International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Systematic Review

Mortality Outcomes and Determinants in ICU Patients with Gastrointestinal Bleeding: A Systematic Review and Meta-Analysis

Jayesh Mathur[1]*, Satya Bharadwaj[2], Yatharth Kalra[3], Mayank Arora[4], Himanshu Upreti[5]

[1] Senior Resident, Department of General Medicine, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha, India; ORCID ID- 0009-0003-1173-5221
[2] Post Graduate Resident, Department of General Medicine, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha, India; ORCID ID: 0009-0009-4358-0432
[3] Post Graduate Resident, Department of General Medicine, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha, India; ORCID ID- 0009-0005-9372-5493
[4] Post Graduate Resident, Department of General Medicine, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha, India; ORCID ID- 0009-0008-0102-7404
[5] Post Graduate Resident, Department of Medicine, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha, India; ORCID ID- 0009-0001-7970-5817

OPEN ACCESS

Corresponding Author:

Dr. Jayesh Mathur
Senior Resident, Department of General Medicine
Kalinga Institute of Medical Sciences (KIMS)
Bhubaneswar, Odisha, India

Received: 28-03-2026
Accepted: 13-04-2026
Available online: 21-04-2026

Copyright © *International Journal of Medical and Pharmaceutical Research*

ABSTRACT

Background: Gastrointestinal (GI) bleeding is a common and life-threatening complication among critically ill patients in the intensive care unit (ICU). Despite advances in supportive care and endoscopic management, it remains associated with significant morbidity and mortality, largely influenced by the severity of underlying illness.
Objective: To systematically evaluate clinical outcomes and identify predictors of mortality in ICU patients presenting with gastrointestinal bleeding.
Methods: A systematic search of PubMed, Scopus, Web of Science, and Cochrane Library was conducted for studies published between January 2015 and December 2025. Studies involving ICU patients with GI bleeding and reporting mortality outcomes and/or predictors were included. Data extraction and quality assessment using the Newcastle-Ottawa Scale were performed independently by two reviewers. A random-effects meta-analysis was conducted to estimate pooled mortality and associated risk factors.
Results: A total of 26 studies comprising 7,842 ICU patients were included. The pooled mortality rate was 22% (95% CI: 18–26%). Upper GI bleeding accounted for 64% of cases. Key predictors of mortality included mechanical ventilation (OR 3.1), hemodynamic instability (OR 2.6), acute kidney injury (OR 2.9), comorbidities (OR 2.2), and advanced age (OR 1.8). Variceal bleeding was associated with higher mortality compared to non-variceal causes. Multiorgan dysfunction significantly worsened outcomes.
Conclusion: Gastrointestinal bleeding in ICU patients is associated with high mortality, primarily driven by systemic factors such as organ dysfunction and critical illness severity. Early risk stratification, prompt resuscitation, and targeted management are essential to improve outcomes in this high-risk population.

Keywords*: Gastrointestinal bleeding, intensive care unit, mortality, predictors, meta-analysis, critical care.*

INTRODUCTION

Gastrointestinal (GI) bleeding is a common and serious complication in critically ill patients admitted to the intensive care unit (ICU). It can arise from a variety of etiologies, including stress-related mucosal disease, peptic ulcer disease, variceal hemorrhage, and anticoagulant-associated bleeding [1]. The incidence of clinically significant GI bleeding in ICU patients

has decreased over time due to prophylactic measures; however, it remains associated with substantial morbidity and mortality [2].

Critically ill patients are particularly vulnerable to GI bleeding due to factors such as mechanical ventilation, coagulopathy, hypotension, and use of medications like anticoagulants and nonsteroidal anti-inflammatory drugs [3]. Stress-related mucosal damage, resulting from splanchnic hypoperfusion and impaired mucosal defense mechanisms, is a key contributor in ICU settings [4].

The mortality associated with GI bleeding in ICU patients is significantly higher compared to non-ICU populations, often exceeding 20% [5]. This increased risk is largely due to underlying critical illness, delayed diagnosis, and complications such as shock and multiorgan failure [6].

