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Original Article

Effect of family-centered nursing based on timing it right framework in patients with acute cerebral infarction

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Abstract: Objective: The purpose of the study was to evaluate the effect of family-centered nursing based on Timing It Right Framework (TIR) on self-management and quality of life in patients with acute cerebral infarction. Methods: According to the rules of randomized control, 100 patients with acute cerebral infarction were divided into two groups, including the control group (n=50) received treatment of routine nursing and follow-up, and the research group (n=50) implemented with a family-centered nursing based on TIR. The changes in self-management ability, mental function, social function, psychological resilience, quality of life, and family nursing ability at discharge and 6 months after discharge were compared between the two groups, and the data of patients' adherence to medication and nursing satisfaction were collected. Results: The overall excellent rate of medication adherence and nursing satisfaction in the research group (96.00%, 98.00%) were significantly higher than those in the control group (80.00%, 78.00%) (P<0.05). The scores of ESCA, CD-RISC, and GQOL-74 in the research group were significantly higher than those in the control group after discharge, while the scores of SDSS, FCTI and NIHSS in the research group were significantly lower than those in the control group (P<0.05). Conclusion: The implementation of the family-centered nursing based on TIR can promote the self-management ability and quality of life, improve psychological resilience, enhance social function and family nursing ability, and improve medication adherence and the nurse-patient relationship in patients with acute cerebral infarction.

Keywords: Acute cerebral infarction, timing it right framework, family-centered nursing, self-management ability, quality of life

Introduction

Acute cerebral infarction refers to the acute injury of brain tissue caused by cerebrovascular obstruction, making it difficult for blood to flow into the brain. Its clinical symptoms are mainly brain dysfunction and neurological symptoms of different degrees, mostly hemiplegia, aphasia, sensory dysfunction, *etc.*, which are not conducive to the quality of life and prognosis of patients [1, 2]. The mortality and disability rate of the disease are relatively high, with the rapid onset and the long treatment cycle, and even cerebral ischemia and hypoxia for 30 seconds will cause cerebral metabolism changes. Thrombolytic therapy is often used clinically, which is helpful to improve cerebral ischemia and hypoxia, prevent the death of brain cells and neurons, and alleviate the condition. However, the recovery time of patients after discharge is relatively long, so a long-term medication treatment is required. Under the influence of factors such as family care ability and lack of knowledge of related diseases, patients have poor self-management ability and low quality of life [3, 4]. Therefore, it is critical to adopt a good nursing plan to improve patients' self-efficacy, family nursing ability and prognosis.

Based on "family-centered nursing", family nursing is an extension of hospital nursing, which can not only improve the relationship between patients, family members and medical staff, strengthen family adaptability and intimacy, but also help connect acute disease treatment

and chronic disease rehabilitation [5]. Timing It Right Framework (TIR) was proposed by Cameron et al. [6] in 2008. As the theoretical basis of continuous nursing, TIR divided the disease into five periods, including diagnosis, stationary, preparation, implementation, and adaptation. The characteristics of the patients' condition in each period were fully mastered considering the needs of emotion, information, evaluation, tools, *etc*., which can help patients adapt to the family and social environment as soon as possible, improve the caregivers' nursing ability and patients' adherence, accelerate the recovery process of patients, and provide research opportunities and theoretical support for the continuous nursing of chronic diseases. At present, TIR has been successfully applied to patients with stroke and acute respiratory distress syndrome abroad with obvious efficacy, but there are few reports on the application of TIR in China [7]. This study applied TIR to the family-centered nursing, and explored the effect of family-centered nursing on the self-management ability and quality of life in patients with acute cerebral infarction, so as to provide reasonable support for the development of clinical nursing work.

