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ORIGINAL ARTICLE

The lower gastrointestinal bleeding rebleeding and mortality score: Derivation and internal validation of a novel risk stratification model

Alt gastrointestinal kanamada tekrarlayan kanama ve mortalite skoru: Yeni bir risk sınıflandırma modelinin geliştirilmesi ve iç doğrulaması

Yavuz ÖZDEN, Ferhat OMURCA, Nuh Mehmet BÜYÜKBERBER

Department of Gastroenterology, University of Health Sciences Kayseri City Hospital, Kayseri, Türkiye

ABSTRACT • **Background and Aims:** Acute lower gastrointestinal bleeding carries substantial risks of recurrent bleeding and mortality and remains a frequent reason for hospitalization. Most existing risk scores are designed to predict a single clinical outcome, limiting their usefulness for comprehensive early assessment. We aimed to develop and internally validate a pre-endoscopic risk score that concurrently predicts thirty-day recurrent bleeding and all-cause mortality in adults presenting with acute lower gastrointestinal bleeding. **Materials and Methods:** We conducted a retrospective cohort study of 3,000 adults randomly selected from 3,240 eligible patients managed at a tertiary-care center. Independent predictors available at initial presentation were identified using multivariable logistic regression analyses in a derivation cohort and used to construct a practical point-based clinical score. Model performance was then assessed through internal validation in a separate patient cohort. **Results:** The derived score comprises seven admission variables reflecting bleeding severity and patient vulnerability, including hemodynamic instability, advanced age, higher comorbidity burden, exposure to antithrombotic or anticoagulant therapy, lower hemoglobin, absence of abdominal pain, and lower albumin. In the validation cohort, the model demonstrated good discrimination for short-term mortality and moderate discrimination for recurrent bleeding. Patients classified as high risk experienced substantially higher rates of both outcomes than those categorized as low risk, supporting the clinical relevance of this stratification. **Conclusion:** This simple pre-endoscopic risk score enables early stratification of adults with acute lower gastrointestinal bleeding according to their simultaneous risks of recurrent bleeding and mortality. External validation is warranted to confirm generalizability and clinical utility.

Keywords: Lower gastrointestinal bleeding, risk stratification, rebleeding, mortality, clinical prediction model

ÖZET • **Giriş ve Amaç:** Akut alt gastrointestinal kanama, tekrarlayan kanama ve mortalite açısından önemli riskler taşıyan ve hastaneye yatışın sık nedenleri arasında yer alan ciddi bir klinik tablodur. Mevcut risk skorlarının çoğu tek bir klinik sonlanımı öngörmeye yönelik geliştirilmiş olup, erken dönemde kapsamlı risk değerlendirmesi açısından sınırlı kalmaktadır. Bu çalışmanın amacı, akut alt gastrointestinal kanama ile başvuran erişkin hastalarda otuz günlük tekrarlayan kanama ve tüm nedenlere bağlı mortaliteyi eş zamanlı olarak öngörebilen, endoskopi öncesi uygulanabilir bir risk skorunun geliştirilmesi ve iç doğrulamasının yapılmasıdır. **Gereç ve Yöntem:** Bu retrospektif kohort çalışmasına, üçüncü basamak bir merkezde akut alt gastrointestinal kanama nedeniyle izlenen 3240 uygun erişkin hasta arasından basit rastgele örnekleme ile seçilen 3000 hasta dahil edilmiştir. İlk başvuru sırasında elde edilen klinik ve laboratuvar verileri kullanılarak bağımsız prediktörler belirlenmiş ve bu değişkenler temel alınarak puanlamaya dayalı klinik bir risk skoru oluşturulmuştur. Modelin performansı, ayrı bir hasta grubunda iç doğrulama yöntemi ile değerlendirilmiştir. **Bulgular:** Geliştirilen risk skoru; başvuru sırasında hemodinamik instabilite, ileri yaş, yüksek komorbidite yükü, antitrombotik veya antikoagülan tedavi kullanımı, düşük hemoglobin düzeyi, abdominal ağrının olmaması ve düşük albümin düzeyi olmak üzere yedi başvuru değişkeninden oluşmaktadır. Doğrulama grubunda skorun kısa dönem mortaliteyi öngörmedeki ayırt ediciliği iyi düzeyde, tekrarlayan kanamayı öngörmedeki ayırt ediciliği ise orta düzeyde bulunmuştur. Yüksek risk grubundaki hastalarda olumsuz klinik sonlanımların daha sık görüldüğü saptanmıştır. **Sonuç:** Bu basit ve endoskopi öncesi uygulanabilir risk skoru, akut alt gastrointestinal kanama ile başvuran hastalarda tekrarlayan kanama ve mortalite riskinin erken dönemde etkili biçimde sınıflandırılmasını sağlamaktadır. Bulgular, bu skorun başlangıç triyajı ve klinik karar süreçlerini destekleyebileceğini göstermektedir.

