



# Effects of Predictive Nursing Intervention among Patients with Acute Stroke

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## Abstract

**Background:** To explore the effects of predictive nursing intervention among patients with acute stroke.

**Methods:** One hundred and sixty participants were included. They were hospitalized in the Department of Neurology of a third-level first-class hospital in Changsha, Hunan Province, from January to August 2019. They were categorized into control group and intervention group by random number table, with 80 patients in each group. General nursing for patients in Neurology Department was offered to the control group. On the basis of general nursing, predictive nursing intervention was offered to the intervention group. The effectiveness of predictive nursing intervention were evaluated by disparity in neurologic function, movement function, daily life ability and sleep quality before intervention and 2 weeks after intervention. The neurologic function, movement function, daily life ability and sleep quality were evaluated by National Institute of Health acute stroke scale (NIHSS), Fugl-Meyer scale, Barthel indicator, and Pittsburgh sleep quality indicator (PSQI), respectively.

**Results:** There was no significant difference in gender, age, complications and treatment methods between two groups. There was no significant difference in the scores of NIHSS, Fugl-Meyer scale, Barthel indicator, and PSQI before intervention. The scores of NIHSS and PSQI were significantly lower in the intervention group than those in the control group, and the scores of Fugl-Meyer scale and Barthel indicator were significantly higher in the intervention group than those in the control group ( $P < 0.05$ ).

**Conclusion:** Predictive nursing intervention could help improve not only neurologic function, movement function, and daily life ability, but also sleep quality among patients with acute stroke.

**Keywords:** Predictive nursing intervention; Acute stroke; Neurologic function; Movement function; Daily life ability; Sleep quality

## Introduction

Acute stroke is a group of acute cerebrovascular diseases characterized by cerebral ischemia or hemorrhagic injury with high morbidity, disability

and mortality (1). It is the main cause of death among Chinese people, and there are as many as 1.3 million people per year who die of acute



stroke (2). It is estimated that there are 11.057 million patients with acute stroke in China, 62% of whom have varying degrees of disability (3).

Acute stroke can be divided into three stages: acute, convalescent and sequelae. Patients with acute stroke often show different degrees of neurological and movement dysfunction, which has a negative impact on their daily life (4). In addition, many patients with acute stroke in acute stage are prone to sleep disturbances, which can lead to recurrent acute stroke (5). The acute stage is a critical period for the early recovery of patients with acute stroke and can have an important impact on the prognosis (6, 7). Therefore, it is of great significance to identify the risk of subsequent complications in patients with acute stroke in acute stage and give timely and targeted predictive nursing.

We aimed to explore the effect of predictive nursing on neurological function, movement function, activity of daily living and sleep quality through the implementation of predictive nursing in patients with acute stroke, so as to provide scientific basis for the evaluation of predictive nursing in patients with acute stroke.

## Subjects and Methods

### Subjects

Overall, 160 eligible patients with acute stroke in acute stage were selected as the subjects. They were hospitalized in the Department of Neurology of a third-level first-class hospital in Changsha, Hunan Province, from January to August 2019. Inclusion criteria: ① Patients who met the diagnostic criteria for cerebral apoplexy formulated by the fourth National Academic Conference on Cerebrovascular Diseases in 1995 (8), and were confirmed by CT or MRI examination of the brain; ② Patients with a time interval of less than 24h between onset and visit; ③ Patients who had signed informed consent and volunteered to participate in the study. Exclusion criteria: ① Patients with severe cognitive impairment or mental illness; ② Patients with a malignant tumor; ③ Patients with vital organ failure.

