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Assessment of ABC Score as a Predictor of Hospital Outcomes in Gastrointestinal Bleeding Patients

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ABSTRACT

Background & Objective: Gastrointestinal (GI) bleeding is one of the major life-threatening emergencies encountered in clinical practice. The present study aimed to evaluate the ABC score as a predictor of hospital outcomes in patients with GI bleeding.

Materials & Methods: In this cross-sectional study, 171 patients with GI bleeding referred to Vali-Asr Hospital of Zanjan were investigated. During 2023, demographic and clinical variables were extracted from patients' medical records. Statistical analyses were performed using Stata 14. ROC curve analysis was applied to determine the optimal cutoff value of the ABC score for predicting in-hospital mortality, length of stay, and duration of mechanical ventilation.

Results: The mean age of patients was 56.50 ± 19.70 years (range: 15–97), with 68% males. The mean ABC score was 3.12 ± 3.12 (range: 0–13). The most common endoscopic findings were non-active bleeding gastric ulcer (15.1%), erosive gastropathy (13.4%), and non-active bleeding duodenal ulcer (11.6%). Hematemesis (46.5%), melena (28%), and rectorrhagia (17.4%) were the most frequent clinical presentations. The optimal cutoff value of the ABC score for predicting in-hospital mortality was 6, with sensitivity of 92.3%, specificity of 83.5%, PPV of 84.9%, NPV of 90.6%, and an AUC of 0.92. A cutoff of 6 also best predicted mechanical ventilation duration (sensitivity: 91.7%, specificity: 81.0%, AUC: 0.91). For length of hospital stay, the optimal cutoff was 5 (sensitivity: 84.2%, specificity: 80.3%, AUC: 0.88).

Conclusion: The ABC score demonstrated strong predictive accuracy for in-hospital mortality, hospital stay, and mechanical ventilation among patients with GI bleeding. Given its simplicity and reliability, the ABC score may serve as a practical tool in clinical decision-making for this high-risk population.

Keywords: *ABC score; diagnostic value; mortality; gastrointestinal bleeding*

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1. Introduction

Gastrointestinal (GI) bleeding is one of the major life-threatening emergencies encountered in clinical practice. It is more prevalent in men than in women, and its incidence increases with advancing age (1, 2). GI bleeding is defined as hemorrhage occurring anywhere from the oral cavity to the rectum. It is classified according to its origin into two categories: upper gastrointestinal bleeding (UGIB), which arises proximal to the ligament of Treitz, and lower gastrointestinal bleeding (LGIB), which originates distal to this landmark. The etiologies of UGIB and LGIB vary depending on the site of bleeding (3, 4). The most common cause of UGIB is peptic ulcer disease (PUD), which results from disruption of the gastric mucosal defense mechanisms due to endogenous factors (such as acid, pepsin, and bile) or exogenous factors (such as infections) (5, 6). Among the most important risk factors for PUD are Helicobacter pylori infection and the use of non-steroidal anti-

inflammatory drugs (NSAIDs). Variceal bleeding, particularly from esophageal or gastric varices, represents the second most frequent cause of UGIB and typically occurs in patients with cirrhosis and portal hypertension (7, 8). Other causes of UGIB include esophagitis, malignancies, and fistulas. Although advances in preventive strategies for peptic ulcer disease have led to a decline in the incidence of UGIB in recent years, it continues to pose a significant clinical challenge for physicians (1, 9).

A major challenge for emergency physicians is the management of patients with acute gastrointestinal bleeding. Therefore, one of the important factors for these physicians is to classify patients into low-risk and high-risk groups and to act appropriately for each group (10). Identifying high-risk patients and performing immediate and inpatient interventions can lead to a reduction in mortality and morbidity for these patients (11). Consequently, given the gaps in management and the type of treatment interventions for patients, the importance of an efficient scoring system for triage and approach to patients with acute gastrointestinal bleeding to reduce mortality and increase patient satisfaction is more than ever apparent (12, 13).

