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ORIGINAL RESEARCH

Identifying Low-Risk Patients with Cirrhosis and Acute Gastrointestinal Bleeding That May Not Require Urgent Endoscopy

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ABSTRACT

Introduction: Urgent endoscopy should be performed in patients with cirrhosis and acute gastrointestinal bleeding (AGIB), but this approach is resource-intensive and associated with procedural risks. Therefore, its necessity has been questioned in low-risk patients. This study aims to identify low-risk patients with cirrhosis and AGIB for whom endoscopy may be unnecessary during hospitalization.

Methods: Patients with cirrhosis and AGIB who presented with melena alone were retrospectively screened from an international multicenter cohort. They were further classified according to the use of endoscopy. Logistic regression analyses were performed to explore the relationship of Child–Pugh score and hepatocellular carcinoma (HCC) with in-hospital death.

Results: Overall, 673 patients were included, of whom 202 (30.0%) did not undergo endoscopy. Child–Pugh score and HCC were significantly associated with in-hospital mortality. There was no death during hospitalization among the 304

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patients with Child–Pugh score ≤ 7 and without HCC, who were stratified as a low-risk population. Among them, neither in-hospital mortality (0.0% vs. 0.0%) nor rate of 5-day failure to control bleeding (1.3% vs. 4.7%, $P = 0.110$) was significantly different between patients who underwent endoscopy and those who did not.
Conclusions: Patients with cirrhosis and AGIB, who present with melena alone, and have Child–Pugh score ≤ 7, but without HCC, may not require urgent endoscopy.
Trial Registration: This study is a secondary analysis based on the data from our previously registered study (ClinicalTrials.gov identifier NCT04662918).

Keywords: Cirrhosis; Acute gastrointestinal bleeding; Endoscopy; Risk stratification; Death

Key Summary Points

Why carry out this study?

Urgent endoscopy should be performed in patients with cirrhosis and acute gastrointestinal bleeding (AGIB), but this approach is resource-intensive and associated with procedural risks.

This study aims to identify low-risk patients with cirrhosis and AGIB for whom endoscopy may be unnecessary during hospitalization.

What was learned from the study?

There was no death during hospitalization among the 304 patients with Child–Pugh score ≤ 7 and without hepatocellular carcinoma, who were stratified as a low-risk population.

This finding is valuable to minimize the necessity of urgent endoscopy in low-risk patients with cirrhosis and GIB.

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INTRODUCTION

Acute gastrointestinal bleeding (AGIB) is a common and potentially fatal complication of cirrhosis with an incidence of 25–40% [1]. Endoscopy is very crucial for identifying the source of AGIB and for immediate endoscopic interventions to stop AGIB, so that it has been widely recommended in patients with gastrointestinal bleeding by clinical practice guidelines [2, 3]. Nevertheless, a proportion of hospitalized patients do not undergo endoscopy in real-world clinical practice. As shown in an international multicenter study by Laine et al., 31% of patients with gastrointestinal bleeding did not undergo endoscopy within 30 days of admission [4]. Similarly, according to the 2022 UK national statistics, 20% of patients with AGIB did not undergo endoscopy [5]. Furthermore, in a prospective observational study by Bryant et al., 20% of patients with upper gastrointestinal bleeding (UGIB) did not undergo endoscopy [6]. Thus, real-world clinical practice is very different from the recommendations from guidelines or consensus statements, and the necessity of endoscopy in all patients with gastrointestinal bleeding is debatable.

Recently, two large-scale retrospective studies demonstrated that urgent endoscopy did not improve the prognosis of patients with gastrointestinal bleeding [7, 8]. Furthermore, patients with model end-stage liver disease score ≤ 17 who underwent urgent endoscopy were more likely to have adverse in-hospital outcomes [9]. Additionally, while endoscopy is usually safe, it may occasionally cause procedure-related complications, such as transient hypoxemia or infections [10]. Therefore, it is necessary to reconsider specific conditions where endoscopy is warranted in patients with AGIB and those where it can be postponed and even compromised. On the other hand, at some primary hospitals, especially those in resource-limited areas, endoscopic equipment and/or experienced endoscopists may be unavailable [11]. In this setting, pharmacological therapy seems to be sufficient for low-risk patients with preserved liver function, no progressive bleeding, and stable hemodynamics; by comparison, high-risk patients should be immediately transferred to some referral centers where endoscopic variceal treatment can be employed.

Herein, we aimed to identify a low-risk group of patients with cirrhosis and AGIB for whom urgent endoscopy might not be required to improve their outcomes.

METHODS

Study Design

We retrospectively collected the data on patients with cirrhosis and AGIB between September 30, 2020 and June 30, 2023 from a prospective international multicenter study, as previously reported (ClinicalTrials.gov identifier NCT04662918) [12–14]. The number of patients enrolled from each of the 23 participating centers is provided in the Supplementary Material.

