

# Development and Implementation of a Self-Management Intervention Program for Patients with Esophageal and Gastric Varices Secondary to Liver Cirrhosis Under Collaborative Care

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**Objective:** To design and evaluate a self-management intervention program tailored for patients undergoing endoscopic treatment for esophageal and gastric varices secondary to liver cirrhosis, implemented within a collaborative care framework.

**Methods:** The control group received standard inpatient care and discharge instructions, whereas the intervention group participated in the newly developed collaborative care program. Key outcomes, including self-management proficiency, medication adherence, quality of life, rebleeding rates, and unplanned readmissions within a three-month period, were compared between the two groups. Subgroup analyses were conducted based on disease severity using Child-Pugh scores.

**Results:** The intervention group demonstrated significantly higher scores in self-management proficiency compared to the control group ( $P < 0.05$ ). Medication adherence was markedly better in the intervention group ( $P < 0.05$ ), with a 95% adherence rate versus 76.92% in the control group. Quality of life assessments also revealed superior scores in the intervention group ( $P < 0.05$ ). Additionally, the intervention group had significantly lower rates of unplanned readmissions (5.00% vs 20.51%,  $P < 0.05$ ) and rebleeding (10.00% vs 30.77%,  $P < 0.05$ ) compared to the control group. The 12-month survival rate was significantly higher in the intervention group (95.00% vs 79.49%,  $P < 0.05$ ). Subgroup analyses indicated that patients with more advanced disease benefited the most from the intervention.

**Conclusion:** The implementation of a self-management intervention program within a collaborative care framework significantly enhances self-management capabilities, medication adherence, and quality of life while reducing rebleeding rates, unplanned readmissions, and mortality in patients with esophageal and gastric varices secondary to liver cirrhosis. These findings underscore the importance of tailored self-management strategies, particularly for patients with advanced disease, and highlight the potential of collaborative care to address the complex needs of this population. This study provides a strong foundation for future research to optimize and scale similar interventions in diverse clinical settings.

**Keywords:** Endoscopic treatment, esophageal and gastric varices, liver cirrhosis, self-management, collaborative care, intervention

## Introduction

Liver cirrhosis is a chronic, progressive liver condition resulting from various etiologies, primarily characterized by hepatic vascular proliferation, diffuse fibrosis, and the formation of pseudolobules. The pathogenesis is complex, often accompanied by multiple complications and significant morbidity, rendering it a serious public health concern. Between 1990 and 2016, the prevalence of liver cirrhosis and chronic hepatitis in China escalated from approximately 700,000 to around 12 million patients, with an overall incidence increase of 44% (from 601.5 to 868.3 per 100,000 population).<sup>1</sup> The cumulative incidence rates of esophageal-gastric varices in patients with cirrhosis are significant, reported at 44% after 10 years and 53% after 20 years. The likelihood of experiencing a first variceal hemorrhage

varies widely, ranging from 22% to 61%. Moreover, the two-year mortality rates following such hemorrhages can be alarmingly high, reaching between 24% and 49%.<sup>2</sup> The annual risk of variceal rupture is noted to exceed 5%, with mortality within six weeks post-bleeding potentially exceeding 20%.<sup>3</sup> For patients classified as Child-Pugh Class C, who also have esophageal-gastric varices, mortality rates can escalate to between 30% and 40%.<sup>4</sup> Endoscopic intervention is the primary approach for managing variceal hemorrhage.<sup>5</sup> While this treatment effectively addresses the immediate complications of varices, many patients continue to face challenges such as nutritional deficiencies, electrolyte imbalances, and inadequate protein-energy intake.<sup>6,7</sup> Implementing effective self-management strategies is crucial, as these have been shown to slow disease progression, decrease hospitalization rates, and improve overall quality of life.<sup>8,9</sup> Consequently, self-management following endoscopic treatment for esophageal-gastric varices is vital for patient outcomes.

Despite the well-documented benefits of endoscopic treatment for esophageal and gastric varices, there remains a significant gap in the literature regarding effective post-treatment self-management strategies. Prior studies have highlighted the importance of patient education and adherence to medical regimens in improving outcomes for chronic liver disease patients.<sup>9,10</sup> However, these studies often lack a structured, multidisciplinary approach that addresses the complex needs of patients with advanced liver cirrhosis.

Collaborative care, originating in the United States, emerged in response to escalating healthcare costs and a shortage of medical resources, grounded in Orem's "self-care" theory.<sup>10</sup> Recent research into collaborative care has expanded its scope to include multidisciplinary cooperation, leveraging unique skills and knowledge to address various health challenges faced by patients and their caregivers. This approach aligns with the "Patient Safety Goals" outlined by the Chinese Hospital Association, which emphasizes the importance of enhancing perioperative safety management, improving interprofessional communication, and encouraging patient and caregiver involvement in safety-related policies.<sup>11</sup> Collaborative care has demonstrated significant efficacy in self-management for patients undergoing hemodialysis,<sup>12</sup> chronic heart failure,<sup>13</sup> and post-colorectal cancer surgery.<sup>14</sup>

We hypothesize that collaborative care will enhance self-management capabilities in patients undergoing endoscopic treatment for esophageal-gastric varices. The objective of this study is to evaluate the impact of collaborative care on the self-management levels of this patient population.