Several scoring systems, including the Glasgow Blatchford score (GBS), AIMS65, and Rockall score, have been used in studies and even in clinical practice. The two systems, AIMS65 and GBS, have been more successful in predicting the prognosis of patients with UGIB, but have not shown satisfactory results in predicting the prognosis of patients with LGIB (14, 15). In 2020, a new scoring system called ABC, which includes age, blood tests, and comorbidities, was introduced by Laursen et al. (16). The ABC score is a simple and rapid tool that can be calculated solely on the basis of initial clinical data obtained at the time of patient presentation. By incorporating variables such as age, physiological status (including blood pressure and heart rate), and comorbidities, this scoring system provides an estimate of in-hospital mortality risk. Owing to its ease of calculation and applicability in emergency settings, the ABC score serves as an attractive instrument for early risk stratification and prompt clinical decision-making (17, 18). Given the high mortality rate of gastrointestinal bleeding and the importance of predicting these deaths for clinical and emergency specialists, as well as the limitations of studies conducted in this field, the present study was designed to evaluate the ABC score as a predictor of hospital outcomes in gastrointestinal bleeding patients.

2. Materials and Methods

2.1 Design and subjects

This was a single-center, retrospective cross-sectional study conducted at Vali-Asr Hospital, Zanjan, Iran. A total of 171 patients who were hospitalized due to gastrointestinal (GI) bleeding in the emergency department during the calendar year 2023 were enrolled. The study was designed as a descriptive-analytical cross-sectional investigation aiming to evaluate the predictive performance of the ABC score for hospital outcomes. Sampling was performed using a consecutive census method, whereby all eligible patients with GI bleeding admitted during the study period were included without random selection. The inclusion criteria were: 1. age greater than 15 years, 2. a confirmed diagnosis of acute gastrointestinal bleeding based on clinical presentation (hematemesis, melena, or hematochezia) and/or endoscopic findings, and 3. admission to the emergency department or hospital wards. The exclusion criteria were: 1. voluntary discharge from the hospital before completion of diagnostic evaluation or treatment, 2. patients who underwent endoscopy for indications other than acute upper GI bleeding (e.g., foreign body removal, therapeutic procedures without active bleeding), 3. patients transferred to another hospital before outcome assessment, and 4. medical records with more than 20% missing data on key study variables (including ABC score components or hospital outcomes).

2.2 Data collection

The data collection tool was a checklist comprising demographic variables (age, sex) and clinical variables (mortality, length of hospital stays, length of ICU stays, duration of mechanical ventilation, diagnostic findings from colonoscopy/endoscopy, patient's chief complaint, blood product transfusion, and ABC score). The ABC score is a validated risk stratification tool for gastrointestinal bleeding that incorporates three domains: A (Age: ≥60 years receives 1 point), B (Blood tests: hemoglobin <10 g/dL = 1 point, urea >10 mmol/L = 1 point, creatinine >100 µmol/L = 1 point), and C (Comorbidities: active malignancy = 2 points, liver disease or heart failure = 1 point each, cognitive impairment = 1 point), with total scores ranging from 0 to 15 where higher scores indicate greater mortality risk. The data were extracted from patients' medical records in the hospital's medical documentation department.

2.3 Statistical analysis

The collected data were entered into Stata version 14. Initially, descriptive statistics were reported for quantitative variables (mean and standard deviation) and qualitative variables (frequency and relative frequency). For analytical analyses, the independent sample t-test and Pearson correlation coefficient were applied to examine the association between the ABC score and the studied variables. To determine the optimal cut-off point of the ABC score in predicting in-hospital mortality, length of hospital stay, and duration of mechanical ventilation, the area under the ROC curve (AUC) was used, and sensitivity, specificity, positive predictive value, and negative predictive value were calculated for the identified cut-off point.

