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Cognitive intervention combined with aerobic limb rehabilitation exercise promotes nerve and limb function recovery in hemiplegic patients with hypertensive intracerebral hemorrhage

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Highlights

- Cognitive intervention combined with aerobic limb rehabilitation significantly improves neurological and motor functions in hemiplegic patients with hypertensive intracerebral hemorrhage.
- This approach enhances psychological resilience and quality of life, showing substantial benefits for patient recovery.
- Integrating professional education, psychological support, and family involvement promotes comprehensive rehabilitation outcomes.

Abstract

Objective: To explore the effect of cognitive intervention combined with aerobic limb rehabilitation exercise on neurological and limb functions in hemiplegic patients with hypertensive intracerebral hemorrhage. **Methods:** A prospective study was conducted with eighty-six hemiplegic patients with hypertensive intracerebral hemorrhage admitted to Taikang Xianlin Drum Tower Hospital from October 2021 to October 2023. The patients were randomly divided into a study group (43 cases) and a control group (43 cases). After 6 months of intervention, neurological function, motor and limb function, psychological state, and quality of life scores were compared between the two groups to assess the effects of the intervention. **Results:** After the intervention, neurological function indexes in the study group, including S100B protein, myelin basic protein and National Institutes of Health Stroke Scale score, were significantly lower than those in the control group (all $P < 0.05$). In contrast, brain-derived neurotrophic factor and Mini-Mental State Examination scores were significantly higher in the study group (all $P < 0.05$). Additionally, motor function, Barthel score, Fugl-Meyer score, and muscle strength (grades V and IV) were significantly higher in the study group compared to the control group (all $P < 0.05$). Psychological resilience, including scores for toughness, optimism, and strength, as well as the total resilience score, were significantly higher in the study group (all $P < 0.05$). Moreover, the Generic Quality of Life Inventory score was also significantly higher in the study group ($P < 0.05$). **Conclusion:** Cognitive intervention combined with aerobic limb rehabilitation exercises can alleviate neurological damage in hemiplegic patients with hypertensive intracerebral hemorrhage, enhance muscle strength, promote limb and motor function recovery, and improve psychological state and quality of life.

Keywords: Hypertension intracerebral hemorrhage, hemiplegia, cognitive intervention, aerobic limb rehabilitation exercises, neurological function

Introduction

If hypertension persists over time, it can cause fibrous in the walls of cerebral basilar arterioles or vitreous lesions, focal necrosis, and reduced elasticity of blood vessel walls. When

blood pressure suddenly rises due to excessive physical labor, mental stress, intellectual work, or intense emotional stimulation, pathological blood vessels may rupture, leading to cerebral hemorrhage, commonly referred to as hypertensive intracerebral hemorrhage (HICH) [1].



HICH has a rapid onset, fast progression, and poor prognosis. Its main clinical manifestations include sudden headache, vomiting, lethargy, and coma, which can reach peak severity within minutes. The mortality rate accounts for more than 20% of total stroke-related deaths [2]. With advancements in emergency treatment technologies, the mortality rate of HICH has been significantly reduced. At present, surgical treatment remains the most effective therapy for HICH, with the primary goal being to reduce neurological damage and promote functional recovery [3]. However, data show that half of the patients who survive cerebral hemorrhage experience sequelae such as motor, cognitive, or neurological dysfunction. Among them, three-fourths are prone to varying degrees of hemiplegia, with more than 40% suffering from severe hemiplegia—this being the most common sequela after acute-stage HICH treatment [4]. Previous studies have consistently shown that rehabilitation training is the primary rehabilitation method to promote nerve function recovery in HICH patients, improve motor function in limbs, enhance quality of life, and improve prognosis [5, 6].

However, the rehabilitation process is lengthy, and patient compliance often remains a challenge. Some studies have suggested that cognitive intervention can enhance patients' awareness of their condition, help establish positive rehabilitation beliefs, and improve their problem-solving and self-management skills through regular training in attention, willpower, memory, and cognitive ability, encouraging active participation in disease prevention [7]. Nevertheless, previous research has mostly focused on simple rehabilitation training, rarely incorporating cognitive intervention, and often only measuring single outcomes such as motor or neurological function, which lacks comprehensiveness [8]. Therefore, this study aims to combine rehabilitation for nerve, muscle, and joint function in HICH hemiplegic patients with cognitive intervention to explore their combined effects on improving nerve and limb function.

Materials and methods

General information

In this study, 86 patients with hemiplegia due to hypertensive intracerebral hemorrhage, admitted to Taikang Xianlin Drum Tower Hospital from October 2021 to October 2023, were recruited and randomly assigned to either the study group (treated with cognitive intervention combined with aerobic rehabilitation exercise) or the control group (treated with routine reha-

bilitation intervention), with 43 cases in each group. The study was approved by the medical ethics committee of Taikang Xianlin Drum Tower Hospital.

Inclusion criteria: Patients diagnosed with cerebral hemorrhage via CT or MRI, with a history of hypertension prior to onset [9]. Patients who were conscious and presented with hemiplegia of varying severity. Patients who had received treatment in Department of Health Management Center and were in a stable bleeding phase with stable vital signs. Patients aged ≥ 50 years. Patients with complete data required for analysis in this study.

Exclusion criteria: Patients with primary limb dysfunction. Patients with severe cognitive dysfunction or consciousness disorders. Patients with tumors or other serious systemic diseases. Patients whose cerebral hemorrhage was caused by other factors or who had other brain diseases. Patients with a history of severe coagulation disorders, liver or kidney dysfunction, or mental illness.

Methods

Patients in the control group received routine rehabilitation intervention [10]. This included guidance on stretching the shoulder, elbow, and wrist joints; the use of tools to assist in increasing the range of motion; rapid traction for muscle expansion and contraction stimulation; and resistance training to stabilize the shoulder, elbow, and wrist joints. Rehabilitation nurses supervised daily training sessions, which lasted approximately 30 minutes. Additionally, patients were encouraged to perform both-handed handshake exercises as needed.

In contrast, patients in the study group received a combination of cognitive intervention and aerobic limb rehabilitation exercises.

Cognitive intervention

Healthcare nurses followed a progressive approach, from simple to complex, in delivering cognitive function interventions to patients [11]. The specific components were as follows:

Disease knowledge awareness: Many patients and their families were not healthcare professionals and lacked a clear understanding of the disease, often leading to panic. Therefore, healthcare workers should educate patients and their families on disease knowledge, rehabilitation mechanisms, the significance of training, and potential complications. This began

with a general lecture to provide an overview of the disease, followed by smaller group sessions to focus on specific rehabilitation mechanisms. These sessions should ensure patients and their families understand the rehabilitation process. Additionally, during rehabilitation, healthcare personnel should inform patients and families about possible complications to prevent panic during emergencies.

Psychological awareness: After hemiplegia, many conscious patients often experienced a lack of self-confidence and enthusiasm for rehabilitation. They may also develop negative emotions such as anxiety and depression due to limited mobility and decreased self-care abilities. Rehabilitation courses tended to be lengthy, and the effects were often slow, which led to feelings of discouragement and despair in both patients and their families. Therefore, psychological interventions were essential to help patients restore their belief in active recovery [12]. First, healthcare workers should communicate actively with patients and families to identify the sources of negative emotions. Based on the patient's personality, tailored interventions can be provided. For patients who have lost confidence, successful rehabilitation examples from previous patients can be shared to boost morale. The importance and effectiveness of active rehabilitation should also be emphasized, reinforcing the patient's psychological readiness to engage in rehabilitation. Finally, patients should be given scientific guidance on how to adjust negative emotions, promoting the understanding that maintaining a positive mindset was crucial.

Family awareness: After discharge, home care relied heavily on family members, making it crucial to enhance their understanding of the importance and necessity of rehabilitation training. Initially, family members should receive training before discharge to ensure they can effectively and correctly assist with rehabilitation exercises. Emphasis should also be placed on the critical role of family in supervising and supporting rehabilitation. After the patient returns home, healthcare workers should regularly follow up with the family through phone calls or text messages to reinforce their understanding and involvement in the rehabilitation process.

Lifestyle awareness: Post-rehabilitation, patients also have specific lifestyle needs. Both patients and their families should be educated on maintaining a healthy lifestyle. In terms of diet, family members should be instructed to ensure a balanced and nutritious diet, emphasizing foods rich in protein and vitamins while

avoiding greasy foods. In daily life, it is important for families to encourage patients to spend time outdoors, promote good sleep hygiene, and engage in regular conversations to improve overall mental well-being.

Aerobic limb rehabilitation exercises

The rehabilitation nurse evaluated the patient's limb mobility and guided them in aerobic limb rehabilitation exercises through video presentations and face-to-face explanations. Family members were also instructed to assist with the exercises. The training mode was tailored to the patient's hemiplegia grade. For patients with grades 0–II, who could only lie in bed, passive exercises were applied, including instructions to raise, flex, and rotate their limbs in bed. For patients with hemiplegia grade II or higher, active exercises were introduced, and the patients were encouraged to perform limb movements independently, including both upper and lower limb exercises [13]. The specific exercises were as follows:

Upper limb movements: This included exercises for the wrists, fingers, shoulders, and arms. First, the rehabilitation nurse assisted patients in swinging their shoulders back and forth, with forearms close to the upper arms for stretching, flexion, and extension. Then, patients were instructed to flex their wrists, bend their fingers, and stretch them as much as possible, with additional assistance in stretching or bending muscles, ligaments, and nerves.

Lower limb movements: Exercises targeted the lower leg, ankle, toes, and knee joints. Initially, the rehabilitation nurse instructed patients to lie prone, assisted with lower leg flexion and extension, and ensured one leg remained upright while practicing with both legs. Next, patients were guided to bend and rotate their ankle joints, move surrounding muscles, ligaments, and nerves, and perform toe movements, such as bending the toes backward while alternating feet. Finally, patients were instructed on knee movements, including joint flexion, and exercises targeting knee muscles, nerves, and surrounding ligaments.