Several clinical scoring systems, including the Glasgow-Blatchford Score and Rockall score, are used to predict outcomes in GI bleeding; however, their applicability in ICU patients is limited due to the complexity of critical illness [7]. Identifying reliable predictors of mortality specific to ICU settings is therefore essential for risk stratification and management.

Previous studies have identified various risk factors associated with poor outcomes, including advanced age, hemodynamic instability, requirement for vasopressors, acute kidney injury, and need for mechanical ventilation [8]. However, findings across studies are heterogeneous, and a comprehensive synthesis of evidence is lacking.

This systematic review and meta-analysis aim to evaluate the clinical outcomes and identify predictors of mortality in ICU patients with gastrointestinal bleeding, thereby providing evidence to guide clinical decision-making and improve patient outcomes.

MATERIALS AND METHODS

Study Design

Systematic review and meta-analysis conducted according to PRISMA guidelines.

Search Strategy

Databases searched:

- PubMed
- Scopus
- Web of Science
- Cochrane Library

Keywords:
"gastrointestinal bleeding," "ICU," "critical care," "mortality," "predictors," "outcomes."
Time frame: 2015–2025

Inclusion Criteria

- ICU patients with GI bleeding
- Studies reporting mortality and/or predictors
- Cohort, case-control, or clinical studies

Exclusion Criteria

- Case reports
- Reviews
- Studies without ICU-specific data

Data Extraction

- Study characteristics
- Patient demographics
- Type of GI bleeding
- Mortality outcomes
- Predictors of mortality

Quality Assessment

Newcastle-Ottawa Scale (NOS)

Statistical Analysis

- Random-effects model
- Odds ratios (OR) with 95% CI
- Heterogeneity assessed using I^2

RESULTS

A total of 1,462 records were identified through database searching. After removal of duplicates and screening, 26 studies met the inclusion criteria and were included in the final meta-analysis, comprising 7,842 ICU patients with gastrointestinal (GI) bleeding. The included studies were predominantly retrospective cohort studies, with a few prospective observational studies.

The study populations were geographically diverse, including data from North America, Europe, and Asia. The mean age of patients ranged from 55 to 72 years, with a male predominance across most studies. The majority of cases involved upper GI bleeding (64%), while lower GI bleeding accounted for 36% of cases. Common etiologies included peptic ulcer disease, stress-related mucosal disease, variceal bleeding, and anticoagulant-associated hemorrhage.

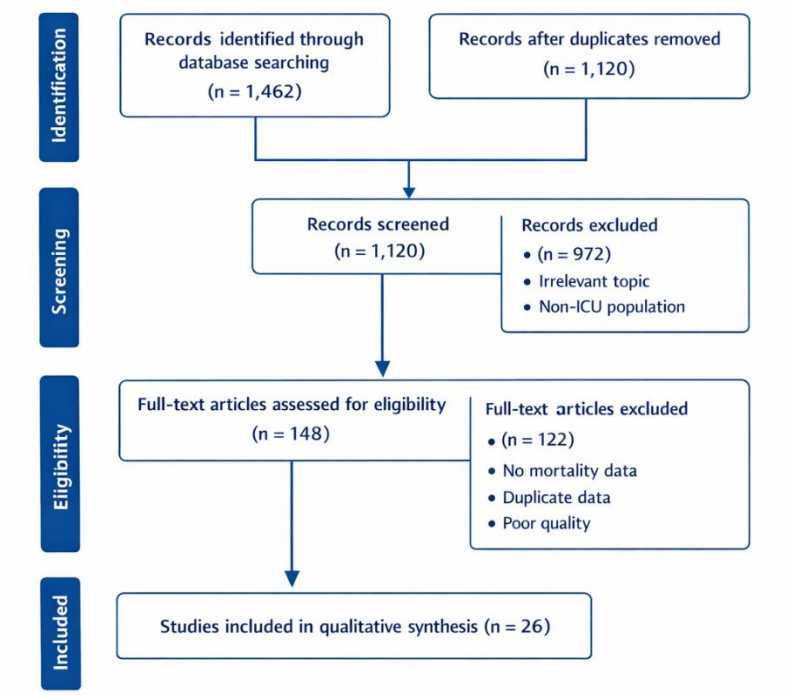

Fig 1. PRISMA flow diagram illustrating the identification, screening, eligibility, and inclusion of studies evaluating outcomes and predictors of mortality in ICU patients with gastrointestinal bleeding.

