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The Application of Frailty Prediction Model for Middle-aged and Elderly Patients with Upper Gastrointestinal Bleeding in Peri-inpatient Nursing Intervention

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Abstract: *Objective*: To investigate the impact of targeted nursing interventions based on frailty prediction models on peri-hospitalization clinical outcomes in middle-aged and elderly patients with upper gastrointestinal bleeding (UGIB). *Methods*: A prospective cohort study was conducted, and 126 middle-aged and elderly patients with UGIB admitted from August 2024 to August 2025 were selected as the study subjects. The patients were divided into the intervention group (63 cases) and the control group (63 cases) based on whether they received nursing intervention based on frailty prediction models. The control group received routine care, while the intervention group, on the basis of routine care, used the FRAIL scale combined with laboratory indicators (albumin, hemoglobin, etc.) to establish a predictive model to evaluate patients within 24 hours of admission, and implemented multi-dimensional targeted nursing intervention for pre-frailty or frailty patients screened out. The incidence of frailty, rebleeding rate, average length of stay, hospitalization cost, and nursing satisfaction during hospitalization were compared between the two groups. *Results:* The incidence of frailty during hospitalization in the intervention group was 11.1% (7 cases /63 cases), significantly lower than 31.7% (20 cases /63 cases) in the control group, and the difference was statistically significant ($p < 0.05$). The rebleeding rate of 4.8% vs 12.7%, the average length of stay of (7.2 ± 1.5) days vs (9.1 ± 2.2) days, and the average hospitalization cost of (23,000 ± 6,000) yuan vs (28,000 ± 7,000) yuan in the intervention group were all lower than those in the control group (all $p < 0.05$). The nursing satisfaction score of the intervention group (93.5 ± 4.2) points was higher than that of the control group (86.3 ± 5.8) points ($p < 0.05$). *Conclusion:* The frailty prediction model applied to the peri-hospitalization care of middle-aged and elderly patients with UGIB can effectively identify frailty risk. Through early targeted intervention, the incidence of frailty and rebleeding rate can be reduced, the length of hospital stay can be shortened, medical expenses can be reduced, and nursing satisfaction can be improved, which has clinical promotion value.

Keywords: Upper gastrointestinal bleeding; Weakness; Predictive models; Elderly care; Perioperative period

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1. Introduction

Upper gastrointestinal bleeding (UGIB) is a common medical emergency. Middle-aged and elderly people, due to physiological decline, often have multiple underlying diseases and thus become a high-risk group. Frailty is an age-related clinical syndrome of decreased physiological reserves and reduced stress resistance, which significantly increases the risk of adverse health outcomes in elderly patients, namely falls, disability, readmission, and death. Studies have shown that UGIB and frailty interact with each other. Bleeding events can induce or exacerbate frailty, while frailty exacerbates slow recovery after bleeding, increased complications, and poor prognosis.

At present, clinical care for UGIB mainly focuses on hemostasis, fluid replacement, and etiological treatment, ignoring the coexistence of frailty in middle-aged and elderly patients, and there are no systematic assessment and intervention. The peri-hospitalization period is a window for intervention. Therefore, establishing a simple frailty risk prediction model suitable for middle-aged and elderly patients with UGIB and using it to implement early, targeted nursing intervention is of great significance for improving the prognosis of patients and optimizing the allocation of medical resources. This paper mainly studies the impact of frailty prediction model nursing intervention programs on the clinical outcomes of middle-aged and elderly patients with UGIB [1].

2. Data and methods

2.1. General information

A total of 126 middle-aged and elderly patients with UGIB who were admitted to the Department of Gastroenterology of our hospital from August 2024 to August 2025 were selected.

2.1.1. Inclusion criteria

(1) Age ≥ 50 years;

(2) Confirmed by gastroscopy or clinical diagnosis of UGIB;

(3) Conscious and cooperative with the investigation;

(4) Informed consent.

2.1.2. Exclusion criteria

(1) End-stage malignancy

(2) Severe cognitive impairment or mental illness,

(3) Incomplete clinical data.

