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Construction of a Nutritional Management System for Dysphagia in Stroke Patients on the Basis of Multidisciplinary Collaboration with the HAPA Model

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Abstract

Objective: To analyze the value of a multidisciplinary collaborative nutrition management system based on the Health Action Process Approach (HAPA) model in stroke patients with dysphagia. **Methods:** A total of 94 stroke patients with dysphagia admitted to our hospital were enrolled and divided into two groups according to admission time. The control group (n = 47, admitted between January 2024 and June 2024) received routine care, while the observation group (n = 47, admitted between January 2025 and June 2025) received a multidisciplinary collaborative nutrition management system based on the HAPA model. The intervention effects of the two groups were evaluated according to swallowing function, self-efficacy, nutritional indicators, and complications. **Results:** After intervention, the observation group showed significantly higher scores than the control group on both the Chinese version of the Gugging Swallowing Screen (GUSS) and the General Self-Efficacy Scale (GSES) ($P < 0.05$). Significant improvements were also observed in hemoglobin (Hb) and albumin (Alb) levels in the observation group compared to controls ($P < 0.05$). Regarding complications during hospitalization (aspiration, aspiration pneumonia, malnutrition, etc.), the observation group exhibited a lower overall incidence rate than the control group ($P < 0.05$). **Conclusion:** The application of the HAPA model-based multidisciplinary collaborative nutritional management system for stroke patients with dysphagia can improve swallow-

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ing function, self-efficacy, and nutritional status and reduce the risk of complications.

Keywords

HAPA Model, Multidisciplinary Collaboration, Nutritional Management System, Stroke, Swallowing Disorders

1. Introduction

As one of the multiple types of cerebrovascular diseases, stroke has remained highly prevalent in the clinic in recent years, becoming a serious disease burden in society and threatening people's life and health [1]. Swallowing disorders are the most common complications caused by stroke; are closely related to complications such as aspiration pneumonia, malnutrition, and aspiration; and increase the risk of illness and death in stroke patients. For stroke patients with swallowing disorders, in addition to conventional treatment, corresponding swallowing training and nutritional management are needed, which is the key to reducing complications and promoting recovery [2]. Conventional single-subject interventions are limited in many aspects, and the overall improvement effect on swallowing disorders needs to be improved. The Health Action Process Approach (HAPA) model conceptualizes health behavior change as a three-phase continuum: the pre-intentional phase, intentional phase, and action phase, which facilitates behavioral transformation by mobilizing individual self-efficacy [3]. The integration of the HAPA with a multidisciplinary collaborative model establishes a comprehensive nutrition management system that synergizes the expertise of diverse healthcare professionals, thereby providing a scientific and efficient intervention pathway for managing post-stroke dysphagia [4]. There are few clinical reports on the combined application of the HAPA model and multidisciplinary collaboration. To this end, this study included stroke patients with swallowing disorders to construct a multidisciplinary collaborative nutritional management system based on the HAPA model and explored its effect, which is reported below.

2. Materials and Methods

2.1. General Information

A total of 94 stroke patients with dysphagia admitted to our hospital were enrolled and divided into two groups chronologically. The control group (n = 47, admitted from January 2024 to June 2024) received routine care, while the observation group (n = 47, admitted from January 2025 to June 2025) received a multidisciplinary nutrition management system based on the HAPA model. The control group comprised patients aged 52 - 76 years (mean 66.37 ± 5.43), including 27 males and 20 females. Their water swallow test results showed: Grade 2 (n = 11), Grade 3 (n = 17), Grade 4 (n = 11), and Grade 5 (n = 8). Patients in the observation

group were aged 51 - 79 years (mean 66.54 ± 5.28), including 29 males and 18 females. Water swallow test results demonstrated: Grade 2 (n = 12), Grade 3 (n = 16), Grade 4 (n = 12), and Grade 5 (n = 7). Baseline characteristics showed no statistically significant differences between groups ($P > 0.05$).

