

Research, Audit and Clinical Practice

Safe discharge of patients with low-risk upper gastrointestinal bleeding (UGIB): Can the use of Glasgow-Blatchford Bleeding Score be extended?

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Abstract

Introduction: Risk stratification of patients with suspected upper gastrointestinal bleeding (UGIB) using either Glasgow-Blatchford Bleeding Score (GBS) or pre-endoscopy Rockall score to facilitate early safe discharge (GBS=0, pre-Rockall=0) has been reported. This observational study compared score utility and considered the impact of extending the range of GBS or pre-Rockall scores permitting safe discharge.

Methods: Consecutive adult patients presenting to acute medical admissions or the emergency department from September 2008-March 2009 with suspected UGIB had clinical history, vital signs, laboratory and endoscopy results prospectively recorded using electronic databases. GBS, pre-Rockall scores and a composite endpoint (blood transfusion, endoscopic therapy, interventional radiology, surgery or 30-day mortality) were calculated.

Results: 388 patients with suspected UGIB were identified of which 92.3% were admitted (median (range) GBS=5 (0-19) and pre-Rockall=2 (0-11)) and 7.7% discharged (GBS=0 (0-4) and pre-Rockall=0 (0-4)). 186 (47.9%) underwent in-patient endoscopy. 151 (38.9%) were found to have the composite endpoint with 77.5% having transfusion, 45.7% endoscopic treatment and an 8.0% mortality within 30 days. AUROC (95% CI) for 30-day composite endpoint was 0.92 (0.89-0.94) using GBS and 0.75 (0.70-0.80) using pre-Rockall scores. Analysis using different GBS thresholds demonstrated that GBS=0, GBS ≤1 and GBS ≤2 had superior utility in identifying freedom from an adverse clinical outcome at

30-days than pre-Rockall score 0.

Conclusions: GBS is superior to pre-Rockall score in identifying patients with suspected UGIB who have a low likelihood of an adverse clinical outcome and can be considered for early discharge. Diagnostic performance at different thresholds suggests that patients with GBS ≤2 could be considered for early discharge, doubling the number of eligible patients (15.2 to 32.5%). This has important patient safety and resource implications.

Keywords

Upper gastrointestinal bleeding, Clinical decision making, health services research.

Introduction

Upper gastrointestinal bleeding (UGIB) has an annual incidence of 48 -160 cases per 100,000 adults¹, with mortality between 4.5-14%^{2,3}. Patients presenting with suspected UGIB comprise approximately 3% of acute medical admissions, have an average hospital stay of 4 days⁴ and account for 14% of all hospital blood transfusions⁵.

Patients are frequently assessed at initial presentation by non-gastroenterologists (either emergency or acute medicine physicians), who may demonstrate a lower threshold for admission given the potential high mortality for patients with GI haemorrhage⁶.

Pre- and post-endoscopy Rockall scores have been well-validated^{7,8} as predictors of re-bleeding

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Current knowledge:

1. Risk stratification in UGIB is currently recommended using Rockall score, but is frequently under utilised.
2. Some patients with the lowest pre-endoscopy Rockall score 0 have adverse events.
3. Currently over 90% of patients presenting with suspected UGIB are admitted.

What is new here:

1. This paper conflicts that Glasgow-Blatchford Bleeding Score (GBS) is superior to pre-endoscopy Rockall score in identifying patients without adverse 30-day outcomes.
2. GBS ≤2 identifies safe discharge better than pre-endoscopy Rockall score 0.
3. Sensitivity analysis suggests patients with admission GBS scores ≤2 may be considered for safe discharge, accounting for 30% of presentations.

How might it impact on clinical practice in the foreseeable future?

1. GBS can be calculated at admission and be used to identify those not requiring hospital admission.
2. Patients discharged may require subsequent out-patient evaluation.
3. Use of GBS compared to pre-endoscopy Rockall scores offers substantial improvements in resource utilisation and stratification for safe discharge.

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and death, and are currently recommended for use in risk stratification by the British Society of Gastroenterology (BSG)⁹, the Scottish Intercollegiate Guideline Network (SIGN)¹⁰ and the International Upper Gastrointestinal Haemorrhage Consensus Group¹¹. Risk scores applied at initial presentation can be used either to predict those with a low-risk of adverse clinical outcome, who can be discharged for out-patient management, or to identify those at high-risk who should be managed in high-dependency or monitored areas. However, use of these tools even by specialists is inconsistent, with Rockall scores documented in only 19% of patients in the British Society of Gastroenterology (BSG) UGIB audit in 2007.

