

Original Article

Evidence-based nursing interventions improve physical function and quality of life of patients with cerebral infarction

Yayan Gu¹, Xin Liu², Meiyi Guo³, Hong Nian⁴

¹General Medical Department, The Second Affiliated Hospital of Harbin Medical University, Harbin, Heilongjiang, China; ²Department of Rehabilitation, The Second Affiliated Hospital of Harbin Medical University, Harbin, Heilongjiang, China; ³Physical Examination Center, The Second Affiliated Hospital of Harbin Medical University, Harbin, Heilongjiang, China; ⁴Department of Radiation Oncology, The Second Affiliated Hospital of Harbin Medical University, Harbin, Heilongjiang, China

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Abstract: This study aimed to investigate the effects of evidence-based nursing interventions on physical function and quality of life (QoL) for patients with cerebral infarction. A total of 512 patients with cerebral infarction were included in the study. Patients were divided, equally, into a study group and a control group. The control group received routine nursing care. The study group received evidence-based nursing interventions based on routine nursing care. Psychological state, neurological impairment, limb motor function, quality of life, and nursing satisfaction of the study and control groups were analyzed. Hamilton Anxiety Rating Scale (HAMA) and Hamilton Depression Rating Scale (HAMD) scores, after intervention, for the study and control groups were significantly lower than at pre-intervention ($P < 0.01$). NIHSS scores were significantly lower in both groups after intervention ($P < 0.01$) and ADL scores were significantly higher in both groups after intervention ($P < 0.01$). Post-intervention WHO QoL-BREF scores were significantly higher than pre-intervention scores in both groups ($P < 0.01$). A significant difference was observed in total patient satisfaction rate between the two groups ($P < 0.01$). Implementation of evidence-based nursing interventions in patients with cerebral infarction can reduce or eliminate negative emotions, enhance nursing satisfaction, and improve overall quality of life.

Keywords: Cerebral infarction, evidence-based nursing interventions, hamilton anxiety rating scale, hamilton depression rating scale

Introduction

Cerebral infarction, a condition that seriously jeopardizes health worldwide, is a complication of cerebrovascular disease with a high incidence rate in recent years. This condition is also known as ischemic stroke, referring to brain tissue softening or necrosis due to cerebral ischemia, hypoxia, or an insufficient blood supply, resulting in hypoxic brain damage due to multiple factors [1]. Recently, the burden of an aging population and related social pressures has increased. Cerebral infarction has occurred more frequently among younger individuals and its incidence rate has increased annually among patients in their 30 s or 40 s, accounting for approximately 5% of all patients

with cerebral infarction [2, 3]. The incidence of cerebral infarction accounts for approximately 70% of all cases of cerebral stroke. Post-onset, a series of complications, such as slurred speech and hemiplegia, can occur [4]. Based on high incidence, disability, and fatality rates of cerebral infarction, the disease affects patient neurological and motor functions, activity of daily life (ADL), and quality of life (QoL), to varying degrees. These may result in serious harm to patient life and health, causing extreme psychological pressure and increasing economic burden for their families [5]. Studies have shown that intravenous thrombolysis can effectively improve clinical treatment of acute cerebral infarction during the early phase. However, some patients do not receive prompt treat-

ment, resulting in poor prognosis [6]. Therefore, based on the needs of patients with cerebral infarction, the establishment of an individualized, symptomatic, and scientific nursing intervention model is important for clinical practice.

Evidence-based nursing has developed based on principles of evidence-based medicine. It is empirical, dynamic, continuous, and scientific [7]. Implementation of evidence-based nursing relies on the professional skills and experience of clinical nurses, careful selection of evidence-based research, effective data collection concerning clinical symptoms and personal patient preferences, development of individualized care for patients, and preparation of corresponding care measures. In this context, evidence-based care is also referred to as empirical care in obtaining a reliable basis for clinical care practice [8]. Currently, several studies regarding the clinical application of evidence-based nursing are available, indicating that this nursing model is more effective in improving various diseases during hospitalization [9, 10].