Outcome measures and evaluation criteria

Main outcome measures

Nerve Function Recovery: Nerve function was assessed using the following biomarkers: S100B protein, myelin basic protein (MBP), and brain-derived neurotrophic factor (BDNF). Fasting venous blood was collected from the

Table 1. Comparison of general data between the two groups [$\bar{x} \pm sd$, n (%)]

Item	Control group (n=43)	Research group (n=43)	χ^2/t	P
Gender (male/female)	25/18	27/16	0.195	0.659
Age (years/ $\bar{x} \pm sd$)	57.5 $\pm$ 3.8	58.8 $\pm$ 3.5	1.650	0.103
Duration of hypertension (year/ $\bar{x} \pm sd$)	11.7 $\pm$ 2.1	11.0 $\pm$ 2.3	1.474	0.144
Mean blood loss (mL)	51.63 $\pm$ 4.28	51.42 $\pm$ 4.09	0.233	0.817
BMI (kg/m ²)	23.77 $\pm$ 3.12	23.48 $\pm$ 3.31	0.418	0.677
Grade of hemiplegia [cases/(%)]			0.125	0.754
0 grade	4 (9.30)	5 (11.63)		
I grade	23 (53.49)	25 (58.14)		
II grade	11 (25.58)	10 (23.26)		
III grade	5 (11.63)	3 (6.98)		
Site of bleeding [cases/(%)]			0.145	0.465
The cerebral cortex	9 (20.93)	12 (27.91)		
The thalamus	8 (18.60)	6 (13.95)		
The cerebellum	6 (13.95)	7 (16.28)		
The brain stem	5 (11.63)	4 (9.30)		
Basal ganglia region	5 (11.63)	4 (9.30)		
Education background [cases/(%)]			0.142	0.943
Primary school	16 (37.21)	15 (34.88)		
Junior high school	17 (39.53)	16 (37.21)		
Senior high school and above	10 (23.26)	12 (25.58)		
Per Capita Monthly Household Income (RMB)			0.184	0.732
<1,000	13 (30.23)	12 (27.91)		
1,000-3,000	18 (41.86)	17 (39.53)		
>3,000	12 (27.91)	14 (32.56)		

Note: BMI, Body mass index.

patients in the early morning, centrifuged at 3,000 rpm for 3 minutes, and analyzed using an enzyme-linked immunosorbent assay (ELISA) kit (Wuhan Xinqidi Biological Technology Co., Ltd, China). Additionally, the National Institutes of Health Stroke Scale (NIHSS) was used to evaluate neurological function [14]. The NIHSS includes 45 points, covering areas such as consciousness level, gaze, visual field, facial paralysis, upper limb movement, lower limb movement, ataxia, and sensation, with the score being directly proportional to the degree of neurological impairment.

Cognitive function: Cognitive function was assessed using the Mini-Mental State Examination (MMSE), which includes dimensions such as orientation, memory, attention and calculation, recall, and language ability [15]. The total score is 30 points, with a score below 27 indicating cognitive dysfunction, and a score of 27 or higher considered normal.

Limb motor function: Limb motor function was evaluated using the Barthel Index, Fugl-Meyer Scale, and muscle strength grading [16, 17]. The Barthel Index has a total score of 100, with the score directly proportional to the patient's ability to perform daily activities. The Fugl-Meyer Scale consists of an upper limb section (66 points) and a lower limb section (34 points),

with higher scores reflecting better motor function. Muscle strength was graded as follows [18]: Grade V: Normal muscle strength with full range of motion. Grade IV: Muscle strength is nearly normal, but the affected limb cannot fully resist external resistance. Grade III: Muscle strength is sufficient to resist gravity but not external resistance. Grade II: Muscle strength can resist gravity but cannot overcome external resistance, allowing only horizontal movement. Grade I: Muscle shows slight contraction but cannot move the joint. Grade 0: No muscle contraction. The above outcomes were assessed before the intervention and at six months post-intervention.

Secondary outcome measures

Mental state: The Connor-Davidson Resilience Scale (CD-RISC) was used to assess mental state [19]. The Cronbach's α coefficient for the scale was 0.878. It consists of three dimensions: toughness (10 items), optimism (8 items), and power (7 items). The scale was scored using a 5-point Likert scale, with positive scores ranging from 1 to 5, for a total score of 100 points. The score was directly proportional to the psychological state.

Quality of life: The Generic Quality of Life Inventory (GQOLI) was used to evaluate quality

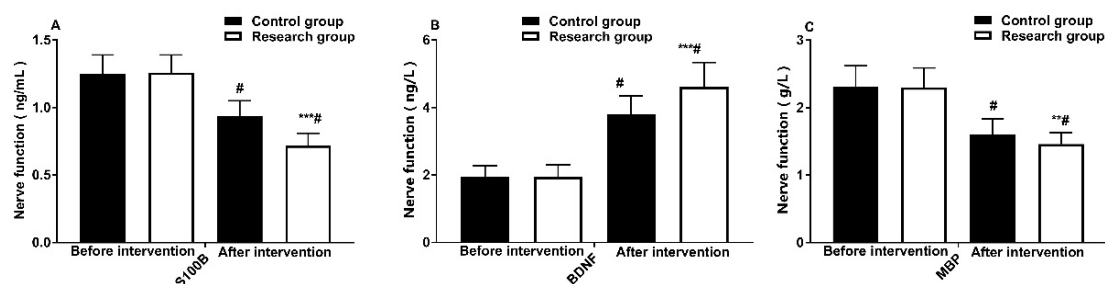


Figure 1. Comparison of neurological function index levels between the two groups before and after intervention. (A) S100B protein; (B) MBP; (C) BDNF. Compared with this group before intervention, #P<0.05; compared with the control group, **P<0.01, *P<0.001. MBP, Myelin basic protein; BDNF, brain-derived neurotrophic factor.**

Table 2. Comparison of NIHSS and MMSE scores between the two groups before and after intervention ($\bar{x} \pm sd$, score)

Group	NIHSS score		MMSE score	
	Before intervention	After intervention	Before intervention	After intervention
Control group (n=43)	13.26±2.14	6.77±1.17*	21.43±2.16	24.35±3.68*
Research group (n=43)	13.57±2.05	4.53±0.82*	21.47±2.93	28.42±3.82*
<i>t</i>	0.686	10.281	0.072	5.032
<i>P</i>	0.495	0.000	0.943	0.000

Note: Compared with Before intervention, *P<0.05. NIHSS, National Institutes of Health Stroke Scale; MMSE, mini-mental state examination.

of life, covering physical health, mental health, social function, and material life, with a total of 74 items and 20 factors [20]. The score was directly proportional to the quality of life.

The above indicators were assessed before the intervention and six months after the intervention.

Statistical methods

All statistical data were analyzed using SPSS 21.0. Measurement data are presented as mean $\pm$ standard deviation (Mean $\pm$ SD). Intra-group comparisons were made using the independent sample t-test, while comparisons between groups were performed using the paired t-test. Counting data are presented as case numbers/percentages (n/%), and the chi-square test was applied. A p-value of <0.05 was considered statistically significant.

Results

Comparison of general data

There were no statistically significant differences between the two groups in terms of gender, age, duration of hypertension, mean blood loss, BMI (body mass index), grade of hemiplegia, site of bleeding, education level, or per capita monthly household income (all P>0.05), as shown in **Table 1**.

Comparison of neurological function indexes

Before the intervention, there were no significant differences in neurological function indexes between the two groups (all P>0.05). After the intervention, levels of S100B and MBP decreased significantly, while BDNF increased significantly in both groups (all P<0.05). Notably, the decreases in S100B and MBP and the increase in BDNF were significantly greater in the study group compared to the control group (all P<0.01), as shown in **Figure 1**.

Comparison of NIHSS and MMSE scores

Before the intervention, there were no significant differences in NIHSS and MMSE scores between the two groups (both P>0.05). After the intervention, the decrease in NIHSS and the increase in MMSE were significant in both groups (both P<0.05), and these changes were significantly greater in the study group compared to the control group (both P<0.001), as shown in **Table 2**.

Comparison of limb motor function

Before the intervention, there were no significant differences in the Barthel scores limb motor function indexes between the two groups (all P>0.05). After the intervention, Barthel scores and motor function scores for upper and lower limbs significantly improved in both groups compared to baseline (all P<0.05). The im-

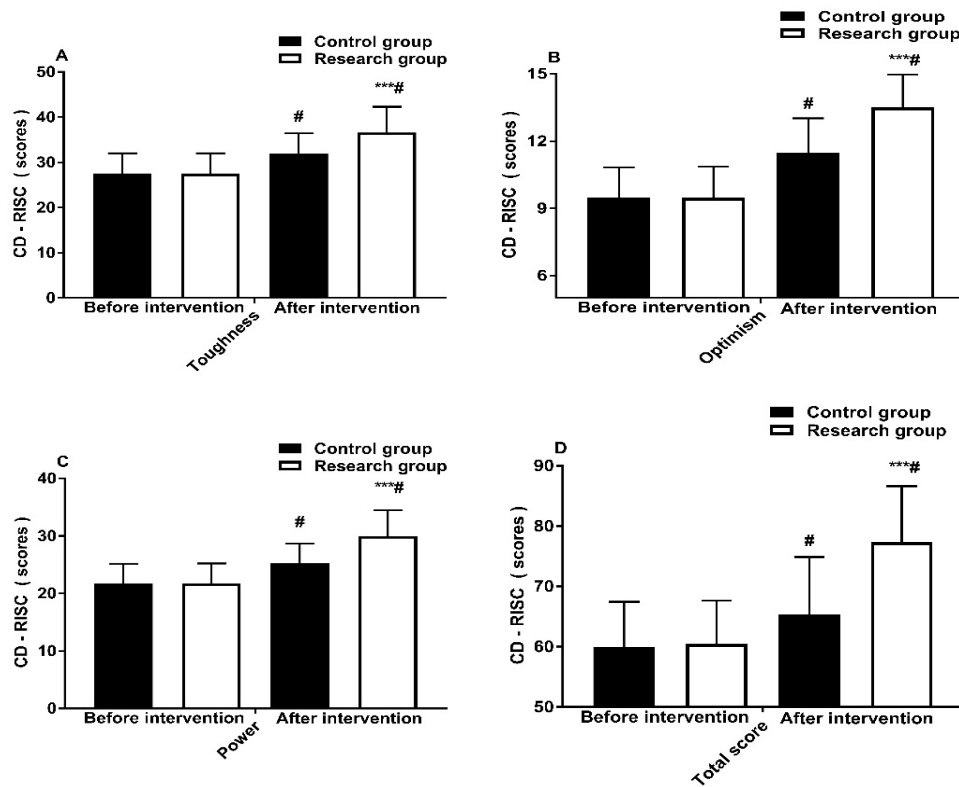


Figure 2. Comparison of CD-RISC scores between the two groups before and after intervention. (A) Toughness; (B) Optimism; (C) Power; (D) Total score. Compared with this group before intervention, # $P < 0.05$; compared with the control group, *** $P < 0.001$. CD-RISC, Connor- Davidson resilience scale.

Table 3. Comparison of limb motor function between the two groups before and after intervention ($\bar{x} \pm sd$, score)

Group	Control group (n=43)	Research group (n=43)	t	P
Barthel score				
Before the intervention	50.56 $\pm$ 4.46	50.19 $\pm$ 5.11	0.358	0.722
After the intervention	61.93 $\pm$ 5.09*	77.46 $\pm$ 6.37*	12.49	0.000
Upper limb motor function score				
Before the intervention	36.37 $\pm$ 3.62	36.82 $\pm$ 3.97	0.549	0.584
After the intervention	44.63 $\pm$ 4.98*	57.54 $\pm$ 5.39*	11.536	0.000
Lower extremity motor function score				
Before the intervention	19.42 $\pm$ 2.78	19.38 $\pm$ 2.92	0.065	0.948
After the intervention	23.62 $\pm$ 3.17*	30.18 $\pm$ 4.28*	8.077	0.000

Note: Compared with Before the intervention, * $P < 0.05$.

provements in these indexes were significantly greater in the study group compared to the control group (all $P < 0.001$), as shown in **Table 3**.

