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Original Article

The combinative effects of orem self-care theory and PDCA nursing on cognitive function, neurological function and daily living ability in acute stroke

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Abstract: Objective: The combined effects of Orem Self-care Theory and PDCA nursing on cognitive function, neurological function and daily living ability of patients with acute stroke were analyzed in this research. Methods: 126 patients, who admitted to our hospital with acute stroke from January 2019 to March 2020, were enrolled in this study as research subjects. The subjects were divided into control-group (n=61) and observation-group (n=65) in accordance with their admission time. The control-group received routine nursing care; and the observation-group, was applied with the combined nursing interventions of Orem's self-care mode and PDCA nursing management in addition to conventional treatment. Subsequently, the changes in daily living ability (ADL score), neurological function (GCS score, NIHSS score) and cognitive function (MoCA and MMSE scores) of the two groups before and after receiving nursing care were compared accordingly. Results: After the implementation of nursing measures, the ADL scores of the two groups improved dramatically than before (*P<0.05*), and observation-group had obviously higher post-intervention scores than that of the control-group (*P<0.05*); The GCS scores of the two groups were remarkably higher than those before nursing (*P<0.05*), and the observation-group had critically higher post-intervention scores than those of the control-group (*P<0.05*); The NIHSS scores of the two groups decreased substantially than before (*P<0.05*), and the observation-group had dramatically lower scores than the control-group (*P<0.05*); The MMSE score in two groups increased remarkably than before nursing (*P<0.05*), and the post-intervention score of observation-group was significantly higher than that of control-group (*P<0.05*). Conclusion: On the basis of Orem Self-care theory, the application of PDCA nursing in daily nursing work to acute stroke patients can actively improve their cognitive function, neurological function and daily life ability. This has a positive role in promoting medical staff to improve the quality of care and provide patients with more comprehensive and thoughtful nursing services.

Keywords: Orem's self-care theory, PDCA nursing, acute stroke

Introduction

Acute stroke is a common clinical cerebrovascular disease, which has high mortality and disability rates that pose serious threat to life safety [1]. The continuing advancement of modern medical techniques has made great progresses in clinical treatment of acute stroke, and the mortality rate has been substantially reduced. While after treatment, patients usually suffer from impairments in cognitive function, neurological function and daily living ability, which result in a decline in their quality of life. Therefore, it has become the focus of clinical research to promote the recovery of cognitive function, neurological function and activities of daily living [2, 3]. Dorothea E. Orem, the famous American nursing theorist, publicly elaborated Orem Self-care Theory for the first time in 1st edition of *The Concept of Nursing Practice* in 1971 [4]. According to this, nursing care helps to prevent the development of self-care defects, and provide therapeutic self-care for those with self-care defects [5, 6]. Orem Self-care Theory divides the nursing system into complete-compensation, partial compensation and supporting education system. The theory emphasizes patients to strengthen self-

care while receiving professional nursing, so that their self-care abilities can be improved [7]. The PDCA cycle, which first proposed by Dr. Deming of the United States, includes four stages: P (Plan), D (Do), C (Check), and A (Action). It is a standard and scientific cycle system that was widely applied in quality management, and is also a cyclical process of continuous learning and improvement [8]. In order to improve the rehabilitation of patients with acute stroke, this study explored the combined effects of Orem Self-care Theory and PDCA nursing on cognitive function, neurological function and daily living ability of patients.

Cases and methods

Research objects

126 patients, who admitted to our hospital with acute stroke from January 2019 to March 2020, were enrolled in this study as research subjects. The subjects were divided into control-group (n=61) and observation-group (n=65) in accordance with their admission time. The study was conducted after receiving approval from the hospital's ethics committee.

Inclusion and exclusion criteria

Inclusion criteria: (1) Patients that confirmed with presence of cerebral infarction, and met the diagnostic criteria of AIS in Chinese Expert Consensus on Emergency Diagnosis and Treatment of Acute Ischemic Stroke; (2) Patients ranged from 35 to 75 years; (3) Patients who have had a stroke for the first time; and (4) Patients who voluntarily signed the informed consent.

Exclusion criteria: (1) Patients with blood system diseases or coagulopathy; (2) Patients with heart, lung, liver or kidney dysfunction; (3) Patients with malignant tumors; (4) Patients with congenital or autoimmune diseases; or (5) Those who already had cognitive impairment and limb dysfunction before illness.

Methods

The control-group was given routine nursing care.