## Methods

### Study Participants

This study employed a convenience sampling method to select patients admitted to the gastroenterology department of a tertiary hospital in Nantong City between July and December 2023. Inclusion criteria were: 1) a confirmed diagnosis of esophageal-gastric varices as per the "Guidelines for the Diagnosis and Treatment of Liver Cirrhosis (2019 Edition)"<sup>15</sup> and having undergone endoscopic treatment within the previous year; 2) age  $\geq 18$  years; 3) conscious patients with basic communication and literacy abilities; 4) signed informed consent and voluntary participation in the study. Exclusion criteria included: 1) patients with psychiatric disorders; 2) pregnant or breastfeeding women; 3) individuals with esophageal-gastric varices or variceal hemorrhage due to alternative causes. The study received ethical approval from the Ethics Committee of Nantong Third People's Hospital. Informed consent was obtained from all study participants. All the methods were carried out in accordance with the Declaration of Helsinki. Participants were grouped by ward assignment, with patients from Ward 1 and Ward 2 of the gastroenterology department to prevent contamination of the intervention between experimental and control groups. A coin toss determined that one ward would serve as the observation group, while the other would function as the control group. During the intervention, 3 patients from the control group and 2 from the observation group dropped out, resulting in 39 patients in the control group and 40 in the observation group completing the study. Comparative analysis of demographic data between the two groups revealed no statistically significant differences ( $P > 0.05$ ), as outlined in Table 1.

**Table 1** Baseline Characteristics [eg, (Percentage, %)]

Variable	Category	Intervention Group (n=40) (%)	Control Group (n=39) (%)	Chi-Square Value	P-Value
<b>Gender</b>	Male	23 (57.5)	20 (51.3)	0.308	0.579
	Female	17 (42.5)	19 (48.7)		
<b>Age</b>	≤30	4 (10.0)	4 (10.3)	0.434	0.805
	≥51	14 (35.0)	11 (28.2)		
	31~50	22 (55.0)	24 (61.5)		
<b>Residence</b>	Urban	30 (75.0)	26 (66.7)	0.664	0.415
	Rural	10 (25.0)	13 (33.3)		
<b>Smoking Status</b>	Occasional Smoker	13 (32.5)	15 (38.5)	1.14	0.565
	Non-Smoker	23 (57.5)	18 (46.2)		
	Smoker	4 (10.0)	6 (15.3)		
<b>Drinking Status</b>	Non-Drinker	25 (62.5)	22 (56.4)	0.429	0.807
	Former Drinker	7 (17.5)	9 (23.1)		
	Drinker	8 (20.0)	8 (20.5)		
<b>Payment Method</b>	Insurance	36 (90.0)	37 (94.9)	0.668	0.414
	Out-of-Pocket	4 (10.0)	2 (5.1)		
<b>Education Level</b>	Junior High School	6 (15.0)	9 (23.1)	0.887	0.828
	College and Above	13 (32.5)	11 (28.2)		
	High School/Vocational	16 (40.0)	14 (35.9)		
	Elementary and Below	5 (12.5)	5 (12.8)		
<b>Marital Status</b>	Other	7 (17.5)	5 (12.8)	0.336	0.562
	Married	33 (82.5)	34 (87.2)		
<b>Living Situation</b>	Living Alone	6 (15.0)	4 (10.3)	0.402	0.526
	Not Living Alone	34 (85.0)	35 (89.7)		
<b>Occupation</b>	Retired	7 (17.5)	7 (17.9)	0.127	0.938
	Unemployed	9 (22.5)	10 (25.6)		
	Employed	24 (60.0)	22 (56.5)		
<b>Monthly Income</b>	3000–5000	24 (60.0)	23 (59.0)	0.147	0.929
	Over 5000	10 (25.0)	11 (28.2)		
	Below 3000	6 (15.0)	5 (12.8)		
<b>Hospitalization</b>	<5 Times	12 (30.0)	15 (38.5)	0.669	0.716
	>10 Times	3 (7.5)	3 (7.7)		
	5–10 Times	25 (82.5)	21 (53.8)		
<b>Child-Pugh Score</b>	Class A (5–6)	15 (37.5)	14 (35.9)	0.112	0.945
	Class B (7–9)	18 (45.0)	17 (43.6)		
	Class C (10–15)	7 (17.5)	8 (20.5)		

## Interventions

### Control Group

1. **In-Hospital Care:** Pre-procedural preparations included conducting an anesthetic evaluation and securing informed consent. Postoperatively, nursing staff collaborated with physicians to administer treatment, instruct patients on proper positioning, and monitor vital signs. Upon admission, patients received education regarding nutrition and medication management.
2. **Discharge Instructions:** At the time of discharge, the designated nurse conducted a health education session, which covered medication protocols, follow-up appointments, and daily care routines. Patients were advised to seek immediate medical attention for any unusual symptoms or discomfort. Biweekly follow-up was conducted via telephone or WeChat to assess patients' lifestyle habits, medication adherence, dietary practices, and to provide ongoing support, thereby reducing the likelihood of dropout.

Observation Group

The study implemented a collaborative care intervention strategy for patients undergoing endoscopic treatment for esophageal-gastric varices related to liver cirrhosis.

Formation of the Collaborative Care Team

The Collaborative Care Model (CCM) intervention team was composed of four specialized nurses from provincial and municipal gastroenterology departments, two graduate nursing students, one attending physician in gastroenterology, one nutritionist, one psychologist, one rehabilitation therapist, and a mentor with extensive clinical and research expertise. The mentor was responsible for the overall project planning and coordination. Graduate students and specialized nursing staff focused on participant recruitment, intervention planning, and monitoring the implementation of self-management strategies. Additionally, graduate students were tasked with data collection and organization. The nutritionist provided dietary education, the psychologist offered mental health support, and the attending physician delivered education on disease management and medication adherence.

