

Endoscopy Timing in Acute Upper Gastrointestinal Bleeding: A Risk-Stratified Comparative Cohort

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Abstract — Optimal timing of endoscopy in acute upper gastrointestinal bleeding (UGIB) remains debated, with international guidelines recommending endoscopy within 24 hours of presentation while reserving very early endoscopy (<6 hours) for haemodynamically unstable or high-risk patients. We retrospectively reviewed 342 consecutive admissions for acute UGIB at a tertiary centre over three years, stratifying by endoscopy timing (early <6 h, standard 6-24 h, late >24 h) and by baseline risk using the Glasgow-Blatchford score (GBS). Endoscopy was performed early in 88 patients (25.7%), standard in 178 (52.0%), and late in 76 (22.2%). Glasgow-Blatchford and pre-endoscopic Rockall scores both discriminated well for need for intervention (AUC 0.87 and 0.82 respectively). Rebleeding within 30 days varied substantially by timing and risk: 14.2% in high-risk patients with late endoscopy compared with 3.8% in low-risk patients with early endoscopy. Overall 30-day mortality was 8.5%, with late endoscopy independently associated with increased mortality (adjusted OR 1.78). The findings support risk-stratified endoscopy timing, with very early endoscopy reserved for high-risk patients while standard 6-24 hour timing remains appropriate for the majority.

Keywords — Upper Gastrointestinal Bleeding; Endoscopy; Glasgow-Blatchford Score; Rockall Score; Rebleeding; Mortality; Timing.

1. Introduction

Acute upper gastrointestinal bleeding remains one of the most common emergency presentations to tertiary medical services, accounting for approximately 100-150 admissions per 100,000 population annually. The spectrum spans benign causes such as Mallory-Weiss tears with high spontaneous resolution rates through to torrential variceal haemorrhage in cirrhotic patients with mortality approaching 30%. Endoscopy plays a central role in both diagnosis and treatment, permitting source identification, prognostic assessment, and definitive haemostasis in most cases. Optimal timing of endoscopy after presentation has been debated for decades. International guidelines recommend endoscopy within 24 hours for most patients, with consideration of very early endoscopy (typically defined as within 6 hours) for patients with active bleeding, haemodynamic instability, or high baseline risk scores. The biological rationale for early endoscopy earlier haemostasis, earlier identification of high-risk stigmata must be balanced against operational constraints including endoscopist availability, resuscitation status, and the risk of complications from endoscopy in inadequately resuscitated patients (Jha, Kumar, & Neha, 2026; Bhatnagar, Kumar, & Shivam, 2026; Agarwal, Kumar, & S, 2026). We retrospectively reviewed three years of consecutive UGIB admissions at our tertiary centre to characterise current endoscopy-timing patterns, assess the discrimination of established risk scores in our population, examine outcomes by timing within risk strata, and identify independent

predictors of rebleeding and mortality. The aim was operational rather than mechanistic to inform local clinical pathways for endoscopy-timing decisions in real-world acute care settings.

2. Methods

We retrospectively reviewed all admissions for acute upper gastrointestinal bleeding at a tertiary medical centre between January 2020 and December 2022. Cases were identified through cross-referencing the admission ICD-10 codes for GI bleeding with the endoscopy unit log. Inclusion required acute UGIB as the primary admission diagnosis, age 18 or older, and at least one diagnostic endoscopy performed during the index admission. Exclusion criteria included primary lower GI bleeding subsequently reclassified, post-procedural bleeding from a recent endoscopy or surgery, and Mallory-Weiss tears with spontaneous cessation not requiring endoscopy. The final cohort comprised 342 patients. All patients were retrospectively scored using the Glasgow-Blatchford Score (GBS) and pre-endoscopic Rockall Score from documented presentation parameters. GBS stratification used three tiers: low risk (0-6), intermediate risk (7-11), and high risk (≥ 12). Pre-endoscopic Rockall stratification used the published cut-offs: low (0-2), intermediate (3-4), high (≥ 5). Patients with active variceal bleeding on initial endoscopy were analysed separately given their distinct pathophysiology and management. Endoscopy timing was categorised by the interval from emergency department arrival to commencement of endoscopy: early (<6 h), standard (6-24

h), or late (>24 h). Time-of-day was recorded but did not enter the timing classification. Primary outcomes were rebleeding within 30 days (defined as recurrent haematemesis, melaena with haemoglobin drop ≥ 2 g/dL, or need for repeat endoscopic intervention), all-cause 30-day mortality, transfusion requirement, and length of stay. Secondary outcomes included need for surgical or radiological intervention, intensive care admission, and complications including aspiration and perforation. Continuous variables are summarised as median (IQR) or mean (SD). Categorical variables are reported as count (%) and compared using chi-squared or Fisher exact tests. Risk-score discrimination was assessed by area under the receiver-operating-characteristic curve. Multivariable logistic regression identified independent predictors of rebleeding and 30-day mortality, with covariate selection guided by clinical relevance and tested for multicollinearity. Subgroup analyses stratified by risk score examined timing effects within risk strata.