3. Result

The mean age of the patients was 56.50 ± 19.70 years (range: 15–97 years), with the majority falling within the 50–60-year age group. Of the study population, 68% were male and 32% female. The mean ABS score was 3.12 ± 3.12 (range: 0–13). The mean duration of mechanical ventilation, ICU stay, and total hospital stay were 5.12 ±

0.80, 5.50 ± 1.00, and 6.99 ± 5.70 days, respectively. Gastrointestinal bleeding manifestations included hematemesis in 46.5%, melena in 28%, and hematochezia in 17.4% of patients. Blood product transfusion was not required in 67% of cases, while 24.4% received packed cell transfusions (Table 1). Based on the diagnostic results of colonoscopy and endoscopy, 17.4% of patients had normal findings. The most common diagnostic findings included non-active bleeding gastric ulcer (15.1%), erosive gastropathy (13.4%), and non-active bleeding duodenal ulcer (11.6%). In addition, four patients were found to have two concurrent conditions (Table 2).

Table 1. Demographic and clinical variables of patients.

Variable		Min	Max	Mean	S.D
Age (year)		15	97	56.50	19.70
ABC Score		0	13	3.12	3.12
Length of Ventilation		0	57	0.80	5.12
Length of Hospitalization in ICU		0	59	1	5.50
Length of Hospitalization		1	68	5.70	6.99
Sex	Female	55 (32)			
	Male	116 (62)			
Patient's Chief Complaint		N (%)			
Melena		48 (28)			
Hematoma		80 (46.5)			
Rectorrhagia		30 (17.4)			
Melena with hematoma		11 (6)			
Melena with rectorrhagia		2 (1.2)			
Blood product transfusion		N (%)			
No injection		115 (65)			
PC		42 (24.4)			
Plt +PC		2 (1.2)			
FFP + PC +Plt		1 (0.6)			
PC +Plt		10 (5.8)			
Plt		1 (0.6)			

Table 2. Diagnostic results of colonoscopy/endoscopy.

Variable	N (%)
Normal	30 (17.4)
Hemorrhoid	8 (4.7)
Gastritis	15 (8.7)
Esophageal	4 (2.3)
Colitis	2 (1.2)
Gastric hernia	4 (2.3)
Erosive gastropathy	23 (13.4)
Non active bleeding gastric ulcer	26 (15.1)
Non active bleeding duodenal ulcer	20 (11.6)
Esophageal ulcer	4 (2.3)
Active bleeding gastric ulcer	11 (6.4)
Active bleeding duodenal ulcer	2 (1.2)
Gastric mass	15 (8.7)
Duodenal mass	1 (0.6)
Colon polyp	2 (1.2)

A significant positive correlation was observed between the ABC score and age, length of ICU stays, total hospitalization time, and duration of mechanical ventilation. Specifically, higher patient age was associated with an increased ABC score (P<0.001). Moreover, as the ABC score increased, the length of ICU stays, overall hospitalization time, and duration of ventilation also increased (P<0.001). No statistically significant association was observed between the ABC score and sex (P>0.05). The mean ABC score was significantly higher in deceased patients compared to survivors (P<0.05). Furthermore, the association between the ABC score and clinical outcome (survival vs. death) remained statistically significant when stratified by the site of gastrointestinal bleeding. In both upper and lower gastrointestinal bleeding, the mean ABC score was significantly higher in deceased patients than in survivors (P<0.05). In addition, a significant positive correlation was observed between the ABC score and the duration of hospitalization in patients with both upper and lower gastrointestinal bleeding (Table 3).

Table 3. Association of ABS score with Demographic and clinical variables.

Quantitative variable	Group	N	Mean	S.D	P-Value*
ABC score regardless of upper or lower bleeding type	Dead	13	8.30	1.93	<0.001
	Alive	158	2.70	2.80	
ABC score in patients with upper gastrointestinal bleeding	Dead	6	7.83	2.40	<0.001
	Alive	85	2.54	2.53	
ABC score in patients with lower gastrointestinal bleeding	Dead	7	8.71	1.49	<0.001
	Alive	73	2.87	3.09	
ABC score	Female	55	3.60	3.61	0.208
	Male	116	2.90	2.84	