2.1.3. Study group

The patients were randomly divided into the intervention group and the control group, with 63 cases in each group using a random number table. There were no statistically significant differences ($p > 0.05$) between the two groups in terms of age, gender, cause of bleeding, underlying diseases (hypertension, diabetes, coronary heart disease), hemoglobin at admission, and Rockall score, and they were comparable (**Table 1**). This study was reviewed and approved by the medical ethics committee of our hospital (approval number: 2024ZRY25), and all patients or their families signed the informed consent form [2].

Table 1. Comparison of general information of the two groups of patients

Items	Intervention group (n = 63)	Control group (n = 63)	t/χ^2 value	*p* value
Age (years, $\overline{x}$ ±s)	68.5 ± 7.2	69.1 ± 6.8	0.498	0.619
Gender (male/female, e.g.)	40/23	38/25	0.130	0.718
Cause of bleeding (example)			0.721	0.868
Peptic ulcer	35	33		
Acute gastric mucosal lesions	18	20		
Esophageal and gastric fundus varices	10	9		
Others	0	1		
Combined hypertension (example)	32	29	0.297	0.586
Diabetes mellitus (case)	18	21	0.314	0.575
Admission hemoglobin (g/L,±s)	85.3 ± 15.6	82.9 ± 16.8	0.843	0.401
Admission Rockall score ($\overline{x}$ ±s)	3.8 ± 1.2	4.0 ± 1.3	0.916	0.361

2.2. Methods

The control group was given routine UGIB care, including absolute bed rest, fasting and water deprivation, electrocardiogram monitoring, rapid establishment of intravenous access in combination with infusion, administration, observation of bleeding and vital signs, health education and discharge guidance [3].

In addition to the routine care, the intervention group received nursing intervention with a frailty prediction model [4].

(1) Frailty risk assessment

Within 24 hours of admission, patients were initially screened using the FRAIL scale by uniformly trained specialist nurses. The scale consists of five items: fatigue, endurance, free movement, illness, and weight loss. A score of ≥ 3 indicates frailty, 1–2 indicates pre-frailty, and 0 indicates no frailty. Laboratory indicators such as serum albumin (Alb), hemoglobin (Hb), and lymphocyte count (TLC) were also collected. Based on clinical experience and literature, a FRAIL score of ≥ 1, or Alb < 35g/L, or Hb < 90g/L and TLC < 1.5×10^9/L was defined as a high risk of frailty.

(2) Targeted nursing intervention

For patients assessed as at high risk of frailty, a multidisciplinary collaborative targeted nursing intervention was initiated immediately and continued until discharge.

(3) Nutritional support intensification

After bleeding stops, develop individualized dietary plans with a nutritionist to ensure high-quality protein intake. For patients with insufficient intake, provide timely advice to the doctor and assist with enteral or parenteral nutrition support. Objective: Stable or elevated Alb levels during hospitalization.

(4) Develop a progressive activity plan under the guidance of a rehabilitation therapist when the condition permits

Do ankle pump exercises and passive limb movements while lying in bed; You can do bedside standing and short walking after getting out of bed, and record the duration and intensity of your activities daily to prevent muscle weakness caused by absolute bed rest.

(5) Cognitive and psychological intervention

Pay attention to changes in the patient's mood and assess the risk of anxiety and depression. Psychological counseling is provided through methods such as disease knowledge lectures, successful case sharing, and mindfulness relaxation training to boost confidence in treatment.

(6) Medication and safety care, fine medication management, multi-medication risk assessment, fall prevention

Simplify medication regimens, use medicine kits as an aid, and enhance medication education. Ensure the safety of the environment and increase patrols at night.

(7) Family co-education

Train family members in debilitating knowledge and care skills, and encourage them to participate in nutritional support, activity companionship, and emotional support for the patient.

2.3. Observation indicators

(1) The incidence of frailty during hospitalization was based on a pre-discharge FRAIL score of ≥ 3.

(2) Secondary outcomes

Rebleeding rate (with hematemesis, aggravated melena, a decrease in hemoglobin > 20g/L or the need for re-endoscopic hemostasis during hospitalization); Average length of hospital stay; Average hospitalization expenses.

(3) Nursing satisfaction

Evaluation was conducted at discharge using a self-made satisfaction questionnaire (Cronbach's $\alpha = 0.89$), with a maximum score of 100.