Comparison of muscle strength

Before the intervention, no significant differences in muscle strength levels were observed between the two groups (all $P > 0.05$). After the intervention, the number of patients with grade V and IV muscle strength in the study group was significantly higher than in the control group (both $P < 0.05$), as shown in **Table 4**.

Comparison of CD-RISC scores

Before the intervention, there were no significant differences in the scores for each dimension or the total score of the resilience scale between the two groups (all $P > 0.05$). After the intervention, both the dimension scores and the total score of the resilience scale significantly increased in both groups (all $P < 0.05$). The study group showed significantly higher scores in tenacity, optimism, and strength, as well as a higher total score of the CD-RISC compared to the control group (all $P < 0.001$), as shown in **Figure 2**.

Table 4. Comparison of muscle strength levels between the two groups before and after intervention [n (%)]

Item	Time	Control group (n=43)	Research group (n=43)	χ^2	P
V level	Before the intervention	0 (0.00)	0 (0.00)	0.000	1.000
	After the intervention	1 (2.33)	6 (13.95)	3.888	0.049
IV level	Before the intervention	6 (13.95)	7 (16.28)	0.091	0.763
	After the intervention	10 (23.26)	19 (44.19)	4.214	0.040
III level	Before the intervention	9 (20.93)	8 (18.60)	0.073	0.787
	After the intervention	18 (41.86)	11 (25.58)	2.549	0.110
II level	Before the intervention	17 (39.53)	16 (37.21)	0.049	0.825
	After the intervention	9 (20.93)	5 (11.63)	1.365	0.243
I level	Before the intervention	11 (25.58)	12 (27.91)	0.059	0.808
	After the intervention	5 (11.63)	2 (4.65)	1.400	0.237

Table 5. Comparison of GQOLI scores between the two groups before and after intervention ($\bar{x} \pm \text{sd}$, score)

Item	Time	Control group (n=43)	Research group (n=43)	χ^2	P
Healthy body	Before the intervention	31.34±3.98	32.10±4.01	0.882	0.380
	After the intervention	36.32±4.02*	45.34±6.46*	7.774	0.000
Mental health	Before the intervention	31.34±3.89	31.56±3.78	0.266	0.791
	After the intervention	37.43±4.01*	46.43±6.23*	7.966	0.000
Social function	Before the intervention	30.12±3.56	31.32±3.67	1.539	0.128
	After the intervention	37.54±3.98*	46.32±4.67*	9.383	0.000
Material life	Before the intervention	23.12±3.21	23.45±3.67	0.444	0.658
	After the intervention	29.23±3.85*	39.32±4.01*	11.902	0.000
Total quality of life	Before the intervention	113.22±12.32	114.21±12.56	0.369	0.713
	After the intervention	139.32±14.25*	183.32±16.43*	13.266	0.000

Note: Compared with Before the intervention, *P<0.05. GQOLI, Generic Quality of Life Inventory.

Comparison of GQOLI scores

Before the intervention, there were no significant differences in quality of life scores or the total scores between the two groups (all $P>0.05$). After the intervention, the scores for all dimensions and the total quality of life scores significantly improved in both groups (all $P<0.05$). The study group showed significantly greater improvements in physical health, mental health, social function, material life, and total scores of the GQOLI compared to the control group (all $P<0.001$), as shown in **Table 5**.

Discussion

Hemiplegia is one of the most common sequelae of HICH, and represents a significant neurological deficit that severely impacts patients' daily activities and motor abilities, leading to poor self-care capabilities [21]. Additionally, due to the extended recovery period, patients often exhibit weak psychological endurance and physical ability. External factors such as economic status, personal quality, and family and societal support contribute to the slow rehabilitation progress of many patients [22]. Therefore, enhancing patients' cognitive abilities and guiding them to establish correct

perspectives are crucial for promoting their rehabilitation [23]. Studies have confirmed that the key to recovering neurological dysfunction lies in the reconstruction of synaptic connections related to brain tissue through learning, ultimately reshaping the brain's structure and function [24]. At present, rehabilitation training is the most important approach for hemiplegic patients with HICH to recover from neurological deficits, improve limb function, and enhance self-care abilities [25, 26].

In this study, conventional aerobic limb rehabilitation exercises combined with cognitive intervention were applied to hemiplegic patients with HICH. The results showed that after the intervention, the S100B, MBP levels and NIHSS scores, were significantly lower in the study group compared to the control group. In contrast, BDNF levels and MMSE scores were significantly higher in the study group, indicating that cognitive intervention significantly improved the neurological function of patients.

Moreover, studies have shown that neurological function is correlated with the quality of life and social status of patients, making it a key index for evaluating the prognosis of hemiplegic patients with HICH. Therefore, assessing the rehabilitation effectiveness in terms of neurological

improvement is of great significance [27].

The improvement in neurological function is attributed to the implementation of both professional knowledge-based cognitive intervention and psychological cognitive intervention. Professional knowledge-based cognitive intervention enhances patients' understanding of their condition by educating them and their families about disease knowledge, rehabilitation mechanisms, training significance, and potential complications. This foundation supports the effective implementation of aerobic limb rehabilitation exercises [28]. The cognitive and emotional components in the brain are activated through such interventions. These components, part of a specific neural matrix, help residual brain cells fully mobilize their compensatory functions, contributing to the reconstruction or remodeling of brain tissue. Simultaneously, the enhancement of cognitive function stimulates nerve cell proliferation, alleviates ischemia and hypoxia in brain tissue, and improves neurological dysfunction. This finding is consistent with the research by Tomida et al., which confirmed that combined skill and strength training significantly improves neurological and limb motor function in stroke patients with hemiplegia [29].

Furthermore, the results showed that after the intervention, psychological state scores and the total resilience score in the study group were significantly higher than in the control group. This suggests that routine rehabilitation, combined with cognitive intervention, can improve the psychological state of patients. This improvement is closely linked to the enhanced psychological cognition of patients and their families.

Hemiplegic patients often struggle with a lack of confidence and rehabilitation motivation and are prone to negative emotions such as anxiety and depression. Families of such patients may also experience negative emotions like discouragement and despair. Therefore, it is crucial to enhance patients' awareness of the importance of maintaining positive emotions, which can improve their enthusiasm for rehabilitation and their compliance with treatment. This, in turn, helps alleviate negative emotions. These findings align with those of Küçük et al., who reported significant improvements in patients' psychological status following psychological cognition interventions [24].

Finally, the results of this study also showed that after the intervention, Barthel and Fugl-Meyer scores, as well as muscle strength levels (grades V and IV), were significantly

higher in the study group compared to the control group. This demonstrates that cognitive intervention effectively improves the limb motor function of patients.

In addition to professional knowledge and psychological interventions, this study also included cognitive intervention for patients' families. It is essential to raise awareness among patients' families regarding the importance and necessity of rehabilitation training, and to ensure they understand rehabilitation techniques. This enables families to assist scientifically and actively supervise patients during rehabilitation, thereby enhancing the effectiveness of the training. The combination of these interventions improved patients' enthusiasm for and the scientific approach to aerobic limb rehabilitation exercises, ultimately improving the therapeutic outcomes. These findings are consistent with those of Zang et al., which indicated that combining skill training with limb training enhances motor function in hemiplegic limbs [30]. Furthermore, the results showed that the GQ-OIL score in the study group was significantly higher than in the control group, indicating that cognitive intervention substantially improved patients' quality of life and contributed to better overall prognosis. This aligns with the findings of Umeki et al. [31].

The strength of this study lies in the independent development of aerobic limb rehabilitation exercises for HICH patients with hemiplegia, the innovative integration of cognitive intervention with rehabilitation training, and the relatively comprehensive research outcomes. However, the study is limited by its single-center design, small sample size, and short follow-up period. Therefore, future studies should extend the follow-up duration and expand the sample size for further validation.

In conclusion, combining cognitive intervention with aerobic limb rehabilitation exercises can alleviate neurological damage in HICH patients with hemiplegia, enhance muscle strength, promote recovery of limb and motor functions, and improve psychological well-being and quality of life. These findings suggest that this approach is worthy of clinical promotion.

Author contributions: Yimun Zhang was responsible for testing and writing. Wu Yan and Yang Bo are responsible for summarizing the data. Qianwen Lou was responsible for finding relevant literature.

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Comfort nursing intervention prevents incontinence-associated dermatitis in critically ill patients

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Highlights

- Comfort nursing intervention significantly reduced the incidence of incontinence-associated dermatitis in critically ill patients compared to routine nursing.
- The implementation of comfort nursing led to a notable decrease in wound infections and muscle soreness.
- Patient and family satisfaction with nursing care was markedly higher in the comfort nursing group, indicating improved treatment outcomes.
- Comfort nursing offers a comprehensive approach to managing incontinence-associated dermatitis and enhancing patient care in critical care settings.

Abstract

Objective: To evaluate the clinical effect of comfort nursing intervention in preventing incontinent-associated dermatitis (IAD) and related complications in critically ill patients. **Methods:** This study enrolled critically ill patients from the Intensive Care Unit at Ningxiang People's Hospital between June 2020 and June 2024. Patients were randomly assigned to a comfort nursing group (n=51) and a routine nursing group (n=53). The comfort nursing group received comprehensive comfort nursing, while the routine nursing group received standard care. The incidence, classification and area of IAD as well as the incidence of complications and patient / family satisfaction with nursing care, were assessed. **Results:** The incidence of IAD was significantly lower in the comfort nursing group (8 patients) compared to the routine nursing group (21 patients) ($P<0.05$). Additionally, the incidences of wound infection and muscle soreness were notably lower in the comfort nursing group (both $P<0.05$). Patient and family satisfaction in the comfort nursing group was significantly higher than in the routine nursing group (both $P<0.05$). **Conclusion:** Comfort nursing intervention is effective in preventing IAD and reducing associated complications in critically ill patients, thereby improving patient and family satisfaction with treatment.

Keywords: Comfort nursing, incontinence-associated dermatitis, critically ill patients, satisfaction

Introduction

Incontinence-associated dermatitis (IAD) is a form of irritant dermatitis that commonly affects elderly patients with incontinence, where wounds are exposed to urine and feces, particularly following trauma. In severe cases, IAD can result in skin lesions, serious infections, and may even pose life-threatening risks [1, 2]. IAD progresses rapidly, with small skin injuries potentially extending to deeper tissues, includ-

ing muscles and bones [2, 3]. This not only imposes a financial burden on patients but also deteriorates their health, limiting their social interaction and leaving them in pain and reduced independence.

Currently, IAD management primarily focuses on symptomatic treatments, which aim to prevent the progression of dermatitis and address complications such as infections with antibiotics and pain through analgesia [4-6]. However,



symptomatic treatment is reactive and does not prevent the initial suffering caused by IAD, underscoring the need for preventive approaches in clinical practice. Routine nursing may fail to detect patient problems in a timely manner or provide adequate psychological support. In contrast, comfort nursing emphasizes these aspects, focusing on comprehensive care tailored to patient needs, which enhances patient satisfaction both physically and emotionally [7, 8]. Comfort nursing is holistic, personalized, and creative, aiming to help patients achieve the highest possible level of comfort physically, mentally, and socially. Although strengthening skin care has been shown to reduce the incidence of IAD, skin care alone is insufficient for comprehensive prevention [9].