We pre-specified some exclusion criteria, as follows. First, according to the current practice guidelines, transjugular intrahepatic portosystemic shunt (TIPS) is mainly recommended as a choice of rescue therapy for acute variceal bleeding after the failure of endoscopic treatment, a choice of secondary prevention of variceal bleeding after endoscopic therapy [15], or a preemptive choice of treatment for acute variceal bleeding in high-risk patients of death [16]. Considering that the primary aim of our

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current study was to explore the necessity of urgent endoscopy, patients who underwent TIPS during hospitalization were excluded. Second, our previous study demonstrated that patients with cirrhosis and variceal bleeding who presented with melena alone had significantly better outcomes than those who presented with hematemesis alone [17]. Hematemesis usually indicates rapid and massive upper gastrointestinal hemorrhage within a short time, where urgent endoscopy is often necessary to save patients' lives. Considering that the primary aim of our study was to identify low-risk patients, patients who presented with hematemesis were excluded. Third, hematochezia typically suggests a high probability of lower gastrointestinal bleeding, which differs substantially from UGIB in terms of etiology, diagnostic approach, and therapeutic methods. Therefore, patients who presented with hematochezia were excluded.

On the basis of the use of endoscopy during hospitalizations, patients were divided into the endoscopy group and the non-endoscopy group. Principal investigators involved in this study were experienced gastroenterologists or hepatologists from large tertiary or referral hospitals. Each participating center was equipped with advanced endoscopic equipment and skilled endoscopists. The decision to perform endoscopy was made by the attending physician after comprehensive evaluation of the patient's condition, including hemodynamic status, gastrointestinal bleeding-related manifestations, and contraindications, such as respiratory failure or disturbance of consciousness, as well as the patient's willingness.

Outcomes of interest included 5-day failure to control bleeding and in-hospital death. The definition of the former is based on the Baveno V consensus. Specifically, 5-day failure to control bleeding would be considered in a patient who presented with gastrointestinal bleeding, if any of the following conditions occurred within 5 days: vomiting fresh blood, drainage of >100 mL of blood from the nasogastric tube, decrease in hemoglobin concentration of >30 g/L without transfusion, hypovolemic shock, or death [14, 18]. Death from any cause during hospitalization was defined as in-hospital mortality.

In this study, "low-risk" patients were defined as patients with cirrhosis and AGIB who did not undergo endoscopy and survived during hospitalization.

Ethical Approval

This retrospective study was approved by the Medical Ethical Committee of the General Hospital of the Northern Theater of Command with an approval number [Ethical Approval Number Y (2025) 017] and was conducted in accordance with the Declaration of Helsinki. As a result of the retrospective nature of the study, the requirement for additional informed consent from individual patients was waived by the ethical committee. All authors have reviewed and approved the final version of the manuscript and consent to its publication.

Statistical Analyses

Continuous variables were presented as mean ± standard deviation (SD) and median with range. If data followed a normal distribution, the independent sample *t* test was employed to assess the differences among groups; otherwise, the Mann–Whitney *U* test was employed. Categorical variables were presented as frequency with percentage. The chi-square test or Fisher's exact test was employed to explore their differences between groups. Univariate logistic regression analyses were used to identify the variables that were significantly associated with in-hospital mortality. Odds ratios (ORs) for each variable were calculated. The "low-risk" group of patients was then identified. All statistical analyses were performed using SPSS 25.0 (SPSS Inc., Chicago, IL, USA) and GraphPad Prism 9.0 (GraphPad Software Inc., San Diego, CA, USA).

RESULTS

Patients

Overall, 673 patients were included in this study (Fig. 1), of whom 202 (30.0%) did not undergo endoscopy. The median Child–Pugh score was 7.