Variable	ABC score	P-Value**
	r	
Age	0.685	<0.001
Length of Ventilation	0.311	<0.001
Length of Hospitalization in ICU	0.481	<0.001
Length of Hospitalization	0.286	<0.001
Length of hospitalization for upper gastrointestinal bleeding	0.477	<0.001
Length of hospitalization for lower gastrointestinal bleeding	0.566	<0.001

Note: *Independent sample t-test
****Pearson correlation coefficient**

The optimal cutoff value of the ABC score for predicting in-hospital mortality was 6. At this threshold, the sensitivity, specificity, positive predictive value, negative predictive value, and area under the ROC curve (AUC) were 92.31%, 83.54%, 84.86%, 90.57%, and 0.92, respectively. The optimal cutoff value for the ABC score in predicting the duration of mechanical ventilation was also 6. At this cutoff, the sensitivity, specificity, positive predictive value, negative predictive value, and area under the ROC curve (AUC) were 91.67%, 81.02%, 82.84%, 98.34%, and 0.91, respectively.

Furthermore, the optimal cutoff value for the ABC score in predicting the total length of hospital stay was determined to be 5. At this cutoff, the sensitivity, specificity, positive predictive value, negative predictive value, and area under the ROC curve (AUC) were 84.21%, 80.26%, 81.01%, 83.56%, and 0.88, respectively (Table 4).

Table 4. Best Cutoff for ABC score in predicting hospital mortality, ventilation duration, and length of hospitalization

ABC score	Cut off	Sensitivity	Specificity	PPV	NPV	Are under ROC curve (95% CI)
Hospital mortality	6	92.31	83.54	84.86	90.57	0.92 (0.88 – 0.97)
Length of Ventilation	6	91.67	80.02	82.84	98.34	0.91 (0.88 – 0.97)
Length of Ventilation	5	84.21	80.26	81.01	83.56	0.88 (0.80 – 0.95)

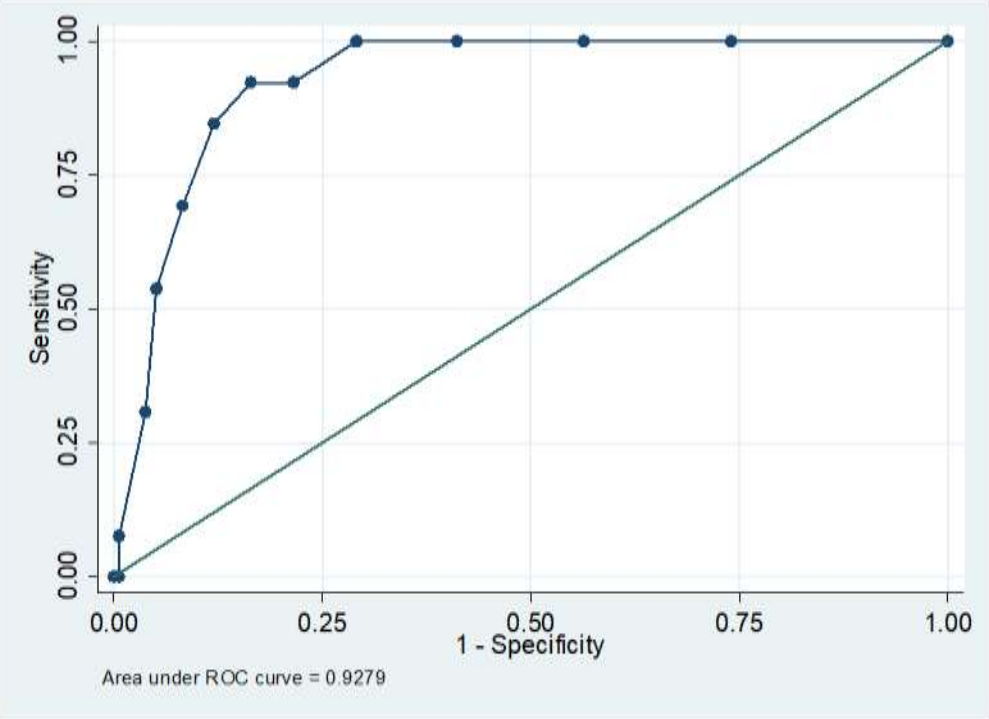

Figure 1. Area under the ROC curve to determine the best cutoff for ABC score in predicting hospital mortality. **(Prepared by Authors, 2026)**.