This study compares the clinical efficacy of comfort nursing versus routine nursing in preventing IAD and associated complications in critically ill patients, aiming to provide evidence for the application of comfort nursing interventions in preventing IAD.

Material and methods

General data

A total of 108 critically ill patients admitted to the Intensive Care Unit at Ningxiang People's Hospital between July 2020 and June 2024 were recruited for this study. Patients were randomly assigned using a computer-generated random number method: 54 were placed in the comfort nursing group, and 54 in the routine nursing group. The comfort nursing group received comprehensive care based on the comfort nursing strategy, while the routine nursing group received standard care according to the routine nursing strategy. During the study, 3 patients from the comfort nursing group and 1 from the routine nursing group dropped out for various reasons, resulting in 51 participants in the comfort nursing group and 53 in the routine nursing group.

Inclusion criteria: Critically ill patients with incontinence who were expected to remain bedridden for more than one week and could not be discharged in the short term, aged between 18 and 85, and those who, along with their families, were willing to cooperate with the study.

Exclusion criteria: Patients with severe damage to vital organs such as the heart, lungs, or kidneys, those with severe mental disorders, patients unable to cooperate with the study, those who withdrew from treatment voluntarily, and

those with pre-existing IAD.

The study received unanimous approval from the Medical Ethics Committee of Ningxiang People's Hospital, and all patients or their guardians provided signed informed consent.

Nursing methods

Routine nursing group: Patients in this group received care based on standard hospital procedures and doctor's instructions. Routine preoperative education and postoperative care were provided. After surgery, dressing changes were performed according to medical advice, and family members were instructed to assist patients with turning over using a turnover pad.

Comfort nursing group: (1) Nursing staff were responsible for maintaining cleanliness in the ward, organizing equipment and materials, and ensuring that items were arranged according to treatment protocols. Workbenches were cleaned and disinfected after each treatment session [10]. Additionally, health education was provided through informational animations to improve patient understanding of disease management. (2) Psychological comfort nursing: Patients or their families will be nervous during diagnosis and treatment, which can easily produce psychological obstacles. Therefore, the nursing staff were arranged to actively and enthusiastically communicate with patients and provide nursing for them, and give necessary help to weak elderly patients and patients with mobility difficulties to improve their comfort. During diagnosis and treatment, patients and their families often experience anxiety, leading to psychological distress. To address this, nursing staff were encouraged to communicate actively with patients, provide support to elderly or immobile patients, and build strong nurse-patient relationships. Staff were expected to answer questions patiently, alleviate psychological stress, and offer professional, compassionate care to enhance patients' comfort. By expressing empathy and helping patients build confidence, nursing staff aimed to minimize discomfort during treatment and reduce pain through tailored nursing plans. (3) Informing Patients of treatment results: Nursing staff closely monitored patients' clinical indicators and promptly communicated daily treatment outcomes, including potential adverse reactions, to alleviate concerns. Listening carefully to patients' needs, offering sufficient care, and sharing successful case examples were strategies employed to help patients accept their situation and adjust their mindset positively. (4) Establishing a Strong Nurse-Patient Relationship: Nursing

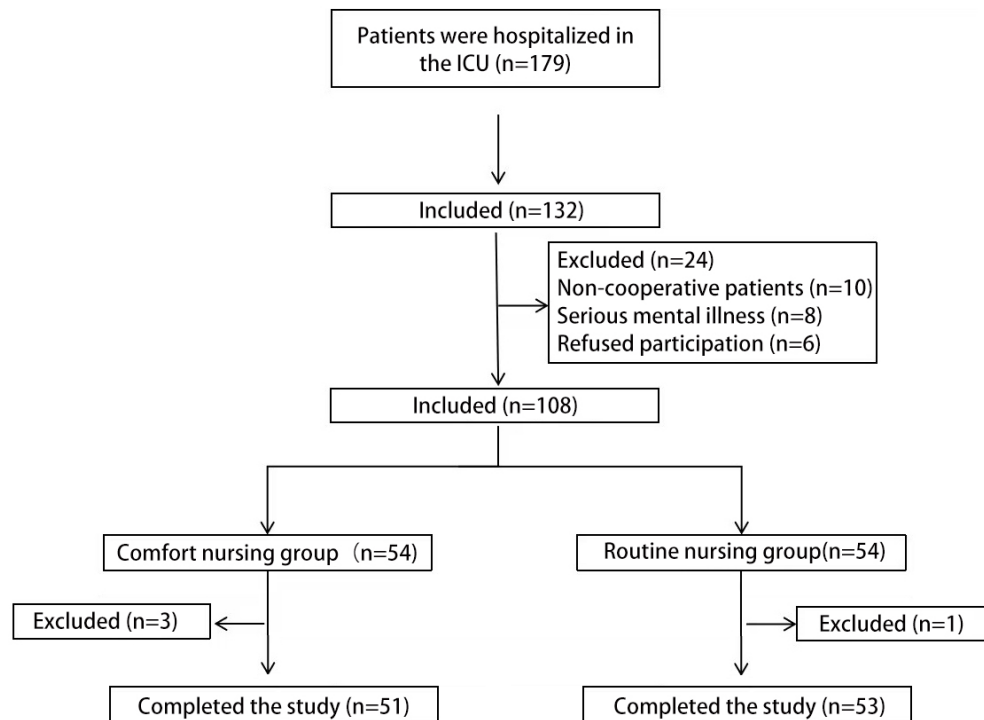


Figure 1. Research flowchart.

staff adhered to a patient-centered approach, employing effective communication skills to prevent patient dissatisfaction. Understanding each patient's personality and providing timely, accurate responses helped ease negative emotions such as anxiety. For patients experiencing post-operative pain or heightened emotional distress, pain management interventions were reinforced. Nursing staff guided patients in relaxation techniques, such as deep breathing and muscle relaxation, to improve compliance and emotional well-being. (5) Skin Care for IAD Prevention: To prevent and manage IAD, skin cleansers with weak acidity that do not require rinsing, along with water-based emollients, were applied. Moisturizing emollients, containing ingredients like glycerin, were used to hydrate the skin. Additionally, skin protectants, such as zinc hydroxide, dimethicone, and petroleum jelly, were applied to create a protective barrier, minimizing skin damage from urine and feces. For patients with IAD, regular treatment included wound care, pain relief with sedatives, and antibiotics for infection control. To reduce pressure on affected areas, patients were frequently repositioned or encouraged to get out of bed.

Outcome measures

The incidence, classification, and extent of IAD, as well as the incidence of complications, and patient / family satisfaction with nursing and

treatment, were evaluated.

Primary outcome measures: We evaluated the incidence of IAD (number of cases with IAD/total number of cases in the group * 100%) within 15 days of hospitalization. The classification of IAD was assessed upon patient admission and then every 3 days. The extent of IAD was classified as: small (<20 cm²), medium (between 20 and 50 cm²), and large (>50 cm²).

Secondary outcome measures: We recorded the number of cases with related complications, including wound infection, muscle soreness, and malnutrition. Additionally, we assessed patient and family satisfaction with nursing care.

IAD was classified into three categories: (1) Class I: Non-pale red local skin over bony prominences, with well-defined borders and non-blanchable redness ; (2) Class II: Superficial ulceration of part of the epidermis, with a red base and no scab, or the presence of intact or ruptured blood-filled blisters; (3) Class III: Full-thickness skin loss, scabbing, or subcutaneous tunneling, without exposure of muscle, tendon, or bone [11, 12].

Satisfaction score: Before discharge, each patient completed a satisfaction survey developed by the hospital. The total score was 100 points, with high satisfaction defined as 90-100

Table 1. Comparison of basic data between the two groups (Mean $\pm$ SD)

	Comfort nursing group	Routine nursing group	t/ χ^2	P
Numbers (n)	51	53		
Age (years)	69.40 $\pm$ 9.40	69.10 $\pm$ 9.00	0.166	0.868
BMI (kg/m ²)	28.13 $\pm$ 5.60	27.78 $\pm$ 5.39	0.366	0.715
Weight (kg)	71.32 $\pm$ 11.41	72.58 $\pm$ 12.09	-0.616	0.539
Gender (n)			0.040	0.843
Male	27	26		
Female	24	25		
Risk assessment (n)			1.062	0.900
No risk	13	15		
Low risk	18	16		
Medium risk	11	12		
High-risk	5	6		
Extremely high risk	4	2		
Disease classification (n)			1.595	0.810
Ischemic cerebrovascular disease	24	26		
Hemorrhagic cerebrovascular disease	15	11		
Spinal cord disease	7	8		
Central nervous system infection	3	5		
Other diseases	2	1		
Combined with underlying diseases (n)			0.403	0.525
Yes	33	36		
No	18	15		
Fasting blood glucose (mmol/L)	7.49 $\pm$ 3.21	7.77 $\pm$ 3.15	-0.506	0.614
Mean blood pressure (mmHg)	84.76 $\pm$ 11.43	82.97 $\pm$ 13.58	0.819	0.414
Hemoglobin (g/L)	10.51 $\pm$ 4.74	10.23 $\pm$ 4.46	0.350	0.727
Malnutrition (n)			0.148	0.701
Yes	18	20		
No	48	46		

Note: SD, standard deviation; BMI, Body Mass Index.

points, moderate satisfaction as 70-89 points, and dissatisfaction as <70 points. Patient / family satisfaction was calculated as: (number of patients / families with high + moderate satisfaction) / total number of patients / families * 100%.

Statistical analysis

Data were analyzed using SPSS 22.0 software. Categorical data were expressed as percentages and compared between groups using the χ^2 test. Continuous data were expressed as mean $\pm$ standard deviation and compared between groups using the independent-samples t-test. A P-value of <0.05 was considered statistically significant.

Results

Comparison of general data

After applying the inclusion and exclusion criteria, 108 out of 179 patients were enrolled in the study. Using a computer-based random number method, 54 patients were assigned to the routine nursing group, and 54 to the com-

fort nursing group. During the study, 3 patients from the comfort nursing group and 1 patient from the routine nursing group dropped out for various reasons. The remaining 53 patients in the routine nursing group and 51 in the comfort nursing group completed the study without any uncontrollable events (**Figure 1**). There were no significant differences in baseline characteristics between the two groups (all $P > 0.05$, **Table 1**).

Comparison of incidence and severity of IAD

Before the intervention, no cases of IAD occurred in either group. After 15 days of hospitalization, 8 cases of IAD were observed in the comfort nursing group, including 5 cases of class I IAD and 3 cases of class II IAD. In contrast, 21 cases were recorded in the routine nursing group, comprising 9 patients with class I IAD, 5 patients with class II IAD, and 7 patients with class III IAD. The incidence of IAD in the comfort nursing group was significantly lower than in the routine nursing group, with a statistically lower severity of IAD in the comfort nursing group ($P = 0.007$, **Table 2**).

