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Application Research of Health Education Based on Empowerment Theory in Self-Management of Patients with Traumatic Brain Injury

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Abstract: ***Objective**: To observe the application effect of the health education nursing intervention program based on the empowerment theory in the self-management of patients with Traumatic brain injury. **Methods**: 86 patients with Traumatic brain injury admitted to a tertiary hospital in Guangxi from September 2022 to December 2023 were selected as the research subjects. They were divided into the control group and the implementation group according to the different wards they were admitted to, with 43 patients in each group. The patients in the control group received routine care, while the patients in the implementation group received the nursing intervention based on the empowerment theory's health education model in addition to the routine care. The self-management ability scale, anxiety self-rating scale, Traumatic brain injury quality of life scale, and nursing satisfaction scale were used to evaluate the intervention effects of the two groups before and after the intervention. **Results**: After the intervention, the self-management ability and quality of life scores of both groups were higher than those before the intervention, and the implementation group was higher than the control group (P<0.05); the anxiety scores of both groups after the intervention were lower than those before the intervention, and the implementation group was lower than the control group (P<0.05); the nursing satisfaction of both groups after the intervention was higher than that before the intervention, and the implementation group was higher than the control group (P<0.05). **Conclusion**: The health education and nursing intervention program based on empowerment theory can effectively enhance the self-management ability and quality of life of patients with Traumatic brain injury, effectively alleviate their anxiety, and improve the satisfaction of nursing care.*

Keywords: Empowerment theory, Traumatic brain injury, Self-management, Quality of life, Nursing satisfaction.

1. Introduction

Traumatic brain injury (TBI) is a common and critical emergency condition in neurosurgery, and it is one of the more severe injuries in surgical trauma. It is a neurological disorder caused by external force or sudden jolts, resulting in damage to the brain tissue structure or functional disorders. It has the characteristics of rapid onset, poor prognosis, high disability rate, and high mortality rate [1]. The sequelae of brain injury lead to long-term problems such as anxiety, depression, sensory and motor function disorders in patients, which seriously affect the quality of life of patients and bring huge impacts and heavy burdens to families and society [2]. Self-management refers to that patients, under the supervision of professional medical staff, make purposeful and beneficial decisions about their own health. Through dietary management, psychological management, and prevention of complications, their health levels can be well regulated [3]. Therefore, enabling patients to establish an early self-management awareness and stimulating their enthusiasm for self-health management are of great significance for the treatment and care of the disease [4]. This study constructs a health education intervention plan for patients with traumatic brain injury based on the empowerment theory, and evaluates the impact of this plan on the self-management, anxiety, quality of life, and nursing satisfaction of patients with traumatic brain injury. It provides theoretical basis and practical guidance for the application of the empowerment theory in the health education of patients with traumatic brain injury.

2. Materials and Methods

2.1 General Information

This study adopted the purposive sampling method to select a total of 86 patients with traumatic brain injury from the Neurosurgery Ward One and Neurosurgery Ward Two of a tertiary grade A hospital in a certain city of Guangxi from September 2022 to December 2023 as the research subjects. Inclusion criteria: (1) Patients with a clear history of head trauma, diagnosed by cranial CT examination and meeting the diagnostic criteria for traumatic brain injury of the Chinese Medical Association Neurosurgery Department[5]; (2) With a GCS score of 13 to 15, conscious, with no communication barriers, good comprehension ability and able to cooperate; (3) Patients aged 18 years or older; (4) Patients hospitalization duration of 7 days or more; (5) Obtaining informed consent from the research subjects. Exclusion criteria: (1) Patients with a score of ≥ 13 upon admission, experiencing changes in condition during hospitalization, and with a GCS score ≤ 12; (2) Patients with concurrent functional impairments of organs such as the heart, liver, and kidneys; (3) Patients transferred to other departments or hospitals or deceased.

2.2 Intervention Methods

86 patients who were hospitalized in a tertiary hospital and met the inclusion and exclusion criteria were selected. To avoid contamination between the groups, the patients were divided into groups based on the different wards they were

admitted to. The patients in both wards were all patients with traumatic brain injury, and the medical conditions, staff composition, treatment and care methods, and approaches were the same. Among them, 43 patients admitted to the first ward were assigned to the control group, and 43 patients admitted to the second ward were assigned to the intervention group.