Materials and methods

Clinical material

A total of 100 patients with acute cerebral infarction, including 67 males and 33 females, who were admitted to our hospital from June 2017 to October 2019 were included in this research. The patients aged 39-75 years, with the average age of 59.6±5.7 years. Patients were divided into a control group (n=50) received treatment of routine nursing and follow-up, and a research group (n=50) implemented with a family-centered nursing based on TIR. Inclusion criteria: patients who were 75 years old or below; patients who met the relevant diagnostic criteria in the "Expert Consensus of Chinese and Western Medicine Emergency Treatment for Acute Ischemic stroke in China" [8], and were diagnosed by imaging (MRI, CT, *etc*.); patients who had onset for the first time, with a score of 3-13 on the Glasgow Coma Scale (GCS); the caregivers' daily care time was four hours or more, and the distance from the patients' residence was 4 km or less; the caregivers were healthy. This research has been approved by the Medical Ethics Committee of Ganzhou People's Hospital. The family members of the patients signed the informed consent. Exclusion criteria: patients with systemic infection, systemic organ failure and malignant tumors; patients who lost self-care ability before disease onset; patients with mental illness history; patients with other types of cerebrovascular diseases, such as brain atrophy, intracranial tumors, *etc*.; patients who had vicious stressful events such as accidental injury, widowhood, divorce, *etc*. at 6 months before enrollment; patients who were taken care of by paid staff such as nannies and volunteers after discharge; and patients who chose professional institutions for follow-up treatment and rehabilitation.

Methods

(1) The control group received routine nursing and follow-up. According to the general requirements, during the first three periods of hospital rehabilitation, the primary nurses provided daily nursing, health education, perioperative treatment and postoperative rehabilitation guidance, *etc*.; the patients were followed up by telephone after discharge with a frequency of about once every two weeks, and the family nursing methods and medication regimens were adjusted according to the changes of the patients' condition.

(2) The treatment of the research group was as follows. (i) A family nursing team was established, including an attending physician and a professor of nursing who had working experience of more than 20 years and experience of scientific research at or above the municipal level, two nurses in department of cardiology who had more than 5 years of working experience, a community nurse who had more than 2 years of working experience in community, and a graduate student in the field of cerebrovascular disease who had a master degree or above and clinical and scientific research experience. Led by the attending physician and the professor of nursing, the team members learned the related content of TIR and the family-centered nursing as well as the instructional language. On the basis of the literature review, the team took TIR as the framework and combined with the clinical characteristics of the disease and the actual condition of the patient to compile

the Acute Cerebral Infarction Care and Family Health Education Manual, which covered medication guidance, disease knowledge, rehabilitation guidance and life care. (ii) An intervention plan was developed. a. The diagnosis period. The team maintained friendly communication with patients and their families and provided them with mental and emotional support; the team comforted patients and their family members, and guided them in the correct way to vent their negative emotions; using pamphlets, pictures, health manuals, *etc*., the team informed patients of the triggers, causes, treatment methods, time to pay attention and the importance of nursing of the illness; the team explained nursing skills to the patients' family, including dietary requirements, bed rest, precautions for the use of bedside equipment, and taking medication on time as directed by the doctor. b. Stationary period. The team informed patients and family members of surgical information, such as preoperative preparations, surgical risks, perioperative precautions, postoperative complications, *etc*.; the team used bedside explanations and demonstrations to guide patients on post-operative posture, diet and drinking requirements, the observation points of the condition and basic bedside nursing precautions such as passive activities, turning over and excretion; the team used pamphlets, videos, *etc*. to demonstrate postoperative rehabilitation content at the bedside, such as bed time, postoperative limb movements, and duration, intensity and methods of postoperative exercises. c. Preparation period. The team emphasized the importance and timing of follow-up visits, and informed the medication guidance, side effects observation and treatment methods of the medication; the team affirmed the caregivers' contribution, gave them emotional support and help; the team explained the concept of family-centered nursing and proposed a rehabilitation plan after discharge, including methods and principles of family exercise, cardiac recovery process, precautions, and solutions for adverse events. d. Adjustment period. The team carried out active nursing guidance and family follow-up, and patiently answered patients and their families' health problems through telephone follow-ups, family visits, expert consultation hotlines, *etc*.; with a combination of demonstrations and literal explanations, the team informed patients of home nursing knowledge such as quitting smoking and drinking, establishing a good lifestyle, and how to help themselves during the disease; the team created a WeChat platform to encourage patients and their families to join in, with dedicated personnel to answer questions online and regularly pushed related health tips. e. Adaptation period (at 3-6 months after onset). The team explained the importance of medication, exercise, emotional regulation, diet, *etc*. to prevent diseases in conjunction with the health manual; the team helped patients and caregivers adjust the pace of life and work, and prompted them to return to society quickly; the team organized patient associations to encourage patients to communicate with each other and share experiences. (iii) The intervention methods were implemented. After the patients admitted to the hospital, the team issued the Acute Cerebral Infarction Care and Family Health Education Manual to the families and carried out health education to the patients and families based on the contents of the manual, and corrected incorrect nursing methods. The intervention sites were in the hospital and in the family. The hospital intervention included the diagnosis period, the stable period, and the preparation period. Two cardiology nurses intervened through bedside guidance and demonstration, and face-to-face teaching; family intervention included the adjustment period and the adaptation period. A nurse and a community nurse provided guidance through telephone follow-up and home visits. The frequency of follow-up was as follows: in the first month of each period, home visits were held every 2 weeks, and telephone visits were held once a week; a home visit and a telephone follow-up were held every 2 weeks in the second month; a telephone follow-up was held in the third month and thereafter.

