

## ORIGINAL RESEARCH

# Application effect of nursing model based on Rockall scoring system in emergency endoscopic treatment for patients with gastrointestinal bleeding

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## Abstract

The study aims to explore the application effect of nursing model based on Rockall scoring system in the emergency endoscopic treatment for patients with gastrointestinal bleeding. 128 patients with gastrointestinal bleeding in the emergency department of our hospital were selected as the study subjects. The patients were divided into the control group (64 cases) treated with routine bleeding management and the observation group (64 cases) treated with the nursing model based on Rockall scoring system by utilizing random number table. The hemostatic time, hospital stay, hemostasis, blood transfusion rate, rebleeding rate, mortality rate and Rockall score, Self-Rating Depression Scale (SDS), Self-Rating Anxiety Scale (SAS) score and nursing satisfaction were compared between the observation and control groups. The results turn out that the hemostatic time, hospital stay, hemostasis, blood transfusion rate, rebleeding rate, mortality rate and Rockall score were notably better than those in the control group. SDS and SAS scores in the observation group were prominently higher than that of the control group, and the satisfaction rate of nursing services of the observation group was higher than that of the control group. The nursing model based on Rockall scoring system could shorten the emergent hemostasis time and hospital stay, elevate recovery effect, and reduce the times of blood transfusion, the rebleeding rate and mortality of patients. Besides, it could lower the risk level of bleeding, improve the mental health status and satisfaction of patients with a great clinical practical value, which is worthy of clinical application.

## Keywords

Rockall scoring system; Gastrointestinal bleeding; Endoscope; Emergency nursing

## 1. Introduction

Acute gastrointestinal bleeding emerges as one of the most common acute and critical diseases in the emergency department. Acute variceal bleeding (AVB) is one of the leading causes of acute upper gastrointestinal bleeding (AUGIB), and its incidence remains second only to peptic ulcer [1]. The annual incidence in adults is as high as (100–180) per 100,000, mortality rate is 2%–15%, and upper gastrointestinal bleeding accounts for more than 50% of all gastrointestinal bleeding and related hospitalization [2]. Patients with acute variceal bleeding also have a high rate of shock, with a mortality of approximately 20% within 6 weeks of each variceal bleeding episode [3]. The disease occurs suddenly, and patients may undergo anxiety and depression during treatment, which affects clinical treatment [2]. Endoscopy is the main means of diagnosing gastrointestinal bleeding, and endoscopic treatment of gastrointestinal bleeding has also been widely used. Endoscopic treatment can quickly and accurately identify bleeding point [4, 5], and timely hemostasis can effectively decrease mortality [6].

The Rockall scoring system is a comprehensive analysis of age, shock index, complications and other indicators of patients to accurately identify the potential bleeding risk of patients and effectively improve the prognosis. Studies have indicated that the Rockall score has been confirmed to be an accurate predictor of rebleeding and death [7]. Therefore, effective risk stratification of gastrointestinal bleeding by the Rockall score can help identify high-risk patients, thereby conducting closer monitoring, faster response, and improvement of prognosis [8]. This consensus recommends urgent assessment of bleeding risk in patients with acute upper gastrointestinal bleeding, suspected upper gastrointestinal bleeding, and acute variceal bleeding [9]. The Rockall scoring system requires careful evaluation from the first episode in attempt to predict and reduce the risk of rebleeding and death [10]. The study aims to investigate the application effect of the nursing model based on the Rockall scoring system in the emergency endoscopic treatment of patients with gastrointestinal bleeding.