The Glasgow-Blatchford Bleeding Score (GBS) was developed to help identify patients' need for treatment or risk of death, with good utility in a prospective validation cohort of 200 patients¹². A multicentre study, conducted mostly in Scottish patients, demonstrated that the Glasgow Blatchford Bleeding Score (GBS; AUROC 0.9 (0.88-0.93))

out-performed both pre- (AUROC 0.7 (0.65-0.75)) and post-endoscopy Rockall score (AUROC 0.81 (0.77-0.84)) in predicting clinical outcome following presentation with UGIB¹³. By suggesting discharge in the lowest risk groups using GBS, admissions were subsequently reduced by 25% without any adverse outcomes recorded. Studies from other centres have supported the use of GBS score 0 rather than pre-endoscopy Rockall scoring for identification of patients suitable for out-patient management¹⁴.

We aimed to confirm the difference in risk score utility between pre-endoscopy Rockall (pre-Rockall) and GBS in a single centre and to explore the safety and impact of extending the range of GBS scores where safe discharge might be considered.

Methods

Consecutive adult patients (aged 16 or over) presenting with suspected UGIB to either the emergency department or acute medicine unit between September 2008 and March 2009 were included in the study. Patient demographics and clinical history, vital signs, laboratory values, endoscopy results and blood transfusion were recorded using electronic databases. Admission variables were subsequently used to calculate GBS (Table 1) and pre-endoscopy Rockall scores (Table 2) in each patient. The frequency of a clinically relevant composite endpoint, summarising both the need for intervention (blood transfusion, endoscopic therapy, interventional radiology or surgery) and 30-day mortality, was determined. Endoscopic findings for patients who had in-patient endoscopy, or early out-patient endoscopy (within 60 days) were recorded. GBS and Pre-Rockall scores were compared against the clinical composite end point. Diagnostic statistics including sensitivity, specificity, positive and negative predictive values were calculated for pre-specified thresholds and area under the receiver operator curve characteristics (AUROC) calculated. All analysis was performed using SPSS version 16 (SPSS Inc).

Results

388 patients presenting with suspected UGIB were identified over the 6-month study period. 92% presented to the Emergency Department (ED) and 8% were referred directly from primary care to the Acute Medicine Unit (AMU). This represented 2.4% of 14,809 medical admissions during the study period. 58% were male, and the median age was 60 (range 16-100). 358 (92.3%) were admitted, with median (range) GBS of 5 (0-19) and pre-endoscopy Rockall score of 2 (0-11). 30 (7.7%) patients were discharged directly with GBS 0 (0-4) and pre-endoscopy Rockall 0 (0-4).

151/388 (38.9%) had a composite clinical endpoint; 31/388 (8.0%) died within 30 days of admission, 117/388 (30.2%) received blood transfusion, 69/388 (17.8%) required endoscopic intervention, 6/388 (1.5%) required surgery or interventional angiography. A single endpoint constituent was recorded in 87 (22.4%) patients, two in 54 (13.9%) and three in 10 (2.6%) patients. Of those

Admission variables	Score value
Blood urea (mmol/L)	
6.5 - 7.9	2
8.0 - 9.9	3
10.0 - 25.0	4
>25.0	6
Haemoglobin for men (g/dL)	
12.0 - 12.9	1
10.0 - 11.9	3
<10.0	6
Haemoglobin for women (g/dL)	
10.0 - 11.9	1
<10.0	6
Systolic blood pressure (mmHg)	
100 - 109	1
90 - 99	2
<90	3
Other markers	
Pulse $\geq$ 100/min	1
Melaena	1
Syncope	2
Hepatic disease*	2
Cardiac failure**	2
* Known history, or clinical and laboratory evidence of chronic or acute liver disease	
** Known history, or clinical and echocardiographic evidence of cardiac failure.	

Table 1. Presentation markers and component values for GBS score;¹³ (calculate using <http://www.mdcalc.com/glasgow-blatchford-bleeding-score-gbs>).