Observation indicators

(1) Medication adherence. Morisky Medication Adherence Scale was used to score the medication adherence of patients at 6 months after discharge. The scale has a total score of 8 points, of which less than 6 points is considered as poor adherence, 6-7 points as good adherence, and 8 points as excellent adherence. The total excellent and good rate = excellent + good.

(2) Self-management ability and neurologic function. The team evaluated the self-management ability of patients before and at 6 months

after discharge from the five dimensions of self-nursing responsibility, health knowledge, self-nursing ability, self-concept, and self-nursing skills with the Exercise of Self-Care A-gency Scale (ESCA) [9]. Each item has a score of 0-4 points with a full score of 172 points, which were positively correlated with the self-management ability. The NIH Stroke Scale (NIHSS) was also used to evaluate patients' neurological function from 11 items including consciousness, gaze, facial paralysis, language, and ataxia, with a score of 0-42 points. The degree of neurological deficit was positively correlated with the score.

(3) Social function and psychological resilience. The Social Disability Screening Schedule (SDSS) [10] and the Connor-Davidson Resilience Scale (CD-RISC) were used to evaluate the social function and psychological resilience of patients before and at 6 months after discharge. The SDSS scale included 5 items of responsibility and planning, degree of interest, personal life, family activities and social activities with a score of 0-2 points each, and social function was negatively correlated with the score; CD-RISC involved optimism, self-improvement, and tenacity, with 25 items in 3 dimensions. Each item adopted Likter scale of 5 grades, with a total score of 100. The psychological resilience was positively correlated with the score.

(4) Quality of life. The Generic Quality of Life Inventory-74 (GQOL-74) [11] was used to evaluate the patients' quality of life before discharge and at 6 months after discharge, which involved 4 dimensions of mental function, physical function, social function, and material function with a score of 100. The quality of life was positively correlated with the score.

(5) The nursing ability of family caregivers. The Chinese version of Family Caregiver Task Inventory (FCTI) was used to evaluate the ability of the family caregivers before and at 6 months after discharge from the five aspects of responding and providing assistance, adapting to caregiving roles, handling personal emotions, evaluating family and community resources, and adjusting life to meet nursing needs, which included 25 items in total with Likter scale of 3 grades in each item. The nursing ability was negatively correlated with the score.

(6) Nursing satisfaction. The self-developed questionnaires of our hospital were distributed to patients to investigate nursing satisfaction in terms of nursing attitude, nursing skills, health education and other aspects, which included great satisfaction, general satisfaction and dissatisfaction.

Statistical analysis

The statistical analysis of data was processed by SPSS 23.0. If the data conformed to the normal distribution, the counting data were expressed as $\bar{x} \pm sd$. The independent t and paired sample t tests were used for inter-group comparisons and intra-group comparisons. Count data were expressed as percentage, and χ^2 test was adopted. $P<0.05$ was considered as statistically significant.

Result

General material

There was no statistically significant difference in gender, age, time from onset to admission, body mass index, infarct size, educational background, and family roles between the research group and the control group ($P>0.05$), which was comparable (**Table 1**).

Medication adherence

The excellent and good rate of medication adherence in the research group (96.00%) was higher than that in the control group (80.00%), and the difference was statistically significant ($P<0.05$), indicating that the family-centered nursing based on TIR could improve medication adherence in patients with acute cerebral infarction (**Table 2**).