## 2. Materials and methods

### 2.1 Study subjects

One hundred and twenty-eight patients with upper gastrointestinal hemorrhage who received endoscopic interventional therapy in the emergency department of our hospital were selected as the study subjects. The patients were divided into the control group (64 cases) treated with routine bleeding management and the observation group (64 cases) treated with the nursing model based on Rockall scoring system by utilizing Double-blind randomized process. Inclusion criteria: ① receive endoscopic treatment for the first time; ② meet the relevant standards of the Guidelines for the Diagnosis and treatment of Acute Non-variceal Upper Gastrointestinal Bleeding [11]; Glasgow Coma Scale (GCS) score is greater than or equal to 9 points; ③ willing to cooperate with the treatment and examination; ④ patients agree to participate in this study and sign the informed consent. Exclusion criteria: ① The GCS score was less than 9; ② have a shock and coma; ③ have metal and cognitive disorders.

### 2.2 Study methods

#### 2.2.1 Study methods in the control group

The control group adopted the routine care: (1) When the patients were admitted, the nurses asked about the patient's medical history and etiology, and understood the time of gastrointestinal bleeding, bleeding severity as well as the history of anticoagulant drugs and non-steroidal anti-inflammatory drugs. Then we maintained the respiratory tract of patients to be unobstructed, took a supine position and tilt the patients' head to one side to avoid hematemeses mistakenly inhaled into the trachea, and immediately established venous channel. Vital signs such as blood pressure, heart rate, pulse and blood routine index were closely monitored. Patients with maladjustment should report to the physician for the first time, and assisted in treatment. (2) The relevant examinations such as electrocardiogram (ECG), blood routine, renal function and coagulation function were perfected by nurses according to the patient's condition. (3) The nurse performs a comprehensive resuscitation of the patient according to the doctor's recommendation, and the UGIB patient received intravenous erythromycin before endoscopy, gastroscopy was performed by doctors to identify the cause of bleeding and treat according to the etiology when the vital signs of patients were stable. (4) The nurse closely observed the patient's vital signs, the occurrence of sudden active bleeding immediately informed the doctor, the patient rescue.

#### 2.2.2 Study methods in the observation group

The observation group used a nursing model based on the Rockall scoring system. Relying on the Multi-Disciplinary Treatment (MDT) expert team, the diagnosis and treatment of diseases were solved, and a standardized, personalized and continuous diagnostic and treatment plan was provided. The specific content is as follows.

#### 2.2.2.1 Establishment of multidisciplinary management team

The head nurse acts as the manager of multidisciplinary management team, including 1 gastroenterologist, 1 head nurse, 1 specialist nurse in gastroent and erology, 1 nurse in the intervention room, and 1 staff member in the intervention department. Each member has a clear division of labor and the head nurse acts as the group leader for overall communication. Team members have established WeChat groups, carried out standardized training on a regular basis, and are familiar with the process and nursing points of emergency diagnosis and treatment of gastrointestinal bleeding.

#### 2.2.2.2 Systematic evaluation

The systematic nursing model was established in terms of emergency diagnosis and treatment process of acute upper gastrointestinal hemorrhage. (1) Emergency evaluation after admission: Rockall score was employed by nurses to screen patients. As for the high-risk bleeding patients, emergency rescue and stratified treatment were carried out, including monitoring and emergency treatment, airway protection, fluid resuscitation and combined medication. (2) Comprehensive evaluation: After patients were in a stable condition, Rockall score was utilized by nurses to perform comprehensive evaluation, speculate on the risk and dynamically monitor changes in the condition. (3) Prognostic evaluation: Nurses help patients establish electronic archives of information, and the archives information and the nursing protocol were sent to the WeChat group. The announcement of Rockall score was established, and patients evaluated and uploaded once a day. Multidisciplinary team members mastered changes in the condition of patients, and facilitated adjustment of nursing measures. After the brainstorming discussion by team members, follow-up arrangements were developed in terms of the Rockall scoring.