2.2.1 Control Group

Routine health education was provided, and health education was conducted face-to-face for the patients and their family members/main caregivers.

2.2.2 Intervention Group

On the basis of routine health education, a health education intervention program based on the empowerment theory was implemented.

(1) Form a health education guidance group based on the empowerment theory

A total of 8 people were formed, including 1 graduate supervisor, 2 ward nurses from the neurosurgery department, 2 nursing experts with over 10 years of clinical experience, 1 master's student, 1 neurosurgeon, and 1 rehabilitation physician.

(2) Implementation of the health education intervention program for patients with traumatic brain injury based on the empowerment theory

1) Intervention form: Mainly individual intervention, combined with the patient's own characteristics and acceptance level, provide health knowledge guidance through targeted explanations, on-site demonstrations, etc. Invite family members or main caregivers to participate, and when necessary, invite fellow patients to participate (peer participation), so as to better enhance the patients' enthusiasm and effectiveness of participation. At the same time, through family group discussions, on-site demonstrations, etc., progress in the entire learning process is carried out step by step, and timely assessment is conducted. 2) Intervention duration: Based on the intervention goals formulated in advance, according to the actual clinical situation investigated, this study designed six empowerment themes, starting from the patient's admission and continuing until the patient's discharge, once a day, each intervention using one-on-one explanation for 15 to 30 minutes. The number and duration of empowerment based on the patient's acceptance ability, physical comfort, and mastery level were appropriately adjusted. The six empowerment themes were carried out in a cycle and repeatedly strengthened. Each theme had 1 to 2 days for patients to study and consolidate, which was determined according to the patient's situation. 3) Intervention personnel: Nursing experts with over 10 years of experience in neurosurgery and who had passed the internal training and assessment, as well as the graduate supervisor themselves, used unified instructions to provide empowerment health education to the patients based on their conditions.

2.3 Outcome Indicators

The main outcome indicator of this study is the patients' self-management ability, and the secondary outcome indicators are the patients' quality of life, anxiety, and nursing satisfaction. The collection time is before the intervention, the day before discharge, and one month after discharge.

2.4 Research Tools

2.4.1 General Information Questionnaire

Designed by the researchers themselves. The purpose of this scale is to understand the basic information of patients, such as marital status, educational level, economic income, and type of brain injury.

2.4.2 Adult Health Self-Management Ability Assessment Scale

This scale was compiled by Professor Zhao Qiuli from Harbin Medical University. It assesses the health self-management ability of adults. The Cronbach's alpha coefficient of this scale is 0.933.

2.4.3 Self-Rating Anxiety Scale

This scale was invented by William W.K. Zung in 1971 as a psychological health indicator. It is a self-assessment by patients of their anxiety status in the past week. The Cronbach's alpha coefficient is 0.931.

2.4.4 Quality of Life Scale for Patients with Brain Injury

This scale was compiled by neurosurgeons from multiple countries such as France and Germany. It aims to measure the relationship between the physical condition, mental condition, and quality of life of patients with brain injury. It can comprehensively evaluate the physiological function, life satisfaction, psychological emotional state, and social function of patients with brain injury. The reliability coefficient of the Chinese version is 0.915 to 0.995.

2.4.5 Nursing Satisfaction Questionnaire

This questionnaire was self-designed by our hospital and is used to assess patients' satisfaction with the nursing staff. The calculation method is (satisfied + moderately satisfied) / total number = satisfaction.

2.5 Data Collection

The research subjects were selected strictly according to the inclusion and exclusion criteria. Before implementing the intervention, a team was established and the team members were trained. During the implementation of the intervention, the intervention was carried out strictly according to the nursing plan, and the head nurse conducted quality control. All data were collected by 2 team members who had undergone unified training. Questionnaires were distributed on-site and collected immediately. The effective questionnaire recovery rate of this study was 100%.

2.6 Statistical Methods

The research data were double-checked for accuracy and SPSS 26.0 software for data analysis and statistics.

(1) Statistical description: Count data are expressed by frequency and percentage; measurement data that conform to normal distribution are described by $\overline{x}$±s, and measurement data that do not conform to normal distribution are described by median and quartiles. (2) Comparison of the balance of demographic data of the two groups before intervention: Count data are tested by chi-square test; measurement data that conform to normal distribution are tested by independent sample t-test, and measurement data that do not conform to normal distribution are tested by Mann-Whitney U rank sum test. Changes in the scores of various outcome indicators before and after intervention are analyzed using repeated measures variance analysis method.