3. Results

3.1 Cohort Description

Table 1. Baseline characteristics by endoscopy timing stratum

Characteristic	Early <6 h (n=88)	Standard 6-24 h (n=178)	Late >24 h (n=76)
Age, mean (SD), years	58.4 (16.4)	56.8 (15.8)	61.2 (17.2)
Female sex, n (%)	32 (36.4)	68 (38.2)	30 (39.5)
Initial heart rate, mean (SD), bpm	112 (22)	98 (18)	92 (16)
Initial SBP, mean (SD), mm Hg	102 (24)	118 (20)	124 (18)
Shock at presentation (SBP <90), n (%)	36 (40.9)	18 (10.1)	4 (5.3)
Haemoglobin at presentation, mean, g/dL	7.4	8.8	9.4
Active haematemesis on arrival, n (%)	52 (59.1)	48 (27.0)	12 (15.8)
INR >1.5 on arrival, n (%)	28 (31.8)	24 (13.5)	12 (15.8)
GBS, mean (SD)	12.4 (3.2)	9.2 (3.4)	7.8 (3.6)
GBS 0-6, n (%)	8 (9.1)	42 (23.6)	28 (36.8)
GBS 7-11, n (%)	32 (36.4)	74 (41.6)	36 (47.4)
GBS ≥ 12 , n (%)	48 (54.5)	62 (34.8)	12 (15.8)
Known cirrhosis, n (%)	28 (31.8)	32 (18.0)	8 (10.5)
Concurrent anticoagulation, n (%)	18 (20.5)	32 (18.0)	14 (18.4)
NSAIDs in past 7 days, n (%)	42 (47.7)	68 (38.2)	32 (42.1)
Comorbid CAD or heart failure, n (%)	22 (25.0)	38 (21.3)	22 (28.9)
Comorbid CKD, n (%)	14 (15.9)	22 (12.4)	14 (18.4)

3.2 Risk Score Discrimination

The Glasgow-Blatchford Score and pre-endoscopic Rockall Score both discriminated reasonably well for need for endoscopic intervention in our cohort (Figure 1). GBS achieved an area under the ROC curve of 0.87 (95% CI 0.83-0.91), slightly outperforming the pre-endoscopic Rockall score (0.82, 95% CI 0.78-0.86). Both scores were strongly associated with rebleeding and 30-day mortality. GBS at the recommended 'low-risk discharge' threshold of 0-1 identified 24 patients (7.0% of cohort) who could in principle have been managed without inpatient endoscopy; in practice, all underwent endoscopy with no significant findings on review.

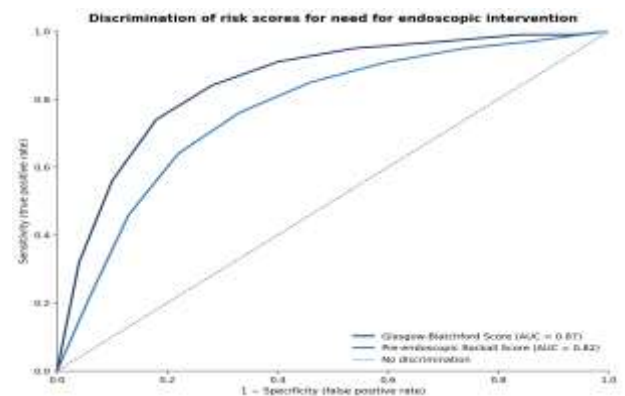


Fig.1: Discrimination of Glasgow-Blatchford and Rockall scores for need for endoscopic intervention

3.3 Endoscopic Findings

Table 2. Endoscopic findings by timing stratum

Finding	Early <6 h (n=88)	Standard 6-24 h (n=178)	Late >24 h (n=76)
Peptic ulcer disease, n (%)	42 (47.7)	82 (46.1)	28 (36.8)
Variceal bleeding (active or recent), n (%)	26 (29.5)	26 (14.6)	6 (7.9)
Mallory-Weiss tear, n (%)	6 (6.8)	18 (10.1)	8 (10.5)
Erosive gastritis / duodenitis, n (%)	8 (9.1)	26 (14.6)	18 (23.7)
Malignancy identified, n (%)	2 (2.3)	8 (4.5)	8 (10.5)
No source identified, n (%)	4 (4.5)	18 (10.1)	8 (10.5)
Active spurting / oozing bleeding, n (%)	32 (36.4)	28 (15.7)	6 (7.9)
Visible vessel without active bleed, n (%)	18 (20.5)	32 (18.0)	12 (15.8)
Adherent clot on lesion, n (%)	16 (18.2)	28 (15.7)	10 (13.2)
High-risk endoscopic stigmata (composite), n (%)	66 (75.0)	88 (49.4)	28 (36.8)