There are very few studies concerning clinical application of evidence-based nursing for treatment of patients with cerebral infarction. To further analyze the value of evidence-based nursing for patients with cerebral infarction, this present study aimed to investigate the effects of evidence-based nursing interventions for patients with cerebral infarction, providing a feasible clinical care model for these patients.

Materials and methods

General information

A total of 512 inpatients with cerebral infarction were included in the study, from March 2012 to June 2017. Using the random number table method, patients were equally divided into either a study group or a control group. The control group received routine care. The study group received evidence-based nursing interventions based on routine nursing care. Study group participants were comprised of 112 males and 144 females, aged between 62 and 77 years (mean age, 64.8 ± 5.3 years). Time from onset of illness to hospitalization was 0.5 h-6.0 h (average time of 3.7 ± 1.2 h). Control group participants were comprised of 127 males and 129 females, aged between 60 and

75 years (mean age, 63.9 ± 4.5 years). Time from onset of illness to hospitalization was 0.4 h-7.0 h (average time of 3.6 ± 1.0 h). Inclusion criteria included: patients that met the 2013 clinical diagnostic criteria for acute cerebral infarction [11], diagnosis of cerebral infarction confirmed via magnetic resonance imaging (MRI) and cranial computed tomography scan, cerebral infarction patients that received thrombolytic therapy, and patients 60 years or over having a Glasgow Coma Score of 8 or higher. This study was approved by the Ethics Committee of The Second Affiliated Hospital of Harbin Medical University. The participants and their family members were informed concerning study details and written informed consent was obtained from all participants. This study excluded patients with severe heart, lung, liver, or renal dysfunction; intracerebral hemorrhage and a bleeding tendency; and thrombolytic contraindications.

Routine nursing interventions

Routine nursing interventions were provided for patients in the control group. Nurses collected the patient profile and characteristics, assessed family history and sociocultural status, helped establish a harmonious doctor-patient relationship, and guided patients in establishing approved dietary habits. According to specific conditions of the patients, nurses selected an appropriate diet and patient positioning at mealtimes. Moreover, they guided patients during rehabilitation exercises, promoted health education regarding their disease, monitored patients for physiological indicators, and assisted with psychological counseling.

Establishment of the study group and evidence-based practice

Under the guidance and planning of the Hospital Nursing Department, a key nursing team was identified. A deputy chief nurse and chief nurse were designated to establish an evidence-based nursing research group, led by the head nurse. The director of the nursing department trained members of the research group regarding evidence-based nursing and explained the concepts, definitions, implementation methods, and steps of the model, in detail, to enhance and improve the capabilities of all members in providing evidence-based nursing

care. With reference to etiological factors concerning cerebral infarction, clinical treatment methods, specific nursing measures, and prognosis, the research group conducted group discussions and proposed evidence-based best-practice management pertaining to this research in regards to specific patient conditions. These conditions included patient age, mental status, etiology, and disease progression. The group aimed to eliminate patient anxiety, depression and other adverse emotions, ameliorate patient neurological and motor function, and improve patient QoL.