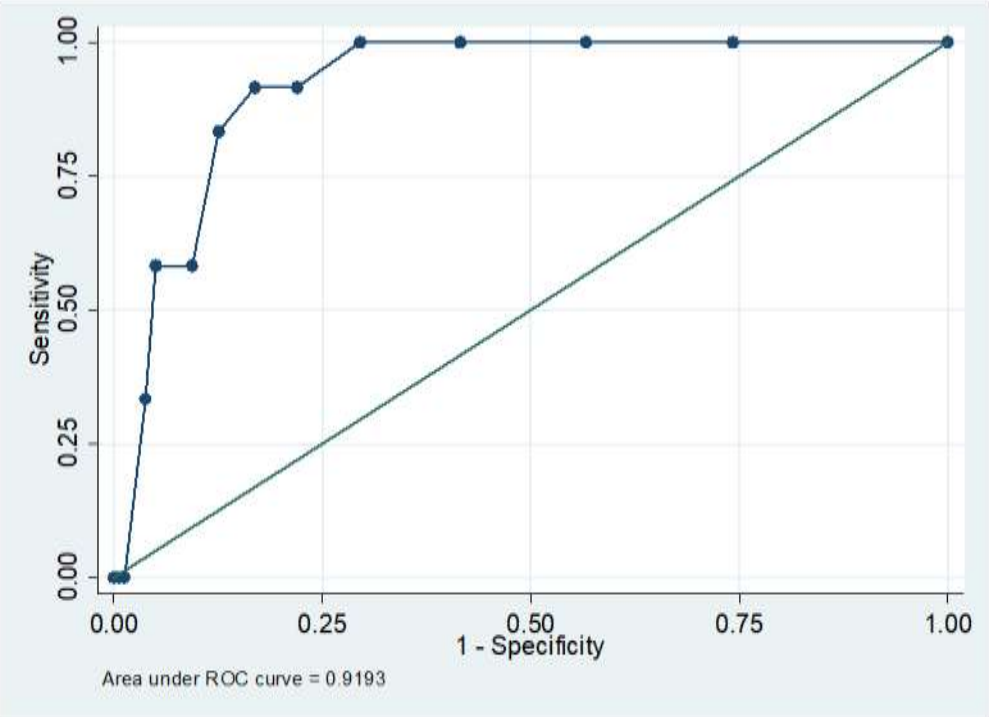

Figure 2. Area under the ROC curve to determine the best cutoff for ABC score in predicting ventilation. **(Prepared by Authors, 2026)**.