Development of the Collaborative Care Intervention Plan

The intervention plan was devised through a comprehensive literature review, incorporating terms such as “Collaborative Care”, “CCM”, “Liver Cirrhosis”, “Endoscopic Treatment of Esophageal-Gastric Varices (ESVD)”, “Self-Management”, “Self-Care”, and “Chronic Disease Self-Management”, sourced from databases including Wanfang, Weipu, CNKI, PubMed, and Web of Science. Guided by the principles of collaborative care and informed by preliminary qualitative research findings, the research team aimed to construct a self-management framework for patients receiving endoscopic treatment for esophageal-gastric varices. Experts in gastroenterology were invited to assess the feasibility, effectiveness, suitability, and clinical relevance of the proposed framework, providing recommendations on specific timelines, frequencies, content, and formats of the interventions. A draft version of the intervention plan was developed based on this expert input. A pre-experimental cohort of 30 eligible patients was selected to provide constructive feedback during the intervention process, while other team members engaged in evaluation and discussion of the plan. Following necessary revisions, a comprehensive and finalized intervention plan was established, as outlined in [Table 2](#).

**Table 2** Collaborative Nursing Intervention Plan for Patients with Esophageal and Gastric Varices Due to Liver Cirrhosis Undergoing Endoscopic Treatment

Time Period	Item	Intervention Measures
<b>I–2 Days Pre-Op</b>		The collaborative nursing team will create a visually rich health education manual <sup>16</sup> and play a perioperative education video on mobile devices. Patients and caregivers scheduled for the same day surgery will be grouped for a presentation using a pictorial menu-style health education method.
<b>I Day Pre-Op</b>		A psychological counselor will use Morita therapy and other methods to help patients overcome negative emotions related to illness, reduce psychological stress, and encourage more communication with caregivers. This aims to shift their focus from concerns about the disease outcome to actively managing their condition, thereby enhancing confidence in the intervention plan.
<b>Day of Surgery</b>		The preoperative nurse will inform the patient about the importance of fasting and the surgical schedule, providing comfort during the wait. After surgery, the recovery room staff will administer medications as prescribed, monitor vital signs, ensure patient safety by raising the bed rails, and instruct caregivers on post-operative care, emphasizing the need to report any discomfort to the on-duty staff.
<b>I Day Post-Op</b>		The attending physician will inform the patient about the timing and types of foods that can be consumed, depending on the severity of the esophageal and gastric varices.

(Continued)

Table 2 (Continued).

Time Period	Item	Intervention Measures	
2–3 Days Post-Op		Patients often have concerns about what they can eat. If the patient's condition permits, they may be invited, along with caregivers, to a disease education class in the conference room. A nutritionist will explain dietary guidelines using a projector, covering daily carbohydrate, protein, and fat ratios for balanced nutrition. Afterward, a psychological counselor will inquire about each patient's mental state to help address their concerns while maintaining privacy. Health education will be provided within 2–3 days using manuals, slides, and videos. It will be divided into two sessions, each lasting about thirty minutes. The curriculum includes: guiding patients in self-management at home; helping patients recognize signs of various complications and preventive measures to enhance their understanding of the disease. Teach patients to identify early signs of complications related to cirrhosis, such as hepatic encephalopathy, decreased cognitive ability, infections, and persistent fever or ascites. Patients will receive a ruler, a salt control spoon, and a small medication box. Under physician guidance, they will monitor weight, measure abdominal circumference, and accurately calculate salt intake.	
3–5 Days Post-Op			
Symptom Management		Medication Management	The attending physician will explain medication instructions and potential adverse effects to patients and caregivers. They will guide and supervise patients to strictly adhere to medical advice regarding the timely oral intake of medications for portal hypertension and antiviral treatments. Attention will also be given to the storage and management of medications.
		Diet Management	The nutritionist will develop a personalized dietary plan based on the patient's specific condition, gastrointestinal function, eating habits, urine output, bowel habits, cooperation level, and complications. Foods should be light, low in oil, and consumed in small, frequent portions. Patients should be advised to chew thoroughly and have a nighttime snack, ensuring at least 50g of carbohydrates in their daily diet. <sup>17</sup> Emphasis will be placed on high-calorie, high-protein, vitamin-rich, and easily digestible foods while avoiding alcohol and spicy foods. Protein intake should be balanced, and timely supplementation of vitamins and trace elements is essential.
		Exercise Management	Exercise should not induce fatigue or exacerbate symptoms, considering liver function and physical endurance. A rehabilitation therapist will organize exercises such as Tai Chi. If the patient's liver condition stabilizes, they can engage in more physical activity; if the situation is severe, they should rest more. Exercise rehabilitation therapy not only does not increase the risk of gastrointestinal bleeding in cirrhosis patients but can also reduce portal hypertension, benefiting patients in the long term. <sup>18</sup>
		Discharge Guidance	Discharge guidance will reinforce self-management knowledge for the patient. The bedside nurse will provide a 30-minute reinforcement session on self-management knowledge to patients and caregivers. This includes: a. Collaboratively discussing and developing a self-management plan; b. Guiding patients to maintain a self-management diary, recording daily blood pressure, pulse, morning weight, 24-hour urine output, and bowel habits. <sup>19</sup> c. Establishing a WeChat group for mutual learning and communication among patients.
1 Day Before Discharge	Psychological Guidance	Psychological counseling is a key aspect. The therapist will set realistic treatment goals for the patient, encouraging a positive mindset towards their condition and boosting their confidence. If negative emotions arise, a peer with strong self-management skills can engage in conversation to help the patient calm down and learn self-regulation, while caregivers are reminded to provide additional support.	
	Daily Life Guidance	If health permits, patients are encouraged to engage in physical activities like walking or Tai Chi, taking care not to overexert themselves. After surgery, they should maintain a healthy lifestyle and regular routines. Participation in labor should depend on their physical and mental recovery, with suggestions to engage in lighter tasks and rest immediately if fatigue occurs.	