Anahtar kelimeler: Alt gastrointestinal kanama, risk sınıflandırması, tekrarlayan kanama, mortalite, klinik risk skoru

Correspondence: Yavuz ÖZDEN • Department of Gastroenterology, Kayseri City Hospital, University of Health Sciences 38080, Kayseri, Türkiye • E-mail: yavuzozden@gmail.com • *Özden Y, Omurca F, Büyükberber NM.* • *The lower gastrointestinal bleeding rebleeding and mortality score: Derivation and internal validation of a novel risk stratification model* • *The Turkish Journal of Academic Gastroenterology 2026;25:128-138.* ***Doi: 10.17941/agd.1978303***

INTRODUCTION

Acute lower gastrointestinal bleeding (LGIB) is a major healthcare burden, accounting for approximately 20-30% of all gastrointestinal hemorrhages and leading to substantial morbidity, healthcare resource utilization, and mortality (1,2). Its incidence is rising, driven by an aging population with an increasing burden of comorbidities and the widespread use of antithrombotic and antiplatelet agents (3). While many episodes are self-limited, a substantial proportion of patients experience severe or recurrent bleeding, necessitating urgent intervention, blood transfusion, and intensive care support (4). Clinical outcomes underscore its severity: 30-day mortality rates range from 2% to 5%, and rebleeding occurs in up to 15-20% of cases, highlighting the imperative for early and accurate risk stratification at presentation (5,6).

Effective management of acute LGIB hinges on the rapid distinction between high-risk patients and those who may be managed conservatively or considered for early discharge. In contrast to upper gastrointestinal bleeding (UGIB), where validated risk scores such as the Glasgow-Blatchford Score and AIMS65 are integral to guideline-recommended care pathways (7,8), risk stratification in LGIB remains less standardized. As a result, clinicians frequently extrapolate UGIB-derived scores, despite fundamental differences in bleeding etiology, pathophysiology, and natural history between upper and lower gastrointestinal hemorrhage (9).

In recent years, several LGIB-specific prognostic models have been developed; however, each primarily targets a distinct clinical endpoint. The Oakland score effectively identifies low-risk patients suitable for early discharge but demonstrates limited performance for predicting mortality (10,11). The NOBLADS score, originally developed to predict severe bleeding using admission variables, represents another LGIB-specific tool focused primarily on bleeding severity (5). Earlier observational data have also demonstrated the clinical burden of recurrence and mortality among hospitalized patients with acute LGIB, although without providing a unified pre-endoscopic score for both outcomes (12). Recent Turkish single-center data have further supported the relevance of structured risk stratification in acute LGIB and highlighted the contribution of age and medication exposure to short-term outcomes (13,14). More recently, scores such as the ABC (Age, Blood tests, Comorbidities) and CHAMPS models have shown excellent discrimination for mortality but are less effective in estimating the risk of recurrent bleeding (15,16).