Self-management ability and neurologic function

The scores of ESCA and NIHSS showed no significant difference between the two groups before discharge ($P>0.05$). After discharge, the ESCA score of the research group was higher than that of the control group, and the NIHSS score of the research group was lower than that of the control group, exhibiting statistically significant difference ($P<0.05$). The above results showed that the family-centered nursing based on TIR could help improve the self-management ability and reduce the degree of neurological

Table 1. Comparison of general data of the two groups (n/$\bar{x}$ ± Sd)

General data		Control group (n=50)	Research group (n=50)
Gender (Male/female)		35/15	32/18
Age (years)		60.5±4.2	59.9±5.1
Time from onset to admission (h)		3.54±0.74	3.98±0.81
Infarct size (cm^2)		32.68±4.51	33.31±3.09
BMI (kg/m^2)		22.16±2.06	22.67±2.17
Educational background	junior high school and below/high school and technical secondary school/junior college and above	25/17/8	37/16/6
Family role	spouse/children/other	28/17/5	32/15/3

Table 2. Comparison of medication adherence between the two groups n (%)

Medication adherence	Control group (n=50)	Research group (n=50)
Excellent	19 (38.00)	25 (50.00)
Good	21 (42.00)	23 (46.00)
Poor	10 (20.00)	2 (4.00)
The excellent and good rate	40 (80.00)	48 (96.00)#

Note: Compared with the control group, #*P*<0.05.

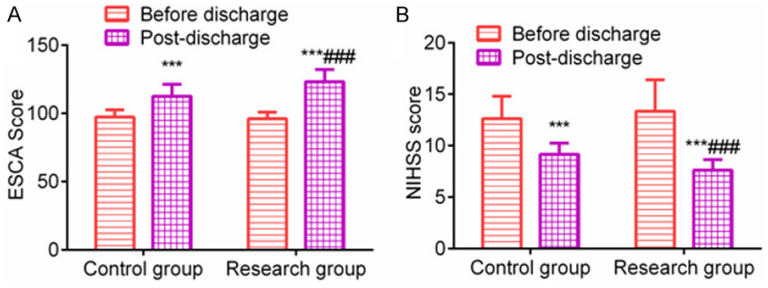

Figure 1. Comparison of ESCA score and NIHSS score between the two groups (points). Note: A: ESCA score; B: NIHSS score. Compared with the same group before discharge, ***P<0.001; Compared with the control group, ###P<0.001.

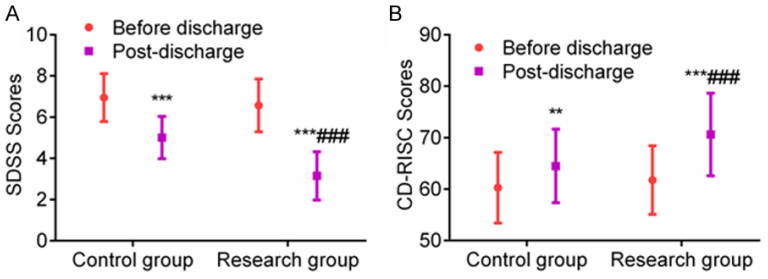

Figure 2. Comparison of SDSS score and CD-RISC score between the two groups (points). Note: A: SDSS score; B: CD-RISC score. Compared with the same group before discharge, **P<0.01, and ***P<0.001; Compared with the control group, ###P<0.001.

deficit of patients with acute cerebral infarction (**Figure 1**).

Social function and psychological resilience

The scores of SDSS and CD-RISC exhibited no significant difference between the two groups before discharge (P>0.05). After discharge, the SDSS score of the research group was lower than that of the control group, and the CD-RISC score of the research group was higher than that of the control group, showing statistically significant difference (P<0.05). It was found that the family-centered nursing based on TIR could help improve the social function and psychological resilience of patients with acute cerebral infarction (**Figure 2**).

Quality of life

There was no statistically significant difference in the scores of each dimension of GQOL-74 between the two groups before discharge (P> 0.05). After discharge, the scores of mental function, physical function, material function and social function in GQOL-74 of the research group were all higher than those of the control group,