The subjects were divided into intervention group and control group according to the random number table method, with 80 subjects in each group. Of the 80 subjects in the intervention group, there were 47 males and 33 females, aged from 47 to 75 yr, with the mean age of  $(63.56 \pm 12.88)$ . The interval between onset and visit was between 2 and 12 h, with the mean time of  $(6 \pm 2)$  h. There were 49 subjects with hemorrhagic acute stroke, 31 subjects with ischemic acute stroke, 58 subjects with combined hypertension, 39 subjects with combined diabetes, 41 subjects with combined hyperlipidemia, 40 subjects with combined coronary disease. Of the 80 subjects in the control group, there were 45 males and 35 females, aged from 45 to 76, with the mean age of  $(63.11 \pm 12.46)$ . The interval between onset and visit was between 1 and 12 h, with the mean time of  $(6.12 \pm 2.54)$  h. There were 51 subjects with hemorrhagic acute stroke, 29 subjects with ischemic acute stroke, 59 subjects with combined hypertension, 38 subjects with combined diabetes, 42 subjects with combined hyperlipidemia, 42 subjects with combined coronary disease. There was no significant difference in sex, age, complications and treatment measures of subjects between the two groups ( $P < 0.05$ ), which was comparable.

### Methods

The subjects in the control group were given routine nursing program of neurology, including close monitoring and recording of changes in heart rate, blood pressure, breathing and other vital signs, administer medication and health education as prescribed by doctors and so on. The subjects in the intervention group were given predictive nursing on the above treatment. Before the formal study, a predictive nursing intervention group was set up, including 1 associate chief physician, 1 chief superintendent nurse, 2 co-chief superintendent nurses and 5 ward nurses in charge. Then, the team members were organized for training, which focused on theoretical knowledge and predictive nursing skills related to acute stroke. After the training, the members were organized to collect the literature and previ-

ous cases of common complications in patients with acute stroke. The obtained data were sorted out and analyzed to obtain the summary of common complications of patients with acute stroke including pulmonary infection, dysphagia, pressure sores, urinary tract infection and sleep disturbance.

All participants gave informed consent and the study was approved by local Ethics Committee.

In view of the above complications summarized by the predictive nursing intervention group, the predictive nursing intervention scheme implemented in this study included:

#### **① Predictive nursing of pulmonary infection**

The temperature and humidity of the ward and the circulation of indoor air were controlled. The patient was guided and helped to discharge sputum. The secretion of mouth and nasal cavity were timely cleaned. The patient on mechanical ventilation were given prophylactic atomization inhalation when necessary, and antibiotics was used rationally as prescribed by doctors. The patient was also instructed to carry out breathing exercise. Their back were regularly pat and their bodies were regularly turned over.

#### **② Predictive nursing of dysphagia**

The patient was instructed to carry out swallowing related muscle training (such as masticatory muscle training, orbicularis oris muscle training, tongue muscle training, pronunciation training, etc.). Sensory stimulation was performed on the patient, including cheek, tongue and lip with cotton swab and tongue depressor. In addition, the popsicles were used to stimulate the posterior root of the tongue, palatal arch, posterior pharyngeal wall and soft palate of the patient to guide the empty swallowing action. Aspiration pneumonia should be avoided.

#### **③ Predictive nursing of pressure sore**

The risk of pressure ulcers was assessed once a day and the patient was given individualized pressure sore prevention nursing according to the Barden scale score. As for patients with Barden

scale score  $\leq 12$ , a turn-over card was created and the patient was turned over once every 1 h according to the patient's conditions. The bed sheets and clothes of the patient were kept dry and changed in time. The color change of the skin under pressure was observed, and the patient was turned over more frequently according to the color of the skin and the patient's conditions. The family members were guided to buy related skin nursing products to carry out early skin nursing.

#### **④ Predictive nursing of urinary system infection**

The perineum and muscle nursing was strengthened, and the family members were guided to wash the perineum with warm water every day. The patient was asked to drink more water. When the patient could automatically urinate timely, the catheter was removed, and the indwelling time of catheters was shortened. Routine urine tests were conducted regularly to understand the patient's urinary infection. Urine culture and drug sensitivity tests were conducted in time when abnormalities were found, and effective antibiotics were used for treatment.

#### **⑤ Predictive nursing of sleep disturbance**

The active communication with patients and their families was taken with a warm, friendly service attitude, to dredge the bad mood of patient. The patient and family members were raised questions with serious and patient explanation. Soothing music was played to guide the patient to meditate and relax mood. Typical successful cases were given to the patient for encouragement, so that the patient could build up the confidence to overcome the disease.