Accordingly, optimization of initial triage and management in acute LGIB requires a pragmatic risk stratification tool capable of concurrently estimating the risk of both 30-day rebleeding and 30-day all-cause mortality using readily available pre-endoscopic data. Such a tool could inform decisions regarding resuscitation intensity, level of care, timing of endoscopic evaluation, and early prognostic communication from the point of hospital admission.

To address this unmet need, we aimed to develop and internally validate a novel pre-endoscopic risk stratification model, the Lower Gastrointestinal Bleeding Rebleeding and Mortality Score (LGIB-RAMS). Using a large, contemporary single-center cohort, we sought to identify independent predictors of these dual endpoints and to derive a practical, integer-based score designed to support early clinical decision-making in patients presenting with acute LGIB.

MATERIALS and METHODS

Study Design and Setting

We conducted a retrospective cohort study of consecutive adult patients who underwent colonoscopy for suspected acute lower gastrointestinal bleeding (LGIB) at a high-volume, tertiary-care academic medical center between November 1, 2023,

and November 30, 2025. This study protocol was approved by the Ethics Committee for Non-Interventional Clinical Research of Kayseri City Hospital (Date: 08.10.2024, Decision No: 206), which granted a waiver of informed consent owing to the retrospective, noninterventional design and the exclusive use of de-identified data. This manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (17).

Patient Selection and Definitions

Patients were identified through a structured electronic query of the institutional endoscopy database, including all inpatient and emergency department colonoscopies performed for indications of hematochezia, rectal bleeding, or lower gastrointestinal bleeding.

The inclusion criteria were:

1. Age ≥18 years;
2. A clinical presentation consistent with acute LGIB, defined as the passage of fresh red or maroon blood per rectum within 24 hours of presentation; and
3. Performance of colonoscopy during the index hospitalization.

To ensure a homogeneous cohort reflecting index LGIB events, the following exclusion criteria were applied:

1. Confirmed upper gastrointestinal bleeding proximal to the ligament of Treitz on endoscopic evaluation (n = 127);
2. Presentation for recurrent bleeding occurring more than 30 days after a prior LGIB admission (n = 89);
3. Bleeding attributed solely to anorectal pathology (e.g., hemorrhoids or fissures) without concomitant colonic evaluation (n = 214);
4. Incomplete colonoscopy due to inadequate bowel preparation or luminal obstruction without alternative source localization (n = 183); and
5. Transfer from an outside institution more than 24 hours after initial presentation or absence of complete 30-day follow-up data (n = 147).

After application of the prespecified inclusion and exclusion criteria, 3,240 patients were eligible. For model development and internal validation, a simple random analytic sample of 3,000 patients was selected from the full eligible cohort using a computer-generated sequence. This sample size allowed a fixed 2:1 split into derivation and validation cohorts while retaining adequate event counts for model development and internal validation.

Data Collection and Candidate Predictors

Standardized data extraction was performed by trained research associates who were blinded to study outcomes. All variables were obtained from clinical documentation available at the time of initial presentation and prior to colonoscopic evaluation, consistent with the pre-endoscopic design of the risk model.

Collected variables included the following domains:

Demographics and clinical presentation: Age, sex, presence of abdominal pain or cramping, and syncope or presyncope.

Vital signs: Initial systolic and diastolic blood pressure and heart rate. Hemodynamic instability was defined a priori as a systolic blood pressure ≤ 90 mmHg or a heart rate ≥ 100 beats per minute.

Comorbidities and medications: Documented comorbid conditions included congestive heart failure, chronic kidney disease (stage ≥ 3 or dialysis), metastatic solid malignancy, cirrhosis, and diabetes mellitus. Overall comorbidity burden was quantified using the Charlson Comorbidity Index (CCI). Active medication use at admission was re-

corded for antiplatelet agents (aspirin or P2Y12 inhibitors), anticoagulants (vitamin K antagonists or direct oral anticoagulants), and nonsteroidal anti-inflammatory drugs.