On the basis of conventional nursing for stroke patients in control-group, the observation-group was applied with the Orem Self-care model for nursing according to their score of ADL. Patients with a score of ≤40 were given a complete-compensation system, those with a score of 40-60 were treated with partial-compensation system, and for rest with over 60 were given an educational support system. The PDCA cycle method was adopted to strengthen the care of stroke patients [9, 10].

The comparative classification of the evaluation of patients' ADL are as follows: (1) Complete-compensation that applicable to those who are totally dependent on others for daily living. The nursing staff instruct the patients with correct limb placement and passive activities, so that the patients are in correct posture and position; enable the patients to perform muscle massage and passive joint movements as soon as possible to prevent muscle atrophy and joint spasm. The patients are assisted to carry out active activities in bed, including lying hand-raising, bridge exercise, bed turning and sitting training, etc. The activities enable patients to exercise muscle strength, thus forming the foundation for the recovery of ADL. Pay attention to the patient's diet and ensure adequate nutrition of them. Regularly remind patients to urinate and defecate, and take care of the patient's skin and life needs. (2) Partial-compensation for patients who are able to master parts of life skills. Encourage patients, help them to establish confidence in recovery, and enable them gradually mastering the daily activities of the affected limb. In terms of dressing, instruct the patient to wear the clothes of the affected limb first, and then the healthy side. In the aspects of eating, washing, combing, shaving, etc., instruct patients to focus on training the skills of one-handed operation first, and then gradually to two-handed training. Through repeated explanation and demonstration, the nursing staff enable the patients to master the training content as much as possible to enhance their confidence and determination, and in the meanwhile, give timely affirmation and praise to every progress of patients. Provide necessary guidance on the use of assistive devices for patients, such as twisting towels with taps, bathing with assistive devices such as bath stools, and enable patients mastering the necessary movements for daily activities through repeated exercises, thereby improving their self-care ability. (3) Educational support system that suitable for patients who can basically fulfill their daily needs. The nursing staff carry out the corresponding theoreti-

cal and skill education for patients, such as encouraging them to do housework within their ability to increase their sense of achievement and self-worth. Other activities include training and instructing patients in cleaning, making beds, sweeping the floor, washing, drying clothes, washing vegetables, chopping vegetables, washing dishes, etc.

Plan: Set up the PDCA nursing management team. The attending physician of patient works as the principal of the team, and leads the management work. He is also responsible for the planning and evaluation of the management work, the implementation and inspection of the plan, and the handling and adjustment of the problems that are found during the process. The nurses in charge are responsible for the operation and implementation of the specific procedures, and feedback the implementation on time.

Do: After admission, the patients are treated with Oerm self-care model according to their score of ADL. After the patient's condition is stable, the nursing staff actively guide them to carry out the rehabilitative training, and evaluate the patient's disease condition and psychological status. According to the patient's individual condition and clinical nursing pathway, the corresponding nursing scheme is implemented accordingly.

Check: The attending physicians and nurses in charge check and summarize the nursing implementation at any time, analyze the implementation of patient care, and discover the problems in time.

Action: Discover and analyze the problems in stroke care by understanding the degree of health knowledge of stroke patients, the improvement of patients' cognitive function, neurological function and daily living ability, etc. At the same time, the nursing staff make corresponding adjustment and improvement of these problems in order to provide better care in the next cycle, and achieve better treatment effect.

Observation of indexes

(1) Activity of daily living (ADL): We evaluated the activity of daily living (ADL) of all enrolled objects by the Barthel Index Scale. The evaluation by Barthel index (BI) before nursing and 4 weeks after nursing was conducted. The scale score interval was 0-100 points, and the lower score referred to the severer of the patient's dysfunction [11]. (2) The comparison of the changes in neurological function before and after the nursing care. The neurological function of the patients was evaluated by the Glasgow Coma Index (GCS) and the National Institutes of Health Stroke Scale (NIHSS) before and after 4 weeks of nursing care. The total score of GCS was 15, and the higher score indicated the lighter of the coma; NIHSS scores ranged from 0 to 42, with lower scores indicating less nerve injury [12]. (3) The comparison of the changes in cognitive function between the two groups in pre- and post-treatment. The cognitive function of patients was evaluated by The Montreal Cognitive Assessment Scale (MoCA) and the Mini-mental State Examination (MMSE) before and after 4 weeks of nursing care. The total score of MoCA was 30 points, with higher score represented better cognitive function [13]; and the overall range of MMSE scale was 0-30 points, and the higher score implied the better cognitive function [14].