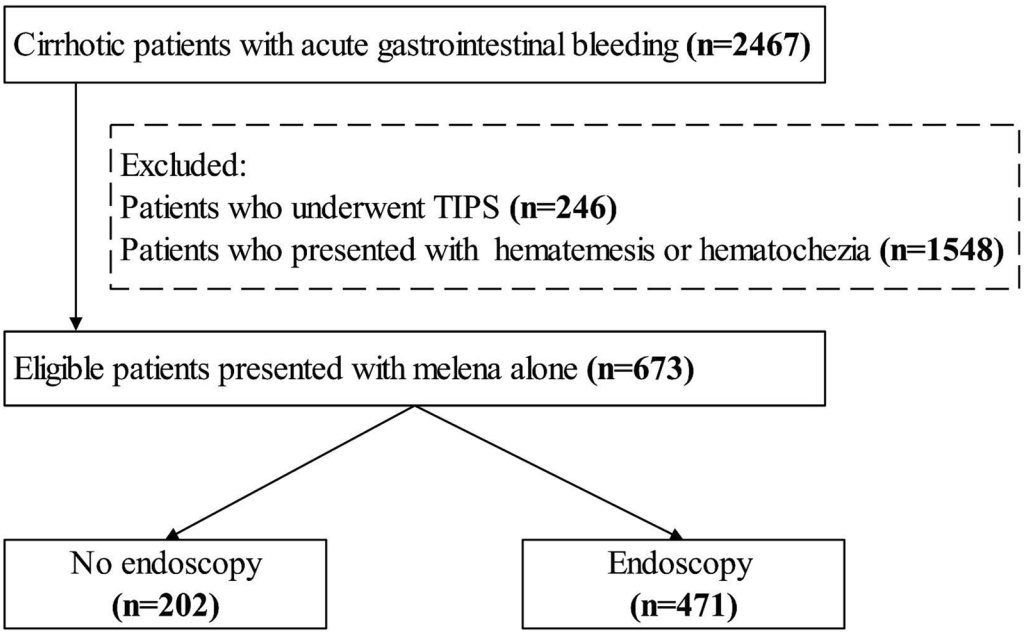

Fig. 1 Flowchart of patients' inclusion. TIPS, transjugular intrahepatic portosystemic shunt

Baseline characteristics of the patients are summarized in Table 1.

Difference Between Overall Patients Who Underwent and Did Not Undergo Endoscopy

Patients who did not undergo endoscopy were significantly older and had higher proportions of hepatocellular carcinoma (HCC), total bilirubin, and Child–Pugh score than those who underwent endoscopy (Table 2). Patients who underwent endoscopy had significantly lower rates of 5-day failure to control bleeding (2.5% vs. 6.4%) and in-hospital mortality (2.8% vs. 8.4%) than those who did not (Table 2).

Identification of Low-Risk Patients

Univariate logistic regression analyses demonstrated that age (OR 1.055, $P=0.001$), history of GIB (OR 0.443, $P=0.030$), HCC (OR 4.845, $P<0.001$), and Child–Pugh score (OR 1.809, $P<0.001$) were significantly associated with in-hospital death (Table 3).

Patients with HCC had a significantly higher in-hospital mortality than those without HCC (10.6% vs. 2.4%, $P<0.001$) (Fig. 2a). The most common cause of death in patients with HCC was liver failure (39%) (Fig. 3).

Patients with Child–Pugh score > 7 had a significantly higher in-hospital mortality than those with Child–Pugh score ≤ 7 (8.2% vs. 1.4%, $P<0.001$) (Fig. 2b). The most common cause of death in patients with Child–Pugh score > 7 was liver failure (28%), followed by HCC (16%) (Fig. 3).

Thus, patients with Child–Pugh score ≤ 7 but without HCC were stratified as low risk.

Difference Between Low-Risk Patients Who Underwent and Did Not Undergo Endoscopy

Low-risk patients who did not undergo endoscopy had significantly lower hemoglobin and were older than those who underwent endoscopy (Table 4). No death was observed in low-risk patients regardless of endoscopy

Table 1 Baseline characteristics of included patients

Variables	Overall ($N = 673$)
Age (years)	55.74 ± 12.76 58.00 (19.00–94.00)
Male (%)	489 (72.7%)
Female (%)	184 (27.3%)
Diabetes (%)	160 (23.8%)
History of gastrointestinal bleeding (%)	441 (65.5%)
HCC (%)	169 (25.1%)
Laboratory parameters	
Hb (g/L)	85.62 ± 27.68 82.00 (27.00–212.00)
PLT (10^9/L)	105.56 ± 75.80 84.00 (8.00–513.00)
TBIL (μmol/L)	44.67 ± 71.74 25.80 (2.30–677.70)
ALB (g/L)	31.91 ± 5.75 31.80 (14.10–47.20)
BUN (mmol/L)	8.18 ± 5.82 6.90 (0.96–63.42)
Scr (μmol/L)	79.07 ± 64.65 65.00 (7.00–950.00)
Na (mmol/L)	137.53 ± 5.60 138.10 (76.00–159.20)
K (mmol/L)	4.03 ± 0.57 4.00 (2.21–7.33)
PT (s)	15.62 ± 3.87 14.70 (10.00–54.40)
INR	1.37 ± 0.36 1.28 (0.91–5.26)
Child–Pugh score	7.64 ± 2.01 7.00 (5.00–15.00)
MELD score	11.64 ± 4.27 10.42 (6.43–31.09)
Vasoconstrictors (%)	597 (88.7%)
PPIs (%)	625 (92.9%)
5-day failure to control bleeding (%)	25 (3.7%)
In-hospital death (%)	30 (4.5%)

A total of 673 patients were included in the analysis presented in this table, with no instances of missing data

Continuous data are presented both as mean ± standard deviation and median (interquartile range). Categorical data are presented as number of patients (%)

SD standard deviation, *No. Pts.* numbers of patients, *HCC* hepatocellular carcinoma, *Hb*hemoglobin, *PLT* platelet, *TBIL* total bilirubin, *ALB* albumin, *BUN* blood urea nitrogen, *Scr* serum creatinine, *Na* sodium, *K* potassium, *PT* prothrombin time, *INR* international normalized ratio, *MELD* model for end-stage liver disease, *PPIs* proton pump inhibitors