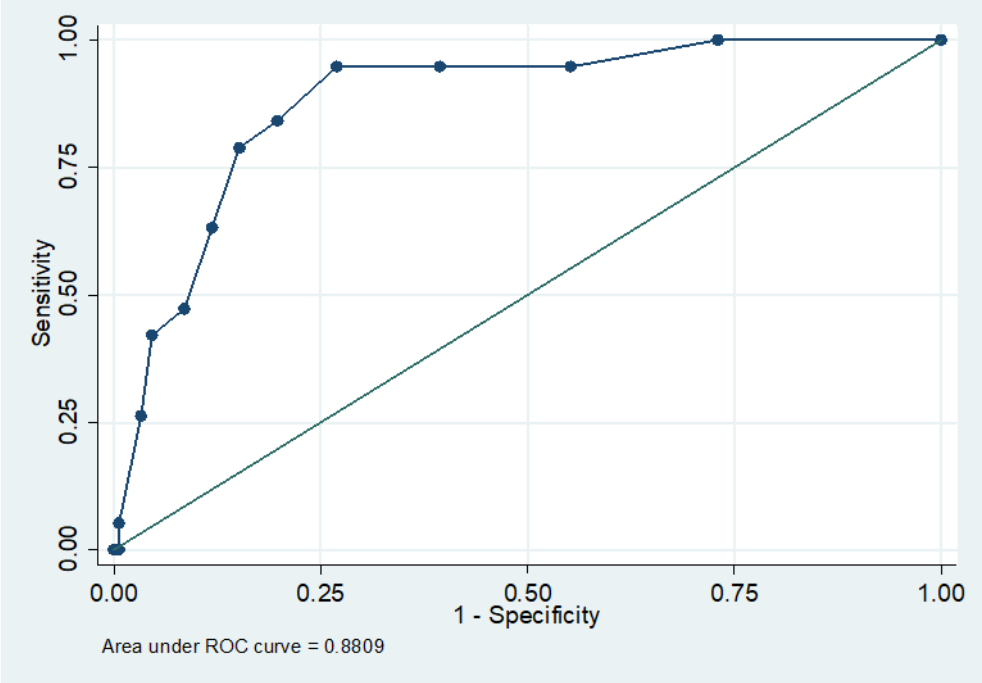

Figure 3. Area under the ROC curve to determine the best cutoff for ABC score in predicting length of hospitalization. (**Prepared by Authors, 2026**).

4. Discussion

In the present study, a significant association was observed between the ABC score and the duration of mechanical ventilation, with higher scores observed in patients who required prolonged ventilation support. This finding is consistent with the established prognostic value of the ABC score in patients with gastrointestinal bleeding, in whom deranged hemodynamic and biochemical parameters — the components of the score — are closely linked to systemic hypoperfusion and respiratory compromise **(19)**. Similarly, O'Connor et al. examined the relationship between surgical complexity, as measured by the ABC score, and quality of life, finding only a weak correlation between these measures **(20)**. Collectively, these findings indicate that while the ABC score is a useful measure of balance, its relationship with broader clinical outcomes may be moderated by other medical and clinical factors. Our study identified a significant association between the ABC score and ICU length of stay, with higher ABC scores observed in patients who experienced longer ICU admissions. This finding contrasts with previous research. For instance, Kherad et al. reported that although the ABC score was effective in predicting mortality, its predictive utility for secondary outcomes, including ICU length of stay (LOS), was limited. Their study documented a mean ICU LOS of 5.4 days and a total hospital LOS of 9.1 days, but the ABC score did not demonstrate strong discriminatory power for ICU LOS in the analyses conducted **(21)**. Similarly, Xu et al. indicated that various risk factors, such as disease severity, can influence ICU LOS, but no direct association between the ABC score and overall hospital stay was observed **(22)**. In our study, a significant relationship was also observed between the ABC score and total hospital length of stay, with higher scores associated with longer admissions. These findings are further contextualized by previous studies. For example, O'Connor et al., in a study focusing on pediatric cardiac surgery, reported that higher ABC scores were associated with lower quality-of-life outcomes. Still, the correlation with hospital length of stay was weak. This suggests that while the ABC score may serve as an indicator of surgical complexity, it does not reliably predict the duration of hospitalization **(20)**. Collectively, these findings highlight that although the ABC score is a valuable tool for assessing patient risk and procedural complexity, its capacity to forecast length of ICU or hospital stay may be influenced by additional clinical and patient-specific factors.

Our study demonstrated that the ABC score increased with advancing age. However, this finding contrasts with previous research. For example, Alsubaie et al. reported a negative correlation between age and ABC scores. Their study also indicated that cognitive performance, which tends to decline with age, was positively associated with the ABC score **(23)**. Furthermore, in our study, the mean ABC score was lower among individuals who had died. Overall, these findings suggest a significant association between survival status and the ABC score. However, previous studies have not specifically examined this relationship, highlighting a gap in the current literature that warrants further investigation.

Our study found no significant difference in the mean ABC score between male and female patients with gastrointestinal bleeding. This suggests that gender may not be a major determinant of ABC score performance in this patient population, consistent with prior research indicating that, although physiological and hormonal

differences exist between men and women, these do not necessarily translate into differences in prognostic scores in acute clinical settings (24).