Statistical analysis

Data processing and analysis were handled with statistical software SPSS 25.0. The comparison of measurement data was performed by *t*-test, and the comparison of enumeration data was carried by χ^2 test. It was signified that the difference was statistically significant by $P<0.05$.

Results

Clinical data

There was no statistically significant difference in the clinical data of the two groups of patients s ($P<0.05$) (**Table 1**).

ADL scores

After the implementation of nursing measures, the ADL scores of the two groups were dramatically higher than before ($P<0.05$), and observation-group had obviously higher post-intervention scores than control-group ($P<0.05$) (**Figure 1**).

Table 1. Comparison of clinical data between two groups of patients

Group	Number of cases	Gender		Age (yd, $\bar{x}\pm s$)	Site of infarction	
		Male	Female		Basal ganglia	Lobus cerebri
Observation-group	65	32	33	62.25±10.10	38	27
Control-group	61	34	27	65.03±11.22	35	26
t/χ^2	-	0.5342		1.4634	0.0152	
P	-	0.4648		0.1459	0.9019	

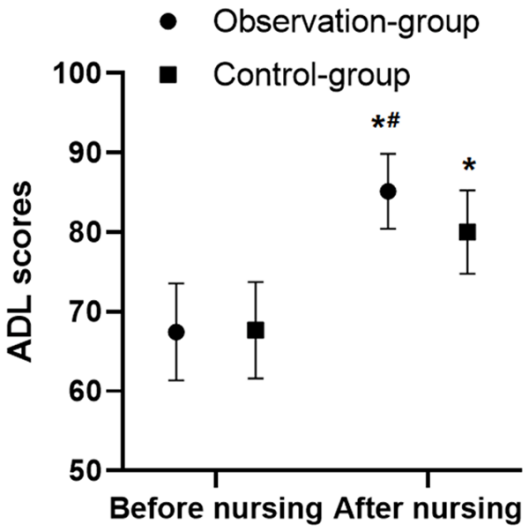

Figure 1. Comparison of ADL scores before and after nursing in the two groups. Note: Compare with before nursing, *P<0.05; compare with control-group, #P<0.05.

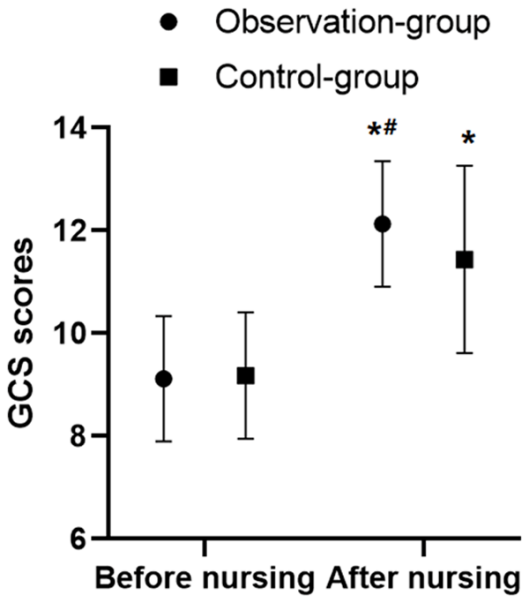

Figure 2. Comparison of GCS scores before and after nursing in two groups. Note: Compare with before nursing, *P<0.05; compare with control-group, #P<0.05.

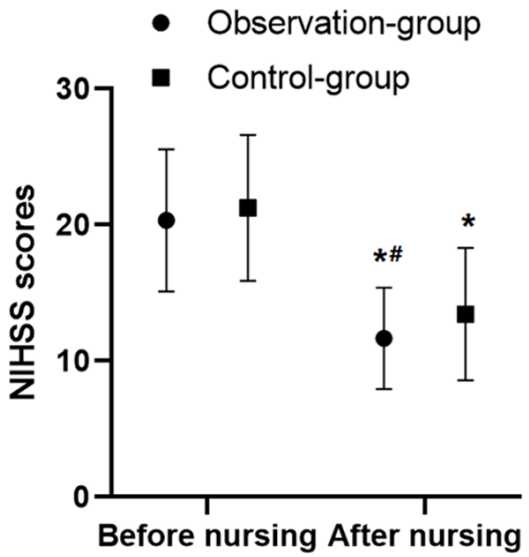

Figure 3. Comparison of NIHSS scores before and after care in the two groups. Note: Compare with before nursing, *P<0.05; compare with control-group, #P<0.05.