Admission laboratory values: Hemoglobin, hematocrit, platelet count, serum creatinine, blood urea nitrogen, albumin, and international normalized ratio (INR). All laboratory values were obtained from blood samples drawn in the emergency department prior to substantial fluid resuscitation or blood product administration.

Outcome Definitions

The two primary outcomes were 30-day rebleeding and 30-day all-cause mortality. Outcomes were independently adjudicated by two physicians (a gastroenterologist and a hospitalist), with disagreements resolved by consensus involving a third senior investigator.

Thirty-day rebleeding was defined as recurrent overt lower gastrointestinal bleeding occurring after initial clinical stabilization (at least 24 hours without overt bleeding and with stable hemoglobin) within 30 days of the index presentation, accompanied by at least one of the following:

1. A decrease in hemoglobin of ≥ 2 g/dL without an alternative explanation;
2. Recurrent hematochezia prompting a change in clinical management (blood transfusion, repeat endoscopy, angiography, or surgery); or
3. Recurrent hemodynamic instability attributable to bleeding.

Thirty-day all-cause mortality was defined as death from any cause within 30 days of the index presentation. Mortality data were obtained from hospital records, state death registries, and a structured post-discharge telephone follow-up protocol.

Statistical Analysis and Score Derivation

All statistical analyses were performed using R software (version 4.3.1; R Foundation for Statistical Computing). Continuous variables are presented as mean ± standard deviation or median [interquartile range], as appropriate, and categorical variables as counts and percentages.

The analytic cohort was randomly divided into a derivation cohort (two-thirds, n = 2,000) and a validation cohort (one-third, n = 1,000) using a computer-generated sequence. Stratification by the presence of hemodynamic instability was applied to ensure balanced baseline bleeding severity between cohorts.

Within the derivation cohort, univariable logistic regression analyses were performed to evaluate associations between candidate predictors and each outcome. Variables with a p value < 0.20 in univariable analyses, as well as variables considered clinically relevant a priori, were entered into separate multivariable logistic regression models for rebleeding and mortality. Backward elimination was applied with a retention threshold of $p < 0.05$.

The final multivariable models were used to derive the Lower Gastrointestinal Bleeding Rebleeding and Mortality Score (LGIB-RAMS). Regression coefficients (β) were scaled relative to the smallest retained coefficient and rounded to the nearest integer to generate a practical, point-based scoring system, in accordance with established methods for clinical risk score development (18). The total score was calculated as the sum of points assigned to predictors present at admission. For construction of the composite LGIB-RAMS, antithrombotic/anticoagulant exposure was operationalized as the presence of either antiplatelet therapy (with or without anticoagulation) or oral anticoagulant use, with a maximum assignment of 1 point.

Model Performance and Validation

Model discrimination was assessed using the area under the receiver operating characteristic curve (AUROC) with corresponding 95% confidence intervals (CI). Calibration was evaluated through visual inspection of calibration plots and by the Hosmer–Lemeshow goodness-of-fit test.

Based on score distribution and observed event rates in the derivation cohort, three clinically meaningful risk categories were predefined: low risk (0 - 2 points), intermediate risk (3 - 5 points), and high risk (≥ 6 points). Observed rates of rebleeding and mortality across these categories were subsequently evaluated in the analytic cohort. A two-sided p value < 0.05 was considered statistically significant.