Evidence-based nursing interventions

Evidence-based nursing interventions were implemented based on routine nursing care. Specific interventions included: (1) Health education was provided according to age, severity of illness, and education level of patients with cerebral infarction. Nurses performed multifaceted and all-round health care, explaining the specific pathogenic factors of the disease, prevention measures, and prognosis, in detail. Relevant knowledge is likely to increase patient awareness of cerebral infarction, strengthen adherence to treatment, and inform patients of the benefits of therapeutic alliance and care for their recovery. (2) Diet management was provided, as nurses conducted scientific calculations and comparisons based on dietary habits and food intake of patients, recommending foods rich in cellulose and protein and minimizing consumption of spicy foods, ensuring that patients received adequate nutrition. Moreover, semi-liquid or easily-spread foods were recommended. To promote food digestion, patients were required to be in a seated upright position for at least 30 minutes, after eating, to avoid food reflux. If patients had difficulty eating, nasogastric feeding was undertaken to ensure adequate nutrient intake. (3) Psychological care was provided and nurses assessed the psychological state of patients. Following onset of cerebral infarction, patients were usually tense, anxious, pessimistic, and depressed. They also may have felt other negative emotions. Therefore, members of the group were instructed to provide targeted psychological counseling to relieve negative emotions and any other psychological problems, according to each patient's condition. Patients and their families were informed concerning the various types of cerebral infarction. Individuals that

had been successfully treated could then encourage other patients to overcome the disease. (4) Post-acute care and recovery of physical function was provided. Cerebral infarction may result in differing degrees of impairment; for example, in terms of neurological and limb function, it requires treatment based on scientific and effective nursing rehabilitation strategies. To assist patients in gradually completing language rehabilitation, the monosyllable alphabet method was used. Concerning limb rehabilitation in the early stages of cerebral infarction recovery, patients performed flexion, extension, internal rotation, and abduction exercises of the limb joints. Muscle massages were performed by nurses as part of passive care rehabilitation. As patients gradually transitioned to more active rehabilitation care, facial movements such as head shaking, cheek bulging, tongue extension, and teeth clicking as well as limb function exercises such as joint flexion and extension, muscle contraction, walking, and cross-stepping, were performed to help patients return to ADL such as undressing, independent eating, and self-toileting.

Monitoring of physiologic indicators

Through pre- and post-implementation of evidence-based nursing interventions, this study analyzed and compared psychological status, improvements in neurological and motor function, QoL, and patient satisfaction of the study and control groups. Specific assessment methods included the Hamilton Anxiety Rating Scale (HAMA) [12], whereby each item was scored on a scale from 0 to 4, with a score of 4 indicating extreme anxiety (a possible total score of 14 could be obtained). The Hamilton Depression Rating Scale (HAMD) [13] was used with a scale from 1 to 4, with a score > 17 indicating significant depression. The National Institute of Health Stroke Scale (NIHSS) [14] has a maximum possible total score of 42 points. A higher score indicates more severe neurological impairment. ADL assessment [15] had a maximum possible total patient score of 100 points. A score ≥ 60 indicated that the patient was able to undertake independent care. A higher score indicated higher ability for self-care and self-discipline. WHO QoL-BREF [16] is a measurement tool that includes 4 aspects (psychology, physiology, environment, and social relations), with measurements recorded as percentage points. A higher average score indi-

Effects of evidence-based nursing interventions for cerebral infarction

Table 1. Baseline data of the study and control groups

Category	Research group (n=256)	Control group (n=256)	t/x ² value	P value
Gender			1.766	0.215
Man	112 (43.75)	127 (49.61)		
Woman	144 (56.25)	129 (50.39)		
Age (year)	64.5±5.3	63.9±4.5	1.381	0.168
Course of illness (year)	3.5±1.8	3.7±1.6	1.329	0.184
Educational level			1.882	0.597
Primary school	25 (9.77)	21 (8.20)		
Junior high school	40 (15.63)	47 (18.36)		
Senior high school	102 (39.84)	91 (35.55)		
University	89 (34.77)	97 (37.89)		
Time from onset to hospital (h)	3.7±1.2	3.6±1.0	1.024	0.306
Area of cerebral infarction			3.134	0.097
Large area	197 (76.95)	213 (83.20)		
Sub-massive	59 (23.05)	43 (16.80)		
Area of infarction			2.530	0.142
Posterior circulation	33 (12.89)	46 (17.97)		
Anterior circulation	223 (87.11)	210 (82.03)		
Total Cholesterol (mmol/L)	4.65±0.25	4.69±0.23	1.884	0.060
Low Density Lipoprotein (mmol/L)	2.71±0.43	2.75±0.46	1.016	0.309
Triglyceride (mmol/L)	1.28±0.83	1.35±0.73	1.013	0.311