Table 2 Difference between patients who underwent endoscopy and those who did not

Variables	No endoscopy ($N = 202$)	Endoscopy ($N = 471$)	*P* value
Age (years)	59.64 ± 13.27 60.00 (27.00–93.00)	56.49 ± 12.43 57.00 (19.00–90.00)	***0.007***
Male (%)	140 (69.3%)	349 (74.1%)	0.201
Female (%)	62 (30.7%)	122 (25.9%)	0.201
Diabetes (%)	42 (20.8%)	118 (25.1%)	0.234
History of gastrointestinal bleeding (%)	128 (63.4%)	313 (66.5%)	0.440
HCC (%)	70 (34.7%)	99 (21.0%)	< ***0.001***
Laboratory parameters0			
Hb (g/L)	85.48 ± 29.62 80.00 (28.00–174.00)	85.68 ± 26.84 83.00 (27.00–212.00)	0.613
PLT (10^9/L)	105.22 ± 77.75 85.00 (8.00–387.00)	105.70 ± 75.03 83.00 (10.00–513.00)	0.637
TBIL (umol/L)	63.06 ± 100.59 29.90 (5.50–677.70)	36.79 ± 53.15 24.40 (2.30–646.30)	***0.001***
ALB (g/L)	30.77 ± 5.68 30.30 (14.10–45.30)	32.39 ± 5.71 32.20 (15.00–47.20)	***0.001***
BUN (mmol/L)	8.56 ± 6.85 7.10 (1.05–63.42)	8.01 ± 5.32 6.77 (0.96–43.93)	0.594
Scr (μmol/L)	84.71 ± 67.53 65.00 (26.80–518.99)	76.65 ± 63.30 64.90 (7.00–950.00)	0.446
Na (mmol/L)	136.95 ± 5.57 137.65 (110.00–159.20)	137.79 ± 5.60 138.50 (76.00–154.00)	***0.010***
K (mmol/L)	4.03 ± 0.66 3.93 (2.21–7.33)	4.03 ± 0.53 4.00 (2.45–6.03)	0.517
PT (s)	16.44 ± 5.33 15.00 (10.00–54.40)	15.26 ± 2.98 14.70 (10.00–34.10)	0.086
INR	8.28 ± 2.20 8 (5–15)	7.37 ± 1.86 7 (5–14)	< ***0.001***
Child–Pugh score	8.28 ± 2.20 8 (5–15)	7.37 ± 1.86 7 (5–14)	< ***0.001***
MELD score	12.88 ± 4.99 11.36 (6.43–31.09)	11.11 ± 3.81 9.96 (6.43–28.90)	< ***0.001***
Vasoconstrictors (%)	175 (86.6%)	422 (89.6%)	0.266
PPIs (%)	183 (90.6%)	442 (93.8%)	0.133
5-Day failure to control bleeding (%)	13 (6.4%)	12 (2.5%)	***0.015***
In-hospital death (%)	17 (8.4%)	13 (2.8%)	***0.001***

A total of 673 patients were included in the analysis presented in this table, with no instances of missing data

Continuous data are presented both as mean ± standard deviation and median (interquartile range). Categorical data are presented as number of patients (%)

SD standard deviation, *No. Pts.* numbers of patients, *HCC* hepatocellular carcinoma, *Hb* hemoglobin, *PLT* platelet, *TBIL* total bilirubin, *ALB* albumin, *BUN* blood urea nitrogen, *Scr* serum creatinine, *Na* sodium, *K* potassium, *PT* prothrombin time, *INR* international normalized ratio, *MELD* model for end-stage liver disease, *PPIs* proton pump inhibitors

Table 3 Univariate logistic regression analysis of factors associated with in-hospital death

Variables	In-hospital death	
	OR (95% CI)	*P* value
Age (years)	1.055 (1.023–1.088)	***0.001***
Gender (male versus female)	0.873 (0.392–1.942)	0.738
Diabetes (yes versus no)	0.609 (0.279–1.329)	0.212
History of gastrointestinal bleeding (yes versus no)	0.443 (0.212–0.924)	***0.030***
HCC (yes versus no)	***4.845 (2.283–10.286)***	***< 0.001***
Laboratory parameters		
Hb (g/L)	1.012 (1.000–1.025)	0.050
PLT (10^9/L)	1.001 (0.997–1.006)	0.543
TBIL (umol/L)	1.040 (0.994–1.088)	0.088
ALB (g/L)	0.910 (0.757–1.095)	0.319
BUN (mmol/L)	1.034 (0.867–1.234)	0.710
Scr (μmol/L)	1.005 (0.990–1.019)	0.535
Na (mmol/L)	0.970 (0.923–1.020)	0.242
K (mmol/L)	1.530 (0.232–10.075)	0.658
PT (s)	0.836 (0.497–1.407)	0.500
INR	0.681 (0.002–285.857)	0.901
Child–Pugh score	***1.809 (1.507–2.170)***	***< 0.001***
MELD score	1.043 (0.745–1.461)	0.806