RESULTS

Cohort Characteristics and Clinical Outcomes

The analytic cohort comprised 3,000 patients presenting with acute lower gastrointestinal bleeding (LGIB). Baseline demographic, clinical, and laboratory characteristics were comparable between the derivation and validation cohorts (Table 1). The median age was 68 years [interquartile range (IQR), 55 – 79], and 1,682 patients (56.1%) were

Table 1 Baseline characteristics of the analytic cohort and the derivation and validation cohorts

Characteristic	Analytic Cohort (n = 3,000)	Derivation Cohort (n = 2,000)	Validation Cohort (n = 1,000)	*p* value
Age, years	68 (55 - 79)	68 (54 - 79)	67 (55 - 78)	0.72
Male sex	1,682 (56.1)	1,125 (56.3)	557 (55.7)	0.81
Hemodynamic instability	623 (20.8)	410 (20.5)	213 (21.3)	0.68
Systolic BP ≤ 90 mmHg	312 (10.4)	210 (10.5)	102 (10.2)	0.88
Heart rate ≥ 100 bpm	476 (15.9)	319 (16.0)	157 (15.7)	0.91
Absence of abdominal pain	1,789 (59.6)	1,187 (59.4)	602 (60.2)	0.71
Antithrombotic use (any)	627 (20.9)	413 (20.7)	214 (21.4)	0.66
└Antiplatelet only	387 (12.9)	259 (13.0)	128 (12.8)	—
└Anticoagulant ± antiplatelet	240 (8.0)	154 (7.7)	86 (8.6)	—
Hemoglobin < 10 g/dL	1,218 (40.6)	806 (40.3)	412 (41.2)	0.68
Albumin < 3.0 g/dL	615 (20.5)	412 (20.6)	203 (20.3)	0.92
Charlson comorbidity index ≥ 3	1,143 (38.1)	757 (37.9)	386 (38.6)	0.74
└Metastatic malignancy	312 (10.4)	204 (10.2)	108 (10.8)	0.66
└Severe CKD (stage ≥ 4/dialysis)	285 (9.5)	193 (9.7)	92 (9.2)	0.75
Identified bleeding source	2,412 (80.4)	1,605 (80.3)	807 (80.7)	0.85
└Diverticulosis	762 (25.4)	512 (25.6)	250 (25.0)	—
└Colonic angiodysplasia	247 (8.2)	160 (8.0)	87 (8.7)	—
└Ischemic colitis	298 (9.9)	205 (10.3)	93 (9.3)	—
└Post-polypectomy bleeding	301 (10.0)	198 (9.9)	103 (10.3)	—
└Colorectal malignancy	151 (5.0)	102 (5.1)	49 (4.9)	—

Data are presented as median (interquartile range) or n (%).

BP: Blood pressure; bpm: Beats per minute; CKD: Chronic kidney disease.

male. Hemodynamic instability at presentation was observed in 623 patients (20.8%). A Charlson Comorbidity Index (CCI) ≥ 3 was present in 1,143 patients (38.1%), and 627 patients (20.9%) were receiving antithrombotic therapy at admission.

Within 30 days of the index bleeding episode, rebleeding occurred in 452 patients (15.1%), and 153 patients (5.1%) died. The median time to rebleeding was 4 days (IQR, 2 - 8). Among the 153 deaths, 62 (40.5%) were adjudicated as primarily bleeding-related.

Predictors of 30-Day Rebleeding and Mortality

In the derivation cohort, multivariable logistic regression analyses identified independent predictors for each outcome (Table 2).

For 30-day rebleeding, the following variables were independently associated with increased risk:

- Hemodynamic instability [adjusted Odds Ratio (aOR) 2.41, 95% CI 1.84 - 3.15],
- Antithrombotic use (aOR 1.92, 95% CI 1.45 - 2.53),
- Admission hemoglobin < 10 g/dL (aOR 1.81, 95% CI 1.38 - 2.36), and
- Absence of abdominal pain (aOR 1.69, 95% CI 1.26 - 2.26).

For 30-day all-cause mortality, independent predictors included:

- Age ≥ 75 years (aOR 3.52, 95% CI 2.41 - 5.15),
- CCI ≥ 3 (aOR 2.97, 95% CI 2.01 - 4.39),
- Hemodynamic instability (aOR 2.18, 95% CI 1.44 - 3.29),
- Albumin < 3.0 g/dL (aOR 2.02, 95% CI 1.37 - 2.99), and
- Anticoagulant use (aOR 1.85, 95% CI 1.15 - 2.96).