2.7 Ethical Principles

All participants signed informed consent forms. Participants have the right to withdraw from the study at any time, and researchers have the obligation to protect all data of the participants. This study has been approved by ethical review before formal implementation, and the approval number is 2022111116.

3. Results

A total of 86 patients who met the inclusion and exclusion criteria and were admitted to two wards of the Neurosurgery Department of a tertiary hospital in Guangxi from September 2022 to December 2023 were selected. During the study, 2 patients in the control group were lost to follow-up and 1 withdrew due to their own reasons. 2 patients in the intervention group were also lost to follow-up. Eventually, 40 patients in the control group and 41 patients in the intervention group were included, totaling 81 patients.

3.1 Comparison of Demographic Data of Patients with Traumatic Brain Injury Between the Two Groups

A total of 81 patients were included in this study for analysis. There were no statistically significant differences in each item of demographic data between the two groups (P>0.05), indicating that the baseline of the two groups was balanced and comparable. See Table 1 for details.

Table 1: Comparison of demographic data between two groups of patients with traumatic brain injury (n, %)

Project		Control Group (n=40)	Implementation Group (n=41)	*T/F*	*P*
Age		56.40±17.00	53.83±16.34	0.70	0.49
Gender	Male	26(65.00)	30(73.20)	0.79	0.43
	Female	14(35.00)	11(26.80)		
Ethnicity	the Han nationality	6(15.00)	13(31.70)	1.45	0.15
	the Zhuang nationality	34(85.00)	27(65.90)		
	Other	0(0.00)	1(2.40)		
Education level:	Junior high school or below	34(85.00)	35(85.37)	-0.57	0.57
	High school or technical secondary school	5(12.50)	2(4.88)		
	University degree or above	1(2.50)	4(9.75)		
Marital Status	Unmarried	3(7.50)	2(4.90)	0.82	0.42
	Married	19(47.50)	26(63.40)		
	Divorced or Widowed	18(45.00)	13(31.70)		
Religious Belief	Yes	3(7.50)	2(4.90)	0.49	0.62
	No	37(92.50)	39(95.10)		
Monthly Income (RMB)	Below 3000	14(35.00)	14(34.10)	-0.03	0.98
	3000-4999	19(47.50)	20(48.80)		
	5000-9999	7(17.50)	7(17.10)		
Residence	Rural	21(52.50)	36(87.80)	-4.23	0.51
	Town/City	19(47.50)	5(12.20)		
Living status	Alone	21(52.50)	15(36.60)	-1.44	0.15
	Living with others	19(47.50)	26(63.40)		
Payment method	Self-payment	18(45.00)	20(48.78)	0.11	0.91
	Medical insurance / social security	21(52.50)	19(46.34)		
	Commercial insurance	1(2.50)	2(4.88)		
Type of brain injury	contusion and laceration of brain	33(82.50)	29(70.70)	-1.24	0.22
	Subdural hematoma	5(12.50)	8(19.50)		
	Epidural hematoma	2(5.00)	4(9.80)		
GCS score	15 points	28(70.00)	22(53.66)	-1.33	0.19
	14 points	6(15.00)	10 (24.39)		
	13 points	6(15.00)	9 (21.95)		

Table 2: Comparison of scores of self-management ability (scores, $\overline{x}$±s)

Group	Before intervention	One day before discharge	One month after discharge	Time effect *F* value	Inter-group effect F value	Interaction effect F value
Control Group(n=40)	105.65±4.06	114.83±5.07	118.53±5.23	314.763***	90.221***	31.801***
Implementation Group (n=41)	107.46±4.25	128.05±5.54	127.29±7.09			
t	-1.963	-11.200	-6.341			
p	0.053	<0.001	<0.001			

Note: **P < 0.05, ***P < 0.001.

Table 3: Comparison of anxiety scores (scores, ($\overline{x}$± s))

Group	Before intervention	One day before discharge	One month after discharge	Time effect *F* value	Inter-group effect F value	Interaction effect F value
Control Group (n=40)	64.05±3.23	56.90±3.56	53.38±4.10	215.512***	8.381**	5.541**
Implementation Group (n=41)	64.27±3.79	53.54±4.47	50.61±4.60			
t	-0.279	3.740	2.851			
p	0.781	＜0.001	0.006			

Note: **P < 0.05, ***P < 0.001.