#### **Observation Indicators**

The application effect of predictive nursing in patients with acute stroke was evaluated by observing and comparing the difference of nerve function, movement function, activity of daily living and sleep quality between the two groups

before intervention and 2 weeks after intervention.

① The National Institutes of Health Stroke Scale (NIHSS) was used to evaluate the neurological function of the patients. A total of 11 items were included in the scale, with a score range of 0-54. The higher the score, the more serious the neurological deficit was.

② Fugl-Meyer assessment scale was used to evaluate movement function, containing 50 items, with a score range of 0-100 points. The lower the score, the worse the movement function.

③ Barthel indicator was used to evaluate patients' ability of daily life activities, containing 10 items including bed chair transfer, eating and toilet, with a score range of 0-100. The lower the score, the lower the ability of daily life activities.

④ Pittsburgh Sleep Quality Indicator (PSQI) was used to evaluate sleep quality, containing 19 self-assessment items and 5 other items, with a score range of 0-21. The higher the score, the worse the sleep quality.

### Statistical Analysis

SPSS24.0 software package (Chicago, IL, USA) was used for statistical analysis. The mean  $\pm$  standard deviation ( $\bar{x} \pm s$ ) was used for statistical description of each observation indicator. *t* test

of 2 independent samples was used to compare the difference of each observation indicator between the intervention group and the control group before intervention and 2 weeks after the intervention when the normal distribution was followed. The median and quartile spacing were used for statistical description, and non-parametric test was used to compare the differences of observed indicators between the intervention group and the control group before intervention and 2 weeks after intervention when the normal distribution was not followed. All tests were bilateral,  $P < 0.05$  was considered statistically significant.

## Results

### Comparison of Nerve Function between Intervention Group and Control Group before and after Intervention

The comparison of nerve function between the two groups before and after intervention is shown in Table 1. The difference of NIHSS score between the two groups was not statistically significant ( $P > 0.05$ ) before intervention, which was statistically significant after 2 weeks of intervention. The score in intervention group was lower than that in the control group.

**Table 1:** Comparison of Nerve Function between Two Groups before and after Intervention

Variable	Number of Cases	NIHSS Score	
		Pre-intervention	After 2 weeks of intervention
Intervention Group	80	14.12 $\pm$ 2.36	.245 $\pm$ 1.03
Control Group	80	14.23 $\pm$ 2.40	.228 $\pm$ 1.34
<i>t</i> value		-0.296	-10.226
<i>P</i> value		0.865	<0.001

### Comparison of Movement Function between Intervention Group and Control Group before and after Intervention

The comparison of movement function between the two groups before and after intervention is shown in Table 2. The difference of Fugl-Meyer

scale score between the two groups was not statistically significant before intervention, which was statistically significant after 2 weeks of intervention. The score in the intervention group was higher than that in the control group.

**Table 2:** Comparison of Movement Function between Two Groups before and after Intervention

Variable	Number of Cases	Fugl-Meyer Scale Scores	
		Pre-intervention	After 2 weeks of intervention
Intervention Group	80	51.33±5.12	75.44±5.65
Control Group	80	51.62±5.21	65.32±5.13
<i>t</i> value		-0.392	13.321
<i>P</i> value		0.766	<0.001

#### *Comparison of Activity of Daily Living between Intervention Group and Control Group before and after Intervention*

The comparison of the activity of daily living between the two groups before and after intervention is shown in Table 3. The difference of

Barthel indicator score between the two groups was not statistically significant ( $P > 0.05$ ) before intervention, which was statistically significant after 2 weeks of intervention. The score in the intervention group was higher than that in the control group.

**Table 3:** Comparison of Activity of Daily Living between Two Groups before and after Intervention

Variable	Number of Cases	Barthel Indicator Score	
		Pre-intervention	After 2 weeks of intervention
Intervention Group	80	25.13±4.69	73.12±7.69
Control Group	80	25.62±4.88	56.11±6.81
<i>t</i> value		-0.463	15.449
<i>P</i> value		0.685	<0.001

#### *Comparison of Sleep Quality between Intervention Group and Control Group before and after Intervention*

The comparison of sleep quality between the two groups before and after intervention is shown in Table 4. The difference of PSQI score between

the two groups was not statistically significant ( $P > 0.05$ ) before intervention, which was statistically significant after 2 weeks of intervention. The score in the intervention group was lower than that in the control group.

