

Title:

Comparison of the AIMS65 score with the Glasgow-Blatchford and Rockall scoring systems for the prediction of the risk of in-hospital death among patients with upper gastrointestinal bleeding

Authors:

Xuefeng Lu, Xiaojie Zhang, Hong Chen

DOI: 10.17235/reed.2020.6496/2019

Link: [PubMed \(Epub ahead of print\)](#)

Please cite this article as:

Lu Xuefeng, Zhang Xiaojie, Chen Hong. Comparison of the AIMS65 score with the Glasgow-Blatchford and Rockall scoring systems for the prediction of the risk of in-hospital death among patients with upper gastrointestinal bleeding. Rev Esp Enferm Dig 2020. doi: 10.17235/reed.2020.6496/2019.



This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

OR 6496 inglés

Comparison of the AIMS65 score with the Glasgow-Blatchford and Rockall scoring systems for the prediction of the risk of in-hospital death among patients with upper gastrointestinal bleeding

Xuefeng Lu¹, Xiaojie Zhang¹ and Hong Chen²

¹Department of Gastroenterology. The Second People's Hospital of Lianyungang. Lianyungang, Jiangsu. China. ²Department of Gastroenterology. Affiliated ZhongDa Hospital. School of Medicine. Southeast University. Nanjing, Jiangsu. China

Received: 26/07/2019

Accepted: 29/12/2019

Correspondence: Hong Chen. Department of Gastroenterology. Affiliated ZhongDa Hospital. School of Medicine. Southeast University. No. 87 Dingjiaqiao Road 210009 Nanjing, Jiangsu, China

e-mail: njchenhong66@163.com

ABSTRACT

Objective: the aim of this study was to compare the AIMS65, Glasgow-Blatchford score (GBS) and Rockall score for the prediction of the risk of in-hospital death among patients with upper gastrointestinal bleeding (UGIB).

Methods: patients with UGIB admitted to the ZhongDa hospital from June 2015 to July 2017 were retrospectively collected. All patients were assessed by the AIMS65, GBS and Rockall score and the main outcomes were in-hospital mortality. Odds ratios (OR) and 95 % confidence interval (CI) were estimated to assess the association of the three scores with the risk of death using logistic regression models. Subsequently, their risk stratification accuracy were compared. Finally, their predictive power was compared using the area under the receiver operating

characteristic curve (AUROC).

Results: of the 284 UGIB patients enrolled in the study, 51 (18.0 %) had variceal bleeding (VUGIB) and 10 patients (3.5 %) died. AIMS65 (OR = 5.14, 95 % CI = 2.48, 10.64), GBS (OR = 1.66, 95 % CI = 1.28, 2.15) and Rockall (OR = 2.72, 95 % CI = 1.76, 4.18) scores were positively associated with death risk among all patients. The AIMS65 score (high-risk group vs low-risk group: 11.9 % vs 0.0 %, $p < 0.001$) was effective to classify high-risk in-hospital deaths populations. The AIMS65 score was the best approach to predict in-hospital death among all UGIB patients (AUROC: AIMS65 0.955, GBS 0.882, Rockall 0.938), NVUGIB patients (AUROC = 0.969, 95 % CI = 0.937, 0.989) or VUGIB patients (AUROC = 0.885, 95 % CI = 0.765, 0.967).

Conclusions: the AIMS65 score is the most convenient UGIB prognostic score to predict in-hospital mortality and may be more suitable for patients with NVUGIB.

Keywords: Upper gastrointestinal bleeding. Risk assessment. AIMS65 score. Glasgow-Blatchford score. Rockall score.

INTRODUCTION

Upper gastrointestinal bleeding (UGIB) includes non-variceal upper gastrointestinal bleeding (NVUGIB) and variceal upper gastrointestinal bleeding (VUGIB) (1). It may cause peripheral circulation disorder and is life-threatening in severe cases, when the amount of bleeding exceeds 1000 mL in a short time or exceeds 20 % of the circulating blood volume. This condition affects 48-165 people per 100,000 adults, annually (2). Patients with UGIB have a risk of a variety of adverse outcomes, including recurrent bleeding (5 %-15 %) and death (1 %-13 %). Even though endoscopy can achieve hemostasis in the early stages of bleeding in some patients, there are still up to 15 % of patients who have a rebleeding after endoscopic therapy, which is thought to be associated with mortality (3,4). The initial disease assessment can assist in the development of follow-up treatment plans and the hierarchical management of patients according to risk stratification can significantly improve prognosis. Therefore, early and accurate risk grading of UGIB patients is a primary concern for clinicians.