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Variable	0	1	2	3
Age	<60	60 - 79	≥ 80	-
Shock	No shock:	Tachycardia:	Hypotension:	-
	BP* >100mmHg Pulse <100	BP >100mmHg Pulse >100	BP <100mmHg	-
Co-morbidity	None	-	IHD, cardiac failure, major comorbidity	Renal Failure Liver failure Disseminated malignancy
*Systolic BP				

Table 2. Pre-endoscopy (admission) Rockall score.⁷

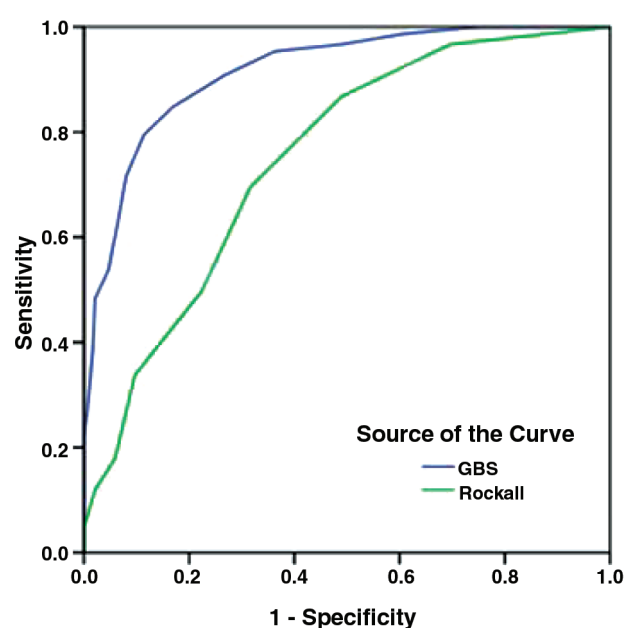


Figure 1. AUROC curves for pre-endoscopy Rockall score (0.75 (0.70 - 0.80)) and Glasgow-Blatchford Bleeding Score (0.92 (0.89 - 0.94)).

receiving blood transfusion, the mean haemoglobin concentration (Hb) at admission was 9.3g/dL for men and 8.5g/dL for women. 32/80 (40%) men and 9/27 (33%) women who received transfusion had an admission Hb >10g/dL.

Area under the ROC curve (95% CI) for 30-day composite clinical outcome for admission GBS was 0.92 (0.89 - 0.94) and for pre-endoscopy Rockall 0.75 (0.70 - 0.80); Figure 1. These findings confirm superior performance with GBS than pre-endoscopy Rockall in identifying clinical outcomes in those presenting with suspected UGIB. Individual and composite clinical outcomes according to admission GBS score are demonstrated in Table 3.

Analysis of diagnostic performance at different thresholds suggested that both the sensitivity and NPV for an adverse 30-day composite clinical endpoint remained high with GBS scores ≤1 and ≤2, (Table 4), and performed better than pre-endoscopy Rockall score, (Table 5).

186/388 (47.9%) underwent in-patient endoscopy, and a further 21/388 (5.4%) had out-patient endoscopy within a median of 12 days of admission. Endoscopy findings stratified by GBS are demonstrated in Table 6.

GBS score	Frequency		Age	Admitted		Composite Endpoint		Deaths		Endoscopic Intervention		Surgery or angiography		Transfusion	
	Number	%	Mean (Yrs)	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
0	59	15.2	42.0	41	69.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1	36	9.3	44.7	32	88.9	2	5.6	0	0.0	2	5.6	0	0.0	0	0.0
2	31	8.0	54.7	26	83.9	3	9.7	1	3.2	1	3.2	0	0.0	1	3.2
3	32	8.2	61.8	30	93.8	2	6.3	0	0.0	2	6.3	0	0.0	2	6.3
4	30	7.7	67.5	29	96.7	7	23.3	3	10.0	3	10.0	0	0.0	1	3.3
5	32	8.2	68.0	32	100.0	8	25.0	2	6.3	4	12.5	0	0.0	5	15.6
>5	168	43.3	67.1	168	100.0	129	76.2	25	14.9	57	33.9	6	3.6	108	64.3
Total	388	100.0	59.9	358	92.3	151	38.9	31	8.0	69	17.8	6	1.5	117	30.2

Table 3. Composite and individual component clinical outcomes for patients with GBS scores 0-5 and >5. This displays mean age, proportion admitted, mortality, endoscopic intervention, surgery and angiography and transfusion according to admission GBS score.