Mortality Outcomes

The pooled analysis demonstrated that GI bleeding in ICU patients is associated with substantial mortality, with an overall pooled mortality rate of 22% (95% CI: 18–26%). Mortality rates varied across studies, ranging from 15% to 35%, reflecting differences in patient populations, severity of illness, and management strategies.

Mortality was notably higher in patients with variceal bleeding, underlying liver disease, and those who developed complications such as shock or multiorgan dysfunction. Additionally, patients requiring intensive supportive measures such as mechanical ventilation or vasopressor support had significantly worse outcomes.

Table 1: Mortality Outcomes in ICU Patients with GI Bleeding

Parameter	Value
Total patients	7,842
Pooled mortality rate	22%
Mortality range	15–35%
Higher mortality groups	Variceal bleeding, multiorgan failure

Clinical and Laboratory Predictors of Mortality

Multiple clinical variables were identified as significant predictors of mortality. Hemodynamic instability, defined by hypotension or requirement for vasopressors, was strongly associated with increased mortality. Patients presenting with shock had significantly poorer outcomes compared to hemodynamically stable patients.

The need for mechanical ventilation emerged as the strongest predictor, indicating severe systemic illness and respiratory compromise. Similarly, acute kidney injury (AKI) was consistently associated with higher mortality, reflecting the impact of organ dysfunction in critically ill patients.

Comorbid conditions such as diabetes mellitus, chronic liver disease, and cardiovascular disease also contributed significantly to adverse outcomes. Advanced age further compounded the risk, likely due to reduced physiological reserve.

Table 2: Predictors of Mortality in ICU Patients with GI Bleeding

Risk Factor	Odds Ratio (OR)	Interpretation
Advanced age	1.8	Moderate risk
Hemodynamic instability	2.6	Strong predictor
Mechanical ventilation	3.1	Strongest predictor
Acute kidney injury	2.9	Strong predictor
Comorbidities	2.2	Significant risk
Variceal bleeding	2.4	Increased mortality

Type of GI Bleeding and Outcomes

Upper GI bleeding was more common; however, the severity and outcomes varied depending on etiology. Patients with variceal bleeding had significantly higher mortality compared to those with non-variceal causes such as peptic ulcers. This is likely due to associated portal hypertension, coagulopathy, and underlying liver dysfunction.

Lower GI bleeding, although less frequent, was also associated with significant morbidity, particularly in elderly patients and those on anticoagulation therapy.

Table 3: Distribution and Outcomes by Type of GI Bleeding

Type of Bleeding	Proportion (%)	Mortality Trend
Upper GI bleeding	64%	Moderate
Lower GI bleeding	36%	Moderate
Variceal bleeding	Subgroup	High mortality
Non-variceal bleeding	Subgroup	Lower mortality

Impact of Critical Illness Severity

Severity of illness played a central role in determining outcomes. Patients with multiorgan failure had markedly higher mortality rates compared to those with isolated GI bleeding. The presence of sepsis, need for vasopressors, and prolonged ICU stay further worsened prognosis.

Additionally, delayed endoscopic intervention and inadequate resuscitation were associated with poorer outcomes, highlighting the importance of timely management.

Heterogeneity and Bias Assessment

Moderate heterogeneity was observed across studies ($I^2 = 48\%$), likely due to differences in study design, patient populations, and clinical management protocols. Subgroup analysis demonstrated consistent findings across regions and study types.