The American College of Gastroenterology recommends risk stratification during the early management of UGIB patients (5). At present, the most studied prognostic scoring system is the Rockall score and the Glasgow-Blatchford score (GBS) (6-11). The practical application of these two scores in the clinic is limited due to the complexity of the calculations. Saltzman JR et al. proposed the AIMS65 scoring system in 2011 (12), which is relatively simple and based on the patient's age, systolic blood pressure (SBP), serum albumin (ALB) and international normalized ratio (INR). The mental state changes are scored and the values range is 0 to 5 points. When the score is greater than or equal to 2, the score is high risk and when less than 2, it categorized as low risk. Furthermore, the calculation of AIMS65 score does not need to be combined with the results of endoscopy, the indicators are easy to obtain and suitable for rapid assessment. The number of articles on AIMS65 scores has increased in recent years, but there is no uniform conclusion on the comparison of the AIMS65, GBS and Rockall score. In fact, most studies excluded patients with VUGIB (13-16). The GBS, Rockall score and AIMS65 scores have limited validation data for patients with VUGIB (17). Therefore, we selected a broad and simple study inclusion criteria that included all patients who underwent endoscopic diagnosis of UGIB, including NVUGIB and VUGIB. A subgroup analysis of the two causes was subsequently performed.

The aim of the study was to evaluate the performance of the AIMS65, GBS and Rockall prognostic scoring systems for the prediction of in-hospital death among UGIB patients in China. Furthermore, the association of each the scores with the occurrence of in-hospital death outcomes, the accuracy of risk stratification and the predictive power on the risk of in-hospital death were also assessed.

MATERIALS AND METHODS

Patients

Patients presenting with UGIB at the Zhongda Hospital between June 2015 and July 2017 were retrospectively evaluated. The inclusion criteria were patients hospitalized within 48 hours of endoscopy and diagnosed with upper gastrointestinal bleeding. The exclusion criteria were: (1) insufficient laboratory data for calculating

the risk scores; (2) endoscopic examination not performed; (3) hemorrhage other than upper gastrointestinal hemorrhage; (4) unacceptable specification system treatment, including automatic discharge and transfer of patients; and (5) non-AUGIB cause death.

Observation indicators

The following data were collected for each patient: age, gender, mental status, symptoms on admission (hematemesis, vomiting coffee-like substance, melena, syncope, lethargy, blood pressure and pulse), comorbidities (ischemic heart disease, diabetes mellitus, congestive cardiac failure and liver disease), laboratory results (ALB levels, INR, BUN and hemoglobin) and endoscopy results. AIMS65, GBS, and Rockall scores were calculated for each patient. Table 1 shows the scoring algorithms for each scoring system. The primary outcome was in-hospital death, defined as death due to UGIB during hospitalization.

The study did not need to be approved by the ethics committee according to the relevant regulations. All the data were anonymously collected and analyzed.

Statistical analysis

The data analysis was performed using the statistical analysis program, SPSS Version 20 (IBM, Armonk, NK) and MedCalc Version 15.2.2 for Windows. The area under the receiver-operating characteristic curve (AUROC) was calculated for each scoring system and binomial outcome. First, the odds ratios (OR) and 95 % confidence interval (CI) were estimated to assess the association of the AIMS65, GBS and Rockall score with death risk using logistic regression models. Then, the in-hospital mortality of patients in different risk groups after stratification according to the three scores were compared using the chi-square test to compare their risk stratification accuracy. Finally, the predictive power of these three scores was compared by using the area under the receiver operating characteristic curve (AUROC). Patients were divided into variceal bleeding and non-variceal bleeding groups and the subgroup analysis was performed within these groups. All reported p values were bilateral and a p value less than 0.05 was considered as statistically significant.