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GBS score	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
GBS 0	100	25	46	100
GBS ≤ 1	99	39	51	98
GBS ≤ 2	97	51	56	96
GBS ≤ 3	95	64	62	95
GBS ≤ 4	91	73	68	92
GBS ≤ 5	85	83	76	90
GBS ≤ 6	80	89	82	87
GBS ≤ 7	62	94	87	80
GBS ≤ 8	54	95	87	76
GBS ≤ 9	48	98	94	75

Table 4. Threshold analysis for GBS representing sensitivity, specificity, negative (NPV) and positive predictive values (PPV) for different GBS score thresholds and freedom from a composite clinical endpoint (blood transfusion, endoscopic therapy, interventional radiology or surgery and 30-day mortality).

Pre-endoscopy Rockall score	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Pre-Rockall=0	97	30	47	94
Pre-Rockall ≤ 1	87	51	53	86
Pre-Rockall ≤ 2	70	68	58	78
Pre-Rockall ≤ 3	50	78	59	71
Pre-Rockall ≤ 4	34	90	68	68
Pre-Rockall ≤ 5	18	94	65	64
Pre-Rockall ≤ 6	12	98	79	63
Pre-Rockall ≤ 7	5	100	100	62

Table 5. Threshold analysis for pre-endoscopy Rockall score representing sensitivity, specificity, negative (NPV) and positive predictive values (PPV) for different thresholds and freedom from a composite clinical endpoint (blood transfusion, endoscopic therapy, interventional radiology or surgery and 30-day mortality).

Readmission to hospital over the 6 months following initial presentation occurred in 92/388 (23.7%), and was related to recurrent UGIB in 25/388 (6.4%).

Discussion

This study of patients presenting with suspected upper gastrointestinal bleeding confirms that the Glasgow Blatchford Bleeding Score (GBS) out-performs pre-endoscopy Rockall score in identifying those with a composite clinical endpoint, consisting of 30-day mortality and the need for blood transfusion, endoscopic therapy, therapeutic angiography, or surgery.

The premise for this study was to determine the most useful clinical risk stratification tool that can be calculated rapidly, once simple admission blood tests, vital signs and clinical history have been recorded. Although both scores use readily available parameters, the variables are weighted and web or handheld applications may help with calculation (e.g. www.mdcalc.com).

Our study supports previous findings in that patients whose admission GBS=0 (15.2% of all patients in our study) did not have any clinically important adverse outcomes^{13,14}.

Furthermore, freedom from an adverse clinical outcome remained high in patients with GBS≤1 (sensitivity and NPV for composite endpoint at 30 days 99% and 98% respectively) and GBS≤2 (97% and 96% at 30 days).

The frequency of adverse outcomes and number of significant endoscopic findings generally increased, as would be expected, with increased risk scores. In those with GBS=1 (9.3% of presentations), there were no deaths at 30 days but 2 patients received endoscopic interventions (one endoclip® applied to a bleeding Mallory-Weiss tear; one band ligation in a patient with oesophageal varices, but who had no endoscopic signs of active or recent haemorrhage at endoscopy within 12 hours of presentation). In those with GBS=2 (8.0% of patients), there was one death within 30 days in a patient with advanced multiple sclerosis who was discharged with palliative care planning and who did not undergo endoscopy by mutual consent. One patient with gastric erosions received blood transfusion which was of uncertain value (admission Hb 13.0g/dL) and one patient had variceal band ligation with no features of shock and admission haemoglobin 13.2g/dL.

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	GBS $\leq$ 2		GBS $>$ 2	
	n	%	n	%
Total	126	32.5	262	67.5
No endoscopy	85	67.5	97	37.0
Endoscopy*	42	32.5	165	63.0
"Low risk" findings	29	70.7	54	32.7
Normal	10	23.8	15	9.1
Oesophagitis or hiatus hernia	8	19.5	28	17.0
Gastric or duodenal erosions	9	22.0	6	3.6
Mallory-Weiss tear	3	7.3	5	3.0
Significant findings	12	29.3	111	67.3
Peptic ulcer disease	5	12.2	61	37.0
Varices	4	9.8	33	20.0
Cancer	0	0	3	1.8
Other	3	7.3	14	8.5

* Endoscopy either as in-patient during initial presentation (n=186), or within 60 days of index admission (n=21)

Table 6. Frequency of patients undergoing endoscopy and findings according to GBS $\leq$ or $>$ 2.