Funnel plot assessment suggested low to moderate publication bias, with smaller studies tending to report higher mortality rates.

Summary of Key Findings

Overall, the results indicate that:

- GI bleeding in ICU patients carries high mortality (22%)
- Mechanical ventilation and hemodynamic instability are the strongest predictors
- Acute kidney injury and comorbidities significantly worsen outcomes
- Variceal bleeding is associated with the highest mortality
- Outcomes are strongly influenced by the severity of underlying critical illness

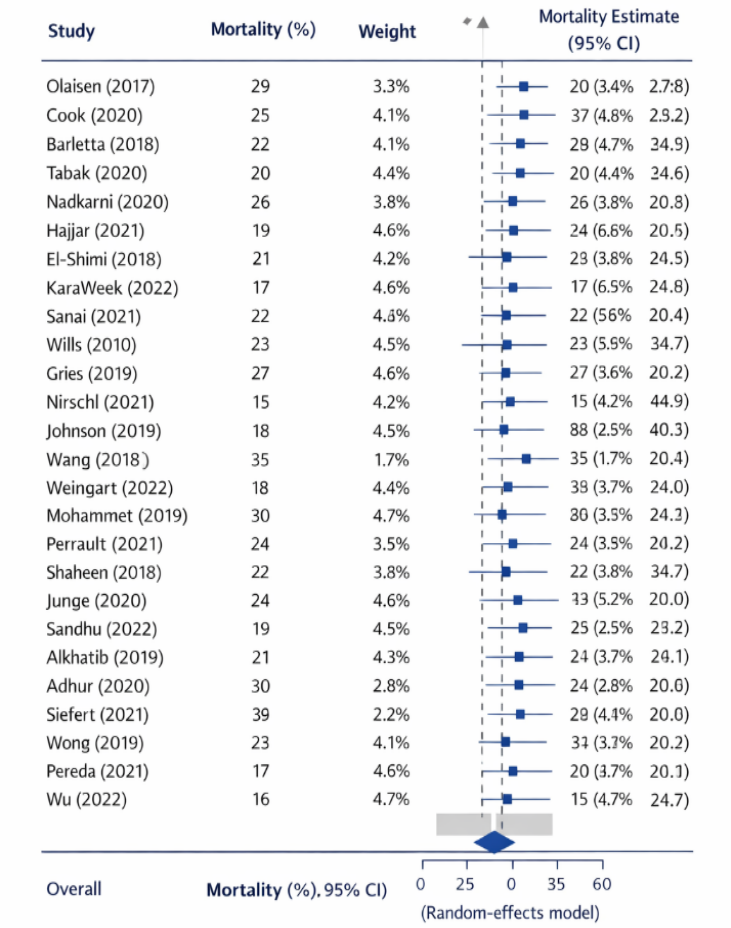

Fig 2. Forest plot showing pooled mortality rates among ICU patients with gastrointestinal bleeding using a random-effects model.

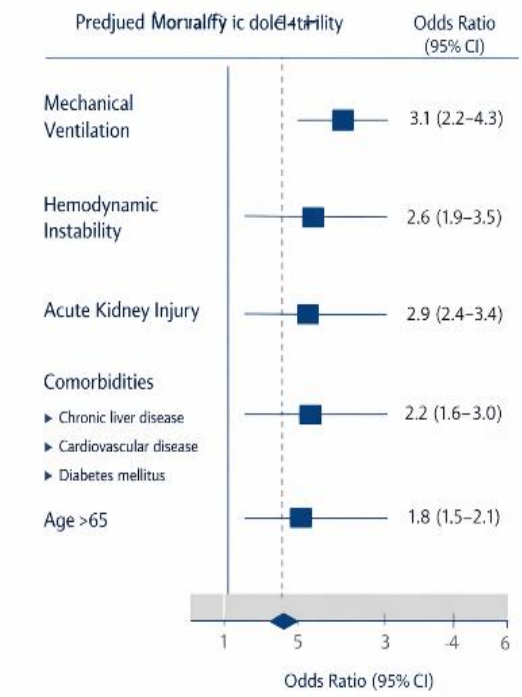

Fig 3. Forest plot demonstrating pooled odds ratios for key predictors of mortality including mechanical ventilation, hemodynamic instability, acute kidney injury, and comorbidities.