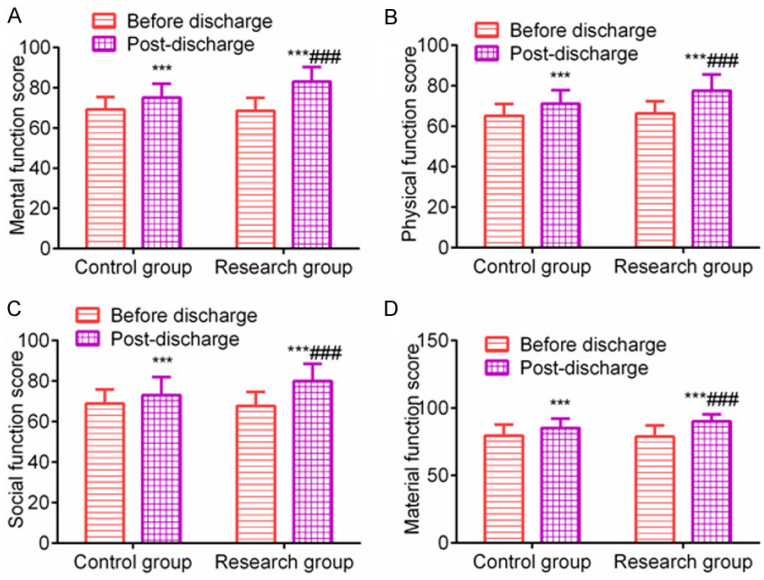

Figure 3. Comparison of GQOL-74 scores between the two groups (points). Note: A: Mental function score; B: Physical function score; C: Social function score; D: Material function score. Compared with the same group before discharge, $^{***}P<0.001$; Compared with the control group, $^{\#\#\#}P<0.001$.

showing statistically significant difference ($P<0.05$). It indicated that the family-centered nursing based on TIR could help improve the quality of life of patients with acute cerebral infarction (**Figure 3**).

Family nursing ability

The scores of each dimension of the FCTI had no statistically significance difference between the two groups before discharge ($P>0.05$). After discharge, the scores of each dimension of the FCTI in the research group were lower than those in the control group, exhibiting statistically significant difference ($P<0.05$). It showed that the family-centered nursing based on TIR could improve the family nursing ability of patients with acute cerebral infarction (**Table 3**).

Nursing satisfaction

The nursing satisfaction of the research group (98.00%) was higher than that of the control group (78.00%), showing statistically significant difference ($P<0.05$). The results indicated that the family-centered nursing based on TIR could not only improve the nursing satisfaction of patients with acute cerebral infarction, but also improve the nurse-patient relationship (**Table 4**).

Discussion

The course and the recovery time of cerebral infarction are relatively long, and most patients regard the community as the first choice for follow-up rehabilitation after discharge from the hospital, which requires the participation of the family members. However, the lack of relevant nursing knowledge and the neglect of their own health care can easily lead to long-term emotional disorders, and decrease of self-management ability and quality of life of patients and caregivers [12, 13]. TIR collects the emotional needs, information, evaluation methods and tools of patients at various periods, and formulates targeted hospital and discharge nursing measures according to the dynamic changes in the needs of patients and caregivers in different periods, so as to avoid interruption of professional guidance after discharge, accelerate the recovery process of patients, and improve their quality of life [14, 15].

The family-centered nursing based on TIR involves five periods, including diagnosis period, stable period, preparation period, implementation period, and adaptation period. The purpose and focus of the intervention is to establish a good nurse-patient relationship, lay the foundation for operation and postoperative recovery, strengthen family and emotional support, and turn to social support [11, 16, 17]. In this study, the research group had higher medication adherence, ESCA score, CD-RISC score, GQOL-74 score, and nursing satisfaction, but lower NIHSS score and SDSS score than the control group. It indicated that the family-centered nursing based on TIR had high feasibility for patients with acute cerebral infarction, which could promote the medication adherence, improve self-management ability and quality of life, improve psychological resilience and social function, and promote the doctor-patient relationship. According to the analysis, the family-centered nursing based on TIR is

Table 3. Comparison of FCTI scores of the two groups ($\bar{x}$ ± Sd, points)

FCTI scores		Control group (n=50)	Research group (n=50)
Respond and provide assistance	Before discharge	2.71±0.57	2.85±0.61
	Post-discharge	2.41±0.45**	1.84±0.37###,***
Adapt to the role of nursing	Before discharge	3.15±0.94	3.32±0.86
	Post-discharge	2.86±0.64*	2.03±0.57##,***
Handle personal emotions	Before discharge	3.06±0.85	3.11±0.86
	Post-discharge	2.55±0.67***	2.01±0.49###,***
Evaluate family and community resources	Before discharge	3.01±0.88	2.96±0.86
	Post-discharge	2.57±0.64***	1.95±0.43###,***
Adjust life to meet the nursing needs	Before discharge	2.99±0.75	2.95±0.81
	Post-discharge	2.16±0.68***	1.48±0.56###,***

Note: Compared with the same group before discharge, *P<0.05, **P<0.01, ***P<0.001; Compared with the control group, ##P<0.01, ###P<0.001.