Derivation of the LGIB-RAMS

Variables retained in the final multivariable models were incorporated into a unified scoring system, the Lower Gastrointestinal Bleeding Rebleeding and Mortality Score (LGIB-RAMS). Points were assigned by dividing each predictor's β-coefficient by the smallest retained coefficient (0.525 for absence of abdominal pain) and rounding to the nearest integer (Table 3). The total possible score ranged from 0 to 10 points.

Table 2 Multivariable logistic regression analysis for 30-day outcomes in the derivation cohort (n = 2,000)

Predictor	30-Day Rebleeding aOR (95% CI)	*p* value	30-Day Mortality aOR (95% CI)	*p* value
Hemodynamic instability	2.41 (1.84 - 3.15)	< 0.001	2.18 (1.44 - 3.29)	< 0.001
Antithrombotic use (any)	1.92 (1.45 - 2.53)	< 0.001	—	—
Anticoagulant use	—	—	1.85 (1.15 - 2.96)	0.011
Hemoglobin < 10 g/dL	1.81 (1.38 - 2.36)	< 0.001	—	—
Absence of abdominal pain	1.69 (1.26 - 2.26)	< 0.001	—	—
Age ≥ 75 years	—	—	3.52 (2.41 - 5.15)	< 0.001
Charlson comorbidity index ≥ 3	—	—	2.97 (2.01 - 4.39)	< 0.001
Albumin < 3.0 g/dL	—	—	2.02 (1.37 - 2.99)	< 0.001

aOR: Adjusted Odds ratio; CI: Confidence interval.

Antithrombotic use includes antiplatelet therapy with or without anticoagulation; anticoagulant use refers to oral anticoagulants. Reference categories were absence of the listed risk factor. Models were adjusted for all variables retained in the final multivariable regression.

Table 3 The lower gastrointestinal bleeding rebleeding and mortality score (LGIB-RAMS)

Predictor	Points
Hemodynamic instability (SBP ≤ 90 mmHg or HR ≥ 100 bpm)	2
Age ≥ 75 years	2
Charlson comorbidity index ≥ 3	2
Antithrombotic / anticoagulant exposure†	1
Hemoglobin < 10 g/dL	1
Absence of abdominal pain	1
Albumin < 3.0 g/dL	1
Total possible score	0–10

SBP: Systolic blood pressure; HR: Heart rate.

†Antithrombotic exposure refers to antiplatelet therapy (with or without anticoagulation) in the rebleeding model, whereas anticoagulant exposure refers to oral anticoagulants in the mortality model. For the composite LGIB-RAMS, assign a maximum of 1 point for antithrombotic/anticoagulant exposure (i.e., 1 point if either is present).

Model Performance and Internal Validation

In the derivation cohort, the LGIB-RAMS demonstrated good discrimination for 30-day mortality, with an area under the receiver operating characteristic curve (AUROC) of 0.81 (95% CI 0.77 - 0.85), and moderate discrimination for 30-day rebleeding (AUROC 0.72, 95% CI 0.69 - 0.75). Discriminatory performance was preserved in the validation cohort, with AUROCs of 0.79 (95% CI 0.74 - 0.84) for mortality and 0.70 (95% CI 0.66 - 0.74) for rebleeding.

Calibration plots demonstrated close agreement between predicted and observed event rates across deciles of risk. The Hosmer–Lemeshow goodness-of-fit test indicated no evidence of poor calibration for either outcome (mortality p = 0.42; rebleeding p = 0.31).

