

## Original Article

# A clinical appraisal of the different types of enteral nutrition support and humanized nursing among cerebral apoplexy ICU patients on mechanical ventilation

Min Wang<sup>1\*</sup>, Xiaobo Gu<sup>2\*</sup>, Jingjing Yu<sup>1</sup>, Yan Zhang<sup>1</sup>, Songfang Chen<sup>3</sup>

<sup>1</sup>Department of Critical Care Medicine, Hai'an People's Hospital, Hai'an, China; <sup>2</sup>Department of Critical Care Medicine, Wuxi Xishan People's Hospital, Wuxi, China; <sup>3</sup>Department of Neurosurgery, The First Affiliated Hospital of Soochow University, Suzhou, China. \*Equal contributors.

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**Abstract:** Objective: To study the clinical effectiveness of different types of enteral nutrition support combined with humanized nursing in intensive care unit (ICU) stroke patients on mechanical ventilation. Methods: One hundred patients with stroke admitted to our hospital's ICU from April 2019 to July 2020 were established as the study cohort and divided into a control group and an experimental group, with 50 cases in each group. The control group was administered one-time injections of enteral nutrition combined with general nursing, and the experimental group was administered enteral nutrition pump infusions combined with humanized nursing. The nursing efficiency, the nursing satisfaction, the Barthel index (BI) scores, the National Institutes of Health Stroke Scale (NIHSS) scores, the adverse reactions, the serum albumin, serum total protein, and serum prealbumin levels, the ICU stay durations, the hospital stay durations, and the mini-nutritional assessment (MNA) scores at 1, 2, and 3 weeks were compared between the two groups. Results: Compared with the control group, the nursing efficiency and satisfaction levels, the BI index scores, the serum albumin, serum total protein, serum pre-albumin levels and the MNA nutritional evaluation scores at weeks 1, 2, and 3 in the experimental group were significantly higher ( $P < 0.05$ ), while the NIHSS scores, the adverse reactions, the time costs in the ICU and the hospital stay durations were significantly lower, with statistical significance ( $P < 0.05$ ). Conclusion: Humanized nursing combined with enteral nutrition pumping can remarkably improve the quality of life and the malnutrition in ICU stroke patients on mechanical ventilation.

**Keywords:** Mechanical ventilation, stroke, enteral nutrition support, humanized nursing, application effect

## Introduction

Stroke is a common cerebrovascular disease characterized by the loss of mobility or aphasia. Patients need thrombolytic therapy promptly after the onset, and if more than 8 hours have passed, anticoagulant therapy is needed [1-3]. Shock, coma, unconsciousness, and even death may occur in severe stroke patients, who need to be treated in the intensive care unit (ICU). Enteral nutrition support remains a major way to maintain the nutritional status of ICU patients with dysphagia caused by stroke. Patients with short-term enteral nutrition support can feed through nasogastric tubes or nasointestinal tubes, which are also the most

common, clinical enteral nutrition support methods [4-6]. Enteral nutritional support can be completed using one-time injections or by continuous pumping with enteral nutrition pumps at a certain interval. It has been reported that continuous pumping with enteral nutrition pumps can effectively reduce patients' gastrointestinal pressure and gastrointestinal complications. Humanized nursing, a people-oriented nursing method, aims to eliminate the distance between the patients and the medical staff and improve patients' inpatient experiences. Thus we attempted to study the clinical effectiveness of the humanized nursing mode and the different enteral nutrition support

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**Table 1.** Comparison of the general data ( $\bar{x} \pm s$ )

Groups	Experimental group	Control group	t/X <sup>2</sup>	P
Gender (male/female)	24/26	23/27	0.04	0.84
Age (years)	62.33±4.98	63.16±4.86	0.84	0.40
Heights (cm)	165.65±7.82	166.28±7.04	0.42	0.67
Weights (kg)	69.31±7.80	69.49±7.01	0.12	0.90
Admission time (h)	2.04±0.33	2.11±0.42	0.92	0.36
Smoking history (years)	7.73±1.28	7.60±1.54	0.46	0.65
Drinking history (years)	10.44±2.21	10.30±2.38	0.30	0.76
Hypertension (cases)	23	21	0.16	0.69
Diabetes (cases)	16	13	0.44	0.51
Hyperlipidemia (cases)	11	10	0.06	0.81

methods in ICU stroke patients on mechanical ventilation in this study.

### Materials and methods

#### General data

One hundred stroke patients referred to the ICU of our hospital from April 2019 to July 2020 were established as the research cohort and divided into the control group or the experimental group, with 50 cases in each group. The patients in the experimental group ranged from 58 to 74 years old, and the patients in the control group ranged in age from 55 to 75 years old. There were no significant differences in terms of gender, age, or nutrient delivery times between the two groups ( $P > 0.05$ , **Table 1**).