RESULTS

Patients characteristics

A total of 337 patients diagnosed with UGIB were enrolled between June 2015 and July 2017, 284 of which were included in the study. Fifty-three patients were excluded, 28 due to an endoscopy within 48 hours of bleeding and another 25 patients due to incomplete data. Table 2 shows the characteristics of the 284 participants included in the study. The median age of the patients was 64 years (interquartile range: 50-73), 69.4 % of which were male. There were 51 patients (18.0 %) with VUGIB and 233 patients (82.0 %) with NVUGIB. There were 164 cases of ulcerative disease among the patients with NVUGIB. This accounted for 70.4 % of non-variceal bleeding, including 78 cases of duodenal ulcer, 48 cases of gastric ulcer, 20 cases of compound ulcer, 16 cases of residual gastric anastomotic ulcer and 2 cases of esophageal ulcers. Other causes included: 31 cases of digestive tract tumors, 14 cases of acute gastric mucosal lesions, 12 cases of Mallory-Weiss syndrome, 5 cases of postoperative hemorrhage after endoscopic submucosal dissection (ESD), 3 cases of Dieulafoy's disease, 3 cases of esophagitis, 1 case of gastric stromal tumor (GST), 1 case of duodenal stromal tumor, 1 case of intragastric foreign body stab wound and 1 case of esophageal trauma.

Association of the AIMS65, GBS and Rockall score with death risk

The overall in-hospital mortality rate was 3.5 % (10 cases). Table 3 shows the association of the AIMS65, GBS and Rockall scores with the risk of in-hospital death among the 284 UGIB patients and subgroups (NVUGIB and VUGIB). According to the univariate analysis, AIMS65 (OR = 5.14, 95 % CI = 2.48, 10.64), GBS (OR = 1.66, 95 % CI = 1.28, 2.15) and Rockall (OR = 2.72, 95 % CI = 1.76, 4.18) scores were positively associated with the risk of death all patients. AIMS65 was the most significant predictor of in-hospital death outcome, with each additional point conveying a greater than 4-fold odds of reaching the in-hospital death outcome. Among patients with NVUGIB, the scenarios of the association of AIMS65, GBS and Rockall scores with in-hospital death were similar to the entire patient cohort. However, only

AIMS65 was positively associated with the risk of in-hospital death among patients with VUGIB.

Risk stratification of death risk among UGIB patients by the AIMS65, GBS and Rockall scoring systems

Table 4 shows the risk stratification of in-hospital death by the AIMS65, GBS and Rockall scoring systems among all 284 UGIB patients and subgroups (NVUGIB and VUGIB). According to the statistics, AIMS65 (high-risk group vs low-risk group: 11.9 % vs 0.0 %, $p < 0.001$) and Rockall (high-risk group vs. risk group vs. low-risk group: 9.4 % vs 0.0 %, $p < 0.001$) were effective to classify high-risk populations with in-hospital deaths among the entire UGIB patients cohort. While, there was no significant difference in the actual in-hospital mortality between the high-risk group and the low-risk group ($p > 0.05$), according to GBS. Among patients with NVUGIB, the death risk stratification by AIMS65, GBS and Rockall scores were similar to those within the entire cohort. However, none of the three scoring systems could effectively distinguish high-risk groups for in-hospital death among patients with VUGIB.

The predictive power of the AIMS65, GBS and Rockall score for death risk among UGIB patients

Figure 1 shows the AUROCs of AIMS65, GBS and Rockall scoring systems to predict in-hospital death among all UGIB patients. AIMS65 (AUROC = 0.955, $p < 0.001$, 95 % CI = 0.923, 0.976) performed the best to predict in-hospital death, followed by Rockall (AUROC = 0.938, $p < 0.001$, 95 % CI = 0.903, 0.963) and GBS (AUROC = 0.882, $p < 0.001$, 95 % CI = 0.839, 0.917).

Figure 2 shows the AUROCs of AIMS65, GBS and Rockall scoring systems to predict in-hospital death among NVUGIB and VUGIB patients. Among NVUGIB patients, AIMS65 (AUROC = 0.969, $p < 0.001$, 95 % CI = 0.937, 0.989) performed the best to predict in-hospital death, followed by Rockall (AUROC = 0.966, $p < 0.001$, 95 % CI = 0.933, 0.985) and GBS (AUROC = 0.890, $p < 0.001$, 95 % CI = 0.843, 0.927).

Among all the VUGIB patients, AIMS65 (AUROC = 0.885, $p < 0.001$, 95 % CI = 0.765, 0.967) performed the best to predict in-hospital death, followed by GBS (AUROC = 0.781, $p < 0.001$, 95 % CI = 0.643, 0.885) and Rockall (AUROC = 0.767, $p = 0.014$, 95 % CI = 0.625, 0.874).