A total of 673 patients were included in the analysis presented in this table, with no instances of missing data

Continuous data are presented both as mean ± standard deviation and median (interquartile range). Categorical data are presented as number of patients (%)

SD standard deviation, *No. Pts.* numbers of patients, *HCC* hepatocellular carcinoma, *Hb* hemoglobin, *PLT* platelet, *TBIL* total bilirubin, *ALB* albumin, *BUN* blood urea nitrogen, *Scr* serum creatinine, *Na* sodium, *K* potassium, *PT* prothrombin time, *INR* international normalized ratio, *MELD* model for end-stage liver disease, *PPIs* proton pump inhibitors

A two-tailed *P* 0.05 was statistically significant

(Fig. 4). Low-risk patients who underwent endoscopy had a lower rate of 5-day failure to control bleeding than those who did not, but the difference was not statistically significant (1.3% vs. 4.7%, $P=0.110$) (Fig. 4).

In 240 low-risk patients who underwent endoscopy, the most common cause of GIB was esophageal variceal bleeding (83.3%). Endoscopic variceal treatment was performed in 192 patients (80.0%), of whom the majority (41.1%) underwent endoscopic variceal ligation alone (Table 5).

DISCUSSION

Our current study found that endoscopy might not improve the in-hospital outcome of patients with cirrhosis without HCC who

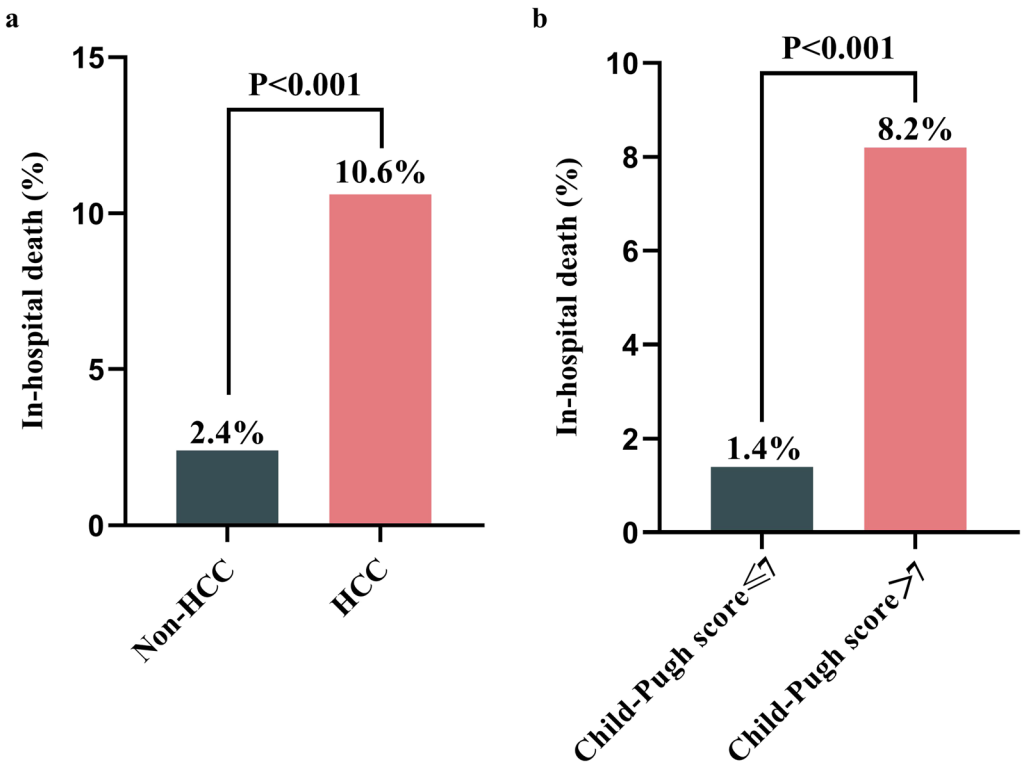

Fig. 2 Difference in in-hospital mortality according to the HCC (**a**) and Child–Pugh score (**b**). HCC, hepatocellular carcinoma

presented with melena and had Child–Pugh score ≤ 7.

Endoscopy is the gold standard for diagnosing UGIB, particularly in high-risk patients. However, its necessity in low-risk patients remains controversial. As mentioned by Stanley et al., the major reason why some patients with UGIB did not undergo endoscopy is that clinicians deemed UGIB to be mild and intervention to be unnecessary [19]. Indeed, mild acute gastric mucosal bleeding often spontaneously resolves without requirement for endoscopic intervention, and has favorable prognosis [20, 21]. Peterson et al. also suggested that routine endoscopy did not provide additional clinical benefits for hospitalized patients with controlled bleeding, except in cases of rebleeding or imaging abnormality [22].