Table 2. Comparison of HAMA and HAMD scores before and after the intervention between the study and control groups (x ± s)

Grade	Before and after the intervention	Research group (n=256)	Control group (n=256)	t value	P value
HAMA grade	Before	18.37±2.83	18.01±2.91	1.419	0.156
	After	10.39±2.46*	14.42±2.57*	18.12	< 0.001
HAMD grade	Before	18.75±3.17	18.29±3.46	1.568	0.117
	After	11.24±2.81*	15.43±3.26*	15.580	< 0.001

Note: Compared with before intervention, *P < 0.01.

cates better patient QoL. Patient satisfaction surveys were scored as follows: unsatisfactory (below 60 points), basically satisfied (between 60 and 79 points), satisfactory (between 80 and 90 points), and quite satisfied (over 90 points). Satisfaction = (basic satisfaction + satisfaction + quite satisfaction)/total number x 100%.

Statistical methods

SPSS version 18.0 (SPSS Co., Ltd., Shanghai, China) was used for statistical analysis. Measured data are expressed as mean ± stan-

dard deviation (x ± s) and compared with independent sample t-tests. Enumeration data are expressed as percentages and compared with Chi-square tests. Statistical significance was considered as P-value < 0.05.

Results

Baseline patient data in the study and control groups

No statistically significant differences were observed in terms of patient characteristics including sex, age, disease duration, education level, time from onset to hospitalization, size and site of cerebral infarct, total cholesterol, low-density lipoprotein, and triglyceride levels between the study and control groups (P > 0.05) (Table 1). Therefore, the two groups were comparable.

Pre- and post-intervention HAMA and HAMD scores of the study and control groups

Pre-intervention HAMA and HAMD scores for study group patients were

18.37±2.83 and 18.01±2.91, respectively, and 10.39±2.46 and 14.42±2.57 after intervention, respectively. Pre-intervention HAMA and HAMD scores for control group patients were 18.75±3.17 and 18.29±3.46, respectively, and 11.24±2.81 and 15.43±3.26 after intervention, respectively. No significant differences were observed in terms of pre-intervention HAMA and HAMD scores between the study and control groups (P > 0.05). Post-intervention HAMA and HAMD scores for patients in the study and control groups were significantly lower than pre-intervention (P < 0.01). Post-intervention HAMA and HAMD scores for the

Effects of evidence-based nursing interventions for cerebral infarction

Table 3. Comparison of NIHSS and ADL scores before and after intervention in the study and control groups ($x \pm s$)

Grade	Before and after the intervention	Research group (n=256)	Control group (n=256)	t value	P value
NIHSS grade	Before	12.73±2.89	12.53±3.08	0.757	0.449
	After	5.13±1.27*	8.53±1.67*	25.930	< 0.001
ADL grade	Before	46.16±4.49	46.73±4.24	1.477	0.140
	After	63.14±5.79*	54.79±5.27*	17.060	< 0.001

Note: Compared with before intervention, *P < 0.01.

Table 4. Comparison of WHOQOL-BREF scores of the study and control groups before and after intervention ($x \pm s$)

WHOQOL-BREF grade	Before and after the intervention	Research group (n=256)	Control group (n=256)	t value	P value
Mentality	Before	71.3±4.2	70.9±3.9	1.117	0.264
	After	83.4±3.6*	77.5±4.6*	16.160	< 0.001
Physiology	Before	67.6±3.8	68.1±3.6	1.528	0.127
	After	86.4±3.5*	78.3±4.1*	24.040	< 0.001
Environment	Before	71.4±4.2	72.1±4.4	1.841	0.066
	After	90.4±5.3*	78.4±5.4*	25.380	< 0.001
Social relations	Before	70.9±3.8	71.5±3.5	1.858	0.063
	After	89.1±3.6*	78.4±3.3*	35.060	< 0.001
Quality of life	Before	72.9±4.6	72.4±3.9	1.327	0.185
	After	90.1±4.0*	81.4±5.1*	21.480	< 0.001

Note: Compared with before intervention, *P < 0.01.

study group were significantly lower than the control group (P < 0.01) (**Table 2**).