In patients that underwent endoscopy with a low risk score (GBS $\leq$ 2) there were some with endoscopic findings, which, although not mandating urgent endoscopic therapy, were important to identify. 5 patients with peptic ulcer disease and 4 with oesophageal varices were identified in those with GBS $\leq$ 2, and would clearly require appropriate therapy and follow-up such as acid suppression, *Helicobacter pylori* eradication therapy or treatment of portal hypertension. However, the value of offering all patients with low risk admission GBS scores subsequent outpatient endoscopy remains to be established. Until this benefit is better understood, we advocate offering all patients who present with low-risk GBS scores subsequent out-patient endoscopy as the safest strategy and establishes an appropriate "safety net" supporting discharge from admitting areas.

One of the strengths of our study is that a complete list of sequential cases were identified from comprehensive emergency and acute medicine department databases, rather than the via the gastroenterology service giving a true reflection of UGIB presentations. In addition, there was an excellent level of data capture with only 1.2% of the data points from admission variables missing after careful review of records prospectively collected by clinical staff. If data collection of admission variables, vital signs or clinical history was incomplete this would underscore GBS and pre-endoscopy Rockall scores, and the adverse composite endpoint would be higher in those patients in whom low scores were recorded.

A potential weakness of our study is that the risk score has been calculated retrospectively with admission data,

which may underestimate true event rate if patients gained some other unmeasured benefit from hospital admission, such as variations in admission PPI use. GBS or pre-endoscopy Rockall score value was not used prospectively to determine admission or discharge in this study, but we have reported the calculated admission score and its relation to subsequent clinical outcome. However, as there are robust clinical endpoints it would seem unlikely that this effect would have a significant impact on clinical outcomes.

It is perhaps surprising that only 47.9% of patients had an in-patient endoscopy, with a further 5.9% returning for early elective endoscopy. This is substantially less than other studies of the management of acute UGIB, including the national BSG audit in 2007⁹. In that study of 6750 patients from 217 hospitals, although 75% were endoscoped as in-patients, endoscopic therapy was only given in 25%. The higher rate of endoscopy in the BSG study may be due to ascertainment bias, as most reporting was from gastroenterologists rather than all acute presentations with suspected UGIB. This could, however, lead to two potential criticisms: firstly no comparison between GBS and post-endoscopy Rockall score could be conducted. This was not felt to be a weakness as we were interested in the outcomes in patients who have risk stratification at the point of presentation when identifying low risk patients offers the greatest opportunity to prevent unnecessary admission. Clearly, post-endoscopy Rockall is not feasible at this stage. In addition, previous clinical studies have suggested that GBS is more accurate than both pre- and post-endoscopy Rockall score¹³.

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Secondly, this study could not examine the performance of GBS risk score to identify *any* important endoscopic finding, but rather to identify those with a relevant combined clinical endpoint. For accurate information on the prevalence of endoscopic findings according to risk score, all patients would need to be endoscoped. This has little relevance to the primary aim of the study, as although endoscopy may establish any finding, if therapeutic interventions are only required or performed in one third, patients judged or scored as low risk could avoid prolonging admission for endoscopy, and return for early elective procedures. This would have implications both for improving in-patient capacity and costs and service provision of available out-patient endoscopy appointments.

Implementing findings from this study has the potential to reduce the need for hospital admission in those who present with low GBS scores. If patients scoring

GBS=0 alone were discharged this has the potential to double current discharge rates. It could be argued that selected patients with GBS $\leq$ 2, could be safely discharged if there were robust planning and capacity for appropriate out-patient follow-up. The level of risk that different units or clinicians are prepared to accept will clearly vary.

In conclusion, this study confirms that admission GBS score is more accurate than pre-endoscopy Rockall in identifying 30-day clinical outcomes in patients with suspected gastrointestinal bleeding. It can be calculated simply in most cases within an hour of emergency admission and has the potential to substantially reduce the need for hospital admission, with important resource implications. No adverse outcomes were reported in those with GBS=0 and our data suggest that patients with GBS $\leq$ 2 also have a low risk of adverse clinical outcomes but may still require outpatient assessment to establish important upper gastrointestinal findings.

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