Changes in neurological function before and after treatment

GCS scores: The GCS scores of the two groups after nursing care increased remarkably than before nursing (*P<0.05*), and the observation-group had critically higher post-intervention scores than the control-group (*P<0.05*) (**Figure 2**).

NIHSS scores: The NIHSS scores of the two groups after nursing care decreased substantially than before (*P<0.05*), and the observation-group had dramatically lower scores than the control-group (*P<0.05*) (**Figure 3**).

Changes in cognitive function before and after treatment

MoCA scores: After 4 weeks of nursing, the MoCA score of the two groups increased remarkably than that before (*P<0.05*), and the observation group had apparently higher post-

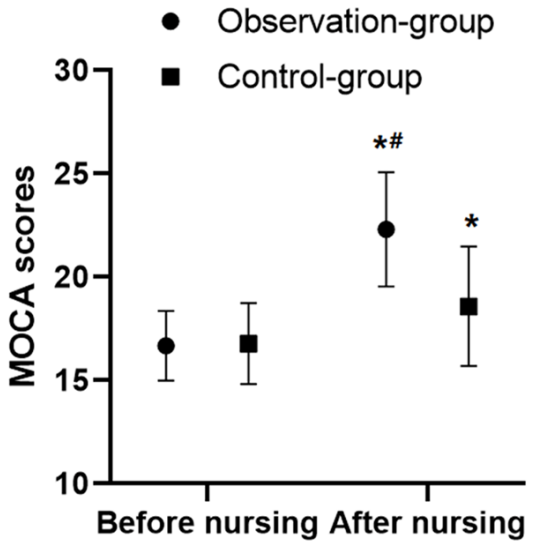

Figure 4. Comparison of MOCA scores before and after nursing in two groups. Note: Compare with before nursing, *P<0.05; compare with control-group, #P<0.05.

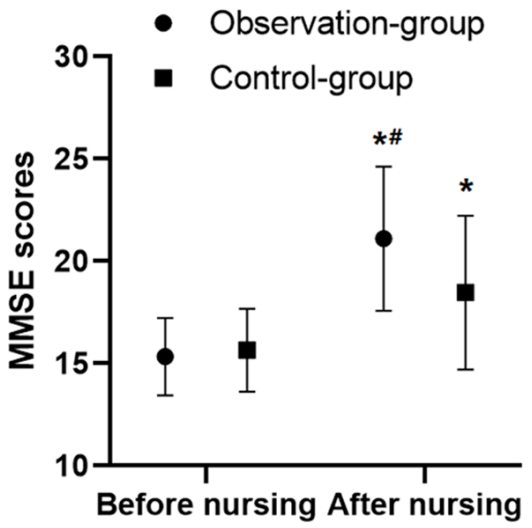

Figure 5. Comparison of MMSE scores before and after intervention between the groups. Note: Compare with before nursing, *P<0.05; compare with control-group, #P<0.05.

nursing scores than the control-group (*P<0.05*) (**Figure 4**).

MMSE scores: The post-nursing MMSE score in two groups increased remarkably than before nursing (*P<0.05*), and the post-nursing score of observation-group was significantly higher than that of control-group (*P<0.05*) (**Figure 5**).

Discussion

Stroke, also known as cerebrovascular accident, is a partial or comprehensive functional defect syndrome or acute cerebrovascular disease caused by local blood circulation disorders [15]. Stroke is often accompanied by brain dysfunction and corresponding physical disorders, and leads to neurological and cognitive impairment, as well as a series of neurological and cognitive defects [16]. Stroke is one of the three major disabling and fatal diseases in human beings with high morbidity and mortality. It has extremely serious adverse effects on patients' cognition, neurological function and self-care ability, and seriously endangers human life expectancy and quality [17, 18]. Good nursing measures are of great significance for the early recovery of health, cognitive function, neurological function and self-care ability of stroke patients. In recent years, with the rapid improvement of medical technology and people's living standards, patients have put forward increasingly higher requirements for the quality of nursing work, and have higher requirements for the professional level and clinical practice skills of nursing staff. It is well known that the acute stroke has high risks, and effective treatment at any stage is of great significance to patients [19]. Therefore, providing patients with effective rehabilitation nursing care is also a treatment approach for them with sequelae of stroke. At present, PDCA management has been gradually recognized in clinical nursing application of patients with ischemic stroke. According to the strict operation procedures, the nursing staff construct the circulating nursing system according to the clinical manifestations of the patients, and help them recover as soon as possible in the processes of feedback and improvement. According to researches [20], as an effective and feasible nursing model, PDCA nursing has undergone continuous development and improvement. Under PDCA care, patients are provided with a scientific diet plan to make reasonable adjustments to their schedules and take medications on time. Compared with the conventional nursing scheme, under the PDCA model, nursing work can be extended to each procedure of patients' rehabilitation work, so that the patients' recovery and their satisfaction with the nursing scheme can obtain feedback timely. It can make timely improvements to each step