The inclusion criteria were as follows: 1) Stroke diagnosis meeting the "Chinese Guidelines for Diagnosis and Treatment of Acute Ischemic Stroke 2018" [5]; 2) Water swallow test Grade ≥2 confirming dysphagia; 3) Age 45-80 years; 4) Intact comprehension and communication abilities; 5) Informed consent obtained regarding trial risks and procedures.

The exclusion criteria were as follows: 1) Comorbid malignancies, hepatic/renal failure or other major systemic diseases; 2) Intracranial tumors, cerebral tuberculosis or other brain lesions; 3) Secondary dysphagia caused by other conditions; 4) Psychological disorders or mental abnormalities.

2.2. Methods

2.2.1. The Control Group Received Routine Care

For patients with Grade 2 in the water swallow test, basic dietary guidance was provided, including instruction on proper evaluation methods for food viscosity, training on appropriate feeding postures, and education regarding techniques for controlling eating pace and correct feeding methods. For patients with Grade 3 or higher, tube feeding was administered as prescribed along with fundamental nursing care, followed by initiation of basic swallowing rehabilitation such as pharyngeal cold stimulation and feeding training after their condition stabilized.

2.2.2. The Observation Group Received a Multidisciplinary Collaborative Nutrition Management System Based on the HAPA Model

1) Pre-intention stage: a) Neurological rehabilitation physicians explained the pathological mechanisms of post-stroke dysphagia to patients, such as cerebral circulatory disorders and nerve damage. b) Nutritionists analyzed the impact of malnutrition on rehabilitation, including potential immune function decline and delayed wound healing. c) Speech therapists presented real cases of aspiration to enhance patients' preventive awareness. This multidisciplinary education improved patients' disease risk awareness and increased compliance.

2) Intentional phase: a) Develop personalized diet plans: Dietitians use the Chinese version of the Gugging Swallowing Screen (GUSS) to assess patients' swallowing function and formulate individualized dietary plans accordingly, categorizing foods into different types such as liquids, semi-liquids, and soft foods, with appropriate additions of nutritional supplements like protein powder and vitamins. b) Swallowing training: Speech therapists develop personalized swallowing training programs based on patients' swallowing function levels, including oral muscle training (e.g., tongue resistance exercises), breathing training (e.g., diaphragmatic breathing), and feeding posture adjustments (e.g., semi-recumbent position, neck flexion). c) Psychological support: Conduct face-to-face psychological assessments with patients, analyze causes of negative emotions, and actively

apply professional psychological interventions (e.g., cognitive behavioral therapy) to alleviate anxiety and depression caused by dysphagia.

3) Action phase: a) Nurses monitor patients' dietary behaviors throughout the nursing process, enforcing the "one bite" principle—the minimum food amount that can be swallowed smoothly—to prevent aspiration from oversized bites. b) Nutritionists dynamically adjust dietary plans based on patients' weight and nutritional indicators, such as gradually transitioning from rice paste to soft rice with proper texture modification. c) Rehabilitation physicians conduct regular videofluoroscopic swallowing studies to identify specific sites of dysphagia and make targeted adjustments to training intensity.

2.3. Observation Indicators

1) Swallowing function: The GUSS was used as the evaluation tool. The total score was 20 points. Swallowing ability was positively proportional to the score.

2) Self-efficacy: The general self-efficacy scale (GSES) was used as the evaluation tool, with a total of 10 scoring items and a total score of 40 points. The level of self-efficacy is positively proportional to the score.

3) Nutritional indicators: Peripheral blood samples (4 mL) from cubital veins in the fasting state were collected from patients. The levels of hemoglobin (Hb) and albumin (Alb) were recorded via an automatic biochemical analyzer.

4) Complications: The relevant complications during hospitalization, including aspiration, aspiration pneumonia, and malnutrition, were evaluated and recorded.

2.4. Statistical Analysis

The data in this study were processed via SPSS 23.0 software. ($\overline{\chi} \pm s$) represents measurement data that fit a normal distribution, and independent samples t-test was used for between-group comparisons. Count data were expressed as [n(%)], and χ^2 test was employed for between-group comparisons, with statistical significance set at $P < 0.05$.