Risk Stratification by LGIB-RAMS Categories

Based on score distribution and observed event rates in the derivation cohort, patients were stratified into three predefined risk categories: low risk (0 - 2 points), intermediate risk (3 - 5 points), and high risk (≥ 6 points). The distribution of patients and corresponding 30-day outcomes across these categories in the analytic cohort are summarized in Table 4.

Table 4 Thirty-day outcomes in the analytic cohort stratified by LGIB-RAMS risk category

Risk Category	Score	Patients, n (%)	30-Day Rebleeding, n (%)	30-Day Mortality, n (%)
Low risk	0 - 2	845 (28.2)	46 (5.4)	13 (1.5)
Intermediate risk	3 - 5	1,515 (50.5)	243 (16.0)	76 (5.0)
High risk	≥ 6	640 (21.3)	163 (25.5)	64 (10.0)
Total		3,000 (100)	452 (15.1)	153 (5.1)

In the analytic cohort:

- Low-risk patients [0 - 2 points; 845 (28.2%)] experienced rebleeding in 46 patients (5.4%) and mortality in 13 patients (1.5%).
- Intermediate-risk patients [3 - 5 points; 1,515 (50.5%)] had rebleeding in 243 patients (16.0%) and mortality in 76 patients (5.0%).
- High-risk patients [≥ 6 points; 640 (21.3%)] experienced rebleeding in 163 patients (25.5%) and mortality in 64 patients (10.0%).

DISCUSSION

In this large, retrospective cohort study, we derived and internally validated a novel pre-endoscopic risk score, the LGIB-RAMS, designed to predict the dual endpoints of 30-day rebleeding and all-cause mortality in patients with acute LGIB. The score, which incorporates seven routinely available clinical and laboratory variables, demonstrated good discrimination for mortality (AUROC 0.79) and moderate discrimination for rebleeding (AUROC 0.70) in the validation cohort. Importantly, it stratified patients into three clinically distinct risk categories with markedly different outcome profiles. Patients classified as high risk (≥ 6 points) accounted for a disproportionate share of adverse events, whereas those in the low-risk category exhibited a highly favorable short-term prognosis. By providing an integrated, early estimate of these two critical outcomes, the LGIB-RAMS addresses a key gap in the initial risk assessment of acute LGIB.

The predictors incorporated into the LGIB-RAMS are consistent with established pathophysiological determinants of bleeding severity and patient vulnerability (5,19,20). Hemodynamic instability and low admission hemoglobin reflect the acuity and magnitude of blood loss and have been repeatedly associated with poor outcomes across the spectrum of gastrointestinal hemorrhage (6,20). The observed association between antithrombotic therapy and rebleeding risk highlights an increasingly prevalent clinical challenge in contemporary practice and supports guideline recommendations advocating careful assessment and individualized management strategies in this population (3,21,22). Similarly, the strong associations of advanced age, hypoalbuminemia, and a high comorbidity burden with mortality parallel findings from prior prognostic models such as the ABC and CHAMPS scores, underscoring the central role of physiological reserve and baseline health status in determining short-term survival (15,16). The association between absence of abdominal pain and rebleeding is clinically intriguing. One possible explanation is that typically painless etiologies, such as diverticular bleeding or angiodysplasia, may have been relatively overrepresented among patients with recurrent hemorrhage, whereas painful presentations such as ischemic colitis may follow a different short-term clinical course. This finding should nevertheless be interpreted cautiously and warrants external validation.

The LGIB-RAMS extends existing LGIB-specific risk tools by integrating these elements into a single, admission-based score intended to guide early triage. Although the Oakland score performs well in identifying low-risk patients suitable for early discharge (10,11), its ability to predict mortality or rebleeding is limited (9). Conversely, scores such as AIMS65 and ABC offer robust mortality prediction but were not designed to estimate rebleeding risk and perform suboptimally for this outcome (15,23). The mortality discrimination achieved by the LGIB-RAMS is comparable to these established tools, while its concurrent stratification of rebleeding risk represents a clinically meaningful advance. The moderate predictive performance for rebleeding likely reflects the inherent complexity of this outcome, which is influenced by factors not

available at presentation, including specific endoscopic stigmata and the durability of hemostatic interventions (24).