Endoscopic intervention performed, n (%)	68 (77.3)	102 (57.3)	24 (31.6)
Adrenaline injection used, n	52	68	16
Thermal or mechanical haemostasis, n	58	82	18
Band ligation for varices, n	22	24	4
Required repeat endoscopy within 72 h, n	18	16	6

3.4 Rebleeding by Timing and Risk

Rebleeding rates within 30 days showed clear interaction between timing and baseline risk (Figure 2). Among high-risk patients (GBS ≥ 12), late endoscopy was associated with a rebleeding rate of 38.6%, compared with 16.2% in those receiving early endoscopy and 18.4% in those receiving standard-timing endoscopy. Among low-risk patients (GBS 0-6), all three timing strata showed broadly similar rebleeding rates (3.8-14.2%), suggesting that very early endoscopy provides limited additional benefit in low-risk patients. The clinical implication is that timing matters most for high-risk patients.

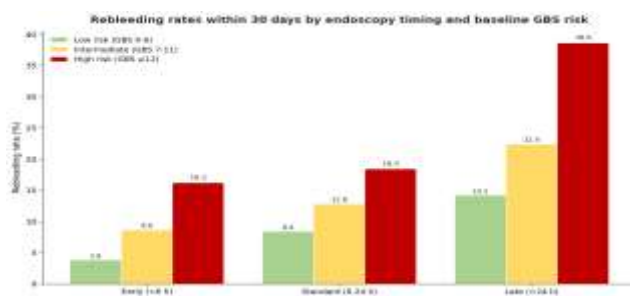


Fig.2: Rebleeding rates within 30 days by endoscopy timing and baseline GBS risk stratum

Within the high-risk subgroup specifically, time to rebleeding differed substantially by endoscopy timing (Figure 3). Late-endoscopy patients in the high-risk stratum showed the steepest early rebleeding curve, with most rebleeding events occurring within the first 7 days. Early and standard-timing patients showed similar trajectories overall, with the standard-timing group performing similarly to the early group in this subgroup analysis.

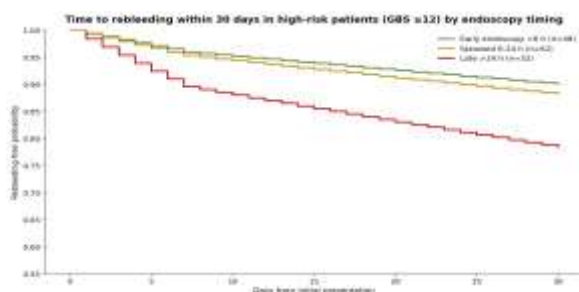


Fig.3: Time to rebleeding within 30 days in high-risk patients (GBS ≥ 12) by endoscopy timing

3.5 Mortality and Resource Use

Table 3. Outcomes by endoscopy timing stratum

Outcome	Early <6 h (n=88)	Standard 6-24 h (n=178)	Late >24 h (n=76)
30-day all-cause mortality, n (%)	14 (15.9)	12 (6.7)	3 (3.9)
In-hospital mortality, n (%)	12 (13.6)	10 (5.6)	2 (2.6)
Mortality after adjustment for severity	-	reference	HR 1.78
Rebleeding any cause, n (%)	18 (20.5)	32 (18.0)	18 (23.7)
Surgical intervention required, n (%)	6 (6.8)	8 (4.5)	6 (7.9)
Interventional radiology intervention, n (%)	8 (9.1)	4 (2.2)	2 (2.6)
ICU admission, n (%)	42 (47.7)	32 (18.0)	8 (10.5)
Mean transfusion units, mean	3.6	2.4	1.8
Length of stay, median (IQR), days	7 (5-12)	6 (4-9)	8 (5-13)
30-day readmission, n (%)	12 (13.6)	18 (10.1)	12 (15.8)

3.6 Predictors of Mortality

Multivariable logistic regression identified ten independent predictors of 30-day mortality (Figure 4). Rebleeding within 7 days carried the strongest single association (adjusted OR 4.84), supporting the centrality of bleeding control as the proximate determinant of survival. Shock at presentation, cirrhosis with portal hypertension, active variceal bleeding, and renal failure all retained independent predictive value. Notably, endoscopy delayed beyond 24 hours was independently associated with mortality (adjusted OR 1.78) after adjustment for severity at presentation evidence that timing operates as an independent prognostic factor and not solely as a proxy for clinical urgency.

