative signified a low-risk score in a patient who succumbed. The sample size was established using a sensitivity and specificity sample size calculator. A minimum of 441 consecutively presenting patients was required, given an anticipated sensitivity of 92.9%, a specificity of 52.9%, a prevalence of 5.9%, a 95% confidence level, and a targeted accuracy of 10% by using the statistics from the study conducted by Custovic N et al. Participants were recruited through a non-probability consecutive sampling method. The inclusion criteria consisted of persons aged 18 to 70 years, regardless of gender, who exhibited UGIB and necessitated an emergency upper gastrointestinal endoscopy within 24 hours of admission. Individuals were excluded if the bleeding resulted from a post-procedural complication after endoscopic resection, if they had any underlying malignancy (including gastrointestinal malignancies), or if a congenital bleeding disease was present. Upon admission, written explicit consent was secured from all participants or their legal representatives. The lead investigator performed a comprehensive clinical history and physical examination. A thorough laboratory evaluation was conducted, encompassing a complete blood count, coagulation profile (PT, APTT, INR), albumin, blood urea nitrogen (BUN), and assessments of liver and renal function. All patients later underwent an endoscopic procedure to identify the source of bleeding. The GBS and Rockall scores were computed promptly upon the availability of the necessary haematological results and endoscopic observations. Patient outcomes were monitored during hospitalisation to ascertain mortality status. Data was analyzed using SPSS version 25.0. Continuous variables were expressed as means ± standard deviations. Categorical variables, were summarized as frequencies and percentages. The diagnostic accuracy parameters of each scoring system were determined using 2x2 contingency tables against the gold standard of in-hospital mortality. Positive and negative likelihood ratios (LR+ and LR-) were calculated. To control for potential effect modification and to assess the robustness of the scores across key demographics, a stratified analysis was performed based on age groups, gender, and BMI.

RESULTS

The study cohort comprised predominantly middle-aged individuals (mean age: 51.58 ± 11.26 years), with a notable female predominance (61.5%). Body Mass Index (BMI) data revealed that nearly half of the patients (49.4%) fell into the overweight category (24-29 kg/m²), while 11.6% were obese (BMI >29 kg/m²). The risk assessment scores indicated that most patients had moderate to high-risk profiles, with mean scores of 9.03 ± 1.27 for GBS and 4.25 ± 0.59 for Rockall, suggesting a substantial likelihood of adverse outcomes. Detailed analysis of quantitative and qualitative variables is reflected in table 1 and table 2. Despite the scoring systems flagging approximately half of the patients as high-risk (GBS: 50.8%; Rockall: 50.3%), the actual mortality rate was significantly lower (8.8%). This discrepancy raises important questions about the specificity and overestimation tendencies of these scores. Ratio of positive and negative findings for clinical outcomes as well as GBS and Rockall score are tabulated in table 3.

GBS had marginally higher sensitivity (71.8% vs. 64.1%) but similar specificity (51.2% vs. 51.0%) compared to the Rockall Score. Both scores demonstrated low PPV (GBS: 12.5%; Rockall: 11.3%), indicating a high false-positive rate. High NPV (GBS: 94.9%; Rockall: 93.6%) suggests they are more reliable in ruling out mortality. Overall

accuracy was both scores, highlighting the need for complementary risk-assessment tools. Diagnostic accuracy analysis' of both scores are illustrated in table 4.

Stratification analysis reflected that both scores have better sensitivity in older patients (>55 years) but catastrophically low specificity. Younger patients (<55) had balanced sensitivity (69.6%) and specificity (71.7%) with GBS. GBS performed markedly better in females (80% sensitivity, 71.9% specificity) vs males (69% sensitivity, 37.6% specificity). Obese patients (BMI>29) showed perfect (100%) metrics, suggesting possible data limitations. On the other hand, normal-weight patients had excellent specificity (98.2%) but poor sensitivity (14.3%). Detailed stratification analysis is illuminated in table 5 and table 6. Likelihood ratios and their respective interpretation is presented in table 7

Table 1: Demographic profile of the study population (quantitative variables) n=441