DISCUSSION

This was a retrospective analysis of 284 patients with UGIB, with a high proportion of male patients and a male to female ratio of approximately 2.3:1. The top four causes of UGIB were duodenal ulcer hemorrhage (27.5 %), gastric fundus esophageal variceal hemorrhage (18.0 %), gastric ulcer hemorrhage (16.9 %) and digestive tract neoplastic hemorrhage (10.9 %). This is consistent with previous reports in the literature (17).

There was a significant positive correlation between AIMS65, GBS and Rockall scores and in-hospital mortality risk in this retrospective study. The positive correlation of AIMS65 was the most significant (OR = 5.14, 95 % CI = 2.48, 10.64) finding, which is similar to a previous retrospective study based on a Chinese UGIB population (18).

In this study, AIMS65 was an accurate risk assessment tool to predict the risk of in-hospital mortality in all UGIB patients (in-hospital mortality: high-risk group 30.9 % and low-risk group 4.5 %, $p < 0.001$). This is consistent with the study by Thandassery RB et al. (19). However, the subgroup analysis demonstrated the poor performance of AIMS65 for the prediction of in-hospital death among VUGIB. Furthermore, a score of 2 cannot identify populations with a high-risk of in-hospital death. There were only 25 people with an AIMS65 score of less than 2, only 3 people with a GBS score of less than 6 points and only 7 with a Rockall score of less than 3 points among VUGIB patients. Therefore, perhaps the critical value for VUGIB patients should be increased to improve its specificity.

In this study based on AUROC, AIMS65 scores were the most useful to predict in-hospital death in patients with UGIB. However, a recent international multicenter prospective study (20) of 3012 patients with UGIB, found that GBS was good at predicting hospital-based intervention or death. This study excluded patients with gastrointestinal bleeding admitted to the hospital for other reasons, which is one of

the reasons for the inconsistent conclusions. In addition, this study included outpatients with gastrointestinal bleeding, who do not have access to standardized treatment and this may affect conclusions. Our study included all hospitalized patients with upper gastrointestinal bleeding and included those treated with standardized hospitalization. The findings of our study are consistent with those of previous prospective studies with similar inclusion criteria (21) and multiple retrospective studies (18,22).

The predictive value of the three scoring systems for in-hospital mortality was better in NVUGIB patients (AUROC: AIMS65 0.969, GBS 0.890, Rockall 0.966), compared with those with VUGIB (AUROC: AIMS65 0.885, GBS 0.781, Rockall 0.767). A recent large-scale prospective study (including 1101 patients with UGIB, 56.6 % of whom were VUGIB) found that the AIMS65 score, GBS and Rockall scores more accurately predict 42-day mortality in NVUGIB patients compared with VUGIB patients (24). This is consistent with the conclusions of this study.

In this study, the GBS and Rockall score were poor predictors of in-hospital death in patients with VUGIB. First, there was no significant positive correlation with the risk of in-hospital death. Second, patients with high-risk of in-hospital death could not be accurately identified in the risk stratification. Furthermore, the AUROCs of the two scores were all below 0.8, which means that the predictive ability was weak. A recent prospective study of the UGIB prognostic assessment also had similar findings (24). This study included 225 patients (22.9 %) with VUGIB and considered that GBS and Rockall had a poor performance to predict in-hospital death, rebleeding and treatment needs (blood transfusion, endoscopic hemostasis, interventional embolization and surgery) among VUGIB patients.

Compared to the GBS and Rockall score, the AIMS65 score is not dependent on endoscopy and can be calculated using conventionally available parameters. Thus, the calculation of the AIMS65 score is simpler. The rescue time can be shortened for emergency patient admissions and the patients' risk is assessed more quickly, thus this approach is superior. In our study, AIMS65 performed the best in these three scoring systems to predict in-hospital death in patients with UGIB. Therefore, in terms of ease of use and predictive power, AIMS65 may be the best tool to predict

in-hospital death in patients with UGIB.

Recently, there have been many studies exploring the risk factors that affect the prognosis of upper gastrointestinal bleeding. A retrospective cohort study showed that an increase in BUN within 24 hours may reflect capacity status and is a predictor of poor prognosis in NVUGIB patients (25). This dynamic change reflects more the prognosis of the disease. Whether or not there are predictions that are more meaningful is worth looking in to.