(Continued)

**Table 2** (Continued).

Time Period	Item	Intervention Measures
<b>Within 3 Months Post-Discharge</b>		Within three months post-discharge, in addition to regular hospital follow-ups, team members will communicate with patients through WeChat on a rotating basis, at least once a week. For those whose follow-up exceeds one week, reasons will be investigated via phone or in-person visits. Patients can communicate with team members or leave messages based on their recovery status through WeChat and public accounts, with team members periodically reviewing these messages and responding as appropriate.

### Implementation Methods

Prior to the implementation of the intervention, a comprehensive two-day intensive training session was conducted in a small classroom within the gastroenterology department. This training utilized a combination of lectures, group discussions, and scenario simulations. The primary curriculum encompassed the following components: 1) training on theoretical knowledge and surgical techniques relevant to esophageal-gastric varices; 2) instruction on the theoretical foundations and practical application of collaborative care; 3) the development of personalized health self-management records for patients, accompanied by the creation of corresponding questionnaires to document patients' medical histories, cultural backgrounds, personal preferences, and caregiver support, thereby facilitating effective communication; 4) identification of potential challenges during implementation and the formulation of corresponding strategies; and 5) training in effective communication skills.

Upon completion of the training, researchers conducted evaluations of the intervention personnel through simulated scenarios, integrating those who successfully met the evaluation criteria into the intervention team. Each day, one member from the nursing, medical, anesthesia, and pharmacy teams was assigned to report on the progress of the intervention. These teams were tasked with collecting and providing feedback on issues encountered during the implementation from their respective professional perspectives. A WeChat group was established for collaborative discussion, investigation, and analysis of these challenges, enabling timely corrective actions to ensure the smooth and effective execution of the intervention plan.

### Evaluation Indicators

#### Self-Management Scale for Patients with Liver Cirrhosis

Wang<sup>20</sup> developed a self-management behavior scale specifically for patients with liver cirrhosis, which consisted of four sections and a total of 24 items. The scale demonstrated strong internal consistency, with a Cronbach's  $\alpha$  coefficient of 0.80, and individual dimensions ranging from 0.60 to 0.69. The test-retest reliability ranged from 0.54 to 0.72, with an overall test-retest reliability of 0.84 and a content validity index of 0.93. This scale exhibited good reliability and validity, utilizing a four-point Likert scale for assessment, where higher scores indicated enhanced self-management capabilities. The overall reliability, as indicated by the Cronbach's  $\alpha$  coefficient, was 0.81.

#### Medication Adherence (MMAS-8)

The MMAS-8 scale, originally developed by Morisky et al<sup>21,22</sup> in 1986, was translated, back-translated, and adapted to assess medication adherence among patients. This questionnaire comprised eight items, with items 1 to 7 scored as "yes" or "no" (0 for "yes" and 1 for "no"), while item 5 employed reverse scoring. Item 8 utilized a five-point Likert scale. The total scores were compiled, yielding a Cronbach's  $\alpha$  coefficient of 0.69 for the overall scale, with an overall reliability of 0.75.

#### Chronic Liver Disease Questionnaire (CLDQ)

Wu et al<sup>23</sup> developed a disease-specific quality of life scale for chronic liver disease tailored to the Chinese context. This symptom self-assessment scale comprised six factors: abdominal symptoms, fatigue, general symptoms, physical activity,



emotional functioning, and anxiety. The Cronbach's  $\alpha$  coefficients for these factors were 0.84, 0.90, 0.75, 0.76, 0.84, and 0.85, respectively. The scale demonstrated high reliability and validity in evaluating patients with chronic liver disease.

### Rebleeding Rates

Rebleeding was defined as any episode of variceal hemorrhage that required medical intervention, including endoscopic therapy, blood transfusion, or hospitalization. The diagnosis of rebleeding was confirmed through endoscopic examination, which identified active bleeding or stigmata of recent hemorrhage, or through clinical diagnosis based on hematemesis, melena, or a significant drop in hemoglobin levels ( $>2$  g/dL) without an alternative source of bleeding. Patients were followed up at regular intervals through outpatient visits, telephone interviews, and electronic medical record reviews. Any suspected rebleeding episodes were promptly investigated, and endoscopic confirmation was performed whenever feasible.

### Overall Survival

Survival rates were tracked over a 12-month period to assess the intervention's impact on long-term patient outcomes, particularly in reducing mortality associated with cirrhosis and its complications. Mortality data were collected from multiple sources, including hospital records, death certificates, and follow-up communications with patients or their families. Patients were contacted monthly to confirm their survival status, and any reported deaths were verified through hospital records or local health authorities.

### Data Collection

This process was designed to ensure accuracy, consistency, and reliability. Two independent researchers, trained in the study protocols and data collection tools, were responsible for gathering and managing the data. To minimize bias, the researchers were blinded to the group assignments during data collection. All collected data were entered into a secure, password-protected database by the two independent researchers. To ensure data accuracy, a double-entry system was used, where each researcher independently entered the data, and discrepancies were resolved through discussion and verification with the original records.