**Table 4:** Comparison of Sleep Quality between Intervention Group and Control Group before and after Intervention

Variable	Number of Cases	PSQI Score	
		Pre-intervention	After 2 weeks of intervention
Intervention Group	80	.207±3.02	.114±2.13
Control Group	80	.187±3.11	.366±2.83
<i>t</i> value		0.112	-5.632
<i>P</i> value		0.993	<0.001

## Discussion

Acute stroke is a public health problem that seriously endangers human health, causing economic burdens of up to 40 billion RMB Yuan per year in China (9, 10). The acute stage is a critical period for preventing and treating complications and improving prognosis. But as for the patients with acute stroke in acute stage, the disease develops rapidly and the patients were difficult to be nursed. Therefore, it is of great significance to optimize nursing intervention for patients with acute stroke in acute stage.

Predictive nursing is a leading nursing mode. It gives preventive nursing to the possible complications of patients based on the development rules of disease. There are more and more reports on the influence of predictive nursing on patients with cerebrovascular diseases. For example, predictive nursing can improve the treatment effect of elderly stroke patients with dysphagia, reduce the incidence of complications, shorten the length of stay, save the cost of hospitalization, and improve the satisfaction of patients with nursing staff (11). Predictive nursing could reduce the incidence of complications (12) and mortality in neurosurgical intensive nursing patients (13). The results of the study on patients with acute stroke rehabilitation by Wang Qin were similar.

There has been only 1 report on patients with acute stroke in acute stage. Predictive rehabilitation nursing could improve movement function and activity of daily living of patients with acute stroke, relieve anxiety and depression (14). But the effect on nerve function and sleep quality was not evaluated. In this study, the predictive nursing intervention model was introduced into patients with acute stroke, and its application in patients with acute stroke was systematically and comprehensively evaluated from four aspects of nerve function, movement function, activity of daily living and sleep quality. The results showed that the NIHSS score and PSQI score of the intervention group were lower than those in the control group. The Fugl-Meyer scale score and

Barthel indicator score were higher than the control group after 2 weeks of intervention ( $P < 0.05$ ). The results showed that the nerve function, movement function, activity of daily living and sleep quality of the intervention group were better than those in the control group. Due to mechanical ventilation and bed rest resulting in decreased immunity, patients with acute stroke are prone to complications like pulmonary infection, urinary system infection and pressure sore.

For these complications, this study carried out a series of predictive nursing measures. The patients were guided and helped to expel sputum, the secretions of patients' oral and nasal cavity were cleaned up in time. Regular urine routine examination was conducted to understand the urine infection of patients. Barden scale was used to screen high-risk groups of pressure sores and create turn-over cards. In addition, dysphagia and sleep disturbances are common complications in patients with acute stroke. Dysphagia can cause dysphagia and severe aspiration pneumonia. Sleep disturbances can have adverse effects on the prognosis of patients, and lead to serious acute stroke recurrence. For dysphagia, this study performed predictive nursing including swallowing related muscle training and sensory stimulation. For sleep disturbances, this study carried out predictive nursing measures including helping patients to remove negative emotions and sleep well.

The neurological function, movement function, activity of daily living and sleep quality of patients with acute stroke have been significantly improved by predictive nursing intervention, including pulmonary infection, dysphagia, pressure sore, urinary system infection and sleep disturbance.

## Conclusion

This study not only improved the neurological function, movement function and activity of daily living, but also improved the sleep quality of patients with acute stroke by implementing predictive nursing intervention for the patients, includ-

ing pulmonary infection, dysphagia, pressure sore, urinary system infection and sleep disturbance. Therefore, predictive nursing intervention model can be further popularized in clinical nursing of patients with acute stroke.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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## Conflict of interest

The authors declare that there is no conflict of interest.

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