Limitations

Our study has some limitations. First, the sample size of the varicose group was very small and cannot truly reflect the predictive value of the three scoring systems for upper gastrointestinal bleeding. Second, the retrospective, single center nature makes the study less representative. Third, only patients who underwent endoscopy were included, which means that patients who refused endoscopy or were discharged directly from the outpatient department were not missed.

CONCLUSION

In this study, the AIMS65 score was positively correlated with the risk of in-hospital death and can accurately identify high-risk populations for in-hospital death among UGIB patients. Furthermore, it may be more suitable for patients with NVUGIB. In fact, compared with GBS and Rockall scores, it appears to be the best score to predict in-hospital death.

REFERENCES

1. Lau JY, Sung J, Hill C, et al. Systematic review of the epidemiology of complicated peptic ulcer disease: incidence, recurrence, risk factors and mortality. *Digestion* 2011;84(2):102-13. DOI: 10.1159/000323958
2. Barkun AN, Bardou M, Kuipers EJ, et al. International consensus recommendations on the management of patients with nonvariceal upper gastrointestinal bleeding. *Ann Intern Med* 2010;152(2):101-13. DOI: 10.7326/0003-4819-152-2-201001190-00009

3. Jairath V, Martel M, Logan RF, et al. Why do mortality rates for nonvariceal upper gastrointestinal bleeding differ around the world? A systematic review of cohort studies. *Can J Gastroenterol* 2012;26(8):537-43. DOI: 10.1155/2012/862905
4. Del P M, Bianco M A, Cipolletta L, et al. The "Prometeo" study: online collection of clinical data and outcome of Italian patients with acute nonvariceal upper gastrointestinal bleeding. *J Clin Gastroenterol* 2013;47(4):e33-e37. DOI: 10.1097/MCG.0b013e3182617dcc
5. Laine L, Jensen DM. Management of patients with ulcer bleeding. *Am J Gastroenterol* 2012;107:345-60. DOI: 10.1038/ajg.2011.480
6. Pang SH, Ching JY, Lau JY, et al. Comparing the Blatchford and pre-endoscopic Rockall score in predicting the need for endoscopic therapy in patients with upper GI hemorrhage. *Gastrointest Endosc* 2010;71:1134-40. DOI: 10.1016/j.gie.2010.01.028
7. Laursen S B, Dalton H R, Murray I A, et al. Performance of new thresholds of the Glasgow Blatchford score in managing patients with upper gastrointestinal bleeding. *Clin Gastroenterol Hepatol* 2015;13(1):115-21. DOI: 10.1016/j.cgh.2014.07.023
8. González-González JA, Vázquez-Elizondo G, García-Compeán D, et al. Predictors of in-hospital mortality in patients with non-variceal upper gastrointestinal bleeding. *Rev Esp Enferm Dig* 2011;103(4):196-203. DOI: 10.4321/S1130-01082011000400005
9. Blatchford O, Murray W R, Blatchford M. A risk score to predict need for treatment for upper-gastrointestinal haemorrhage. *Lancet* 2000;356(9238):1318-21. DOI: 10.1016/S0140-6736(00)02816-6
10. Rockall TA, Logan RF, Devlin HB, et al. Risk assessment after acute upper gastrointestinal haemorrhage. *Gut* 1996;38(3):316-21. DOI: 10.1136/gut.38.3.316
11. Recio-Ramírez JM, Sánchez-Sánchez MP, Peña-Ojeda JA, et al. The predictive capacity of the Glasgow-Blatchford score for the risk stratification of upper gastrointestinal bleeding in an emergency department. *Rev Esp Enferm Dig*

2015;107(5):262-7.