Pre- and post-intervention NIHSS and ADL scores of the study and control groups

As shown in **Table 3**, pre-intervention NIHSS and ADL scores of patients in the study group were 12.73±2.89 and 12.53±3.08, respectively, and 5.13±1.27 and 8.53±1.67 after intervention, respectively. Pre-intervention NIHSS and ADL scores of patients in the control group were 46.16±4.49 and 46.73±4.24 respectively, and 63.14±5.79 and 54.79±5.27 after intervention, respectively. No significant differences were observed in terms of pre-intervention NIHSS and ADL scores between the study and control groups (P > 0.05). Post-intervention NIHSS scores were significantly lower than pre-intervention NIHSS scores in both the study and control groups (P < 0.01) and post-intervention ADL scores were significantly higher than pre-intervention ADL scores

(P < 0.01). Post-intervention, NIHSS scores of the study group were significantly lower than the control group (P < 0.01) and ADL scores of the study group were significantly higher than the control group (P < 0.01).

Pre- and post-intervention WHO QoL-BREF scores in the study and control groups

No significant differences were observed in terms of pre-intervention WHO QoL-BREF scores between the study and control groups (P > 0.05) and post-intervention QoL-BREF scores of study and control groups were significantly higher than pre-intervention scores (P < 0.01). After intervention, WHO QoL-BREF scores of the study group were significantly higher than the control group (P < 0.01) (**Table 4**).

Patient satisfaction between the study and control groups after intervention

In the study group, 159 patients were basically satisfied, 62 were satisfied, 25 were quite satisfied, and 10 were not satisfied. As shown in **Table 5**, the total satisfaction rate was 96.09%. In the control group, 107 patients were basically satisfied, 65 were satisfied, and 29 were quite satisfied. However, 55 patients were not satisfied and the total satisfaction rate was 78.51%. The difference in total patient satisfaction rates between the study and control groups was statistically significant (P < 0.01).

Discussion

Cerebral infarction is a neurological disease caused by cerebral vascular abnormalities. The burden of an aging population and related social pressures has increased, particularly in elderly individuals with hyperlipidemia and hypertension. Additionally, unhealthy lifestyle

Effects of evidence-based nursing interventions for cerebral infarction

Table 5. Comparison of patient satisfaction rate after intervention between the study group and control groups, n (%)

Group	n	Basically satisfied	Satisfied	Quite satisfied	Not satisfied	The total satisfaction
Research group	256	159 (62.11)	62 (24.22)	25 (9.77)	10 (3.91)	96.09%
Control group	256	107 (41.80)	65 (25.39)	29 (11.33)	55 (21.48)	78.51%
χ^2 value	-		41.686			13.211
P value	-		< 0.001			< 0.001

habits, such as alcohol consumption and cigarette smoking, have resulted in an annual increase in incidence rate and mortality of cerebral infarction [17]. Studies have shown that patients with cerebral infarction are more likely to have a poor prognosis. Should these patients survive, most will likely have a residual degree of neurological and motor dysfunction. Clinical treatment for cerebral infarction consists, primarily, of ameliorating impaired cerebral circulation, improving motor and neurological dysfunction, and reducing patient mortality and disability [18, 19]. Therefore, effective implementation of nursing interventions is important in the comprehensive treatment of patients with cerebral infarction.