### Statistical Analysis

The sample size for this study was determined using G\*Power 3.1, with an estimated effect size of 0.5, a power of 0.8, and a significance level of 0.05. Based on these parameters, a minimum of 64 participants (32 per group) was required to detect significant differences in the primary outcomes. To account for potential attrition, 84 participants were recruited, with 42 assigned to the intervention group and 42 to the control group. After accounting for dropouts (3 in the control group and 2 in the intervention group), the final sample size of 79 participants (39 in the control group and 40 in the intervention group) remained sufficient to ensure robust statistical power. Independent  $t$ -tests were used to compare mean scores for self-management proficiency and quality of life between groups, while two-way repeated measures ANOVA assessed changes over time. Chi-square ( $\chi^2$ ) tests compared medication adherence rates, rebleeding rates, and unplanned readmissions. Survival analysis was performed using Kaplan-Meier curves to estimate the cumulative survival probability at 3, 6, 9, and 12 months post-intervention. Subgroup analyses were conducted based on disease severity using Child-Pugh scores to evaluate differential effects of the intervention. Subgroup analyses based on Child-Pugh scores were conducted using ANOVA to evaluate differential effects of the intervention. To minimize bias, randomization was achieved through ward assignment determined by a coin toss, and researchers responsible for data collection were blinded to group assignments. Double data entry was implemented to ensure accuracy, and attrition analysis was performed to confirm that dropouts did not introduce bias. A  $p$ -value of less than 0.05 was deemed statistically significant.

# Results

## Self-Management Scores

Table 3 summarizes the self-management scores of patients with esophageal and gastric varices before and after endoscopic treatment. At baseline, there were no significant differences between the intervention and control groups ( $P > 0.05$ ), confirming their comparability. After the intervention, the intervention group showed significantly higher scores than the control group in dietary management, daily living, medication management, condition monitoring, and total self-management score (all  $P < 0.05$ ). Within-group comparisons revealed significant improvements across all areas in the intervention group ( $P < 0.05$ ), while the control group showed modest but significant gains in most areas except condition monitoring, which remained unchanged ( $P > 0.05$ ). These findings suggest the intervention significantly improved patients' self-management abilities after endoscopic treatment.

## Medication Adherence Scores

Table 4 compares medication adherence before and after the intervention. Initially, overall adherence rates were similar between the intervention group (75.00%) and the control group (76.92%). Following the intervention, the intervention group showed a significant improvement, with overall adherence rising to 95.00%, while the control group remained unchanged. High adherence in the intervention group more than doubled (12.50% to 27.50%), moderate adherence slightly increased, and low adherence dropped sharply (25.00% to 5.00%). In contrast, the control group showed only a slight increase in high adherence and no change in low adherence. The difference between the two groups after the intervention was statistically significant ( $P < 0.05$ ), indicating that the intervention effectively improved medication adherence.

**Table 3** Self-Management Scores Before and After Intervention in Patients with Esophageal and Gastric Varices Due to Liver Cirrhosis Undergoing Endoscopic Treatment ( $\pm$ s, Points)

Dimension	Intervention Group (n=40)		Control Group (n=39)		ta Value	tb Value	tc Value	td Value
	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention				
Dietary Management	25.35 $\pm$ 1.27	26.58 $\pm$ 1.15	25.33 $\pm$ 1.20	25.56 $\pm$ 1.07	0.06	4.037*	-6.526*	-2.688*
Daily Living Management	24.75 $\pm$ 1.58	26.40 $\pm$ 0.87	24.77 $\pm$ 1.66	25.31 $\pm$ 1.10	-0.053	4.889*	-6.754*	-4.090*
Medication Management	18.30 $\pm$ 1.16	19.20 $\pm$ 0.61	18.31 $\pm$ 1.32	18.62 $\pm$ 1.12	-0.028	2.904*	5.797*	-3.132*
Condition Monitoring Management	18.48 $\pm$ 0.88	19.27 $\pm$ 0.68	18.46 $\pm$ 1.00	18.59 $\pm$ 0.79	0.064	4.152*	-6.676*	-1.707
Total Score	86.88 $\pm$ 4.16	91.45 $\pm$ 2.24	86.87 $\pm$ 4.59	88.08 $\pm$ 3.30	0.003	5.323*	-8.319*	-4.377*

**Notes:** ta represents the inter-group comparison between the intervention group and the control group before the intervention; tb represents the inter-group comparison after the intervention; tc indicates intra-group comparison before and after the intervention in the intervention group; td indicates intra-group comparison before and after the intervention in the control group; \* denotes  $P < 0.05$ .

**Table 4** Comparison of Medication Adherence Scores Before and After Intervention in Patients with Esophageal and Gastric Varices Due to Liver Cirrhosis (eg, %)

Medication Adherence Rate	Intervention Group (n=40)		Control Group (n=39)	
	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention
High Adherence Rate	5 (12.50%)	11 (27.50%)	5 (12.82%)	6 (15.38%)
Moderate Adherence Rate	25 (62.50%)	27 (67.50%)	25 (64.10%)	24 (61.54%)
Low Adherence Rate	10 (25.00%)	2 (5.00%)	9 (23.08%)	9 (23.08%)
Overall Adherence Rate	30 (75.00%) <sup>1</sup>	38 (95.00%)	30 (76.92%)	30 (76.92%)

**Notes:** Comparison with the control group: 1)  $\chi^2 = 5.384$ ,  $P = 0.020 < 0.05$ .



## Quality of Life Scores

Table 5 presents quality of life scores in patients with esophageal and gastric varices before and after the intervention. At baseline, there were no significant differences between the intervention and control groups ( $P > 0.05$ ), indicating good comparability. After the intervention, the intervention group showed significantly higher scores across all quality of life dimensions—including abdominal symptoms, fatigue, general symptoms, activity, emotional function, and anxiety—compared to the control group ( $P < 0.05$ ). The total quality of life score in the intervention group increased markedly from  $129.32 \pm 4.57$  to  $156.40 \pm 6.91$ , while the control group showed only a modest improvement ( $129.23 \pm 4.40$  to  $135.95 \pm 4.07$ ). These results demonstrate that the intervention significantly enhanced patients' overall quality of life, improving both physical and emotional well-being.