In some special conditions, such as the COVID-19 pandemic, medical resources are extremely limited. Accordingly, the risk should be accurately stratified by the severity of the patient's condition to use medical resources more efficiently and appropriately. Patients with a Glasgow-Blatchford score (GBS) of 0–1 have a very low risk of in-hospital death and do not need endoscopy [23]. Dunne et al. conducted a prospective multicenter study in 397 patients with UGIB during the COVID-19 pandemic, to evaluate whether patients with a GBS of 0–3 could safely delay or avoid endoscopy during hospitalization. They showed no significant difference in in-hospital mortality or rebleeding between patients who received endoscopy and those who did not [24]. However, the GBS is suitable for non-variceal UGIB [16, 25], but not patients with cirrhosis and AGIB. In this setting, our study has identified that avoid endoscopy can be avoided in the "low-risk" group of patients with cirrhosis and AGIB. These patients could be treated with medication alone without endoscopy. By comparison, "high-risk"

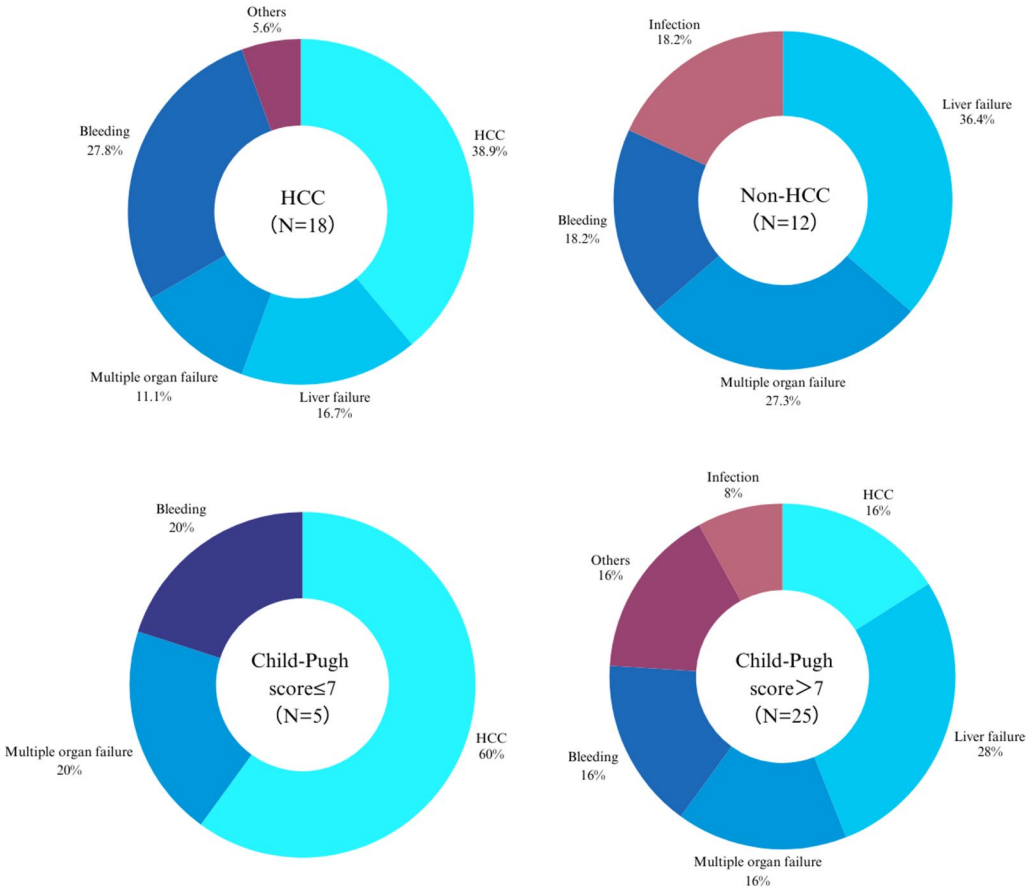

Fig. 3 Causes of death stratified by HCC and Child–Pugh score. HCC, hepatocellular carcinoma

patients should be promptly transferred to referral centers for urgent endoscopy and advanced treatment.

Patients with GIB are often admitted because of specific symptoms, such as hematemesis and/or melena. Indeed, such clinical symptoms are useful for determining the risk of mortality [26]. Compared to hematemesis, melena is typically considered a sign of slower gastrointestinal bleeding and smaller blood loss, associated with lower risk of mortality [17, 27, 28]. In our previous study, patients with cirrhosis and melena alone had significantly lower rates of 5-day rebleeding and in-hospital mortality than those with hematemesis [17].

