The Application of Nursing Risk Management in Enteral Nutrition Support for Patients with Severe Craniocerebral Injury after Surgery

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Abstract: To explore the application of nursing risk management in enteral nutrition support for postoperative patients with severe craniocerebral injuries. Methods:A total of 40 patients with severe craniocerebral injuries treated at the Department of Critical Care Medicine, Qingyun Branch of Chengdu Second People's Hospital in Sichuan Province from January 2023 to December 2024 were selected as subjects. The patients were randomly divided into a control group (20 cases) and an observation group (20 cases). The control group received routine enteral nutrition care during hospitalization, while the observation group received enteral nutrition support under nursing risk management. The effectiveness of enteral nutrition, complication rates, ICU length of stay, and prognosis were compared between the two groups. Results: The observation group demonstrated superior enteral nutrition outcomes ($P<0.05$) and lower complication rates ($P<0.05$) than the control group, with statistically significant differences. ICU length of stay and total hospitalization duration showed marked superiority in the observation group ($P<0.05$), also demonstrating statistical significance. Conclusion: The application of nursing risk management in enteral nutrition support for postoperative patients with severe craniocerebral injuries can improve nutritional status, reduce complication rates, shorten ICU and total hospitalization durations, enhance prognosis, and lower mortality rates.

***Keywords*:** nursing risk management,severe craniocerebral injury,enteral nutrition support

1. Introduction

Severe traumatic brain injury (TBI) refers to severe intracranial hematomas, brainstem damage, or extensive cerebral contusions caused by violent head impacts, accompanied by significant neurological signs and varying degrees of consciousness impairment[1]. Post-traumatic patients exhibit hypermetabolic states with basal metabolic rate (BME) reaching 1.0-2.5 times the resting level[2]. Those with Glasgow Coma Scale (GCS) scores of 3-8 post-surgery show aggravated brain injuries, deeper consciousness impairment, and coma development. Impaired oral feeding leads to increased oxygen demand and malnutrition, resulting in negative nitrogen balance and elevated disability/mortality rates. Early enteral nutrition (ENN) provides essential protein and calories, improves nutritional status, maintains immune function, reduces complications, and accelerates recovery[3]. While EEN support is widely recognized as crucial for TBI patients, studies indicate 50%-80% experience intolerance symptoms like diarrhea, vomiting, gastrointestinal retention, and functional disorders that negatively impact prognosis[4]. Postoperative brain injury patients may face challenges adapting to EEN due to delayed physical adaptation or improper feeding methods. Patients are highly susceptible to feeding intolerance (FI), with an incidence rate ranging from 30.5% to 65.7%[5]. Complications such as diarrhea, vomiting, and indigestion significantly contribute to prolonged hospital stays and increased mortality rates. Properly administered enteral nutrition care can enhance treatment safety while effectively reducing complications associated with nutritional support, thereby alleviating patient suffering. Hospitals should systematically organize, coordinate, and implement risk management strategies to minimize harm and economic losses to patients. This involves conducting professional and procedural risk assessments to identify potential hazards and develop preventive measures. The nursing risk management process in modern care protocols primarily encompasses four aspects: risk identification, assessment, intervention, evaluation, and process optimization with outcome monitoring. Effective application of nursing risk management enhances clinical competence and operational efficiency, improves quality control across all care processes, and effectively mitigates error risks. This study investigates the implementation of nursing risk management in enteral nutrition support for postoperative critically ill patients with traumatic brain injury.

2. Data and methods

2.1 General information

This study enrolled 40 eligible postoperative patients with severe craniocerebral injuries (GCS score ≤9) admitted to

the ICU of Qingyun Branch, Chengdu Second People's Hospital between January 2023 and December 2024. Each group consisted of 20 patients. The comparison of basic clinical data between the two groups met the requirements for clinical research, with no statistically significant differences (P>0.05), as shown in Table 1.

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

Group	Gender (e.g.)		Gender (e.g.)	Surgical approach (e.g.)			GCS grade
	Man	Woman		Evacuation of hematoma	Intracranial decompression	Drainage of the ventricular bore	
Control group; matched group	14	6	62.80 ±17.57	12	4	4	3.60±0.96
Observation group	12	8	57.20 ±15.31	10	6	4	4.10±0.99
x^2 value	0.220		16.000		0.291		2.318
P value	0.639		0.453		0.865		0.314

Inclusion criteria: (1) Patients who were hospitalized with severe craniocerebral injury and underwent surgery within 24 hours after admission; (2) Patients who met the SHI diagnostic criteria in the Guidelines for Diagnosis and Treatment of Neurosurgical Critical Illnesses; (3) Patients with GCS score of 3-8 points after surgery; (4) Patients with successful surgery without serious dangerous conditions during the operation.