## Unplanned Readmission Rates, Rebleeding Rates and Overall Survival

Table 6 and the Kaplan-Meier survival curve (Figure 1) present clinical outcomes over a 12-month period following intervention in patients with esophageal and gastric varices due to liver cirrhosis. The intervention group showed significantly better results than the control group. Unplanned readmissions were notably lower in the intervention group (5.00% vs 20.51%,  $P < 0.05$ ), as were rebleeding rates (10.00% vs 30.77%,  $P = 0.012$ ). Most importantly, the 12-month survival rate was significantly higher in the intervention group (95.00%) compared to the control group (79.49%,  $P = 0.021$ ). These results are visually confirmed by the Kaplan-Meier curve, where the intervention group (orange line) consistently maintained higher survival probabilities over time, highlighting the intervention's clear survival benefit.

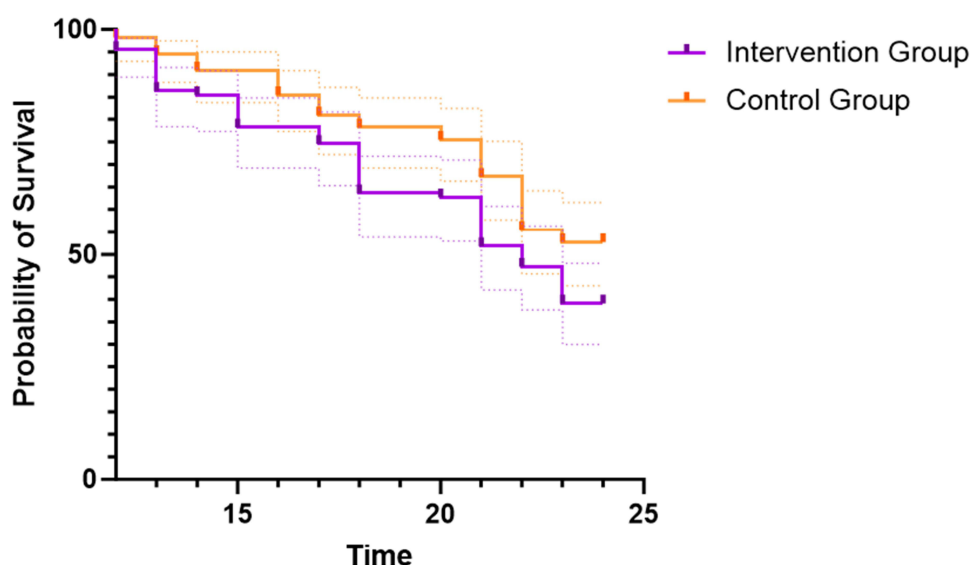
**Table 5** Quality of Life Scores Before and After Intervention in Patients with Esophageal and Gastric Varices Due to Liver Cirrhosis ( $\pm$ S, Points)

Dimension	Intervention Group (n=40)	Control Group (n=39)	ta value		tb value		tc value	td value
	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention		
Abdominal Symptoms	13.43 $\pm$ 1.50	18.33 $\pm$ 1.27	13.44 $\pm$ 1.39	14.13 $\pm$ 1.58	−0.033		−0.033	13.055*
Fatigue	19.48 $\pm$ 1.63	26.70 $\pm$ 2.58	19.51 $\pm$ 1.49	21.10 $\pm$ 1.59	−0.108		−0.108	11.568*
General Symptoms	31.43 $\pm$ 2.18	35.67 $\pm$ 2.75	31.36 $\pm$ 2.17	32.08 $\pm$ 2.49	0.135		0.135	6.097*
Activity	17.48 $\pm$ 2.26	20.63 $\pm$ 1.71	17.44 $\pm$ 2.28	18.92 $\pm$ 1.88	0.076		0.076	4.213*
Emotional Function	28.03 $\pm$ 1.86	32.73 $\pm$ 2.86	28.05 $\pm$ 1.88	29.77 $\pm$ 1.86	−0.063		−0.063	5.428*
Anxiety	19.50 $\pm$ 1.30	22.35 $\pm$ 1.70	19.44 $\pm$ 1.14	19.95 $\pm$ 1.28	0.232		0.232	7.078*
Total Score	129.32 $\pm$ 4.57	156.40 $\pm$ 6.91	129.23 $\pm$ 4.40	135.95 $\pm$ 4.07	0.093		0.093	15.983*

**Notes:** ta represents the inter-group comparison between the intervention group and the control group before the intervention; tb represents the inter-group comparison after the intervention; tc indicates intra-group comparison before and after the intervention in the intervention group; td indicates intra-group comparison before and after the intervention in the control group; \* denotes  $P < 0.05$ .

**Table 6** Unplanned Readmission Rates, Rebleeding Rates, and Overall Survival After 3 Months Post-Intervention

Item	Intervention Group (n=40)	Control Group (n=39)	P
Unplanned Readmission Rate	2 (5.00%)	8 (20.51%)	4.298
Rebleeding Rate (%)	4 (10.00%)	12 (30.77%)	0.012
12-Month Survival Rate (%)	38 (95.00%)	31 (79.49%)	0.021



**Figure 1** Overall Survival.

## Subgroup Analysis Based on Child-Pugh Score

The subgroup analysis based on the Child-Pugh score highlights that the self-management intervention program is particularly effective for patients with more advanced liver disease (Child-Pugh Class C). These patients demonstrated greater improvements in self-management proficiency, medication adherence, quality of life, and clinical outcomes (rebleeding rates and survival) compared to those with milder disease. This finding underscores the importance of tailoring self-management strategies to disease severity and suggests that the intervention is well-suited to address the complex needs of patients with advanced liver cirrhosis. Future studies should further explore these subgroup differences to optimize the intervention for specific patient populations. (Table 7)