#### Inclusion/exclusion criteria

**Inclusion criteria:** ① Patients whose imaging and other examinations met the diagnostic criteria for stroke patients and who were hospitalized in the ICU of our hospital and put on mechanical ventilation. ② Patients with an ICU mechanical ventilation time  $> 48$  hours and with early enteral nutrition support, and patients whose stay in the ICU is expected to be 7 days or more. ③ Patients 18 to 70 years old whose Acute Physiology and Chronic Health Evaluation scale (APACHEII) scores  $\geq 8$  points, NRS2002 scores  $\geq 3$  points. Patients with no other organic diseases. ④ Patients with no history of drug allergies, drug abuse, or bad habits, and patients with a clear consciousness who can cooperate with the treatment and express their own demands. ⑤ The study was approved by the hospital ethics committee. All

the patients voluntarily participated in the study and signed the informed consent.

**Exclusion criteria:** ① Patients with communication difficulties or who were unable to cooperate. ② Patients with mental diseases (such as schizophrenia, depression, etc.) or with cognitive dysfunction. Patients with a history of epilepsy, or with the past abuse of psychotropic drugs and narcotic drugs. ③ Patients with complete intestinal obstructions or gastrointestinal failure.

#### Methods

The patients in the control group were administered routine nursing combined with enteral nutrition support using a one-time injection: the patients were fed with an indwelling nasogastric tube once every 4-6 h, and the temperature of nutrient solution was maintained at 37-41°C [10-12]. The patient's position was upright when feeding, kept at a certain angle with the hospital bed to prevent aspiration. If aspiration occurred, the feeding was stopped immediately, and the appropriate treatment was administered. Routine ICU care was administered to the patients, the working status of the ventilator was checked regularly, and the changes in the vital signs and indicators were observed to prevent complications such as ventilator infection pneumonia.

The patients in the experimental group were administered enteral nutrition pump infusions combined with humanized nursing. The nutrition solution was continuously pumped through each patient's indwelling nasogastric tube, diluted in advance, and connected with the enteral nutrition pump. The pumping speed of the nutrition pump was adjusted, and a heater was set outside the nutrition solution to prevent the gastrointestinal discomfort caused by the cooling of the nutrition solution. After pumping, warm water was used to flush the nasogastric tube to prevent the tube from being blocked by the residual nutrient solution. Humanized nursing was also administered. The nursing staff were required to have a clear division of labor, to carry out the nursing respectively, to monitor the patients' vital signs, to

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**Table 2.** Comparison of the nursing efficiency between the two groups

Groups	high efficiency	effective	ineffective	total efficiency rate (%)
Experimental group	29	14	7	86%
Control group	11	16	23	54%
$\chi^2$				12.19
P				< 0.001

communicate with the doctors about the feasibility of the nursing scheme and plan, to obtain the patients' next treatment plans, and to carry out the nursing work according to the treatment plan.

### Observation indexes

The nursing efficiency, the serum total protein, the nursing satisfaction levels, the serum prealbumin levels, the Bi index scores, the serum albumin levels, the NIHSS scores, incidence of adverse reactions, the ICU stay durations, the hospital stay durations, and the MNA indexes in the two groups of patients were compared.

In the nursing process, the patients with no adverse reactions, with a good nutritional status, and with their stroke symptoms significantly reduced were classified as markedly effective. The patients with mild adverse reactions, good nutritional status, and their clinical manifestations reduced to a certain extent were classified as effective. The patients with serious adverse reactions and malnutrition and whose clinical symptoms were reduced significantly were classified as ineffective.

The NIHSS neurological function scores range from 0 to 42. The higher the score, the more serious the nerve defect. 0-1 indicates normal, 1-4 indicates mild stroke, 5-15 indicates moderate stroke, 16-20 indicates moderate and severe stroke, and 21-42 indicates severe stroke.

The total possible score of the BI index is 100 points, and 100 points means that the patients do not need other people's care and can take care of themselves. 61-99 points indicates that the patients occasionally need other people's care, and can basically take care of themselves. 41-60 points indicates that the patients need other people's care in most cases, and can't take care of themselves. 40 points or below indicates that the patients can't

take care of themselves, and need intensive care [13-15].

The normal serum albumin level is 20-40 g/L. The normal serum prealbumin level is 213-441.9 mg/L. The normal total serum protein level is 60-80 g/L, and the normal total serum prealbumin level is 213-441.9 mg/l.