12. Saltzman J R, Tabak Y P, Hyett B H, et al. A simple risk score accurately predicts in-hospital mortality, length of stay, and cost in acute upper GI bleeding. *Gastrointest Endosc* 2011;74(6):1215-24. DOI: 10.1016/j.gie.2011.06.024
13. Jung S H, Oh J H, Lee H Y, et al. Is the AIMS65 score useful in predicting outcomes in peptic ulcer bleeding?. *World J Gastroenterol* 2014,20(7):1846-51. DOI: 10.3748/wjg.v20.i7.1846
14. Chen I C, Hung M S, Chiu T F, et al. Risk scoring systems to predict need for clinical intervention for patients with nonvariceal upper gastrointestinal tract bleeding. *Am J Emerg Med* 2007;25(7):774-9. DOI: 10.1016/j.ajem.2006.12.024
15. Romagnuolo J, Barkun AN, Enns R, et al. Simple clinical predictors may obviate urgent endoscopy in selected patients with nonvariceal upper gastrointestinal tract bleeding. *Arch Intern Med* 2007,167(3):265-70. DOI: 10.1001/archinte.167.3.265
16. Yaka E, Yilmaz S, Dogan NO, et al. Comparison of the Glasgow-Blatchford and AIMS65 scoring systems for risk stratification in upper gastrointestinal bleeding in the emergency department. *Acad Emerg Med* 2015,22(1):22-30. DOI: 10.1111/acem.12554
17. Wang H, Dun X, Bai Y, et al. Clinical epidemiological analysis of upper gastrointestinal bleeding in China. *Chinese Journal of Digestive Endoscopy* 2013;30(2):83-6.
18. Gu L, Xu F, Yuan J, et al. Comparison of AIMS65, Glasgow-Blatchford and Rockall scoring approaches in predicting the risk of in-hospital death among emergency hospitalized patients with upper gastrointestinal bleeding: a retrospective observational study in Nanjing, China. *BMC Gastroenterol* 2018;18(98). DOI: 10.1186/s12876-018-0828-5
19. Thandassery RB, Sharma M, John AK, et al. Clinical Application of AIMS65 Scores to Predict Outcomes in Patients with Upper Gastrointestinal Hemorrhage. *Gastrointest Endosc* 2015;48(5):380-4.
20. Stanley AJ, Laine L, Dalton HR, et al. Comparison of risk scoring systems for patients presenting with upper gastrointestinal bleeding: international

- multicentre prospective study. *BMJ* 2017;365:i6432. DOI: 10.1136/bmj.i6432
21. Abougergi MS, Charpentier, JP, Bethea, E, et al. A Prospective, Multicenter Study of the AIMS65 Score Compared With the Glasgow-Blatchford Score in Predicting Upper Gastrointestinal Hemorrhage Outcomes. *J Clin Gastroenterol* 2016;50(6):464-9. DOI: 10.1097/MCG.0000000000000395
22. Tang YD, Shen J, Zhang F, et al. Scoring systems used to predict mortality in patients with acute upper gastrointestinal bleeding in the ED. *Am J Emerg Med* 2017;36(1):27-32. DOI: 10.1016/j.ajem.2017.06.053
23. Rout Gyanranjan, Sharma Sanchit, Gunjan Deepak, et al. Comparison of various prognostic scores in variceal and non-variceal upper gastrointestinal bleeding: A prospective cohort study. *Indian J Gastroenterol* 2019;05:04. DOI: 10.1007/s12664-018-0928-8
24. Thanapirom K, Ridditid W, Rerknimitr R, et al. Prospective comparison of three risk scoring systems in non-variceal and variceal upper gastrointestinal bleeding. *J Gastroenterol Hepatol* 2016;31(4):761-7. DOI: 10.1111/jgh.13222
25. Kumar N L, Claggett B L, Cohen A J, et al. Association between an increase in blood urea nitrogen at 24 hours and worse outcomes in acute nonvariceal upper GI bleeding. *Gastrointest Endosc* 2017,86(6):1022-7. DOI: 10.1016/j.gie.2017.03.1533

Table 1. Scoring algorithms for the AIMS65, Glasgow-Blatchford and Rockall scores

AIMS65 score

Factor	Score
Albumin < 3.0 mg/dL	1
INR > 1.5	1
Altered mental status	1
SBP ≤ 90 mmHg	1
Age > 65 y	1
Maximum score	5

Note: When the score is ≥ 2 , it is classified into the high-risk group, < 2 is classified into the low-risk group. INR: international normalized ratio; SBP: systolic blood pressure; y: years.

Glasgow-Blatchford score

Factor	Score
<i>BUN, mg/dL</i>	
≥ 18.2 to < 22.4	2
≥ 22.4 to < 28.0	3
≥ 28.0 to < 70.0	4
≥ 70.0	6
<i>Hemoglobin, men g/dL</i>	
≥ 12.0 to < 13.0	1
≥ 10.0 to < 12.0	3
< 10.0	6
<i>Hemoglobin, women g/dL</i>	
≥ 10.0 to < 12.0	1
< 10.0	6
<i>SBP, mmHg</i>	
100-109	1
90-99	2
< 90	3
<i>Other markers</i>	
Pulse ≥ 100 bpm	1
Melena	1
Syncope	2
Hepatic diseases	2
Heart failure	2
Maximum score	23

Note: When the score is ≥ 6 it is classified into the high-risk group, < 6 it is classified into the low-risk group. BUN: blood urea nitrogen; SBP: systolic blood pressure; bpm:

beats per minute.