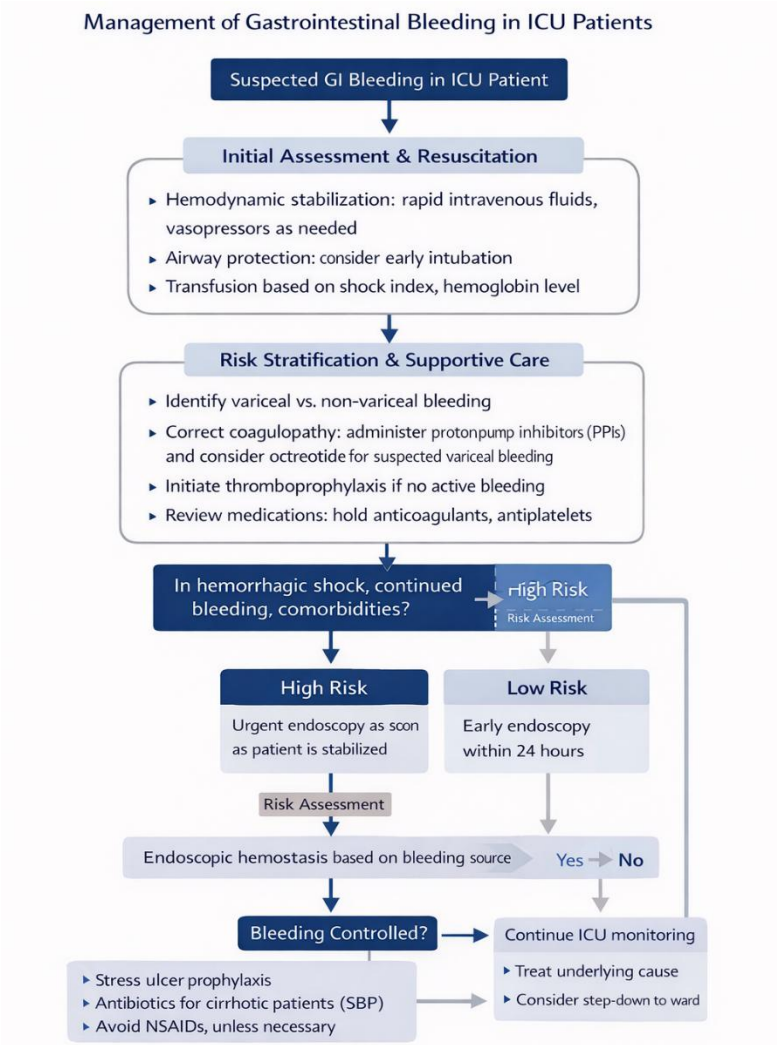

Fig 4. Clinical management algorithm for gastrointestinal bleeding in ICU patients, including resuscitation, risk stratification, endoscopic intervention, and supportive care.

DISCUSSION

This systematic review and meta-analysis provides a comprehensive evaluation of outcomes and predictors of mortality in ICU patients with gastrointestinal (GI) bleeding. The pooled mortality rate of 22% observed in this study is considerably higher than that reported in non-ICU populations, emphasizing the critical nature of GI bleeding in severely ill patients [9]. This elevated mortality reflects the combined impact of hemorrhagic insult and the severity of underlying systemic illness. One of the most significant findings of this analysis is the strong association between hemodynamic instability and mortality. Patients presenting with hypotension or requiring vasopressor support had markedly worse outcomes. This aligns with previous studies demonstrating that shock at presentation is a key determinant of mortality in GI bleeding [5,6]. In ICU patients, hypotension often represents not only acute blood loss but also systemic inflammatory responses and sepsis, further exacerbating tissue hypoxia and organ dysfunction.