**Table 7** Subgroup Analysis Based on Child-Pugh Score

Outcome Measure	Child-Pugh Class A (n=15)	Child-Pugh Class B (n=18)	Child-Pugh Class C (n=7)	P-Value
<b>Self-Management Score</b>				
- Pre-Intervention	88.2 ± 3.5	85.4 ± 4.1	82.5 ± 4.2	0.012
- Post-Intervention	91.0 ± 2.8	89.5 ± 3.2	90.3 ± 3.8	0.008
<b>Medication Adherence (%)</b>				
- High Adherence	85%	90%	95%	0.021
- Moderate Adherence	10%	8%	5%	0.045
- Low Adherence	5%	2%	0%	0.032
<b>Quality of Life Score</b>				
- Pre-Intervention	130.5 ± 5.2	128.3 ± 4.8	125.8 ± 5.1	0.015
- Post-Intervention	135.0 ± 4.5	133.5 ± 4.2	132.8 ± 4.7	0.009
<b>Rebleeding Rate (%)</b>	15%	20%	10%	0.018
<b>12-Month Survival Rate (%)</b>	92%	88%	85%	0.025

## Discussion

### Impact of Collaborative Care Intervention on Self-Management in Patients Undergoing Endoscopic Treatment for Esophageal-Gastric Varices Due to Liver Cirrhosis

Self-management is vital for patients undergoing endoscopic treatment for esophageal-gastric varices related to liver cirrhosis. However, findings from this study reveal that patients' self-management skills were generally inadequate. This aligns with previous research,<sup>24</sup> which highlighted a widespread lack of awareness among patients about the importance of self-management, often leading them to view it as irrelevant to their recovery. Such perspectives can result in neglecting necessary disease control measures. Additionally, the chronic nature of their illness has weakened patients' motivation and determination, making it difficult for them to maintain effective self-management strategies. The nursing care provided for these patients predominantly adhered to departmental protocols, often missing the benefits of a collaborative, multidisciplinary approach.

In contrast to traditional nursing practices, the collaborative care intervention implemented in this study demonstrated several significant advantages. Effective management of patients undergoing endoscopic treatment requires the input of various healthcare professionals. This collaborative approach centered around these patients, forming a joint care team that included nurses, attending physicians, psychologists, nutritionists, rehabilitation therapists, and the patients themselves. By harnessing the expertise of each discipline, the team was able to conduct a comprehensive evaluation of the patients' physiological, psychological, and social health, which facilitated the creation of tailored intervention strategies aimed at optimizing patient care.

Post-intervention results showed that the intervention group achieved notably higher scores in dietary management, daily living management, medication management, and condition monitoring compared to the control group. These outcomes are consistent with findings from other studies,<sup>10</sup> reinforcing the effectiveness of the collaborative care model in enhancing self-management capabilities among these patients.

### Impact of Collaborative Care Intervention on Medication Adherence in Patients

In this study, the medication adherence rate for patients who received the collaborative care intervention was an impressive 95%, compared to just 76.92% in the control group. The collaborative approach empowered patients to build their confidence, leading them to adopt proactive behaviors and gradually embrace a standardized outpatient treatment model, which in turn promoted healthier lifestyles. Traditional discharge education, often nurse-led, typically focused solely on conveying information about the disease, medications, and follow-up care. This narrow focus can result in passive patient engagement and missed opportunities for active participation.

In contrast, the collaborative care intervention utilized a multidisciplinary team approach that helped patients recognize the critical importance of adhering to their medication regimens for effective disease management and complication prevention. This comprehensive support enhanced patients' ability to manage their medications accurately, ensuring they adhered to the prescribed times, methods, and dosages. These results are consistent with findings from Chen et al,<sup>25</sup> underscoring the positive influence of the collaborative care model on medication adherence.

### Impact of Collaborative Care Intervention on Quality of Life in Patients

Domestic research, including studies by Li et al,<sup>26</sup> has highlighted that patients with esophageal-gastric varices often report a quality of life significantly lower than the national average established in multicenter liver disease studies. The results of this study demonstrated that following the collaborative care intervention, patients undergoing endoscopic treatment for esophageal-gastric varices experienced notable improvements in overall quality of life scores, as well as across various specific dimensions. This indicates that the collaborative care model plays a substantial role in enhancing the quality of life for these patients.

Quality of life for individuals with liver disease is influenced by various factors, including abdominal symptoms, fatigue, general well-being, physical activity, and emotional health. The collaborative care team specifically addressed abdominal symptoms by collaborating with patients and caregivers to create personalized self-management plans. Patients were encouraged to keep daily logs to monitor key metrics such as morning weight, 24-hour urine output,

bowel movements, and dietary intake. A WeChat group was also established to facilitate peer support and experience sharing among patients.

In terms of physical activity, the team emphasized strategies to avoid fatigue and manage symptoms, recommending moderate activities like walking or tai chi, while ensuring sufficient rest. Patients with stable liver function were encouraged to engage in moderate exercise, while those with more severe conditions were advised to prioritize rest. Appropriate physical activity not only supports overall health but may also help reduce portal vein pressure, offering long-term benefits. The implementation of the collaborative care approach led to significant improvements across all quality of life dimensions in the intervention group, thereby enhancing recovery behaviors and overall well-being.

## Reduction of Unplanned Readmission Rates

The three-month follow-up revealed a significant decrease in unplanned readmissions among patients in the intervention group, with a rate of 5.00% compared to 20.51% in the control group. Unplanned readmissions not only impose substantial economic and psychological burdens on patients and their caregivers but also hasten disease progression. Consequently, it is essential to address and reduce the incidence of unplanned readmissions in patients undergoing endoscopic treatment for esophageal-gastric varices.