The present study showed the ABC score has strong predictive accuracy for in-hospital mortality, hospital stay, and mechanical ventilation among patients with GI bleeding. Recent evidence supports the utility of the ABC score in predicting outcomes for patients with gastrointestinal bleeding. Saade et al. (2022) demonstrated that the ABC score has sufficient accuracy for predicting 30-day mortality and suggested that it outperforms traditional scoring systems (17). Similarly, Ramesh et al. (2023), in a cohort of 250 patients with acute gastrointestinal bleeding, reported an AUC-ROC of 0.852 for the ABC score in predicting 30-day mortality in UGIB, significantly higher than both AIMS65 (AUC-ROC=0.752) and GBS (AUC-ROC=0.742). These findings indicate that the ABC score not only effectively predicts mortality but also identifies patients at risk of rebleeding, emphasizing its clinical relevance (25). Choi et al. (2022) demonstrated that the ABC score was the most effective tool for predicting 30-day mortality in patients with non-variceal upper gastrointestinal bleeding, compared with other scoring systems (26). Similarly, Sengupta et al. (2017) developed a clinical prediction tool for 30-day mortality in patients with lower gastrointestinal bleeding. They highlighted the role of the ABC score in predicting outcomes in this population, showing that it can serve as a valuable complement to other clinical tools in risk stratification (27). Kim et al. (2023) conducted a study with the objective of establishing a mortality risk scoring system for patients experiencing upper gastrointestinal bleeding secondary to malignancy. By comparing various prognostic models, including the ABC score, they demonstrated that the ABC score provides superior predictive accuracy for 30-day mortality compared with existing scoring systems (28). In a related investigation, Laursen et al. (2020) showed that patients with higher ABC scores had significantly greater mortality rates, and further confirmed the score's ability to predict adverse clinical outcomes accurately (16). Consistent with these findings, Ky et al. highlighted the ABC score as a valuable tool for identifying patients who require intensive care, thereby enabling clinicians to initiate timely and targeted interventions (29).

Despite the advantages of the ABC score, several challenges and limitations remain: First, population heterogeneity: The predictive performance of the ABC score may vary across different populations, and Factors such as ethnicity, sex, and socioeconomic status may influence its applicability. Second, exclusion of additional risk factors: Although the ABC score incorporates three key parameters, other potential contributors such as family history of cardiovascular disease, alcohol consumption, or specific medications may also affect outcomes but are not accounted for. Third, need for further validation: additional studies are required to validate the ABC score and confirm its reliability across diverse patient populations.

5. Conclusion

In conclusion, the ABC score demonstrates considerable accuracy and clinical utility in predicting in-hospital mortality, length of stay, and duration of mechanical ventilation in patients with gastrointestinal bleeding. As a simple and practical tool, it may support timely clinical decision-making and optimize the allocation of healthcare resources. Nevertheless, further validation studies are required to confirm its reliability across diverse patient populations.

6. Declarations

6.1 Acknowledgments

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6.2 Ethical Considerations

The study was approved by the Deputy of Research and Ethics Committee of Zanjan University of Medical Sciences (IR.ZUMS.REC.1402.046).

6.3 Authors' Contributions

Conceptualization, supervision, funding acquisition and resources: Mohsen Salehi and Faezeh Barhgi; Methodology: Kamyar Mansori and Sattar Jafari; Data collection: Salar Hejabari Safa; Data analysis: Kamyar Mansouri; Investigation and writing: All authors.

6.4 Conflict of Interest

The authors declare that they have no competing interests.

6.5 Fund or Financial Support

This study was funded by Zanjan University of Medical Sciences.

6.6 Using Artificial Intelligence Tools (AI Tools)

The authors used AI tools solely for language and copy editing of the author-written manuscript, including improvements to grammar, clarity, and readability. The authors reviewed and revised all AI-assisted edits and take full responsibility for the final manuscript.

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