Table 4: Comparison of quality of life scores (score, ($\overline{x}$±s))

Group	Before intervention	One day before discharge	One month after discharge	Time effect *F* value	Inter-group effect F value	Interaction effect F value
Control Group (n=40)	87.28±4.96	99.05±5.91	103.15±5.44	303.590***	12.948***	6.185**
Implementation Group (n=41)	88.80±4.81	103.44±8.29	109.39±7.61			
t	-1.409	-2.737	-4.235			
p	0.163	0.008	＜0.001			

Note: **P < 0.05, ***P < 0.001.

Table 5: Nursing Satisfaction (case,(%))

Group	Satisfied	Moderately Satisfied	Dissatisfied	Satisfaction Rate
Control Group (n=40)	30	8	5	88.37%
Implementation Group (n=41)	38	2	3	93.02%
total	68	10	8	90.69%

4. Discussion

4.1 Health Education Based on Empowerment Theory can Enhance the Self-management Ability of Patients with Traumatic Brain Injury

Before the intervention, the self-management ability of patients in both groups was evaluated. The research results showed that the self-management ability of patients with traumatic brain injury was at a medium level, which was consistent with previous studies [6]. The possible reasons might be the lack of knowledge related to the disease, the decline in self-care ability after injury, excessive reliance on family members and medical staff, or failure to adapt to the role of the patient, as well as the fact that the disease often comes with discomfort symptoms such as pain, which makes patients worry about the treatment effect and prognosis, thereby easily generating negative emotions such as anxiety and depression, seriously damaging the patients' confidence in self-management. After the intervention, there were statistically significant differences in the assessment of self-management ability of patients in both groups in terms of time effect, inter-group effect, and interaction (P < 0.05). The possible reason might be that through early empowerment intervention, timely and comprehensive professional information and emotional support were provided to patients, helping them better understand the disease and encouraging them to actively participate in self-health management, thereby enhancing their confidence in self-management [7]. A study [8] indicated that paying attention to patients' early attitude towards their own health management is crucial for cultivating their good self-management behaviors. After the intervention, the self-management ability of patients in both groups showed an upward trend, which indicates that health education can provide patients with disease-related knowledge and other health contents, facilitating them to better conduct health self-management during hospitalization. The intervention plan of the implementation group had a greater advantage in improving patients' self-management ability, which might be because the empowerment intervention enhanced the intrinsic motivation of patients to participate in self-management and gradually strengthened their ability and confidence in self-management. Patients receiving health education based on empowerment theory solved their own health management problems by learning the five steps of empowerment. When facing health management problems again after discharge, they could delve deeper into their existing health problems and actively seek solutions. Thus, based on empowerment theory, health education not only provides patients with disease-related knowledge and psychological counseling and other health contents, but also enables patients to independently explore, discover and solve problems after discharge, thereby more effectively conducting self-health management.

4.2 Health Education Based on Empowerment Theory can Alleviate the Anxiety of Patients with Traumatic Brain Injury

The most common negative emotions among patients with traumatic brain injury are anxiety and depression [9]. The research results show that the anxiety scores of both groups significantly decreased after the intervention, and the decrease in the implementation group was significantly greater than that of the control group (F = 8.381, P < 0.05), which is consistent with the research results of Liu Wenli [10]. Before the intervention, the anxiety scores of patients in both groups were at the moderate anxiety stage. The possible reasons for this might be that patients were not familiar with their own diseases, had uncertainty about the treatment effects of the diseases, and were worried about the prognosis. During hospitalization, the intervention group received empowerment education, and there was an emotional expression session during each intervention, which enabled patients to express their feelings and confusion in a timely manner and receive timely explanations, making patients feel that they were given sufficient attention and care. The buried pain could be expressed to an object, the suppressed emotions were relieved,

and the psychological burden of patients was reduced. At the same time, the five steps of empowerment education were carried out during each intervention, making it easier for patients to identify problems and solve them. Through one-on-one individual interviews with patients to provide psychological counseling, effective measures were taken to alleviate patients' negative emotions, increase emotional efficacy, improve patients' ability to cope with diseases, and reduce patients' dependence on others. The participation of family members strengthened the communication between family members, allowing family members to better understand the feelings of patients and strengthening the support of family affection. The results of this study give us the following enlightenment: Medical staff should pay attention to the psychological changes of patients and, based on the different personalities, psychological states of patients and their actual needs, provide psychological counseling to patients, so that patients can build confidence in defeating the disease, adopt positive coping methods to continue their lives, and achieve the optimal treatment and care effect.