during the nursing schedule, and provide basis and ideas for the following work, thereby forming the most beneficial cycle for patients. Nursing staff can improve the medical care of stroke patients through PDCA care, improve and enhance the cognitive function, neurological function, as well as the self-care ability of patients, and reduce the burden on society and family. Meanwhile, it can effectively improve the disease symptoms of patients, increase their treating compliance and improve the satisfaction with nursing, which providing good clinical application value for improving the nursing quality of stroke patients [21]. PDCA cycle is a comprehensive management model that's responsible for patients. It follows the principle of constant improvement and development, and is based on the objective law of recognition, practice, re-understanding, and re-practice. It is a high-quality and efficient management and working method, and is also a scientific method that systematically help patients to solve health problems [22]. In current clinical care of patients with ischemic stroke, the application of PDCA management is gradually increasing. Nursing staff follow strict operating procedures and construct a cyclic nursing system based on the clinical manifestations of patients, and help them recover as soon as possible in the process of feedback and improvement [23].

Orem Self-care Theory, which proposed by the famous American nursing theorist Dorath E. Orem, is a widely recognized and applied theory that is more conducive to the recovery of patients' health, who also believes that in order to improve the self-care ability of patients, self-care should be strengthened while receiving care provided by professional nursing staff [24]. Orem believes that diseases will lead to a decline in 'physiological functions or self-care defects, which makes it impossible to meet self-care needs. It requires the help of others to achieve nursing compensation and restore the self-care ability, and requires the self-care education and guidance by nursing staff for patients and family members, thus helping to improve the patient's self-care ability, further complete the self-care activities, and comprehensively improve the patient's neurological and cognitive function [25]. Orem also revealed three needs of patients, the physiological, psychological and social needs. When a patient meets his self-caring needs, he can achieve a state of pleasure [26]. Therefore, the application of Orem Self-care Theory to patients whose life self-care ability is affected by stroke is more conducive to their overall recovery of physical and mental health.

Based on Orem Self-care Theory and PCDA theory, this study aims to explore the good nursing care for patients with acute stroke, and improve their cognitive function, neurological function and daily life ability in nursing process. The observation-group in this study implemented the PDCA management on the basis of Oerm self-care model. Through scientific processes such as formulating plans, implementing plans, checking implementation, and improving treatment, nursing staff can discover, improve and supplement the deficiencies in time, and continue the cycle of this process. The results of the comparison between the two groups of patients before and after nursing show that after 4 weeks of nursing, the ADL score of the two groups were dramatically higher than before, indicating the strengthened self-care ability of patients, and confirming the effectiveness of Orem Self-care Theory to the recovery of stroke patients. After 4 weeks of nursing, the GCS and NIHSS scores of the two groups of patients were critically improved comparing with those before nursing, and the observation-group had critically higher post-intervention scores than the control-group, indicating that the model has a certain positive effect on improving the neurological function of stroke patients. In addition, MOCA and MMSE scores of the two groups after 4 weeks of nursing increased remarkably than before nursing, and the observation-group was obviously higher than the control-group, which refers the improvement of the patient's cognitive function. Therefore, this study has confirmed that the nursing model can improve the cognitive function, neurological function and daily living ability of patients with acute stroke. The results, which are consist with the related research outcomes of scholars [27], may be owing to the continuous evaluation and adjustment of nursing work in PDCA model, which makes the overall nursing process more scientific, improves the patient's compliance and satisfaction, and enables patients to receive better nursing care. However, due to the relatively small sample size enrolled in this study,

there may be some deviation in the results. Therefore, further expansion to the sample size is required to obtain more reliable clinical study results.

To conclude, on the basis of Orem Self-care Theory, the application of PDCA nursing in daily nursing work to acute stroke patients, as well as the strict planning, implementation, inspection and adjustment of each step can actively improve the cognitive function, neurological function and daily life ability of patients. It has a positive role in providing more comprehensive and thoughtful nursing services, and is worthy of application.

Disclosure of conflict of interest

None.

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