With the development of evidence-based medicine, the concept and practice of evidence-based nursing has been a primary focus for medical staffs. Clinical staffs have revised the rationale, scientific evidence, and efficacy of traditional nursing models. Thus, evidence-based nursing practices have developed gradually, in response to evidence-based medicine. The concept and method of evidence-based nursing can help nursing staffs seek, analyze, and utilize clinical nursing experience using relevant knowledge and data, along with scientific methods. Nursing intervention models based on patient-specific conditions should be established for use in clinical practice [20, 21]. Therefore, the evidence-based nursing model is more scientific and effective than traditional nursing models.

In this study, an evidence-based research group was established to assess nursing management of patients with cerebral infarction. Concerning evidence-based best practice regarding the nursing process, nursing interventions were implemented based on evidence-based scientific research, clinical experiences of nurses, and patient aspirations. This study showed that post-intervention HAMA and

HAMD scores in the study group were significantly lower than pre-intervention scores. After intervention, scores in the study group were significantly lower than those of the control group, suggesting that the evidence-based nursing model can effectively alleviate negative emotions. This study suggests that health education, based on evidence-based research and health publicity, should be introduced to patients during the early stages of cerebral infarction recovery to promote awareness concerning their disease. Moreover, targeted psychological counseling, based on evidence-based nursing, should be conducted with an aim of alleviating patient anxiety, depression, and other negative emotions. The present study suggests that evidence-based nursing can effectively ameliorate neurological impairment and motor dysfunction, promote the recovery of bodily functions, and improve patient QoL with cerebral infarction. Analysis from this study suggests that evidence-based nursing intervention models should be established based on evidence-based nursing for patients with cerebral infarction. For these patients, interventions based on evidence-based nursing need to focus on health publicity, psychological counseling, and rehabilitation care. Through early psychological nursing interventions, adherence to follow up rehabilitation care was further improved. Moreover, negative emotions of patients were lessened and a good foundation for implementation of evidence-based rehabilitation care was established. Evidence-based nursing has been shown to provide a multi-aspect and comprehensive assessment of clinical symptoms of patients with acute stroke. Moreover, it can effectively ameliorate negative emotions of patients and improve treatment adherence. Therefore, it promotes the recovery of bodily functions. Through managing patient prognosis, one study found that clinical efficacy was enhanced [22], similar to results of the present study. After providing nursing interventions to patients with cerebral

Effects of evidence-based nursing interventions for cerebral infarction

infarction, patient satisfaction rates of the study group were significantly higher than the control group, suggesting that evidence-based nursing can improve physical function and QoL of patients with cerebral infarction and, at the same time, promote patient satisfaction.

In the present study, all patients met the inclusion criteria during screening. No differences were observed in terms of sex, age, duration of the disease, educational level, time from onset to hospitalization, cerebral infarct size, infarct site, total cholesterol, LDL, triglyceride levels, or pre-intervention NIHSS, ADL, NIHSS, ADL, and WHO QoL-BREF scores of the two groups. This helped ensure the rigor and reliability of the study. However, the study had some limitations. Failure to observe changes in patient vital signs was not clearly defined in evidence-based nursing interventions for other diseases, therefore, this was considered a limitation of the model. Evidence-based nursing interventions need to be implemented in individuals with different diseases to validate the results of this study. Once confirmed, they could be used as a basis for the promotion and application of evidence-based nursing in clinical settings.

In summary, the implementation of evidence-based nursing intervention was able to relieve and eliminate negative emotions, enhance patient satisfaction, ameliorate neurological impairment and motor dysfunction, promote recovery of bodily functions, and significantly improve the QoL of patients with cerebral infarction.

Disclosure of conflict of interest

None.

Address correspondence to: Hong Nian, Department of Radiation Oncology, The Second Affiliated Hospital of Harbin Medical University, No.246, Xuefu Road, Nangang District, Harbin 150086, Heilongjiang, China. Tel: +86-18504510836; E-mail: nianhongg@163.com

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Effects of evidence-based nursing interventions for cerebral infarction

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