Variable	Minimum	Maximum	Mean ± SD
Age (years)	29.00	70.00	51.58 ± 11.26
BMI	16.80	31.50	25.27 ± 3.95
GBS Score	6.50	11.80	9.03 ± 1.27
Rockall Score	2.90	5.50	4.25 ± 0.59

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Table 2: Demographic profile of the study population (qualitative variables) n=441

Variable	Category	Frequency (N)	Percentage (%)
Gender	Female	271	61.5%
	Male	170	38.5%
Age Group	≤ 55 years	306	69.4
	>55 years	135	30.6
BMI Group	>29 kg/m^2	51	11.6
	24-29 kg/m^2	218	49.4
	< 24 kg/m^2	172	39.0

Table 3: Overall results of ultrasonography and MRI findings for the diagnosis of in detecting rotator cuff tears

Findings	Clinical Outcome (Mortality)	Prediction of mortality on GBS	Prediction of mortality on Rockall score
Negative	402 (91.2%)	217 (49.2%)	219 (49.7%)
Positive	39 (8.8%)	224 (50.8%)	222 (50.3%)
Total	441 (100%)	441 (100%)	441 (100%)

Table 4: Diagnostic accuracy of GBS and Rockall scoring for predicting the in hospital mortality keeping clinical outcome as gold standard

Prediction of mortality on GBS	In Hospital Mortality (Clinical Outcome)		
	POSITIVE	NEGATIVE	TOTAL
POSITIVE	28 (71.8%) (True Positives)	196 (48.8%) (False Positives)	224 (50.8%)
NEGATIVE	11 (28.2%) (False Negatives)	206 (51.2%) (True Negatives)	217 (49.2%)
TOTAL	39 (100%)	402 (100%)	441 (100%)

Sensitivity (%)	Specificity (%)	Accuracy (%)	PPV (%)	NPV (%)
71.8	51.2	53.1	12.5	94.9

Prediction of mortality on Rockall	In Hospital Mortality (Clinical Outcome)		
	POSITIVE	NEGATIVE	TOTAL
POSITIVE	25 (64.1%) (True Positives)	197 (49.0%) (False Positives)	222 (50.3%)
NEGATIVE	14 (35.9%) (False Negatives)	205 (51.0%) (True Negatives)	219 (49.7%)
TOTAL	39 (100%)	402 (100%)	441 (100%)

Sensitivity (%)	Specificity (%)	Accuracy (%)	PPV (%)	NPV (%)
64.1	51.0	52.2	11.3	93.6

PPV: Positive Predictive Value, NPV: Negative Predictive Value

Table 5: Diagnostic accuracy of GBS for predicting the in hospital mortality keeping clinical outcome as gold standard (stratification analysis for study confounders)

Study Confounders	Sensitivity	Specificity	Accuracy	PPV	NPV
Gender					
Male	80.0	71.9	72.4	15.1	98.3
Female	69.0	37.6	41.0	11.7	91.0
Age Groups					

Study Confounders	Sensitivity	Specificity	Accuracy	PPV	NPV
Gender					
Male	80.0	71.9	72.4	15.1	98.3
Female	69.0	37.6	41.0	11.7	91.0
≤55 Years	69.6	71.7	71.5	16.7	96.7
>55Years	75.0	2.5	11.1	9.4	42.9
BMI					
>29 kg/m2	100.0	***	100.0	100.0	***
24-29 kg/m2	78.3	22.6	28.4	10.7	89.8
< 24 kg/m2	14.3	98.2	94.8	25.0	96.4

*PPV: Positive Predictive Value, NPV: Negative Predictive Value ***Undefined (No count)*

Table 6: Diagnostic accuracy of Rockall scoring for predicting the in hospital mortality keeping clinical outcome as gold standard (stratification analysis for study confounders)

Study Confounders	Sensitivity	Specificity	Accuracy	PPV	NPV
Gender					
Male	70.0	71.9	71.8	13.5	97.5
Female	62.1	37.2	39.9	10.6	89.1
Age Groups					
≤55 Years	56.5	71.4	70.2	13.8	95.3
>55Years	75.0	2.5	11.1	9.4	42.9
BMI					
>29 kg/m2	100.0	***	100.0	100.0	***
24-29 kg/m2	69.6	22.6	27.5	9.6	86.3
< 24 kg/m2	***	97.6	93.6	***	95.8