#### 2.2.2.3 Grading nursing protocol

The risk factor of bleeding was determined *via* Rockall score. Patients with a score of  $\geq 5$  were classified as high-risk group, patients with a score of 3–4 were classified as medium-risk group, and patients with a score of 0–2 were classified as low-risk group. Different levels of nursing intervention were taken according to different risk levels of bleeding. (1) Patients in the medium and high risk groups: ① The disease changes of patients were closely monitored. The patients were instructed to strictly rest in bed, and to lie supine with head tilted to one side. Keep the ward quiet, and increase the frequency of making the rounds of wards during the time of high risk of bleeding such as 5–6 o'clock and 18–24 o'clock. ② ECG, oxygen inhalation, blood pressure, blood oxygen saturation were continuously monitored, venous access was established, and central venous catheterization was given if necessary. Patients with disorders of consciousness, and circulatory failure were given airway protection when necessary to prevent aspiration. ③ Diet nursing: When patients had a large amount of bleeding, they should fast. If the amount of bleeding was small, a bland liquid diet without stimulation was chosen, and low-protein, high-vitamin and high-energy foods were appropriately added to prevent rebleeding. ④ Oral care: After the hematemeses, patient's mouth was carefully rinsed to reduce

**TABLE 1. Comparison of general data between the observation and control groups (x ± s, n (%)).**

Item	Observation group (n = 64)	Control group (n = 64)	c <sup>2</sup> /t	p
Gender (Male/Female), n				
	43/21	41/23	0.139	0.710
Age/years, x ± s	48.92 ± 5.33	48.36 ± 6.00	-0.561	0.576
Causes, n			0.882	0.927
Duodenal ulcer, n	33 (51.6%)	30 (46.9%)	0.281	0.596
Gastric ulcer, n	19 (29.7%)	21 (32.8%)	0.145	0.703
Gastric cancer, n	7 (10.9%)	9 (14.1%)	0.286	0.593
Hemorrhagic gastritis, n	3 (4.7%)	1 (1.6%)	1.032	0.310
Mallory-Weiss Syndrome, n	2 (3.1%)	3 (4.7%)	0.208	0.648
Risk Stratification			0.447	0.504
Medium and high risk	53 (82.8%)	50 (78.1%)		
Low Risk	11 (17.2%)	14 (21.9%)		

**TABLE 2. Comparison of hemostatic time, hospital stay and recovery effect of patients between the observation and control groups (x ± s).**

Group	Hemostatic time (h)	Hospital stay (d)	Hemostatic efficacy
Observation group (n = 64)	28.45 ± 1.15	9.84 ± 1.51	42 (65.6%)
Control group (n = 64)	34.21 ± 1.29	11.70 ± 1.52	32 (50.0%)
t value	26.704	6.936	3.203
p value	<0.001	<0.001	0.073

**TABLE 3. Comparison of blood transfusion rate, rebleeding rate and mortality of patients between the observation and control groups (n (%)).**

Group	Blood transfusion rate	Rebleeding rate	Mortality rate
Observation group (n = 64)	3 (4.7%)	2 (3.1%)	0 (0.0%)
Control group (n = 64)	11 (17.2%)	10 (15.6%)	3 (4.7%)
χ <sup>2</sup>	5.133	5.885	3.072
p	0.023	0.015	0.080

the residual oral blood and fishy smell, thus preventing nausea and vomiting and increasing the patient's comfort. ⑤ Mental care: Medical staff to do a good job of psychological care of patients, and the fear and anxiety of rebleeding were reduced. ⑥ First aid items preparation: Adequate first aid items were prepared. When the patients experienced massive hemorrhage, the rescue work for the patients could be conducted at the first time. ⑦ The methods for hemostatic control: As for high-risk UGIB patients with acute ulcer bleeding, endoscopic thermocoagulation or injection sclerotherapy was used at the discretion of the endoscopy physician, and high-dose PPIs were administered continuously or intermittently after endoscopic hemostasis (Duration ≥ 3 d, dose ≥ 80 mg/d), which can effectively repress the gastric acid secretion, thereby reducing the risk of rebleeding and death in patients. When hemoglobin (Hb) was less than 70g/L, concentrated red blood cells were transfused according to the patient's age, complications and bleeding status. (2) Patients in low-risk group: Patients were given routine care. ① Admission nursing: After learned about the medical history of patients, performed a compre-

hensive evaluation on patients to find the cause of bleeding. ② Strengthen the communication: After communicated with the patient and family in a trusting relationship and listen to their complaints. ③ Health education: health education were carried on *via* distinct ways such as video, picture and WeChat public account. Education included the cause of bleeding, complications, and the corresponding precautions. The anxiety and depression scores of patients were evaluated, and the corresponding psychological support were given according to the scores of patients to change the mentality of patients and encourage them to communicate more.