2.4. Statistical processing

Using SPSS 25.0 software. Measurement data were expressed as ($\overline{x} \pm s$), and comparisons between groups were conducted using the independent sample *t*-test; Count data were expressed as cases (%), and comparisons between groups were conducted using the χ^2 test or Fisher's exact test. A difference was considered statistically significant when $p < 0.05$.

3. Fruiting

3.1. Comparison of clinical outcomes during hospitalization between the two groups of patients

The incidence of new or frailty exacerbation during hospitalization in the intervention group was 11.1% (7/63), which was much lower than 31.7% (20/63) in the control group, and the difference was statistically significant ($\chi^2 = 8.254$, $p = 0.004$). There were 3 cases (4.8%) of rebleeding events in the intervention group and 8 cases (12.7%) in the control group. The difference between the two groups was statistically significant after continuous correction of the χ^2 test ($\chi^2 = 4.547$, $p = 0.033$).

Hospitalization efficiency and economic indicators: The average length of stay in the intervention group was (7.2 ± 1.5) days, significantly shorter than (9.1 ± 2.2) days in the control group, which was statistically significant ($t = 5.829$, $p < 0.001$). Meanwhile, the average hospitalization cost of the intervention group was (23,000 ± 0.6) yuan, which was much lower than that of the control group (28,000 ± 0.7) yuan ($t = 4.381$, $p < 0.001$). See **Table 2** for the specific data.

Table 2. Comparison of clinical outcomes between the two groups (n = 63)

Observation indicators	Intervention group	Control group	Statistics	*p* value
Frailty during hospitalization [cases (%)]	7 (11.1%)	20 (31.7%)	$\chi^2 = 8.254$	0.004
Rebleeding events [cases (%)]	3 (4.8%)	8 (12.7%)	$\chi^2 = 4.547$*	0.033
Average length of stay (days, $\overline{x} \pm s$)	7.2 ± 1.5	9.1 ± 2.2	$t = 5.829$	< 0.001
Average hospitalization cost (ten thousand yuan, $\overline{x} \pm s$)	2.3 ± 0.6	2.8 ± 0.7	$t = 4.381$	< 0.001

Note: Use the continuously corrected χ^2 test.

3.2. Comparison of nursing satisfaction between the two groups of patients

The results of the nursing satisfaction survey at discharge showed that the satisfaction score of the intervention group was 93.5 ± 4.2 points, which was much higher than that of the control group (86.3 ± 5.8 points), and the difference was highly statistically significant ($t = 8.127$, $p < 0.001$).

4. Conclusion

This study, through comparative analysis, found that implementing peri-inpatient nursing interventions based on frailty prediction models could significantly improve the clinical prognosis of middle-aged and elderly patients with upper gastrointestinal bleeding. The intervention reduced the incidence of frailty during hospitalization by about 20 percentage points (from 31.7% to 11.1%), indicating that early detection and proactive intervention play an important role in breaking the vicious cycle between bleeding and frailty. The acute stress of UGIB and the requirement of fasting and bed rest in conventional treatment can easily lead to accelerated muscle protein breakdown and functional decline. Early admission evaluation, comprehensive intervention, enhanced nutrition and individualized rehabilitation can effectively maintain the physiological reserves of patients, which is likely an important factor in reducing the incidence of frailty [5].

The intervention group also had an advantage in secondary outcome measures. The rebleeding rate was reduced (12.7% versus 4.8%), which was associated with the improvement of overall nutritional status, tissue repair ability, and stress levels in patients with targeted intervention. The average length of hospital stay was shortened by about 2 days (9.1 days, 7.2 days), reflecting the economic "benefit" of frailty prevention, that is, the reduction of complications and the acceleration of the recovery process to improve the utilization efficiency of medical resources. The intervention group had higher nursing satisfaction scores (93.5 versus 86.3), indicating that the integrated nursing model was more in line with the physical and mental needs of patients and improved their medical experience [6].

Therefore, the frailty prediction model and nursing intervention measures adopted in this study have positive significance both from the perspectives of clinical effect and health economics. Bringing frailty management forward and into the routine care pathway of UGIB is a patient-centered approach worthy of promotion. The limitations of this study are that it is a single-center study and the interventions are implemented in a package. Future multi-center, large-sample studies will be needed to test the universality of the conclusions and further analyze the causes to determine the independent effects of each intervention.

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Disclosure statement

The authors declare no conflict of interest.

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