Table 2. Comparison of severity of incontinence associated dermatitis between the two groups (n, %)

	Comfort nursing group (n=51)	Routine nursing group (n=53)	χ^2	P
Degree I	5	9		
Degree II	3	5		
Degree III	0	7		
Total	8 (15.69)	21 (39.62)	7.405	0.007

Table 3. Comparison of extent of incontinence associated dermatitis between the two groups (n)

	Comfort nursing group (n=8)	Routine nursing group (n=21)	χ^2	P
Small-size	7	8		
Medium-size	1	6	6.020	0.049
Large-size	0	7		

Table 4. Comparison of complications between the two groups

	Comfort nursing group (n=51)	Routine nursing group (n=53)	χ^2	P
Wound surface infection (n)	0	6		
Muscle soreness (n)	3	10		
Malnutrition (n)	3	6		
Total (n, %)	6 (11.76)	22 (41.51)	11.690	0.001

Table 5. Comparison of treatment satisfaction between the two groups

	Comfort nursing group (n=51)	Routine nursing group (n=53)	χ^2	P
Very satisfied (n)	36	20		
Generally satisfied (n)	11	18		
Dissatisfied (n)	4	15		
Satisfaction (n, %)	47 (83.33)	38 (59.09)	7.286	0.007

Comparison of the extent of IAD

After 15 days of hospitalization, 7 out of the 8 cases in the comfort nursing group had small-size IAD, and 1 case had medium-size IAD. In the routine nursing group, 8 patients had small-size IAD, 6 had medium-size IAD, and 7 had large-size IAD. The comfort nursing group showed significantly smaller extent of IAD compared to the routine nursing group ($P=0.049$, Table 3).

Comparison of complications

The incidences of wound infection and muscle soreness were notably lower in the comfort nursing group compared to the routine nursing group ($P=0.001$, Table 4).

Comparison of satisfaction

Patient and family satisfaction with treatment was significantly higher in the comfort nursing group compared to the routine nursing group ($P=0.007$, Table 5).

Discussion

Critically ill patients in the ICU often remain bedridden for extended periods due to incontinence, making IAD a common issue. IAD not only increases medical resource consumption but also adds to the nursing workload. If left unaddressed, it can lead to further complications [13, 14]. Therefore, nursing strategies that prevent IAD in a timely manner should be prioritized.

IAD is primarily influenced by factors such as the degree of incontinence, friction, pressure, and the patient's skin condition. Among these, pressure is a crucial factor, with its impact determined by both the magnitude and duration of pressure applied to the body [8, 15]. Studies have indicated that a pressure of approximately 5 kPa sustained for 4 hours can cause changes in local skin tissue, and doubling the pressure shortens the time required for tissue damage by half [16, 17]. Comprehensive comfort nursing emphasizes health education and high-quality care, including the assessment of the patient's general condition and timely, effective nursing, which creates favorable conditions for the prevention of IAD [18, 19].

In this study, comfort nursing, which included

actively assisting and encouraging patients to turn over and get out of bed, was shown to significantly reduce both the severity and incidence of IAD. This may be attributed to the comprehensive nature of comfort nursing, which combines psychological support, health education, high-quality care, and nutritional nursing. As a result, patients experience both physical and mental comfort, leading to better therapeutic outcomes [20]. Moreover, as demonstrated by this study, comfort nursing effectively reduces related complications, such as wound infection and muscle soreness, likely due to its holistic approach to both physical and psychological care.

The nutritional status of the skin plays a crucial role in the development and progression of IAD in patients [21]. Nutrition, as a long-term influencing factor, requires targeted nutritional nursing to achieve optimal outcomes. Studies have demonstrated that comprehensive comfort nursing can significantly improve the malnutrition status of long-term hospitalized patients [22, 23]. In some cases, malnutrition in hospitalized patients arises because family members fail to provide adequate care, or nursing staff neglect to guide family members appropriately. This is particularly true for patients with difficulty in food intake; if nurses do not carefully monitor and support their nutritional intake, these patients are at a higher risk of malnutrition. While short-term nutritional care can improve skin conditions to some extent, it is often insufficient to provide the sustained nutritional support required for ideal outcomes [24].

In this study, although there was no significant difference in the rate of malnutrition between the two groups, the number of malnourished patients in the comfort nursing group was lower. This may be attributed to the emphasis on nutritional care in the comfort nursing group, which likely helped reduce the incidence of malnutrition. Additionally, patient and family satisfaction with nursing and treatment in the comfort nursing group was notably higher, possibly due to the significant reduction in complications during hospitalization and the comprehensive nature of comfort nursing. This approach addresses both psychological and physiological factors, incorporating preventive and therapeutic measures that benefit both patients and their families. However, the relatively small sample size and short follow-up period in this study may introduce bias into the results. A prospective study with a larger sample size is needed to confirm these findings.

In conclusion, comfort nursing intervention is effective in preventing IAD in critically ill patients, reducing associated complications, and improving patient and family satisfaction with treatment.

Author contributions: Linlin Zou was responsible for the translation of the manuscript and data statistics. Siting Jiang managed the data analysis and writing of the experimental section. Rong Jiang reviewed and organized the manuscript. Lin Cai conceived the original idea and designed the experiments.

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High-quality nursing intervention improves negative emotions and quality of life in gynecological patients after laparoscopy

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Highlights

- High-quality nursing intervention significantly reduced anxiety and depression levels in gynecological patients after laparoscopy, with the observation group showing lower self-rating anxiety scale and self-rating depression scale scores compared to the control group.
- The observation group reported significantly lower pain scores at 6, 24, 48, and 72 hours post-surgery compared to the control group, indicating effective postoperative pain management.
- The observation group exhibited better quality of life, enhanced self-care abilities, and higher nursing satisfaction compared to the control group, with significant improvements in physical function, mental health, and self-care skills.

Abstract

Objective: To explore the effects of high-quality nursing intervention on negative emotions and quality of life in gynecological patients after laparoscopy. **Methods:** A total of 132 gynecological patients after laparoscopy were randomly divided into an observation group (n=66) and a control group (n=66) in a prospective study. The control group received routine nursing care, while the observation group received high-quality nursing intervention. Anxiety, depression, quality of life, postoperative pain, self-care ability, and patient satisfaction were compared between the two groups. **Results:** The Self-Rating Anxiety Scale and Self-Rating Depression Scale scores were significantly lower in the observation group compared to the control group (both $P<0.001$). Pain scores at 6, 24, 48, and 72 hours post-surgery were also lower in the observation group (all $P<0.001$). The observation group showed significantly higher scores in physical function, general health, social function, emotional role, and mental health (all $P<0.001$). Furthermore, the observation group demonstrated better self-care skills, self-concept, self-care responsibility, and health knowledge (all $P<0.001$). Nursing satisfaction during hospitalization was significantly higher in the observation group than in the control group ($P<0.05$). **Conclusion:** High-quality nursing intervention is effective in improving depression, anxiety, postoperative pain, and quality of life in gynecological patients after laparoscopy. It also enhances self-care ability and patient satisfaction, making it worthy of clinical promotion and application.

Keywords: High-quality nursing intervention, laparoscopy, quality of life, anxiety, depression

Introduction

In recent years, minimally invasive surgery, represented by laparoscopy, has developed rapidly and is widely used in clinical practice, showing good efficacy [1-4]. At present, lap-

aroscopic surgery for gynecological diseases primarily includes hysterectomy, myomectomy, ovarian cystectomy, surgery for ectopic pregnancy, tubal surgery, infertility exploration, and pelvic dissection [5-7]. Although laparoscopic surgery for gynecological diseases offers high



clinical value and is considered relatively safe, it remains an invasive procedure. Postoperative complications such as bleeding, nausea, and other symptoms may occur, negatively affecting patient prognosis and quality of life, and causing psychological distress [8, 9]. Therefore, implementing appropriate nursing interventions to alleviate these negative emotions and improve quality of life is essential for promoting patient recovery. It has been reported that high-quality nursing interventions can reduce perioperative depression and anxiety in patients with thyroid cancer and those with liver metastases after laparoscopic colorectal cancer resection [10, 11]. Comfort nursing for gynecological patients undergoing laparoscopic surgery for ovarian cysts has also been shown to improve comfort and reduce anxiety [12]. However, there is no research on the impact of high-quality nursing on the self-care abilities of gynecological patients after laparoscopy. Therefore, this study aimed to evaluate the effects of high-quality nursing interventions on anxiety, depression, quality of life, postoperative pain, self-care ability, and patient satisfaction in gynecological patients after laparoscopy, providing theoretical guidance for clinical nursing practice.

Materials and methods

General data

This prospective study included 132 gynecological patients who underwent laparoscopy at the First Affiliated Hospital of Baotou Medical College between June 21, 2022, and June 25, 2023. The patients were randomly assigned to either the observation group (n=66) or the control group (n=66). The control group received routine nursing care, while the observation group received high-quality nursing. This study was approved by the medical ethics committee of the First Affiliated Hospital of Baotou Medical College, and all participants provided informed consent.

Inclusion criteria: Gynecological patients requiring laparoscopic surgery; Patients with normal cognitive function; Patients aged over 18 years old.

Exclusion criteria: Patients with severe heart, liver, or kidney disorders; Patients with a history of psychosis; Patients who did not cooperate; Patients with allergic reactions to therapeutic drugs; Patients with incomplete data.

Methods

Routine care was provided to the control group,

which included health education, electrocardiogram monitoring, and close observation of vital signs such as heart rate and blood pressure. Intravenous access was established to provide nutritional support as needed.

The observation group received high-quality nursing, with the following specific measures [12]:

Establishment of nursing team: A high-quality nursing team was established, consisting of one attending physician, one head nurse, two nursing group leaders, and one charge nurse. The team developed a scientific and rational nursing plan, which was used as the basis for unified training for the nursing staff. All team members were required to implement the measures according to the training plan to ensure consistent nursing care.

Preoperative nursing: Preoperative education was provided to inform patients about the surgical process and precautions. Patients were encouraged to ensure adequate sleep and closely monitored for vital signs. Psychological status was assessed, and if anxiety or depressive tendencies were detected, the nursing staff communicated with the patients and their families, sharing successful case examples to boost confidence and ensure a positive attitude toward surgery.

Intraoperative care: During surgery, attention was paid to ensuring the integrity of the periumbilical skin. Heat preservation was maintained, and the nursing staff assisted the surgical team in monitoring the operation time.

Postoperative care: The incision was cleaned promptly, and the staff monitored for any signs of exudation. For patients with severe incision pain, analgesics and oxygen therapy were administered. Patients were instructed in pain relief techniques such as deep nasal breathing. The drainage tube was kept unobstructed, and the color, quantity, and shape of the drainage fluid were observed; any abnormalities were promptly reported to the physician. Early mobilization was encouraged, and family members were instructed to perform clockwise abdominal massage to alleviate abdominal distension. Patients were advised to eat light foods after gastrointestinal function recovery, with increased intake of vegetables and fruits. The nursing staff assisted patients with turning and encouraged them to cough to clear respiratory secretions and prevent pulmonary infections. Postoperatively, patient communication focused on surgical complications, with close at-

Table 1. Comparison of general baseline data between the two groups (n, $\bar{x}\pm s$)

Indicators	Observation group (n=66)	Control group (n=66)	X ² /t	P
Age (years old)	45.50±10.1	47.60±11.9	1.061	1.978
BMI (Kg. m ⁻²)	22.73±2.04	22.50±3.02	0.527	0.603
Reason for surgery (case)			1.987	0.575
Ovarian cyst	23	28		
Uterine leiomyoma	20	15		
Ectopic pregnancy	13	10		
Cervical cancer	10	13		
Education level (case)			3.873	0.144
Illiteracy	10	15		
Less than high school	31	36		
High school or above	25	15		
Complications (case)				
Hypertension	13	18	1.054	0.304
Surgical history	18	25	1.690	0.193
Diabetes	3	4	0.150	0.697
Other internal medical diseases	5	7	0.366	0.544

Note: BMI, Body mass index.