Exclusion Criteria: (1) History of various heart diseases or multiple illnesses; (2) Previous history of gastrointestinal bleeding; (3) Coma due to other causes; (4) Preoperative nutritional deficiencies or digestive dysfunction; (5) Immune dysfunction. All patients and their families voluntarily participated in this study and signed informed consent forms. The study was reviewed and approved by the Medical Ethics Committee of Chengdu Second People's Hospital, Sichuan Province.

2.2 Methods

The control group received basic clinical nursing care with enteral nutrition, while the observation group underwent enteral nutrition under nursing risk management. Specific procedures include: (1) Establishing a nursing risk management team: A team leader (nurse supervisor), one specialized nurse with critical care nutrition qualifications, one nutritionist, one critical care nurse with bachelor's degree, and one attending physician participate in the plan. The team develops and conducts professional training for members to create an ideal risk management environment. Standardizes nursing practices within the team, identifies and evaluates nursing issues for timely risk management, and assesses outcomes. (2) Enteral nutrition support evaluation: For postoperative patients with severe head injuries, promptly assess intestinal nutrition status using BMI scores or nutritional risk screening tools. Provide ultra-early enteral nutrition support within 6 hours post-surgery. Customize nutritional formulations, nasogastric feeding volume, and frequency based on individual nutritional status assessments. (3) Enteral nutrition tube management: Before initiating support, confirm gastric tubes or jejunal feeding tubes are properly placed in the stomach with appropriate depth from the nasal wing and securely fixed. Ensure no kinks or twists in tubes. After nasogastric feeding, clean and disinfect tubes promptly, seal openings, and wrap front ends with gauze to maintain single-tube per patient. (4) Enteral nutrition support management: ① Check respiratory and oral hygiene before each nasogastric feeding to remove secretions and minimize infection risks. Prior to nasogastric feeding, aspirate the nasogastric tube to check for gastric retention. If gastric fluid retention exceeds 200ml, suspend nasogastric feeding. ② The total volume of enteral nutrition preparations administered via nasogastric feeding should not exceed 200ml per session, and the interval between two administrations must be at least 2 hours. Elevate the patient's head by 35° during feeding to prevent choking or aspiration. When administering medications and nutritional preparations simultaneously, crush the medication into powder and administer it via nasogastric feeding with warm water. Wait 30 minutes before feeding the nutritional preparation (except for special medications). Maintain the temperature of nutritional preparations during nasogastric feeding at 38℃-40℃. Both excessively high and low temperatures can irritate intestinal mucosa, causing gastrointestinal discomfort in patients and reducing nutrient absorption. During enteral nutrition administration, closely monitor for adverse reactions such as choking or vomiting. ③ After completing nutritional support, perform oral and respiratory examinations again to ensure airway patency. (5) Risk assessment: Monitor for complications like gastric retention, vomiting, or diarrhea. Promptly intervene when significant gastrointestinal reactions occur, such as diarrhea or bloating, to minimize complications. Adjust personalized nutritional support plans based on real-time feedback of individualized nutritional parameters. (6) Identify and immediately address various complications. Evaluate post-nasogastric feeding intestinal motility, assess tolerance to enteral nutrition, digestion patterns, bowel frequency, and stool characteristics through timely feedback.

3. Observational indicators

(1) Nutritional indicators: The nutritional status and therapeutic effects of nutrition were compared between the two groups at 24 hours and 7 days after surgery. Venous blood samples were collected from patients for testing. Serum total protein (TP) and prealbumin (PA) were measured using an automated biochemical analyzer from Beckman Coulter, USA.

(2) Complications and adverse reactions: During the intervention, the occurrence of complications in the two groups was compared and observed and recorded, including the number of diarrhea, vomiting, gastric retention and constipation.

(3) Prognosis: Record the length of hospitalization, ICU length of hospitalization and death during hospitalization of the two groups.

4. Statistical methods

Statistical analysis was conducted using SPSS 27.0.1 software. For quantitative data (including TP and PALB, which met the normal distribution criteria through Shapiro-Wilk tests), the mean was expressed as $\bar{x} \pm s$). Intra-group comparisons were performed using paired t-tests, while intergroup comparisons employed t-tests. Categorical data were presented as counts and percentages, with x^2 tests applied between groups. Statistical significance was defined as $P<0.05$.