The MNA scores range from 0-30 points. If the score exceeds 23.5 points, the nutritional status is defined as good, 17-23.5 points as moderate, and less than 17 points as severe.

The nursing satisfaction level scale made by our hospital is used to evaluate the nursing satisfaction. The scale is completed by the patients and their families. Nursing satisfaction is classified as very satisfied, satisfied, and dissatisfied. Satisfaction = (very satisfied + satisfied)/total number of cases  $\times$  100%.

### Statistical analysis

In this study, SPSS 20.0 was utilized to process and analyze the data, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) to plot the graphics. The count data and measurement data were expressed as n (%) and ( $\bar{x} \pm s$ ), respectively, and  $\chi^2$  and t tests were adopted to examine the differences. Significance was set at  $P < 0.05$ .

## Results

### Comparison of the nursing efficiency

The two groups' nursing efficiency was compared, and the experimental group exhibited a significantly higher nursing efficiency level ( $P < 0.05$ ). See **Table 2**.

### Nursing satisfaction

The data showed that the nursing satisfaction levels in the experimental group were considerably higher than they were in the control group ( $P < 0.05$ ). See **Table 3**.

### The BI index scores and the NIHSS scores

**Figure 1** shows that the BI index scores were significantly higher in the experimental group ( $P < 0.05$ ), but the NIHSS scores were evidently lower as compared to the control group ( $P < 0.05$ ).

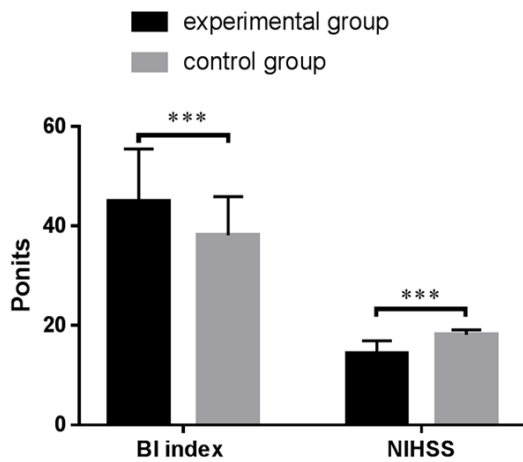
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**Table 3.** Comparison of the nursing satisfaction levels between the two groups

Groups	Very satisfied	Satisfied	Not satisfied	General satisfaction (%)
Experimental group	32	16	2	96%
Control group	21	10	19	62%
$\chi^2$				17.42
P				< 0.001

*The MNA nutritional evaluation scores of the two groups at weeks 1, 2, and 3 during the nursing*

**Figure 3** shows that the MNA nutritional scores in the experimental group at weeks 1, 2, and 3 were notably higher than they were in the control group ( $P < 0.05$ ).



**Figure 1.** Comparison of the BI index scores and the NIHSS scores between the two groups. \*\*\* indicates  $P < 0.001$ .

### Adverse reactions

The adverse reactions in the two groups of patients during the nursing process mainly included cough, aspiration, gastric retention, and gastrointestinal infections. The experimental group had a remarkably lower incidence of adverse events compared to the control group ( $P < 0.05$ , **Table 4**).

### *The serum total protein, serum prealbumin, and serum albumin levels*

Compared to the control group, the experimental group had notably higher serum prealbumin, serum albumin, and serum total protein levels ( $P < 0.05$ , **Table 5**).

### *The ICU stay and hospital stay durations*

**Figure 2** shows that in comparison with the control group, the hospitalization stay and ICU stay durations in the experimental group were significantly shorter ( $P < 0.05$ ).

## Discussion

Gastrointestinal diseases are prone to occur in stroke patients due to their limited mobility and weak gastrointestinal peristalsis speeds. Consequently, enteral nutrition support has normally been able to ensure patients' demand for nutrients, and to reduce the gastrointestinal complication rates. At present, the commonly used enteral nutrition support for stroke patients includes nasogastric tubes or nasointestinal tube feeding' [16-18]. Nasogastric tube feeding can be classified into two types: enteral nutrition pumping and one-time interval injection. It has been reported that enteral nutrition pumping is easier to be absorbed than one-time interval injections, and the probability of gastrointestinal adverse reactions is smaller [19-22]. As a patient-centered nursing method, humanized nursing outperforms the conventional nursing mode and well adapts to the current medical situation. To explore different enteral nutrition support methods and humanized nursing in ICU stroke patients with mechanical ventilation, this paper took ICU stroke patients as the research cohort and compared them in terms of various indexes.