Table 2. Comparison of visual analogue scale scores between the two groups (points, $\bar{x}\pm s$)

Postoperative pain	Observation group (n=66)	Control group (n=66)	t	P
6h	2.32±0.21	2.89±0.13	18.749	<0.001
24h	1.54±0.15	2.61±0.23	31.657	<0.001
48h	1.25±0.20	2.56±0.21	36.698	<0.001
72h	0.78±0.26	1.98±0.20	29.720	<0.001

tention paid to emotional changes. If anxiety or depressive tendencies were observed, targeted psychological interventions were provided immediately.

Aseptic Technique: Strict aseptic procedures were followed, including hand hygiene and adherence to aseptic protocols during invasive procedures.

Outcome measures

Primary outcome measures

The self-rating anxiety scale (SAS) was used to assess the anxiety status of patients. A SAS score ≥ 50 indicates anxiety symptoms; the higher the score, the more severe the anxiety [13].

The self-rating depression scale (SDS) was used to assess the depression status of patients. Mild depression: 53–62 points; moderate depression: 63–72 points; severe depression: ≥ 72 points. The higher the SDS score, the more severe the depression [14].

The medical outcomes study 36 - item short

- form health survey scale was used to evaluate the quality of life of patients. This scale includes five dimensions: physical function, general health, social function, emotional role, and mental health. The maximum score for each dimension is 100, with higher scores indicating better quality of life in the corresponding dimension [15].

Secondary outcome measures

The visual analogue scale was used to assess pain levels. A higher score indicates more severe pain. Patients were asked to mark a point on a 10-point scale, with 0 indicating no pain and 10 indicating the worst pain [16].

The exercise of self-care agency scale was used to assess patients' self-care abilities, including four dimensions: self-care skills, self-concept, self-care responsibility, and health knowledge level. A higher score indicates stronger self-care ability [17].

Patients completed a self-developed satisfaction survey from our hospital to assess nursing satisfaction. Satisfaction scores were catego-

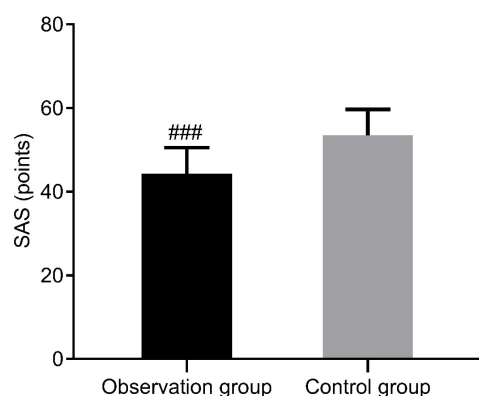


Figure 1. Comparison of SAS scores between the two groups. Compared with control group, ###P<0.001. SAS, self-rating anxiety scale.

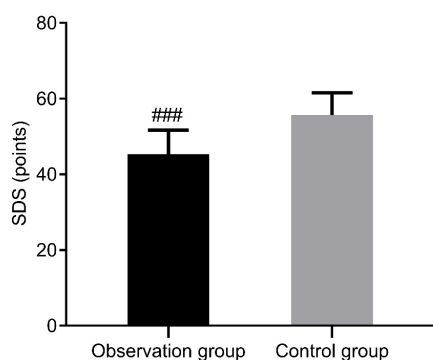


Figure 2. Comparison of SDS scores between the two groups. Compared with control group, ###P<0.001. SDS, self-rating depression scale.

alized as: satisfactory (90–100 points), basically satisfactory (60–89 points), and unsatisfactory (<60 points). Nursing satisfaction= (satisfactory + basically satisfactory) cases/total cases*100%.

Statistical analysis

Data were analyzed using SPSS 20.0. Enumeration data are presented as n (%), and the χ^2 test was used for comparisons. Measurement data with a normal distribution are expressed as mean $\pm$ standard deviation ($\bar{x} \pm s$), with the independent t-test used for group comparisons. Rank sum tests were used for comparisons of ordinal data. For comparisons among multiple time points, one-way analysis of variance (ANOVA) was applied, followed by post-hoc tests for pairwise comparisons. P<0.05 was considered statistically significant.

Results

Comparison of general baseline data between

the two groups

There were no significant differences in age, cause of surgery, education level, or complications between the two groups (all P>0.05), indicating comparability between the groups. As shown in Table 1.

Comparison of anxiety status between the two groups

The SAS score in the observation group was lower than that in the control group with statistically significant difference (all P<0.001). As shown in Figure 1.

Comparison of depression status between the two groups

The SDS score in the observation group was lower than that in the control group with statistically significant difference (all P<0.001). As shown in Figure 2.

Comparison of postoperative pain between the two groups

The pain scores at 6, 24, 48, and 72 hours after surgery were lower in the observation group compared to the control group, with statistically significant differences (all P<0.001). As shown in Table 2.

Comparison of quality of life between the two groups

The observation group scored higher in physical function, general health, social function, emotional role, and mental health dimensions compared to the control group, with statistically significant differences (all P<0.001). As shown in Table 3.

Comparison of self-care ability between the two groups

The observation group scored higher in all dimensions of self-care skills, self-concept, self-care responsibility, and health knowledge compared to the control group, with statistically significant differences (all P<0.001). As shown in Table 4.

Comparison of nursing satisfaction between the two groups

The nursing satisfaction rate during hospitalization was significantly higher in the observation group than in the control group (P<0.05). As shown in Table 5.

Table 3. Comparison of quality of life scores between the two groups (points, $\bar{x}\pm s$)

Quality of life scores	Observation group (n=66)	Control group (n=66)	t	P
Physical function	79.65±9.43	64.54±8.32	9.761	<0.001
General health	92.65±11.21	84.09±12.56	4.131	<0.001
Social function	73.86±10.34	64.29±9.56	5.521	<0.001
Role emotional	63.09±8.98	54.97±6.90	5.825	<0.001
Mental health	68.87±9.43	56.09±6.98	8.850	<0.001

Table 4. Comparison of self-care agency ability scores between the two groups (points, $\bar{x}\pm s$)

Self-care ability scores	Observation group (n=66)	Control group (n=66)	t	P
Self-care skills	39.20±1.89	29.76±2.91	22.102	<0.001
Self-concept	26.76±1.32	22.16±2.23	14.421	<0.001
Self-care responsibility	21.65±2.34	18.65±1.45	8.853	<0.001
Health knowledge level	71.78±2.38	54.58±1.97	45.228	<0.001

Table 5. Comparison of satisfaction with nursing care between the two groups [n (%)]

Group	Satisfactory	Basically satisfactory	Unsatisfactory	Satisfaction
Observation group (n=66)	30 (45.45)	29 (43.94)	7 (10.61)	59 (89.39)
Control group (n=66)	24 (36.36)	24 (36.36)	18 (27.28)	48 (72.73)
U/ χ^2	5.978			5.970
P	0.050			0.014

Discussion

High-quality nursing intervention is based on a patient-centered approach, fully implements the nursing responsibility system, enhances the quality of care, and consequently improves patient and societal satisfaction [18]. Since its introduction into clinical practice, high-quality nursing intervention has been widely applied in the management of severe diseases, postoperative recovery, and chronic conditions, yielding positive outcomes and improving patient prognosis and nursing quality [19-21].

Anxiety and depression can result in symptoms such as increased heart rate, rapid breathing, sleep disturbances, depressed mood, and gastrointestinal issues. In severe cases, they may lead to hallucinations, delusions, and other psychotic symptoms. Studies have shown that gynecological patients undergoing laparoscopic surgery often experience anxiety and depression due to pain and the fear of postoperative complications [22]. Another study suggested that anxiety and depression can exacerbate postoperative pain in patients undergoing gynecological laparoscopic surgery [23]. Li et al. studied 90 patients with ovarian cysts, where the control group received routine care and the observation group received the high-quality care model. The results revealed significantly lower General Comfort Questionnaire and Hospital anxiety and depression scale scores in the observation group compared to the control

group after intervention, concluding that the high-quality care model reduced the likelihood of anxiety [24].

Liu et al. conducted a study on 110 patients with uterine fibroids who underwent laparoscopic myomectomy [25]. The study found that the observation group had better outcomes, including shorter medication time, reduced bed rest, and shorter postoperative hospital stay, while nursing satisfaction and General Comfort Questionnaire scores were higher. The study concluded that high-quality nursing significantly reduced postoperative stress, improved patient satisfaction, and promoted rehabilitation [25]. In the present study, the observation group received the high-quality nursing model. Compared with the control group receiving routine nursing, the SAS and SDS scores of patients in the observation group were lower, indicating that the high-quality nursing model alleviated anxiety and depression. This effect may be attributed to health education on disease knowledge, the necessity of laparoscopic surgery, and postoperative complications, which helped patients actively cooperate with treatment and build confidence. Additionally, attention was paid to patients' emotional well-being postoperatively, with targeted psychological counseling to address anxiety and depression, helping to eliminate negative post-surgery emotions.

Pain is a complex physiological and psychological experience. Prolonged pain can become an unbearable affliction, amplifying negative

emotions and increasing pain perception. Studies, such as that by Zhong et al., have shown that high-quality nursing can effectively alleviate pain in patients with severe intrauterine adhesions after hysteroscopic resection [26]. In this study, the observation group, receiving the high-quality nursing model, had significantly lower pain scores compared to the control group. These results suggest that the high-quality nursing model effectively relieved patient pain, likely due to the reduction of negative emotions, which in turn decreased the perceived pain.

Self-care refers to activities performed by an individual to sustain life, health, and comfort. Studies have shown that high-quality care improves the self-care abilities of patients with chronic diseases and those recovering from surgery [10]. In this study, the observation group received the high-quality nursing model. Compared with the routine nursing model in the control group, the results demonstrated that the self-care ability of the observation group was superior. This suggests that the high-quality nursing model can enhance the self-care abilities of gynecological patients undergoing laparoscopic surgery. The improvement may be attributed to health education, psychological counseling, and other interventions that reduce patients' adverse emotions. These strategies help patients better understand the surgery and prognosis, maintain optimal psychological states, alleviate pain, and ultimately improve their physical well-being and self-care abilities.

Studies have indicated that gynecological patients undergoing laparoscopic surgery are often at risk for complications such as pain, infection, bleeding, bladder and ureteral injury, intestinal obstruction, subcutaneous emphysema, and lower extremity deep venous thrombosis, all of which negatively impact their quality of life [12]. In this study, the observation group, receiving high-quality nursing, exhibited significantly higher quality of life scores across all dimensions compared to the control group. This suggests that the high-quality nursing model can improve the quality of life for gynecological patients undergoing laparoscopic surgery, likely due to the enhancement of patients' self-care abilities.