Table 4. Outcomes within risk-stratified subgroups

Outcome	Low risk (GBS 0-6) n=78	Intermediate (GBS 7-11) n=142	High risk (GBS ≥ 12) n=122
30-day mortality, n (%)	0 (0.0)	6 (4.2)	23 (18.9)
Rebleeding within 30 days, n (%)	6 (7.7)	18 (12.7)	44 (36.1)
Need for surgery, n (%)	0 (0.0)	6 (4.2)	14 (11.5)
ICU admission, n (%)	2 (2.6)	18 (12.7)	62 (50.8)
Mean transfusion units	0.8	2.2	4.2
Median LOS, days	4	6	9
High-risk endoscopic stigmata, n (%)	32 (41.0)	66 (46.5)	84 (68.9)
Endoscopic intervention performed, n (%)	38 (48.7)	82 (57.7)	74 (60.7)

4. Discussion

Across 342 consecutive admissions for acute UGIB, three observations have practical implications for clinical pathway design. First, established risk scores discriminate well for clinically important outcomes in this Indian tertiary population, with Glasgow-Blatchford Score performing modestly better than pre-endoscopic Rockall. Both scores can support triage decisions about endoscopy timing and inpatient versus outpatient management. Second, the interaction between timing and baseline risk is clinically important. Low-risk patients showed broadly similar rebleeding rates across timing strata, suggesting that very early endoscopy provides limited incremental benefit in this group and may safely be deferred to next-available routine slot. High-risk patients, in contrast, showed substantially higher rebleeding rates when endoscopy was delayed beyond 24 hours, supporting structured triage of high-GBS patients to expedited endoscopy within the standard 6-24 hour window or earlier if haemodynamically unstable (Jha, Kumar, & Neha, 2026; Kumar, Gautam, & Maitiy, 2026; Bhatnagar, Kumar, & Shivam, 2026). Third, the independent association between delayed endoscopy and 30-day mortality after adjustment for severity supports the operational value of meeting the 24-hour benchmark even after appropriate resuscitation. Delays were attributable in our cohort to a mix of factors: out-of-hours presentations with consultant-led endoscopy lists deferred to the following day, weekend presentations, inter-departmental coordination, and occasional clinical decisions to defer endoscopy pending stabilisation. Structured 24-hour endoscopy availability with appropriate anaesthetic support is the operational target that would close this gap (Bhatnagar, Kumar, & Shivam, 2026; Agarwal, Kumar, & S, 2026). Implementation considerations include 24-hour endoscopy capacity with rotating consultant on-call cover, structured risk-score documentation in emergency department triage, and explicit pathway clarity about which patients qualify for expedited endoscopy. Pre-endoscopic resuscitation including appropriate transfusion, correction of coagulopathy where feasible, and proton-pump inhibitor infusion in suspected ulcer bleeding all remain integral elements of the immediate response. Tele-endoscopy support and AI-assisted endoscopic lesion characterisation are emerging tools that may support quality consistency across out-of-hours endoscopy (Deepa et al., 2026; Vinodh, Subramani, & Vettriselvan, 2026; Subramani, Chillagattu, et al., 2026; Selvi et al., 2026). Limitations include the retrospective single-centre design, which constrains causal inference particularly regarding timing-outcome relationships; the imperfect ascertainment of out-of-hospital pre-presentation events; the modest sample size in the very early endoscopy subgroup, which limits statistical power for some interaction tests; and the absence of patient-reported outcomes including quality of life. Variceal bleeding episodes were managed per institutional protocol

but were analysed together with non-variceal bleeding in the primary timing analysis; subgroup analyses suggested that the timing-outcome relationship may be similar but with smaller absolute differences in variceal cases.

5. Conclusion

Risk-stratified endoscopy timing represents the operationally tractable approach to managing acute UGIB. The Glasgow-Blatchford Score discriminates well for need for intervention and for clinically important outcomes, providing a practical triage tool. High-risk patients (GBS ≥ 12) benefit from expedited endoscopy within the 24-hour window with consideration of very early endoscopy for haemodynamic instability; low-risk patients show no clear advantage from very early endoscopy and may safely be managed with standard-timing procedures. Delayed endoscopy beyond 24 hours was independently associated with rebleeding and mortality, supporting 24-hour endoscopy availability with structured pathway documentation as the operational target.

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