AGIB, especially acute variceal bleeding, can greatly worsen clinical outcomes of patients with HCC. Lee et al. found that patients with variceal bleeding and HCC had significantly higher rate of 5-day failure to control bleeding and 6-week mortality than those without HCC [29]. Our current study showed that HCC was an independent risk factor for in-hospital death, which is consistent with our previous study [30]. This may be due to several reasons: (1) HCC damages liver tissue and worsens portal hypertension [30, 31]; (2) tumor cells can invade the portal vein system and destroy blood vessels, compromising bleeding control [32]; and (3) blood loss can cause hypoperfusion, which activates Toll-like receptor 4 and its downstream NF-κB signaling pathway, leading to the release of inflammatory cytokines, such as tumor necrosis factor alpha (TNFα) and interleukin (IL)-6. This may trigger systemic inflammatory response syndrome,

Table 4 Difference between low-risk patients who underwent endoscopy and those who did not

Variables	No endoscopy ($N = 64$)	Endoscopy ($N = 240$)	*P* value
Age (years)	59.00 ± 15.19 59.50 (27.00–93.00)	55.32 ± 12.27 56.00 (19.00–85.00)	***0.044***
Male (%)	39 (60.9%)	159 (66.3%)	0.201
Female (%)	25 (39.1%)	81 (33.7%)	0.201
Diabetes (%)	13 (20.3%)	48 (20.0%)	0.873
History of gastrointestinal bleeding (%)	45 (63.4%)	172 (66.5%)	0.440
Laboratory parameters			
Hb (g/L)	80.05 ± 27.06 73.50 (38.00–151.00)	89.92 ± 27.63 88.00 (27.00–212.00)	***0.006***
PLT (10^9/L)	115.72 ± 81.41 89.00 (18.00–343.00)	106.15 ± 78.87 80.00 (10.00–513.00)	0.388
TBIL (umol/L)	20.43 ± 10.79 16.90 (5.50–50.00)	21.87 ± 12.49 19.20 (5.30–83.30)	0.376
ALB (g/L)	34.27 ± 4.44 34.05 (26.30–45.30)	35.17 ± 4.90 35.40 (18.00–47.20)	0.184
BUN (mmol/L)	8.29 ± 5.55 7.00 (1.14–29.30)	7.16 ± 4.13 6.00 (1.19–34.44)	0.235
Scr (μmol/L)	82.68 ± 59.61 70.00 (27.80–400.00)	67.28 ± 32.01 62.80 (25.00–419.80)	0.099
Na (mmol/L)	139.12 ± 2.89 139.00 (132.00–145.20)	138.73 ± 5.41 139.00 (76.00–153.40)	0.570
K (mmol/L)	3.93 ± 0.40 3.90 (2.61–4.90)	3.98 ± 0.47 3.95 (2.48–5.50)	0.594
PT (s)	14.47 ± 2.25 14.10 (10.60–25.30)	14.24 ± 1.91 14.00 (10.00–21.70)	0.638
INR	1.24 ± 0.16 1.21 (0.97–1.80)	1.23 ± 0.15 1.21 (0.91–1.65)	0.807
Child–Pugh score	6.23 ± 0.79 6.00 (5.00–7.00)	6.08 ± 0.79 6.00 (5.00–7.00)	0.153
MELD score	10.12 ± 3.28 9.19 (6.43–23.47)	9.31 ± 2.14 8.93 (6.43–22.11)	0.143
Vasoconstrictors (%)	55 (85.9%)	218 (90.8%)	0.250
PPIs (%)	56 (87.5%)	226 (94.2%)	0.067
5-Day failure to control bleeding (%)	3 (4.7%)	3 (1.3%)	0.110
In-hospital death (%)	0 (0.0%)	0 (0.0%)	–

Table 4 (continued)

A total of 304 patients were included in the analysis presented in this table, with no instances of missing data

Continuous data are presented both as mean ± standard deviation and median (interquartile range). Categorical data are presented as number of patients (%)

SD standard deviation, *No. Pts.* numbers of patients, *HCC* hepatocellular carcinoma, *Hb* hemoglobin, *PLT* platelet, *TBIL* total bilirubin, *ALB* albumin, *BUN* blood urea nitrogen, *Scr* serum creatinine, *Na* sodium, *K* potassium, *PT* prothrombin time, *INR* international normalized ratio, *MELD* model for end-stage liver disease, *PPIs* proton pump inhibitors

A two-tailed *P* 0.05 was statistically significant

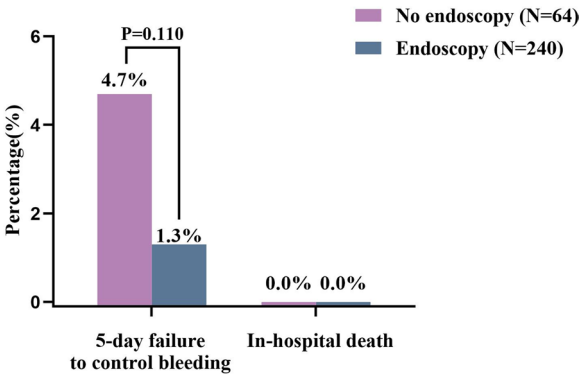

Fig. 4 Difference in in-hospital outcomes between low-risk patients who underwent endoscopy and those who did not

worsen multiple organ dysfunction, and eventually cause organ failure and death [33].