### 2.3 Observation criteria

① Hemostatic time, hospital stay, hemostatic effect (effectiveness indicated that patients stop bleeding 48–72 h after the intervention with stable vital signs); ② Blood transfusion rate, rebleeding rate, mortality in patients of both group were compared; ③ Rockall score (0–2 points for low risk, 3–4 points for medium risk, 5–6 points for high risk), the Rockall

score in patients of both group was compared; ④ the degree of anxiety and depression was assessed: Zung's Self-Rating Depression Scale (SDS) and Self-Rating Anxiety Scale (SAS) were employed to evaluate the mental status of patients. SAS standard score  $>50$  points is synonymous with anxiety, SDS standard score  $>53$  points means depression. Higher score indicates higher anxiety, depression and stress. ⑤ Nursing satisfaction (a self-designed satisfaction questionnaire in our hospital was utilized, which was divided into four levels: very satisfied, satisfied, fair and dissatisfied. Satisfaction rate (%) = (very satisfied + satisfied)/(total number of cases) were compared between the two groups.

## 2.4 Statistical analysis

Statistical Product and Service Solutions (SPSS) 22.0 (IBM Corporation, Armonk, NY, USA) was used for data analysis. Enumeration data were represented as frequency or percentage (%).  $\chi^2$  was adopted for comparison between groups. Measurement data were represented as mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ). Independent sample *t*-test was used for comparison between groups.  $p < 0.05$  indicated that the differences were statistically significant.

## 3. Results

### 3.1 General data analysis between the observation and control groups

The patients were divided into the control group (64 cases) treated with routine bleeding management and the observation group (64 cases) treated with the nursing model based on Rockall scoring system by utilizing Double-blind randomized clinical trial. The general data analysis were demonstrated in Table 1. There are no significant differences in gender, age, cause and risk between the observation and control groups.

### 3.2 Comparison of hemostatic time, hospital stay and recovery effect of patients between the observation and control groups

The observation group was superior to the control group in hemostatic time, hospital stay and hemostatic effect, and the differences indicated statistical significance ( $p < 0.05$ ), as shown in Table 2.

### 3.3 Comparison of blood transfusion rate, rebleeding rate and mortality of patients between the observation and control groups

The blood transfusion rate, rebleeding rate and mortality in the observation group were lower than that of the control group, and the differences were statistically significant ( $p < 0.05$ ), as demonstrated in Table 3.

### 3.4 Comparison of Rockall score in patients between the observation and control groups

The Rockall score between the observation and control groups before and after intervention was compared. As shown in Table 4, before intervention, the Rockall score between the observation and control groups were compared, and the differences demonstrated no statistical significance ( $p > 0.05$ ). After intervention, the Rockall score between the observation and control groups was evidently lower than that before intervention, and particularly, the Rockall score in the observation group was significantly higher than that in the control group ( $p < 0.05$ ).

**TABLE 4. Comparison of Rockall score between the observation and control groups before and after intervention (point,  $\bar{x} \pm s$ ).**

Group	Pre-intervention	Post Intervention
Observation group (n = 64)	4.50 $\pm$ 1.62	2.59 $\pm$ 1.14
Control group (n = 64)	4.47 $\pm$ 1.93	2.28 $\pm$ 1.56
<i>t</i>	-0.099	3.369
<i>p</i>	0.921	0.005

### 3.5 Changes of SAS and SDS scores between the observation and control groups before and after intervention

As shown in Table 5, the SAS and SDS scores between the observation and control groups before intervention were compared, and the differences had no statistical significance ( $p < 0.05$ ). After intervention, the SAS and SDS scores in the observation group were prominently lower than that in the control group, and the difference had statistical significance ( $p < 0.05$ ).