The current study results showed that the nursing efficiency, the nursing satisfaction, the BI index scores, the serum albumin, serum total protein, and serum prealbumin levels and the MNA nutritional evaluation scores at weeks 1, 2, and 3 in the experimental group were significantly higher than they were in the control group. It can be assumed that enteral nutrition pumping combined with humanized nursing can evidently improve nursing quality and efficiency, improve patients' self-care abilities and serum protein content, promote nutrition absorption, and avoid malnutrition during hospitalization. Due to the fact that patients' gas-

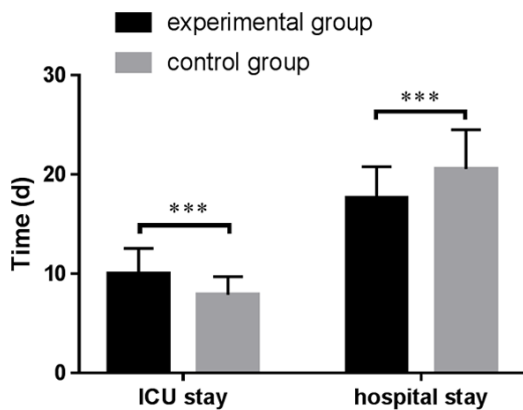
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**Table 4.** Comparison of the adverse reactions between the two groups

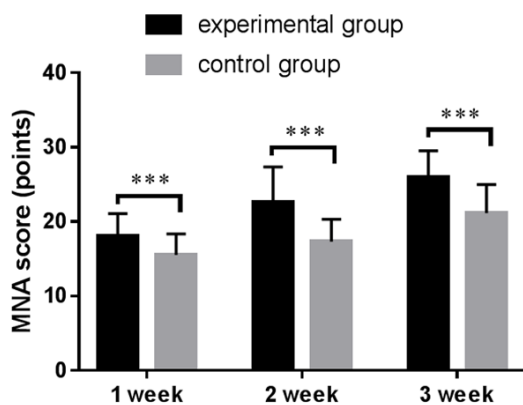
Groups	cough	aspiration	gastric retention	gastrointestinal infection	adverse reactions (%)
Experimental group	3	1	1	0	10%
Control group	4	3	4	6	34%
$\chi^2$					8.39
P					0.004

**Table 5.** Comparison of the serum albumin, serum prealbumin, and serum total protein levels between the two groups

Groups	Serum albumin (g/L)	Total serum protein (g/L)	Pre-albumin (mg/L)
Experimental group	36.52±3.36	71.09±6.34	364.59±37.12
Control group	32.20±3.17	64.51±6.20	305.40±31.22
t	6.61	5.25	8.63
P	< 0.001	< 0.001	< 0.001



**Figure 2.** Comparison of the ICU and hospital stay durations between the two groups \*\*\* indicates  $P < 0.001$ .



**Figure 3.** Comparison of the MNA scores between the two groups at weeks 1, 2, and 3. \*\*\* indicated  $P < 0.001$ .

gastrointestinal tracts can absorb nutrients in the nutrient solution during the infusion process, the continuous infusion of nutrient pumping into the nutrient pump is more suitable. In contrast, the one-time injection of nutrient solution at intervals is not conducive to good absorption and digestion, so nutrient loss and gastric retention may arise. Coupled

with a corresponding nursing plan based on the humanized nursing mode, the patient nutritional status and self-care abilities can be substantially improved with ICU stroke patients undergoing mechanical ventilation and undergoing enteral nutrition pumping. Also, compared with the control group, the NIHSS scores, the rate of adverse reactions, the hospital and ICU stay durations in the experimental group were significantly lower ( $P < 0.05$ ). The NIHSS score is the standard to judge the degree of neurological deficit in stroke patients can reflect patients' rehabilitation situations. Additionally, the experimental group was administered enteral nutrition pumping combined with humanized nursing and witnessed a remarkably lower incidence of adverse reactions and in turn yielded a favorable prognosis. Our findings are in agreement with Long et al. [23] who proposed that enteral nutrition support combined with humanized nursing can significantly improve the serum total protein, serum albumin, and serum prealbumin levels, and alleviate the neurological deficit degree. Still, there were some limitations in this study. First, it was a single center study with a small sample size and a short follow-up. Second, no blinding was done in this study.

In conclusion, the administration of enteral nutrition pumping for enteral nutrition support combined with humanized nursing can serve as a promising option for ICU stroke patients undergoing mechanical ventilation'.



## Disclosure of conflict of interest

None.

**Address correspondence to:** Songfang Chen, Department of Neurosurgery, The First Affiliated Hospital of Soochow University, Suzhou, China. Tel: +86-13776105404; E-mail: chensongfang2021@163.com

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