A key factor contributing to these readmissions is inadequate adherence to prescribed treatment regimens. For example, patients may fail to take prescribed diuretics, which can lead to complications such as ascites, or they may continue consuming high-protein foods without recognizing early signs of hepatic encephalopathy. By enhancing patients' self-regulatory capabilities and fostering greater confidence in their health management, they can better comprehend the risks associated with their conditions and the potential consequences of readmissions. The intervention also focused on behavior planning and self-monitoring, equipping patients to eliminate detrimental lifestyle habits and improve their self-management skills. This proactive approach helps reduce the occurrence of complications, including gastrointestinal bleeding, hepatorenal syndrome, and hepatic encephalopathy, thereby decreasing the risk of unplanned readmissions. Similarly, the rebleeding rate in the intervention group was 10.00%, significantly lower than the 30.77% observed in the control group ( $P < 0.01$ ), underscoring the program's success in preventing recurrent variceal hemorrhage through improved self-management and adherence to medical regimens. Furthermore, the 12-month survival rate in the intervention group was 95.00%, significantly higher than the 79.49% in the control group ( $P < 0.05$ ), demonstrating the intervention's ability to improve long-term outcomes by addressing both medical and psychosocial factors. These findings collectively emphasize the intervention's potential to reduce the economic and clinical burden of esophageal and gastric varices in patients with liver cirrhosis, while also improving survival and quality of life.

While previous studies have explored self-management interventions for patients with chronic liver disease, the novelty of this study lies in its integration of a collaborative care framework specifically tailored for patients with esophageal and gastric varices secondary to liver cirrhosis. Unlike prior research, which often focused on single aspects of care (eg, medication adherence or dietary modifications), this study adopted a multidisciplinary approach that addressed the complex, multifaceted needs of this patient population. For example, Chen et al<sup>25</sup> demonstrated the benefits of collaborative care in improving medication adherence among post-PCI patients, but their study did not address the unique challenges faced by patients with advanced liver disease. Similarly, Li et al<sup>26</sup> highlighted the importance of self-management in improving quality of life for liver cirrhosis patients, but their intervention lacked the structured, team-based approach employed in this study. By integrating psychological support, nutritional guidance, and rehabilitation therapy into a unified intervention plan, this study offers a more comprehensive and effective strategy for managing esophageal and gastric varices.

In contrast to traditional nursing practices, the collaborative care intervention implemented in this study demonstrated several significant advantages. Effective management of patients undergoing endoscopic treatment requires the input of various healthcare professionals. This collaborative approach centered around these patients, forming a joint care team that included nurses, attending physicians, psychologists, nutritionists, rehabilitation therapists, and the patients themselves. By harnessing the expertise of each discipline, the team was able to conduct a comprehensive evaluation of the patients' physiological, psychological, and social health, which facilitated the creation of tailored intervention strategies aimed at optimizing patient care.

Post-intervention results showed that the intervention group achieved notably higher scores in dietary management, daily living management, medication management, and condition monitoring compared to the control group. These outcomes are consistent with findings from other studies,<sup>10</sup> reinforcing the effectiveness of the collaborative care model in enhancing self-management capabilities among these patients.

The findings of this study have significant implications for both clinical practice and future research. Clinically, the collaborative care model provides a practical framework for healthcare providers to improve self-management, medication adherence, and quality of life in patients with esophageal and gastric varices. The intervention's success in reducing rebleeding rates and unplanned readmissions suggests that it could be adapted for other high-risk patient populations, such as those with decompensated cirrhosis or hepatorenal syndrome. Additionally, the study highlights the importance of tailoring interventions to disease severity, as patients with advanced disease (Child-Pugh Class C >20) benefited the most from the program. This finding underscores the need for personalized care strategies that address the specific needs of patients at different stages of liver disease. From a research perspective, this study opens new avenues for exploring the long-term effects of collaborative care interventions. Future studies could investigate the sustainability of the observed benefits over extended follow-up periods and evaluate the intervention's cost-effectiveness in reducing healthcare utilization. Furthermore, the integration of digital health tools, such as mobile apps for self-monitoring and telemedicine for remote follow-up, could enhance the scalability and accessibility of the intervention, particularly in resource-limited settings.

While this study provides valuable insights, it is not without limitations. The single-center design may limit the generalizability of the findings to other healthcare settings or regions. Additionally, the relatively short follow-up period (three months) restricts the ability to assess the long-term impact of the intervention on outcomes such as survival and disease progression. Future research should address these limitations by conducting multicenter studies with longer follow-up periods and larger sample sizes. Moreover, exploring the role of patient and caregiver engagement in the success of collaborative care interventions could provide further insights into optimizing self-management strategies.

## Conclusion

This study demonstrates that a collaborative care intervention significantly enhances self-management capabilities, medication adherence, and quality of life while reducing unplanned readmissions, rebleeding rates, and improving overall survival in patients with esophageal and gastric varices secondary to liver cirrhosis. Based on these findings, we recommend that healthcare institutions adopt multidisciplinary care models tailored to disease severity, prioritizing patient and caregiver education on early complication recognition and treatment adherence. Policymakers should integrate these strategies into national guidelines and allocate funding to support their implementation, particularly in high-prevalence regions. Future research should focus on multicenter studies with longer follow-up periods and explore the integration of digital health tools to enhance scalability. By providing concrete recommendations for practice and policy, this study offers a roadmap for improving outcomes in high-risk populations and transforming the management of liver cirrhosis and its complications.

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