*PPV: Positive Predictive Value, NPV: Negative Predictive Value *** Undefined (No count)*

Table 7: Likelihood Ratios for GBS and Rockall Scores

Variables	Score	LR+	LR-	Interpretation
Overall	GBS	1.47	0.55	Minimal rule-in utility; Moderate rule-out capability
	Rockall	1.31	0.70	Slightly worse than GBS for both rule-in and rule-out
Male	GBS	2.85	0.28	Good rule-in (LR+>2) and excellent rule-out (LR-<0.3)
	Rockall	2.49	0.42	Clinically useful for males
Female	GBS	1.11	0.82	Limited clinical utility (LR+≈1)

Variables	Score	LR+	LR-	Interpretation
	Rockall	0.99	1.02	No diagnostic value (LR+≈1, LR-≈1)
≤55 Years	GBS	2.45	0.42	Useful for both ruling in and out mortality
	Rockall	1.98	0.61	Moderate utility
>55 Years	GBS/Rockall	0.77	10.00	Useless for ruling in (LR+<1); Dangerous for ruling out (LR-=10 indicates failure)
BMI - >29 kg/m²	GBS/Rockall	∞*	0	Perfect sensitivity but undefined specificity (small sample artifact)
BMI - 24-29 kg/m²	GBS	1.01	0.96	No diagnostic value
	Rockall	0.90	1.35	Potentially misleading (LR->1)
BMI - <24 kg/m²	GBS	7.94	0.87	Strong rule-in if positive (high LR+) but low sensitivity
	Rockall	N/A	N/A	Insufficient data

*∞ = *Undefined due to 100% sensitivity and 0%*

DISCUSSION

Upper gastrointestinal bleeding (UGIB) constitutes a critical medical emergency, requiring precise risk classification instruments to inform clinical decision-making. This study assessed the diagnostic precision of two prevalent scoring systems, the Glasgow Blatchford Score (GBS) and the Rockall Score, in forecasting in-hospital mortality among 441 patients with upper gastrointestinal bleeding (UGIB). The findings elucidate significant insights on the strengths and limits of these scoring systems, especially in relation to demographic stratifications such as age, gender, and BMI. The findings indicate that although both ratings are effective in excluding mortality (as shown by strong negative predictive values), their overall accuracy is moderate, and their efficacy differs markedly among various patient subgroups. This discourse will situate these findings within the current literature, examine clinical ramifications, and provide avenues for future inquiry. The study population was primarily middle-aged (mean age: 51.58 ± 11.26 years), with a significant female majority (61.5%). Approximately 49.4% of the patients were classified as overweight (BMI 24–29 kg/m²), whilst 11.6% were categorized as obese (BMI >29 kg/m²). The mean GBS (9.03 ± 1.27) and Rockall Scores (4.25 ± 0.59) suggested that the majority of patients were classified within moderate-to-high-risk categories. Nevertheless, although over half of the group was designated as high-risk by both assessments (GBS: 50.8%; Rockall: 50.3%), the observed mortality rate was merely 8.8%. This mismatch underscores a significant weakness of these scores: their propensity to overestimate danger, resulting in possible overtreatment. In comparison to the Rockall Score, the GBS showed almost the same specificity but slightly higher sensitivity. A substantial false-positive rate was indicated by the low positive predictive values (PPV) of both scores. The high negative predictive values (NPV: Rockall 93.6%) and GBS 94.9%, on the other hand, support their usefulness in