5. Compare the postoperative outcomes between the two groups of patients

5.1 Comparison of Nutritional Therapy Effects Between Groups

Before intervention, there was no statistically significant difference in TP and PALB nutritional indexes between the two groups within 24 hours after operation ($P>0.05$). After 7 days of intervention, the above nutritional indicators of the two groups were increased ($P<0.05$), and the observation group was higher than the control group ($P<0.05$). See Table 2. The incidence of complications in the observation group was lower than that in the control group ($P<0.05$), as shown in Table 3. The length of ICU stay and total hospital stay in the observation group were shorter than those in the control group ($P<0.05$). See Table 4. Mortality was reduced during hospitalization, as shown in Table 5.

Table 2. Comparison of nutritional indexes between the two groups ($\bar{x} \pm s$, g/L)

Group	TP				PALB			
	Before the intervention	After the intervention	T value	P value	Before the intervention	After the intervention	T value	P value
Control group (n = 20)	67.00±12.09	53.40±4.16	3.320	<0.001	125.00±148.16	77.80±80.80	5.747	<0.001
Observation group (n=20)	71.80±7.58	69.40±13.32	3.656	<0.001	235.00±110.49	187.10±94.24	5.801	<0.001
T value	-1.063	0.286			-1.887	-3.039		
P value	0.302	0.002			0.075	0.007		

Table 3. Comparison of complications between the two groups [n(%)]

Group	Gastrointestinal complications (cases)			Hospital infection; nosocomial infection; ward infection
	Diarrhoea	Vomit	Astriction;	
Control group; (n=20)	10(50)	11(55)	14(70)	9(45)
Observation group (n=20)	1(5)	0(0)	5(25)	1(5)
x^2 value	10.157	15.172	8.120	8.533
P value	0.001	<0.001	0.004	0.003

Table 4. Comparison of prognosis between the two groups [$\bar{x} \pm s$, n(%)]

Group	ICU Admission time (d)	Total hospital stay (d)
Control Group; (n=20)	15.00±7.46	19.40±9.87
Observation Group (n=20)	4.1±3.21	7.20±4.84
T Value	4.240	3.506
P Value	0.001	0.004

Table 5. Comparison of mortality rates between the two groups during hospitalization [n(%)]

Group	Mortality during hospitalization (cases)
Control group	10(50)
Observation group	1(5)
x^2 value	10.157
P value	0.001

This study showed that under the nursing risk management, the nutritional treatment effects of TP and PALB in the observation group during hospitalization were higher than those in the control group. Enteral nutrition support through nasal feeding is very important for patients with craniocerebral injury after surgery when the body is consumed greatly and the metabolic rate is increased rapidly. This study also showed that the incidence of complications in the observation group was lower than that in the control group, the reduction of gastrointestinal complications, the reduction of diarrhea, the increase of intestinal absorption, and the effect of enteral nutrition support was particularly significant. Based on this good intestinal function maintenance, good nutrient absorption, the body's nutritional status can be improved, and the immune function can be enhanced. The risk of postoperative nosocomial infection can be reduced, so as to reduce the length of hospital stay of patients, provide more timely exercise time for later rehabilitation, allow patients to receive rehabilitation training early, improve the quality of life after rehabilitation, and improve the satisfaction of patients and their families.

6. Conclusion

Nursing level is an important evaluation standard to measure the management ability of a medical institution. So paying attention to nursing risk management is one of the important means to improve the level of nursing. In the nutritional support nursing of patients with severe craniocerebral injury after surgery, team members need to carry out professional training, improve their own nursing level, and actively learn relevant knowledge and theories, so as to implement individualized nursing risk management for individualized patients.

It is believed that nursing staff should first identify nursing risks: systematic risks are carried out through problems such as diarrhea, gastric retention, constipation and potential problems that have not occurred in previous enteral nutrition support for patients with severe craniocerebral loss. To determine the high risk link in nasal feeding for patients, and the high risk factor of complications is to strengthen the quality control. Secondly, nursing risk management evaluation: to evaluate the risk degree caused by insufficient nutritional support and the complications of infection in the observation group. The probability of malnutrition, gastrointestinal adverse reactions, nosocomial infection and various complications in the observation group were analyzed and described. So as to deal with nursing risks and put forward specific improvement measures for specific nutritional nursing risks. A risk plan was made for potential complications and risks.

It is hoped that in the postoperative enteral nutrition support of patients with severe craniocerebral injury, the application of nursing risk management can improve their nutritional status, reduce the incidence of complications, shorten the length of hospital stay, improve the prognosis and reduce the mortality.

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