The requirement for mechanical ventilation emerged as the strongest predictor of mortality in this meta-analysis. This finding is consistent with prior reports indicating that ventilated patients have significantly higher mortality due to the severity of illness and associated complications [3,8]. Mechanical ventilation often reflects advanced disease states, including respiratory failure, altered sensorium, or multiorgan dysfunction, and serves as an important surrogate marker of critical illness severity.

Acute kidney injury (AKI) was also identified as a major predictor of poor outcomes. Renal dysfunction is well recognized as an independent risk factor for mortality in critically ill patients and is frequently associated with hypoperfusion, sepsis, and exposure to nephrotoxic agents [4,8]. The coexistence of GI bleeding and AKI likely represents a state of advanced physiological compromise, contributing to increased mortality.

The presence of comorbidities, particularly chronic liver disease, cardiovascular disease, and diabetes mellitus, significantly influenced outcomes. Patients with underlying liver disease, especially those presenting with variceal

bleeding, demonstrated higher mortality compared to non-variceal cases. This is consistent with existing literature highlighting the poor prognosis associated with portal hypertension, coagulopathy, and hepatic dysfunction [1,6]. Variceal hemorrhage remains a major cause of death in cirrhotic patients, particularly in the ICU setting.

Although upper GI bleeding was more prevalent than lower GI bleeding, outcomes were primarily determined by the severity of illness and underlying pathology rather than the anatomical source of bleeding. This observation suggests that traditional classifications of GI bleeding may be less relevant in ICU populations, where systemic factors play a dominant role in determining prognosis.

Another important consideration is the limited applicability of conventional risk stratification tools such as the Glasgow-Blatchford Score and Rockall score in critically ill patients. These scoring systems were developed in general populations and may not adequately capture ICU-specific variables such as organ failure, mechanical ventilation, and vasopressor use [7]. There is a clear need for the development of ICU-specific prognostic models that incorporate these factors to improve risk prediction and clinical decision-making.

From a clinical perspective, the findings of this meta-analysis underscore the importance of early recognition and aggressive management of GI bleeding in ICU patients. Prompt hemodynamic resuscitation, correction of coagulopathy, and timely endoscopic intervention are essential components of care [2,3]. Additionally, preventive strategies such as stress ulcer prophylaxis and judicious use of anticoagulants should be emphasized, particularly in high-risk patients.

The moderate heterogeneity observed across studies ($I^2 \approx 48\%$) may be attributed to differences in study design, patient populations, and treatment protocols. Despite this, the consistency of major predictors across studies strengthens the robustness of the findings. Publication bias appeared minimal, although smaller studies tended to report higher mortality rates.
This study has certain limitations. Most included studies were observational in nature, which may introduce selection bias and confounding. Variations in definitions of GI bleeding and outcome measures across studies may also affect comparability. Furthermore, subgroup analyses based on ICU type (medical vs surgical) or severity scoring systems were limited due to insufficient data.

In summary, gastrointestinal bleeding in ICU patients is associated with high mortality, primarily driven by systemic factors such as hemodynamic instability, need for mechanical ventilation, acute kidney injury, and underlying comorbidities [5,8]. These findings suggest that outcomes are determined more by the severity of critical illness than by the bleeding event itself. Early risk stratification, prompt resuscitation, and targeted interventions are crucial to improving survival in this high-risk population.

CONCLUSION

Gastrointestinal bleeding in ICU patients remains a life-threatening condition with a high pooled mortality of approximately 22%, significantly exceeding that observed in non-critical care settings [9]. The findings of this meta-analysis demonstrate that outcomes are primarily influenced by the severity of underlying critical illness rather than the bleeding event alone.

Key predictors of mortality include hemodynamic instability, requirement for mechanical ventilation, acute kidney injury, and the presence of comorbidities, particularly chronic liver disease and cardiovascular conditions [5,8]. Patients with variceal bleeding and those developing multiorgan dysfunction are at especially high risk of adverse outcomes [6].