identifying low-risk patients who might not need intense intervention. The poor overall accuracy (GBS: 53.1%, Rockall: 52.2%) highlights the necessity for additional biomarkers and clinician judgement, indicating that neither score is sufficiently trustworthy as a stand-alone tool for mortality prediction. These findings are align with the previously published studies. In a recent comparative analysis of risk scoring systems in predicting mortality in UGIB patients, Custovic N et al, reported that sensitivity and specificity of Rockall sore >4.5 for predicting the mortality were 92.9% and 57.5% respectively, while sensitivity and specificity of GBS sore >9.5 were 92.9% and 52.9% respectively while mortality rate was 5.9%. Jayalal et al. indicated that GBS had the best sensitivity (80.0%) but the lowest specificity (41.2%) for variceal haemorrhage, whereas Rockall demonstrated a balanced performance (AUC: 0.75). El-Mohr et al. established that GBS (AUC: 0.98) and Rockall (AUC: 0.84) are robust mortality predictors, with GBS exhibiting superior specificity (88.1% compared to 60.6%). Gu et al. observed that AIMS65 outperformed both GBS and Rockall in mortality prediction (AUC: 0.91 compared to 0.71 and 0.79), however Rockall exhibited superior specificity in non-variceal UGIB.

The stratification demonstrated significant disparities in performance based on age. This pattern indicates that both scores disproportionately categorise elderly individuals as high-risk, even when mortality is improbable. Comparable trends were noted with the Rockall Score, which demonstrated specificity under 3% in elderly individuals. The findings are troubling, as older individuals are frequently susceptible to unwarranted invasive treatments (e.g., endoscopy), which entail elevated complication rates in this demographic. The poor specificity in older persons may indicate comorbidities or scoring settings (e.g., age weighting) that insufficiently differentiate between actual risk and confounding variables. GBS had significantly superior performance in females relative to males. The gender disparity was less noticeable however still apparent for the Rockall Score. The increased specificity in females may be attributed to physiological differences (e.g., reduced incidence of alcohol-related upper gastrointestinal bleeding) or confounding social factors (e.g., healthcare-seeking behaviour). In contrast, the low specificity in males may indicate a greater prevalence of risk factors, such variceal haemorrhage or NSAID consumption. These inequalities indicate that gender-specific score changes could enhance accuracy, although additional research is required. These findings contrast with Martínez-Cara et al., where GBS and Rockall performed similarly across age groups (AUC: 0.76–0.78) but were less reliable for rebleeding. Similarly, Khatana found GBS and Rockall effective in variceal UGIB (AUC: 0.89 and 0.75, respectively) but not in non-variceal cases. The most surprising finding was the flawless sensitivity, specificity, and accuracy (100%) in obese individuals (BMI >29 kg/m^2) for both assessments. This oddity presumably arises from a limited sample size (n=51) or selection bias, as obesity is infrequently linked to impeccable test performance. In contrast, normal-weight patients had high specificity but low sensitivity (undefined due to no true positives). The current study's low PPVs (≤12.5%) suggest overestimation of risk, potentially leading to unnecessary interventions that is align with the findings of Mokhtare et al., where GBS excelled in predicting transfusion needs (AUC: 0.757) but Rockall was superior for 1-month mortality (AUC: 0.648). On the other hand, Shabaan et al. highlighted superiority of few other scores over GBS and Rockall for mortality prediction (AUC: 0.95 vs. 0.88 vs. 0.83).

Few limitations of this study must be acknowledged. This study was a single-centre retrospective analysis with a limited subgroup sample size, especially within BMI categories, potentially restricting the generalizability of the findings and amplifying certain results (e.g., perfect accuracy among obese patients). The retrospective design may introduce selection bias, and significant confounders, including medication history and comorbidities, could not be evaluated. Additionally, mortality was defined as in-hospital death from any cause, which may obscure UGIB-specific outcomes and does not consider post-discharge events such as rebleeding. Finally, the GBS and Rockall Scores were created in distinct populations; thus, their calibration for this cohort may not be optimal, and emerging risk

stratification tools were not assessed for comparison.

CONCLUSIONS

Both the GBS and Rockall scores are highly effective for ruling out mortality in UGIB patients, evidenced by their excellent negative predictive values. However, their poor positive predictive value leads to a significant overestimation of risk, resulting in a high false-positive rate. This limitation is particularly pronounced in elderly patients, where specificity is critically low. Consequently, these scores should not be used in isolation to guide aggressive interventions. They are best utilized as part of a comprehensive clinical assessment to safely identify low-risk patients for outpatient management, while avoiding unnecessary procedures in those falsely classified as high-risk.

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