Finally, this study assessed nursing satisfaction in both groups. The results revealed significantly higher nursing satisfaction in the observation group compared to the control group. This could be attributed to the fact that high-quality nursing interventions reduced pain, anxiety, and depression, improved self-care abilities

and quality of life, enhanced clinical outcomes, and provided a better subjective experience for patients seeking medical care. However, the study had limitations, including a small sample size, a single-center design, and a short follow-up period. Additionally, the study did not evaluate anxiety and depression after discharge or assess the negative emotions of core caregivers. Future studies with larger sample sizes and longer follow-up periods are needed to confirm the feasibility and significance of the high-quality nursing model for gynecological patients following laparoscopy. Further research is also needed to explore the broader application value of high-quality care.

Conclusion

In conclusion, the application of high-quality nursing for gynecological patients after laparoscopy shows positive effects. It can alleviate depression, anxiety, and postoperative pain, improve quality of life, enhance self-care abilities, and increase patient satisfaction. These findings suggest that the high-quality nursing model is worthy of clinical promotion and application.

Author Contributions: Yixuan Tian designed the study, conducted the data analysis, and drafted the manuscript. Chen Zhao contributed to the study design, data collection, and interpretation of the results. Wenxiu Yang assisted with the data collection, statistical analysis, and provided critical revisions to the manuscript. Rong Zhang supervised the study, contributed to the interpretation of the data, and reviewed and edited the manuscript. All authors have read and approved the final manuscript.

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Dynamic nursing quality feedback model improves postoperative rehabilitation and psychological well-being in elderly colon cancer patients

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Highlights

- The dynamic nursing quality feedback model significantly improves psychological flexibility, nutritional status, and self-management abilities in elderly patients undergoing radical resection for colon cancer.
- This precise nursing approach enhances patient satisfaction, promotes awareness of postoperative care, and effectively reduces psychological distress.
- The findings underscore the clinical value of implementing dynamic feedback systems to refine nursing practices and improve rehabilitation outcomes.

Abstract

Objective: To investigate the impact of precise nursing care based on dynamic nursing quality feedback model on the postoperative recovery of elderly patients undergoing radical resection for colon cancer, with a particular focus on its effects on psychological flexibility. **Methods:** Medical records of 124 elderly patients undergoing radical resection for colon cancer at The First Affiliated Hospital of Baotou Medical College between January 2021 and May 2024 were retrospectively analyzed in this study. Based on the received nursing interventions, the patients were divided into a control group (standard nursing care) and an observation group (precise nursing care based on a dynamic nursing quality feedback model). **Results:** The observation group exhibited significantly higher levels of hemoglobin, prealbumin, and albumin compared to the control group. Additionally, the observation group had lower scores in somatization, interpersonal sensitivity, depression, anxiety, obsessions-compulsions, hostility, phobic anxiety, psychoticism, and paranoid ideation. The observation group also demonstrated higher scores in active coping, self-efficacy, and the management of emotions, life, and symptoms. Improvements were also observed in nursing quality, perioperative intervention, satisfaction with rehabilitation guidance, and awareness of regular re-examinations, diet intervention, and complication prevention (all with $P < 0.05$). **Conclusion:** Precise nursing based on a dynamic nursing quality feedback model can improve nutritional status and medical coping style, reduce psychological issues, and enhance self-management abilities in elderly patients following radical resection of colon cancer. Additionally, it increases nursing satisfaction and raises awareness regarding the importance of regular reexaminations and complication prevention.

Keywords: Dynamic nursing quality feedback model, accurate nursing, radical resection of colon cancer in the elderly, nutritional status, psychological flexibility

Introduction

Radical resection of colon cancer is a widely used treatment that enables the removal of lesion tis-

sue, which greatly prolongs patients' life expectancy [1]. The surgical indications are broad, and most patients experience favorable prognosis. However, elderly patients frequently pres-



ent with various underlying diseases and may lack awareness or understanding of surgical procedures and treatment options, which can result in significant psychological fluctuations [2]. Psychological flexibility refers to an individual's ability to adapt to negative life events, such as stress, frustration, and trauma [3]. A study by Wang et al. found that patients with colon cancer had low psychological flexibility scores, and that higher levels of psychological flexibility were positively correlated with better quality of life [4]. Low levels of psychological flexibility can adversely affect the immediate surgical outcomes and postoperative recovery in elderly patients with colon cancer following surgery.

The nursing quality feedback theory is a crucial foundation for refining nursing practices. It provides feedback on issues identified in daily nursing, enabling real-time, dynamic improvements and tailored responses to the patient's age, disease type, and surgical procedures. This approach facilitates the development of a real-time, dynamic, and precise nursing plan, ultimately enhancing the quality of nursing care [5]. Lu et al. demonstrated that applying a dynamic nursing quality feedback model in elderly patients undergoing radical resection for esophageal cancer resulted in significant reductions in the time to first flatus, recovery time for bed mobility, and hospital stay, while also enhancing nursing satisfaction [6]. However, there is a scarcity of research on the impact of this model on postoperative rehabilitation and psychological flexibility in elderly patients who have undergone radical resection for colon cancer [7, 8]. This study aims to analyze the effects of the dynamic nursing quality feedback model on the recovery of elderly patients following radical colon cancer resection.

Materials and methods

Data collection

The clinical data of 124 elderly patients who underwent radical resection of colon cancer at the First Affiliated Hospital of Baotou Medical College between January 2021 and May 2024 were retrospectively analyzed. Patients were divided into an observation group (dynamic nursing quality feedback model with precise nursing, n=62) and a control group (routine nursing, n=62) based on the nursing interventions they received.

Inclusion criteria: 1) patients who met the diagnostic criteria for colon cancer [9]; 2) patients scheduled for radical resection of colon cancer with an expected favorable survival post-sur-

gery; 3) patients aged 60 years or older.

Exclusion criteria: 1) patients with coagulation disorders, mental disorders, or other malignant tumors; 2) patients with articulation disorders, blood disorders, or severe liver and kidney dysfunction; 3) patients with distant metastasis, recurrence, or autoimmune diseases. This study was approved by the First Affiliated Hospital's Ethics Committee of Baotou Medical College.

Intervention methods

Routine nursing care was provided to the control group. Patients' physical status was comprehensively assessed at the admission. Education on colon cancer, including its pathogenesis, clinical manifestations, and surgical plans, was emphasized. Additionally, patients were informed about postoperative rehabilitation and essential precautions to help them gain a thorough understanding of the recovery process, which fostered their cooperation with nursing procedures [10].

Observation group received precise nursing care based on the dynamic care quality feedback model [6]:

Establishing a nursing team: The head nurse, in coordination with hospital leadership, formed a dedicated nursing team. Team members were recruited voluntarily and underwent training to enhance their professional skills. Only those who passed the assessment were deemed qualified to participate in the nursing activities.

Preoperative care: Preoperative care involved more frequent visits than usual. Nurses provided individualized care based on each patient's medical history and condition. The laminar flow operating room was prepared for surgery, with the operating room temperature maintained between 22°C-26°C and humidity controlled at 40.0%-60.0%. All drugs and devices were sterilized prior to surgery. Nurses also reviewed previous nursing practices for elderly colon cancer patients undergoing radical resection, identified areas for improvement, and implemented necessary corrections to enhance nursing quality.

Intraoperative nursing: Nurses positioned the patient on an electric shaker bed, assisted in adjusting body position, and supported the work of the anesthesiologist while ensuring proper protection of the patient's eyes. To prevent potential complications, precautions were taken to avoid skin damage and brachial plexus injury. The patient was positioned with the up-

per leg bent and the lower leg straight, with a soft pillow placed between them to reduce the risk of pressure sores. During the operation, the length of the gastric tube was adjusted according to the surgical needs, and drainage and jejunostomy tubes were properly placed in various body parts such as the neck, abdomen, and chest. The scrub nurse prepared the necessary instruments for the surgery and applied paraffin to lubricate the celiac foramen and surgical devices, minimizing the risk of intercostal nerve injury.

Postoperative care: After recovery from anesthesia, patient's body position was adjusted. Nurses also instructed patients in breathing exercises and initiated dietary interventions, encouraging the intake of nutrient-dense foods to facilitate postoperative recovery. Additionally, patients were guided to perform physical exercises based on their recovery progress. Nursing evaluations were conducted two weeks post-surgery.

Outcome measures

Main outcome measures

Psychological flexibility: Symptom Checklist 90 was used to assess the psychological flexibility of patients, with a total of 90 items divided into 10 categories including somatization, interpersonal sensitivity, depression, anxiety, obsessions-compulsions, hostility, phobic anxiety, psychoticism, paranoid ideation and others. Each item was rated on a 1-5 point scale. Valid questionnaires refer to those in which all 90 items were completed. The total score was summed from each item, and higher score correlated with better psychological flexibility [11, 12].

Medical coping style: The Chinese version of Social Coping Style Questionnaire was used to assess patients' coping styles. The questionnaire consists of 19 items, each scored on a 5-point scale, with scores ranging from 0-3 for each item. The response options were: never, occasionally, sometimes, and frequently. The total score was the sum of all item scores, with a higher score indicating that the patient frequently used the corresponding coping style [13].

Secondary outcome measures

Baseline data: Baseline data, including gender, age, cause of the disease, tumor location, TNM stage, and pathological type, were compared between two groups.

Nutritional status: Nutritional status was compared between the two groups. 3mL of peripheral blood was collected from each patient before nursing and on the next day after 2 weeks of nursing. Hemoglobin, prealbumin, and albumin levels were measured using an automatic biochemical analyzer (Mindray BS-280 automatic biochemical analyzer, Shenzhen Mindray Bio-Medical Electronics, China) after centrifugation.

Self-management level [14-16]: The general self-management questionnaire was administered before nursing and after 2 weeks of nursing to assess self-efficacy and the management of patient's mood, life and symptoms in both groups. The total score was 16 points, with the total score being the sum of all item scores. Higher scores were positively correlated with a better level of self-management.

Satisfaction and awareness rate: After 2 weeks of nursing, patients' satisfaction with nursing quality, perioperative intervention, and rehabilitation guidance was assessed, as well as their awareness of regular reexamination, dietary intervention, and prevention of complications. Satisfaction and awareness rate were evaluated using separate questionnaires, each with a total score of 100 points. A score of ≥ 90 points indicated satisfaction and compliance [17, 18]. The satisfaction rate = the number of satisfied cases / total number of cases * 100%. The awareness rate = number of aware cases / total number of cases * 100%.

Statistical analyses

Statistical analyses were conducted using SPSS 18.0 software. Categorical data were presented as frequencies (n) and percentages (%) and analyzed using the chi-square (χ^2) test. Continuous data were expressed as the mean ($\bar{x}$) $\pm$ standard deviation (sd), and inter-group comparison was conducted using independent t-tests, while intra-group comparison before and after the intervention was conducted using paired t-tests. A P-value < 0.05 was considered statistically significant.