4.3 Health Education Based on Empowerment Theory can Improve the Quality of Life of Patients with Traumatic Brain Injury

The results of this study show that after the intervention, the quality of life scores of both groups were significantly higher than those before the intervention in this group, and the implementation group was higher than the control group at the same period ($F = 12.948$, $P < 0.001$). This indicates that health education guided by the empowerment theory is a way to improve the quality of life of patients [12]. With the continuous advancement of society, the medical model centered on people is gradually becoming widespread, and quality of life has become a key factor in evaluating the treatment effect of patients [11]. Craniocerebral injury is one of the common diseases in neurosurgery, and the incidence is increasing year by year. After craniocerebral injury, symptoms such as dizziness, headache, and deconditioning syndrome occur, which easily cause negative psychology in patients and seriously affect their quality of life [13]. In this study, medical staff guided by the "patient-centered" concept adhered to by the empowerment theory provided patients with professional knowledge, skills and resources, stimulated patients' self-potential, and used the five steps of empowerment at each empowerment time to conduct a comprehensive assessment of patients, clearly identifying the current problems of patients, understanding the needs of patients, and providing targeted repeated health education based on the actual situation of patients, so that patients could master relevant knowledge and skills, have certain coping abilities, be better able to adapt and manage their own health, and improve their health management compliance. The quality of life score of the implementation group was significantly higher than that of the control group, which once again confirmed that the self-management intervention plan formulated in this study is scientific, reasonable and effective, and can significantly improve the quality of life of patients.

4.4 Health Education Based on Empowerment Theory can Enhance Nursing Satisfaction

Nursing satisfaction refers to the degree of patients' satisfaction with the nursing services. Through detailed analysis of satisfaction, the service concept can be deepened and the service quality can be improved [14]. The results of this study show that after the intervention, the nursing satisfaction of the intervention group significantly increased, indicating that the intervention group was more satisfied with the health education guided by the empowerment theory and more recognized the health care method guided by empowerment. The possible reason might be that the health education based on the empowerment theory enables patients to fully exert their subjective initiative in their own health management, discover their own potential, and master their own health management rights. Through the basic principles of the empowerment theory (centering on the patient, enhancing the patient's own initiative, subjective initiative, and stimulating the patient's potential), theoretical knowledge such as the principles of diseases and treatment methods is explained to patients, which can more effectively alleviate the patients' concerns due to the lack of disease cognition, alleviate their anxiety and depression, and enhance their confidence in defeating the disease. Through verbal and non-verbal communication, nurses can perceive the emotional changes of patients and provide positive feedback and nursing interventions from the patient's perspective. Thus, the application of the empowerment theory should focus on the characteristics of patients and continuously strengthen it through the five-step cycle, listen to the patients' voices, and pay attention to enhancing the patients' subjective initiative, enabling patients to establish the concept that they are the first responsible person for their own health, fully recognize the treatment and care of the disease, reduce the impact of negative emotions, promote recovery, and thereby facilitate the improvement of patients' perception of empowerment.

5. Summary

In conclusion, the nursing intervention with health education based on empowerment theory has a certain positive effect on patients with craniocerebral injury. Through this intervention mode, it can effectively improve the self-management ability and quality of life of patients with craniocerebral injury, alleviate anxiety, improve nursing satisfaction, and provide new ideas and methods for clinical nursing. However, this study also has some limitations. Firstly, the sample size is small, and it is limited to a tertiary hospital. The generalizability of the research results may be limited. Secondly, this study mainly relies on self-assessment scales for data collection, which may have subjective bias. Future research should expand the sample size, select patients from different regions and hospitals, and further verify the effect of the empowerment theory. At the same time, using more objective indicators (such as physiological indicators) for assessment will help to comprehensively evaluate the effect of nursing intervention.

Author Contribution Statement

Lin-Yu Huang and Dan-Dan Zeng contributed equally to this work and are co-first authors.

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Competing interests

The authors declare no competing interests.

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