Rockall score

Factor	Score
<i>Age, y</i>	
< 60	0
60-79	1
> 80	2
<i>Shock</i>	
No shock	0
Pulse > 100 bpm, SBP > 100 mmHg	1
SBP < 100 mmHg	2
<i>Comorbidity</i>	
No major	0
CCF, IHD, or major comorbidity	2
Renal failure, liver failure, metastatic cancer	3
<i>Diagnosis</i>	
Mallory-Weiss tear or no lesion and no stigmata	0
All other diagnoses	1
GI malignacy	2
<i>Evidence of bleeding</i>	
No stigmata or dark spot on ulcer	0
Blood in upper gastrointestinal tract, clot, visible or spurting vessel	2
Maximum score	11

Note: when the score is ≥ 5 , it is classified into the high-risk group, 3-4 is classified into the middle-risk group and ≤ 2 is classified into the low-risk group. SBP: systolic blood pressure; y: years; bpm: beats per minute; CCF: congestive cardiac failure; IHD: ischemic heart disease.

Table 2. The characteristics of patients with UGIB

Characteristics	n (%)
<i>Total</i>	284 (100)
Male	197 (69.4)
Female	87 (30.6)
Age (year)	61 (interquartile range: 50-73)
<i>Bleeding type</i>	
Non-variceal	233 (82.0)
Variceal	51 (18.0)
<i>Comorbidities</i>	
Cardiac disease	26 (9.2)
Liver disease	57 (20.1)
Chronic renal impairment	22 (7.7)
Malignancy	43 (15.1)
<i>Outcomes</i>	
In-hospital mortality	10 (3.5)
<i>Score (mean + SD)</i>	
AIMS65	1.12 ± 1.18
GBS	8.70 ± 3.93
Rockall	4.26 ± 1.79

Table 3. Associations of RS, GBS and AIMS65 scores with the risk of in-hospital death among all 284 UGIB patients and subgroups (NVUGIB and VUGIB)

Patient	Scoring system	Odds ratio (95 %)	p value
Overall UGIB	AIMS65	5.14 (2.48-10.64)	0.000
	GBS	1.66 (1.28-2.15)	0.000

	Rockall	2.72 (1.76-4.18)	0.000
NVUGIB	AIMS65	7.08 (2.48-20.17)	0.000
	GBS	1.77 (1.30-2.43)	0.000
	Rockall	3.23 (1.83-5.69)	0.000
VUGIB	AIMS65	2.97 (1.01-8.73)	0.048
	GBS	1.44 (0.87-2.39)	0.159
	Rockall	1.73 (0.82-3.69)	0.153

CI: confidence interval.

Table 4. Risk stratification of in-hospital death among UGIB patients by AIMS65, GBS and Rockall scoring systems

Scoring system	Risk stratification	Overall UGIB	NVUGIB	VUGIB
AIMS65	High-risk group (score ≥ 2)	10/84 (11.9 %)	7/57 (12.3 %)	3/26 (11.5 %)
	Low-risk group (score < 2)	0/200 (0.0 %)	0/176 (0.0 %)	0/25 (0.0 %)
	χ^2	21.299	18.268	1.335
	p	0.000 [#]	0.000 [#]	0.248 [#]
GBS	High-risk group (score ≥ 6)	10/228 (4.4 %)	7/181 (3.9 %)	3/48 (6.3 %)
	Low-risk group (score < 6)	0/56 (0.0 %)	0/52 (0.0 %)	0/3 (0.0 %)
	χ^2	1.418	0.959	—
	p	0.234 [#]	0.328 [#]	1.000 [*]
Rockall	High-risk group (score ≥ 5)	10/106 (9.4 %)	7/70 (10.0 %)	3/37 (8.1 %)
	Middle-risk group (score 3-4)	0/139 (0.0 %)	0/132 (0.0 %)	0/7 (0.0 %)
	Low-risk group (score ≤ 2)	0/39 (0.0 %)	0/31 (0.0 %)	0/7 (0.0 %)
	χ^2	15.742	13.554	0.513
	P	0.000 [*]	0.000 [*]	1.000 [*]

[#]Using the corrected χ^2 test. ^{*}Using Fisher's exact probability method.