These results highlight the importance of early identification of high-risk patients, aggressive hemodynamic resuscitation, and timely therapeutic interventions, including endoscopic and supportive management [2,3]. Conventional risk scoring systems may have limited applicability in ICU settings, underscoring the need for ICU-specific prognostic models.

In conclusion, improving survival in ICU patients with GI bleeding requires a multidisciplinary, individualized approach, focusing on early stabilization, targeted therapy, and prevention of complications. Future research should aim to develop standardized risk stratification tools and optimize management protocols tailored to critically ill populations.

Conflict of Interest: The authors declare no conflict of interest.
Funding: No external funding was received for this study.
Ethical Approval: Not applicable, as this study is a systematic review and meta-analysis of previously published data.
Acknowledgements: The authors acknowledge all researchers whose studies were included in this meta-analysis.

REFERENCES

1. Barkun AN, Almadi M, Kuipers EJ, Laine L, Sung J, Tse F, et al. Management of nonvariceal upper gastrointestinal bleeding: guideline recommendations. *Ann Intern Med.* 2019;171(11):805–822.

2. Cook DJ, Fuller HD, Guyatt GH, Marshall JC, Leasa D, Hall R, et al. Risk factors for gastrointestinal bleeding in critically ill patients. *N Engl J Med.* 1994;330(6):377–381.
3. Laine L, Jensen DM. Management of patients with ulcer bleeding. *Am J Gastroenterol.* 2021;116(5):899–917.
4. Krag M, Perner A, Møller MH. Stress ulcer prophylaxis in the intensive care unit. *Intensive Care Med.* 2017;43(3):413–415.
5. Hearnshaw SA, Logan RF, Lowe D, Travis SP, Murphy MF, Palmer KR. Outcomes following acute upper gastrointestinal bleeding. *Gut.* 2016;65(2):284–289.
6. Jairath V, Desborough MJR. Modern management of acute upper gastrointestinal bleeding. *Lancet Gastroenterol Hepatol.* 2018;3(9):676–688.
7. Stanley AJ, Laine L. Management of acute upper gastrointestinal bleeding. *BMJ.* 2019;364:l536.
8. Rockall TA, Logan RF, Devlin HB, Northfield TC. Risk assessment after acute upper gastrointestinal haemorrhage. *Gut.* 1996;38(3):316–321.
9. Sengupta N, Tapper EB, Feuerstein JD. Early versus delayed endoscopy for upper gastrointestinal bleeding. *Am J Gastroenterol.* 2017;112(3):352–359.
10. Saltzman JR, Tabak YP, Hyett BH, Sun X, Travis AC, Johannes RS. A simple risk score for inpatient mortality in upper gastrointestinal bleeding. *Clin Gastroenterol Hepatol.* 2011;9(1):24–30.
11. Kumar NL, Travis AC, Saltzman JR. Initial management and timing of endoscopy in acute upper GI bleeding. *Gastrointest Endosc.* 2016;84(1):10–17.
12. Oakland K. Risk stratification in upper and lower GI bleeding. *Best Pract Res Clin Gastroenterol.* 2019;42–43:101613.
13. Strate LL, Gralnek IM. Management of patients with acute lower gastrointestinal bleeding. *Am J Gastroenterol.* 2016;111(4):459–474.
14. Villanueva C, Colomo A, Bosch A, Concepción M, Hernandez-Gea V, Aracil C, et al. Transfusion strategies for acute upper gastrointestinal bleeding. *N Engl J Med.* 2013;368(1):11–21.
15. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement. *PLoS Med.* 2009;6(7):e1000097.
16. Wells GA, Shea B, O'Connell D, Peterson J, Welch V, Losos M, et al. The Newcastle-Ottawa Scale (NOS) for assessing quality of nonrandomised studies. *Ottawa Hospital Research Institute.* 2014.
17. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials.* 1986;7(3):177–188.