Table 4. Comparison of nursing satisfaction of the two groups [n (%)]

Nursing satisfaction	Control group (n=50)	Research group (n=50)
Great satisfaction	15 (30.00)	26 (52.00)
General satisfaction	24 (48.00)	23 (46.00)
Dissatisfaction	11 (22.00)	1 (2.00)
Total satisfaction	39 (78.00)	49 (98.00)#

Note: Compared with the control group, #P<0.05.

mainly divided into two parts: hospital nursing and family nursing. The hospital intervention includes the diagnosis period, the stable period, and the preparation period and is carried out by bedside guidance and demonstration, and face-to-face lectures. Among them, the implementation of cognitive guidance with the participation of patients and their families could carry out purposeful and planned knowledge education and management for patients and their families, which could effectively stimulate their sense of responsibility, enhance the knowledge and skills of understanding and problem-solving, arouse patients' motivation and willpower, promote the transformation of the nursing process from passive to active, and actively establish spontaneous behavior and healthy behaviors, thereby ensuring the smooth implementation of nursing work [18]. Besides, health education can not only enable patients and their families to pay attention to the disease, fully motivate the enthusiasm of family members and enhance their nursing ability, but also enable patients to fully feel the power of family affection during the nursing process, thereby enhancing their compliance. In addition, periodic health education can help patients master the skills of self-nursing, prompt patients to get rid of and release unhealthy mental states such as anxiety, uncertainty and fear about disease, improve psychological resilience, emotional cognition, and daily management of the disease, *etc*., and then promote their health function [19]. Family intervention includes the periods of adjustment and adaptation, which is mainly based on follow-up. It emphasizes the important role of the family in the process of disease recovery, which can fully motivate the enthusiasm of family members for learning and nursing, and enhance family intimacy and adaptability. Through correct guidance, it can promote a virtuous interaction cycle between patients, family members, and medical staff, and avoid adverse events caused by the inability to obtain professional guidance after discharge. Regular telephone follow-ups and home visits can help medical staff dynamically track the progress and recovery status of patients, promptly answer the health problems of patients and their families in different periods, and provide targeted advice based on feedback information, which can provide patients with continuous nursing services [20, 21]. The establishment of the WeChat platform can convey and exchange information in a timely manner, enhance the communication and interaction between patients and medical staff, alleviate the relationship between doctors and patients, and integrate medical services into the lives of patients to improve work efficiency. In addi-

tion, measures such as emotional support, helping patients balance their life and work, organizing patient associations, and seeking professional assistance can help patients obtain family support and social support, cultivate the correct treatment mentality, and prompt them to quickly return to society [22].

Due to doubts about self-care ability, worries about the patients' condition, and lack of professional disease and nursing knowledge, caregivers are difficult to adapt to their own roles, and unable to take care of patients for a long time, affecting the quality of rehabilitation nursing. Therefore, it is particularly important to actively enlighten caregivers' psychological emotions and scientifically guide their nursing skills [23]. In this research, the scores of all dimensions of the FCTI in the research group after discharge were lower than those in the control group, similar to the results of Xu et al. [24], which further indicated that the family-centered nursing based on TIR could improve the caregivers' nursing ability for patients with acute cerebral infarction. The reason may be that based on the TIR, the patients and family members can be tailored to formulate intervention plans for different periods. It not only explains relevant health knowledge for caregivers and gives guidance of their nursing skills, but also guides them to vent negative emotions correctly, enhance interpersonal communication, and adjust the pace of life, which is helpful for caregivers to maintain mental health and reduce physical burden.

This study applies the family-centered nursing based on TIR, and explores the impact of this model on the self-management ability and quality of life of patients with acute cerebral infarction. The results showed that this nursing model could promote the self-management ability and quality of life, improve the mental elasticity, enhance social function and family care ability, improve medication compliance, enhance patient-care relationship, and provide reasonable theoretical support for the development of clinical nursing work, which is of high innovation.

This study has certain shortcomings such as small sample size. The randomness of the grouping was guaranteed in order to ensure the accuracy of the study. In the observation of the indicators, all the scale tests were carried out and evaluated by professionally trained nurses. In the next study, the sample size will be increased to further verify the research results.

In summary, the implementation of the family-centered nursing based on TIR for patients with acute cerebral infarction can promote their self-management ability and quality of life, improve psychological resilience, enhance social function and family nursing ability, and improve medication adherence and nurse-patient relationship.

Disclosure of conflict of interest

None.

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