### 3.6 Comparison of nursing satisfaction between the observation and control groups

As shown in Table 6, after intervention, the nursing satisfaction of the observation and control groups was conspicuously better in the observation group than that in the control group, and the difference was statistically significant ( $p < 0.05$ ).

## 4. Discussion

### 4.1 The nursing model based on Rockall scoring system can facilitate the recovery of emergency gastrointestinal bleeding patients

The results of this study displayed that, the hemostatic time, hospital stay, hemostatic effect, blood transfusion rate, rebleeding rate, mortality, and Rockall score of patients in the observation group were significantly superior to that of the control group. It exhibited that the nursing model based on the Rockall scoring system could achieve good effect in the treatment of bleeding, shorten the hemostasis time, reduce

**TABLE 5. Changes of SAS and SDS scores in the observation and control groups before and after intervention (point,  $x \pm s$ ).**

Group	SAS		SDS	
	Pre-intervention	Post Intervention	Pre-intervention	Post Intervention
Observation group (n = 64)	58.73 ± 4.46	40.66 ± 5.58	62.00 ± 4.36	38.73 ± 4.46
Control group (n = 64)	59.03 ± 3.64	40.94 ± 5.55	63.03 ± 3.64	41.23 ± 4.21
<i>t</i>	0.413	4.761	0.378	0.946
<i>p</i>	0.681	<0.001	0.149	0.001

SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale.

**TABLE 6. Comparison of nursing satisfaction between the observation and control groups (n (%)).**

Group	Very Satisfied	Satisfied	Fair	Dissatisfied	Overall satisfaction rate
Observation group (n = 64)	35 (54.9%)	9 (14.0%)	1 (1.5%)	1 (1.5%)	62 (96.9%)
Control group (n = 64)	33 (51.6%)	7 (10.9%)	6 (9.4%)	3 (4.7%)	55 (85.9%)
$\chi^2$					4.873
<i>p</i>					0.027

the blood transfusion rate and rebleeding rate, and reduce the mortality of patients. Analysis of the primary etiology is rooted in the predisposition of rebleeding or bleeding within 24 hours of admission and within 24 hours of initial diagnosis [12, 13]. Hence, the systematic nursing model assessed patients three times according to expert consensus on the emergency diagnosis and treatment process for acute upper gastrointestinal bleeding [14]. Emergency evaluation at admission can be used to quickly stratify the risk level of patients, accurately treat patients with high-risk bleeding and increase the survival rate. Furthermore, it can shorten the hemostatic time, and greatly improve the therapeutic effect of patients [15]. When the patients were out of danger, a comprehensive evaluation of the patients could make an accurate judgment on the severity of the patient's condition and the risk of active bleeding. Etiological treatment and symptomatic treatment were performed simultaneously to impel the rehabilitation of patients and shorten the hospital stay [16]. Secondly, a systematic nursing model was established through the process of emergency evaluation-emergency treatment-comprehensive assessment-clinical treatment-prognostic assessment [17], the reliability of diagnosis and treatment was increased, missed diagnosis and misdiagnosis were reduced, and the danger of life in patients due to rebleeding was reduced [18].

#### 4.2 The nursing model based on Rockall scoring system alleviates the anxiety and depression in patients with emergency gastrointestinal bleeding