Results

Comparison of baseline data between the two groups

There were no significant differences in gender ($P=0.211$), age ($P=0.917$), course of disease ($P=0.829$), lesion site ($P=0.930$), comorbidities ($P=0.134$), or TNM stages ($P=0.929$) between

Table 1. Comparison of baseline data between two groups (n, %; $\bar{x} \pm sd$)

Index	Observation group (n=62)	Control group (n=62)	χ^2/t	P
Gender			1.562	0.211
Male	35 (56.45)	37 (59.68)		
Female	27 (43.54)	25 (40.32)		
Age (years)	70.8 $\pm$ 5.3	70.9 $\pm$ 5.4	0.104	0.917
Course of disease (months)	4.12 $\pm$ 0.51	4.14 $\pm$ 0.52	0.216	0.829
Location of colon cancer			0.146	0.930
Ascending colon	24 (38.71)	22 (35.48)		
Transverse colon	26 (41.94)	27 (43.54)		
Descending colon	12 (19.35)	13 (20.97)		
TNM stages			0.148	0.929
I	21 (33.87)	19 (30.65)		
II	22 (35.48)	23 (37.10)		
III	19 (30.65)	20 (32.26)		
Pathological type			2.250	0.134
Squamous cell carcinomas	36 (58.06)	38 (61.29)		
Adenocarcinoma	26 (41.94)	24 (38.71)		

Table 2. Comparison of nutritional status between two groups ($\bar{x} \pm sd$)

Groups	Hemoglobin (g/L)	Prealbumin (g/L)	Albumin (g/L)
Observation group (n=62)			
Before nursing	102.59 $\pm$ 8.35	145.68 $\pm$ 8.95	28.74 $\pm$ 3.66
After 2 weeks of nursing	132.59 $\pm$ 13.25 ^{#####}	221.59 $\pm$ 12.16 ^{#####}	39.68 $\pm$ 5.45 ^{#####}
Control group (n=62)			
Before nursing	103.11 $\pm$ 8.47	146.41 $\pm$ 8.99	28.75 $\pm$ 3.67
After 2 weeks of nursing	121.43 $\pm$ 10.58 ^{***}	194.39 $\pm$ 10.34 ^{***}	32.41 $\pm$ 4.36 ^{***}

Note: Compared with that before nursing, ***P<0.001; compared with Control group, ###P<0.001.

the two groups (Table 1).

Comparison of nutritional status between the two groups

There was no significant difference in nutritional status between the two groups before nursing (all P>0.05). After 2 weeks of nursing, the levels of hemoglobin, prealbumin, and albumin were higher in both groups compared to pre-nursing levels. These indicators were significantly higher in the observation group than in the control group after 2 weeks of nursing (all P<0.001) (Table 2).

Comparison of psychological scores between the two groups

Before nursing, the psychological scores did not significantly differ between the two groups across various aspects (all P>0.05). After 2

weeks of nursing, the scores for somatization, depression, anxiety, obsessions-compulsions, hostility, phobic anxiety, interpersonal sensitivity, psychoticism, and paranoid ideation decreased in both groups, with the observation group showing more significant reductions (all P<0.001) (Table 3).

Comparison of coping styles between the two groups

Before nursing, there was no significant difference in coping style scores between the two groups (all P>0.05). After 2 weeks of nursing, both groups showed higher active coping scores and lower avoidance coping and yielding coping scores compared to before nursing. Additionally, the observation group had significantly higher active coping scores and lower avoidance and yielding coping scores than the control group (all P<0.001) (Table 4).

Table 3. Comparison of psychological flexibility between two groups ($\bar{x} \pm sd$, scores)

Index	Observation group (n=62)		Control group (n=62)	
	Before nursing	After 2 weeks of nursing	Before nursing	After 2 weeks of nursing
Somatization	4.06±0.59	1.39±0.42 ^{#####}	4.08±0.62	2.63±0.47 ^{***}
Obsessions-compulsions	3.86±0.41	0.78±0.31 ^{#####}	3.89±0.43	1.84±0.35 ^{***}
Interpersonal sensitivity	4.20±0.59	1.21±0.38 ^{#####}	4.18±0.56	2.69±0.49 ^{***}
Anxiety	4.24±0.63	1.33±0.39 ^{#####}	4.23±0.62	2.83±0.53 ^{***}
Depression	4.41±0.67	0.95±0.38 ^{#####}	4.40±0.65	3.21±0.56 ^{***}
Hostility	4.22±0.59	1.16±0.34 ^{#####}	4.19±0.58	3.04±0.53 ^{***}
Phobic anxiety	3.23±0.41	1.53±0.36 ^{#####}	3.25±0.46	2.31±0.42 ^{***}
Paranoid ideation	3.96±0.64	0.88±0.18 ^{#####}	3.95±0.63	2.25±0.41 ^{***}
Psychoticism	3.75±0.61	0.93±0.17 ^{#####}	3.74±0.62	2.67±0.53 ^{***}
Others	3.91±0.55	1.13±0.26 ^{#####}	3.84±0.57	2.02±0.31 ^{***}

Note: Compared with that before nursing, ^{***}P<0.001; compared with Control group, ^{###}P<0.001.

Table 4. Comparison of coping styles between two groups ($\bar{x} \pm sd$, scores)

Groups	Active coping	Avoiding coping	Yielding coping
Observation group (n=62)			
Before nursing	14.96±3.24	16.33±3.21	13.02±2.16
After 2 weeks of nursing	22.49±4.31 ^{#####}	12.15±2.49 ^{#####}	10.17±0.79 ^{#####}
Control group (n=62)			
Before nursing	15.03±3.26	16.34±3.22	13.05±2.18
After 2 weeks of nursing	17.48±4.15 ^{***}	15.21±3.10 ^{***}	12.21±1.67 ^{***}

Note: Compared with that before nursing, ^{***}P<0.001; compared with Control group, ^{###}P<0.001.

Table 5. Comparison of self-management abilities between two groups ($\bar{x} \pm sd$, scores)

Groups	Emotion management	Symptoms management	Life management	Self-efficacy
Observation group (n=62)				
Before nursing	2.59±0.91	2.35±0.98	2.12±0.85	2.85±0.78
After 2 weeks of nursing	3.24±0.52 ^{#####}	3.51±0.46 ^{#####}	3.42±0.43 ^{#####}	3.37±0.51 ^{#####}
Control group (n=62)				
Before nursing	2.54±0.87	2.41±1.12	2.07±0.83	2.88±0.81
After 2 weeks of nursing	2.97±0.73 ^{***}	3.12±0.58 ^{***}	2.96±0.58 ^{***}	3.11±0.63 ^{***}

Note: Compared with that before nursing, ^{***}P<0.001; compared with Control group, ^{###}P<0.001.

Comparison of self-management scores between the two groups

There was no significant difference in self-management scores between the two groups before nursing (all P>0.05). After 2 weeks of nursing, both groups showed increased scores in self-efficacy and the management of emotions, life, and symptoms, with the observation group demonstrating significantly higher scores than

the control group (all P<0.001) (Table 5).

Comparison of nursing satisfaction rate and awareness rate between the two groups

After 2 weeks of nursing, the observation group demonstrated higher satisfaction rates in nursing quality, perioperative intervention, and rehabilitation guidance compared to the control group (all P<0.05). Similarly, the observation group reported significantly higher awareness

Table 6. Comparison of satisfaction with nursing and awareness rate of reexamination, diet intervention and complications prevention between the two groups (n, %)

Groups	Observation group (n=62)	Control group (n=62)	χ^2	P
Satisfaction rate				
Nursing quality	60 (96.77)	51 (82.26)	6.961	0.008
Perioperative intervention	61 (98.39)	50 (80.65)	10.398	0.001
Rehabilitation guidance	62 (100.00)	49 (79.03)	11.801	0.001
Awareness rate				
Regular reexamination	58 (93.55)	50 (80.65)	4.593	0.032
Diet intervention	59 (95.16)	52 (93.87)	4.211	0.040
Complications prevention	57 (91.94)	49 (79.03)	4.159	0.041

rates regarding regular reexamination, dietary intervention, and prevention of complications compared to the control group (all $P < 0.05$) (Table 6).

Discussion

Colon cancer is a malignant tumor of the digestive tract, characterized by high incidence and mortality rates. Radical resection remains a crucial treatment method, as it can effectively curb disease progression and extend life expectancy. However, surgery may adversely affect patients' psychological flexibility and quality of life. In recent years, the application of precise nursing care based on a dynamic nursing quality feedback model in elderly patients undergoing radical resection for colon cancer has shown significant effectiveness [19, 20].

In this study, after 2 weeks of nursing, the nutritional status indicators—hemoglobin, prealbumin, and albumin levels—in the observation group showed improvement. This suggests that the application of precise nursing based on a dynamic nursing quality feedback model can enhance the postoperative nutritional levels of patients. This improvement is likely due to the real-time monitoring of patients' dietary rehabilitation and ongoing assessment of gastrointestinal function and nutritional intake. Zhu et al. found that in patients with cerebral infarction, those receiving precise nursing care had higher serum albumin levels compared to those receiving routine nursing, a result consistent with our findings [21].

After 2 weeks of nursing, the observation group exhibited significant reductions in scores for somatization, interpersonal sensitivity, depres-

sion, anxiety, obsessions-compulsions, hostility, phobic anxiety, psychoticism, paranoid ideation, and other psychological measures, indicating that precise nursing reduces psychological distress and facilitates patient recovery. The dynamic nursing quality feedback model played a pivotal role by analyzing previous nursing issues in relation to the type of surgery, the varying diseases, and the patients' individual physical conditions [22]. This approach enabled continuous monitoring of patients' psychological states, allowing for timely adjustments to the nursing plan. Additionally, the model fostered better communication with patients, providing a platform for timely feedback, which encouraged proactive identification of potential issues by nurses. As a result, precise nursing not only enhances the overall quality of nursing care but also boosts patient satisfaction with nursing services [23-25].

In this study, the observation group showed improvements in active coping, self-efficacy, emotion management, and the management of life and symptoms, along with increased satisfaction with nursing quality, perioperative intervention, rehabilitation guidance, and greater awareness regarding regular reexamination, dietary intervention, and complication prevention. These findings indicate that the dynamic nursing quality feedback model can significantly enhance patients' self-management abilities, leading to favorable nursing outcomes, consistent with the study by Lu et al. [6].

However, this study also has several limitations. It included a small sample size and had a short observation period, which may impact the generalizability of the results. Furthermore, potential biases could have influenced the outcomes.

To better assess the effectiveness of the dynamic nursing quality feedback model, further research with larger sample sizes and extended study durations is needed.

In summary, the application of precise nursing based on a dynamic nursing quality feedback model for elderly patients undergoing radical resection of colon cancer has demonstrated significant benefits. It effectively reduces psychological distress, improves nutritional status, enhances coping styles and self-management abilities, and increases awareness regarding regular reexamination, dietary intervention, and complication prevention. These outcomes contribute to higher patient satisfaction with nursing care. Given these promising results, this approach holds considerable value for wider application and promotion in clinical practice.

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