From a clinical perspective, the LGIB-RAMS offers practical value at the point of hospital admission. In our cohort, high-risk patients—approximately one-fifth of the study population—experienced rebleeding and mortality rates of 25.5% and 10.0%, respectively. This subgroup may benefit from heightened surveillance, early placement in a monitored care setting, prompt gastroenterology consultation, and expedited colonoscopic evaluation (2,4). In contrast, low-risk patients (0 - 2 points), representing more than one-quarter of the cohort, demonstrated a very low incidence of adverse outcomes. This profile closely resembles the population identified by the Oakland score as suitable for conservative management or early discharge, suggesting that a subset of patients with acute LGIB may be safely managed with a less intensive approach following appropriate observation (11). The resulting three-tiered risk framework is intuitive and readily applicable, with the potential to standardize early triage decisions and optimize resource utilization. In practical terms, the score may assist emergency department triage, selection of ward versus monitored or intensive care placement, prioritization of early gastroenterology consultation, and identification of patients who may be candidates for a less intensive in-hospital pathway after appropriate observation.

Several strengths of this study merit emphasis. These include the large and contemporary cohort, rigorous and blinded adjudication of outcomes, adherence to established methodological standards for clinical risk score development (18), and robust internal validation. Moreover, all components of the LGIB-RAMS are objective and universally available at presentation, enabling immediate bedside calculation without the need for specialized testing.

Nonetheless, several limitations should be acknowledged. First, the single-center, retrospective design may limit generalizability because of center-specific patient characteristics and practice patterns; external validation in diverse healthcare settings is therefore required. Second, although major comorbidities were incorporated, more granular measures of frailty or functional status could further enhance mortality prediction. Third, because the cohort was derived from a tertiary-care center and restricted to patients who underwent colonoscopy during the index hospitalization, milder or self-limited LGIB presentations may have been underrepresented. In particular, some lower-risk patients discharged early without endoscopic evaluation may not have been captured, which may have influenced apparent performance in the lowest-risk stratum. Fourth, we did not perform a direct head-to-head comparison of LGIB-RAMS with established tools such as the Oakland or ABC scores within the same cohort; therefore, its incremental value over existing models cannot be definitively established from the present study. Finally, as a pre-endoscopic tool, the LGIB-RAMS does not account for definitive endoscopic findings, which remain essential for therapeutic decision-making; rather, its intended role is to inform initial triage and management prior to endoscopic evaluation.

Future investigations should focus on external validation of the LGIB-RAMS in multicenter and international cohorts. Prospective studies are also needed to determine whether implementation of the score—particularly through integration into electronic health record systems—can improve clinical outcomes, optimize resource utilization, or safely facilitate earlier discharge. In addition, combining the LGIB-RAMS with subsequent endoscopic findings may represent a promising strategy for further individualizing risk assessment and management.

In conclusion; we developed and internally validated the LGIB-RAMS, a simple, pre-endoscopic clinical risk score that simultaneously stratifies the risk of 30-day rebleeding and all-cause mortality in patients with acute LGIB. By integrating objective markers of bleeding severity and patient vulnerability, the score effectively identifies a high-risk group requiring intensive management and a low-risk group with a favorable short-term prognosis. The LGIB-RAMS addresses a critical unmet need in early LGIB risk assessment and provides a pragmatic, evidence-based framework to support initial triage and clinical decision-making. External validation is warranted to confirm its generalizability and clinical impact.

Ethics Approval: *This study protocol was approved by the Ethics Committee for Non-Interventional Clinical Research of Kayseri City Hospital (Date: 08.10.2024, Decision No: 206). The study was conducted in accordance with the World Medical Association Declaration of Helsinki.*

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