Hemorrhage of digestive tract, as a common emergency of digestive tract, can easily cause anxiety, depression, fear and other negative emotions, resulting in excessive sadness, lack of sleep or agitation, which can easily cause neurological disorders and induce gastrointestinal bleeding [19, 20]. Therefore, great humanistic care is required. The outcomes of this study revealed that SDS and SAS scores in the observation group were conspicuously better than that of the control group

after the intervention. The reason was that the Rockall score could classify the patients into high-risk cases that required immediate treatment before endoscopy and low-risk cases that required no treatment before, during, and after endoscopy [21]. Stratification of bleeding risk reduces the number of emergency endoscopy examinations, improves medical efficiency, and reduces the burden on physicians [22]. Meanwhile, high-risk patients could be treated immediately and shorten the time to stop bleeding in high-risk patients [23]. Secondly, stratified management could also carry out personalized graded nursing according to patients with different risk coefficients [24]. Gastrointestinal bleeding often has a significant circadian rhythm, so nurses should increase the frequency of patrol (the frequency of ward visit by night nurses) during high-risk bleeding periods, identify bleeding signs of patients as early as possible, and actively cooperate with doctors to do a good job in the rescue of patients [25]. Good job in health education for patients and their families should be performed to ensure that their families achieve 24-hour escort, guide their families to learn the observation methods and emergency measures of the basic condition. Besides, all predisposing factors, timely dealt with the dirt and blood of patients were avoided so as not to stimulate the mood of patients, thereby maintaining the emotional stability of patients, and then reducing the anxiety and depression of patients [26].

#### 4.3 The nursing model based on Rockall scoring system improves the nursing satisfaction of patients with emergency gastrointestinal bleeding

The outcomes of this study implied that the nursing satisfaction of the observation group was notably better than that of the control group. The main reason was that the diagnosis and treatment process based on the Rockall scoring system nursing model was professional and standardized, and the patients could receive rapid and professional treatment, which greatly improved the emergency treatment efficiency of emergency

gastrointestinal bleeding patients. Besides, the hospital regularly provided standardized training for MDT team members, so that team members can continuously learn and optimize the management strategies for patients with gastrointestinal bleeding. doctor took the lead in reporting the condition, and the professional knowledge of different departments was integrated to make the whole emergency diagnosis and treatment more reasonable and effective through the discussion of multidisciplinary team [27]. Secondly, the Rockall scoring system can be used to identify the bleeding level of patients in the early stage, and take different nursing measures in terms of the bleeding grade of patients [28]. According to the rehabilitation of patients, a personalized follow-up plan was developed, and the cognitive level of patients and their families was improved. Patients and their families truly understand the significance of prevention. The rate of home rebleeding was reduced, and the quality of life of patients was improved, which greatly improved the satisfaction of patients [29].

## 5. Conclusions

In brief, a nursing model based on the Rockall scoring system can gradually adjust treatment protocols through multiple assessments to treat gastrointestinal bleeding, shorten the time required for hemostasis, and save the patient's life. Additionally, it can shorten the length of hospital stay, reduce the economic pressure, anxiety, and depression of patients, and strengthen the patient's self-confidence in rehabilitation. As a result, the patient's quality of life improves. Thus, the model has good practical significance in clinical practice and is worthy of wide promotion in clinical practice [30]. However, this study is a single-center study, the sample size that is limited to patients in our hospital, and there is a lack of large-scale random sampling, which has certain limitations. A multi-center large-sample study will be conducted in future studies to fully validate the clinical practice effectiveness of this study.

## AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

## AUTHOR CONTRIBUTIONS

JL, SFW and ZQH—designed the study and carried them out, supervised the data collection, analyzed the data, interpreted the data, prepare the manuscript for publication and reviewed the draft of the manuscript. All authors have read and approved the manuscript.

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study conformed to the Declaration of Helsinki and all subjects signed the informed consent form, which was reviewed and approved by the Ethics Committee of Lianyungang Hospital of Traditional Chinese Medicine (Approval no. 2022-

KY-39). Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

## ACKNOWLEDGMENT

Not applicable.

## FUNDING

This research received no external funding.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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**How to cite this article:** Jia Liu, Shufang Wang, Zhongqin Han. Application effect of nursing model based on Rockall scoring system in emergency endoscopic treatment for patients with gastrointestinal bleeding. *Signa Vitae*. 2023; 19(4): 167-173. doi: 10.22514/sv.2023.060.