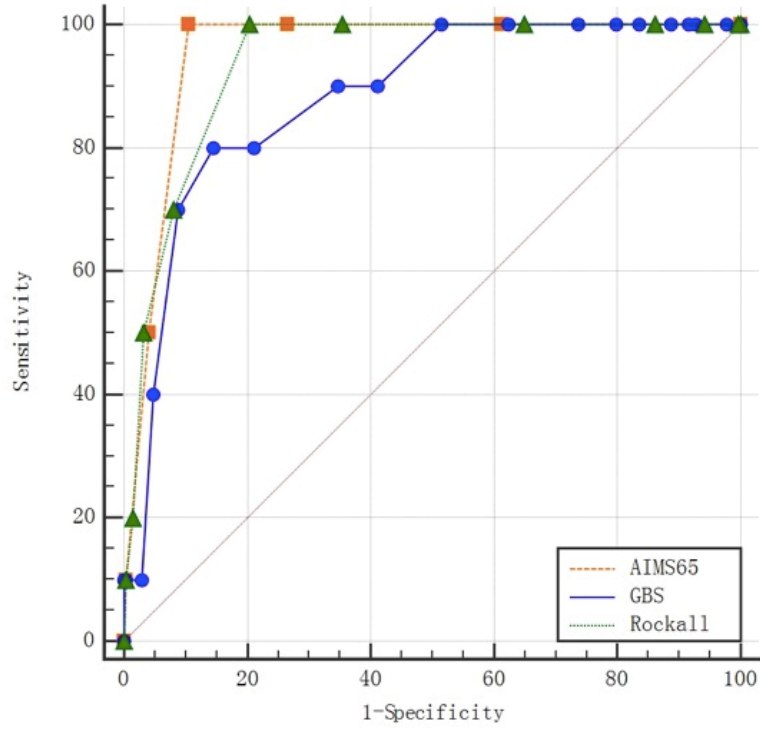


Figure1 Comparison of ROC curves for AIMS65, GBS, and Rockall scores predicting in-hospital death(UGIB)

Fig. 1. Comparison of ROC curves for AIMS65, GBS and Rockall scores to predict in-hospital death (UGIB).

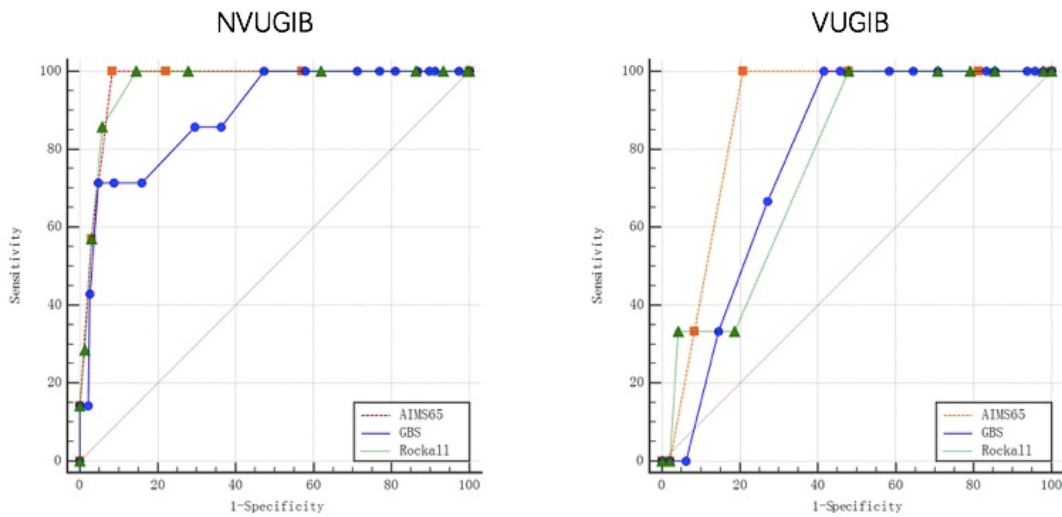


Figure2 Comparison of ROC curves for AIMS65, GBS, and Rockall scores predicting in-hospital death(NVUGIB and VUGIB)

Fig. 2: Comparison of ROC curves for AIMS65, GBS and Rockall scores to predict in-

hospital death (NVUGIB and VUGIB).

Accepted Article