Clinically, Child–Pugh score is a well-recognized tool used to assess liver function and prognosis by utilizing straightforward parameters, including bilirubin, albumin, international normalized ratio, ascites, and hepatic encephalopathy [34]. Zhang et al. found that Child–Pugh score was an independent risk factor for 5-day treatment failure in patients with cirrhosis and GIB, regardless of the timing of endoscopy [35]. Furthermore, Thapa et al. demonstrated that patients with higher Child–Pugh scores exhibited more severe esophageal varices [36]. Accordingly, early endoscopy might significantly reduce the risk of bleeding-related complications in patients with higher Child–Pugh scores [37]. In our study, a low Child–Pugh score in combination with two other clinical indicators, such as the absence of HCC or the presence of melena alone, can further identify low-risk patients. Notably, instead of conventional Child–Pugh class A/B/C, we chose to stratify patients using a single Child–Pugh score of 7.

Table 5 Findings of endoscopy in low-risk patients

Variables	Frequency (%)
Causes of GIB	
Variceal bleeding (%)	200 (83.3)
Ulcer bleeding (%)	15 (6.2)
Others (%)	25 (12.5)
Endoscopic variceal treatment	192 (80.0)
EVL alone (%)	79 (41.1)
EIS alone (%)	8 (4.2)
ECGI alone (%)	17 (8.9)
EIS + ECGI (%)	34 (17.7)
EVL + EIS (%)	4 (2.1)
EVL + ECGI (%)	34 (17.7)
EVL + EIS + ECGI (%)	15 (7.8)
Others (%)	1 (0.5)

GIB gastrointestinal bleeding, *ECGI* endoscopic cyanoacrylate glue injection, *EIS* endoscopic injection sclerotherapy, *EVL* endoscopic variceal ligation

Our study has several limitations. First, the decision to undergo endoscopy is often made in a case-by-case manner. Some patients might be too sick, including those in a palliative setting, to undergo endoscopy, and others might be poorly compliant. This might lead to selection bias. Second, according to the pre-specified protocol, only in-hospital outcomes were collected, but not long-term follow-up outcome. Third, as a result of the retrospective nature of the study,

our findings are subject to several inherent limitations, including selection bias, information bias, and the inability to control for unmeasured confounders. In addition, some clinical parameters, such as heart rate, blood pressure, and the presence of shock, were not available, as were several established risk scores, such as GBS, Rockall score, and AIMS65. The absence of these data compromised the comprehensive assessment of the disease severity and the necessity of urgent measures and to directly compare the performance of our criteria with other scores. Fourth, the difference in the 5-day failure to control bleeding is not statistically significant between low-risk patients who underwent and did not undergo endoscopy ($P = 0.110$), which may be attributed to the relatively small sample size of our study.

CONCLUSIONS

Patients with cirrhosis who presented with melena alone, and had Child–Pugh score ≤ 7, but without HCC may not require endoscopy during hospitalization. This finding provides novel risk stratification for patients with cirrhosis and GIB to minimize the necessity of urgent endoscopy in low-risk patients. Meanwhile, it should be potentially valuable to optimize the medical resource allocation, reduce the financial burden, and alleviate the patients' psychological fear on endoscopy in resource-limited areas. Certainly, in the future, a prospective multicenter large-scale study is needed to validate this risk stratification strategy.

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Declarations

Conflict of Interest. All authors—Sijia Zhang, Mingyu Sun, Shanshan Yuan, Su Lin, Fernando Gomes Romeiro, Yingli He, Qiang Zhu, Dapeng Ma, Yiling Li, Cyriac Abby Philips, Xiaofeng Liu, Nahum Méndez-Sánchez, Lichun Shao, Yunhai Wu, Metin Basaranoglu, Kanokwan Pinyopornpanish, Yu Chen, Andrea Mancuso, Ling Yang, Frank Tacke, Bimin Li, Lei Liu, Fanpu Ji, and Xingshun Qi—have nothing to disclose. Xingshun Qi is an Editorial Board member of *Advances in Therapy*, but was not involved in the selection of peer reviewers for the manuscript nor any of the subsequent editorial decisions.

Ethical Approval. This retrospective study was approved by the Medical Ethical Committee of the General Hospital of the Northern Theater of Command with an approval number [Ethical Approval Number Y (2025) 017] and was conducted in accordance with the Declaration of Helsinki. As a result of the retrospective nature of the study, the requirement for additional informed consent from individual patients was waived by the ethical committee. All authors have reviewed and approved the final version of the manuscript and consent to its publication.

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