3. Results

3.1. Comparison of Swallowing Function and Self-Efficacy between the Two Groups before and after the Intervention

The GUSS and GSES results revealed that the scores of the two groups after the intervention increased compared with those before the intervention ($P < 0.05$), and the increase in the observation group was greater than that in the control group ($P < 0.05$). See Table 1.

3.2. Comparison of the Nutritional Indicators of the Two Groups before and after the Intervention

After the intervention, the observation group showed significantly higher levels of Hb and Alb compared to the control group ($P < 0.05$). See Table 2.

Table 1. Comparison of swallowing function and self-efficacy between the two groups before and after the intervention ($\overline{\chi} \pm s$, score).

Groups	GUSS score		GSES score	
	Before intervention	After intervention	Before intervention	After intervention
Control group (n = 47)	9.36 ± 1.46	11.69 ± 1.69*	21.38 ± 2.59	23.47 ± 2.78*
Observation group (n = 47)	9.24 ± 1.58	13.53 ± 1.84*	20.96 ± 2.41	26.39 ± 2.96*
t	0.382	5.049	0.814	4.930
P	0.703	0.000	0.418	0.000

Note: Compared with the group before intervention, *$P < 0.05$.

Table 2. Comparison of nutritional indicators between the two groups before and after the intervention ($\overline{\chi} \pm s$, g/L).

Groups	Hb		Alb	
	Before intervention	After intervention	Before intervention	After intervention
Control group (n = 47)	118.69 ± 7.58	129.67 ± 8.16*	33.37 ± 3.17	36.48 ± 3.56*
Observation group (n = 47)	117.86 ± 7.74	143.62 ± 9.47*	33.69 ± 3.35	39.47 ± 3.78*
t	0.525	7.6510	0.476	3.948
P	0.601	0.000	0.635	0.000

Note: Compared with the group before intervention, *$P < 0.05$.

3.3. Comparison of the Complications between the 2 Groups

Compared with the incidence of complications during hospitalization, the total incidence in the observation group was lower than that in the control group ($P < 0.05$). See Table 3.

Table 3. Comparison of complications in the 2 groups [n (%)].

Groups	Aspiration	Aspiration pneumonia	Malnutrition	Total incidence
Control group (n = 47)	3	2	3	8 (17.02)
Observation group (n = 47)	1	1	0	2 (4.26)
χ^2				4.029
P				0.045

4. Discussion

During the recovery phase, stroke patients are more prone to developing dysphagia, and without prompt therapeutic and rehabilitation interventions, their feeding difficulties may worsen, potentially leading to psychological disorders, social isolation, and various complications [6]. While traditional single-discipline inter-

ventions, such as nutritional support or swallowing therapy alone, have shown some effectiveness in improving swallowing function [7]. However, not all patients benefit equally due to inherent limitations. For instance, nutrition specialists often overlook how swallowing training affects dietary safety, while rehabilitation teams frequently fail to monitor nutritional indicators during therapy, often resulting in adverse events like aspiration and malnutrition—underscoring the urgent need for more scientific and efficient management systems [8].

Our results revealed that, after intervention, the GUSS and GSES scores of the observation group increased compared with those of the control group; moreover, the Hb and Alb levels in the observation group increased compared with those in the control group after intervention. The results suggest that the application of the HAPA model-based multidisciplinary collaborative nutritional management system for stroke patients with dysphagia can improve swallowing function, self-efficacy, and nutritional status. Analysis of specific reasons: The multidisciplinary collaborative nutrition management system based on the HAPA model divides the intervention process into three steps, among which the pre-intention stage helps patients gain an in-depth understanding of the mechanism, risk factors, common complications, and harmfulness of dysphagia with the help of multidisciplinary education such as nutrition, neurorehabilitation, and speech rehabilitation, so as to improve patients' risk awareness, enhance health beliefs, and secondary self-efficacy [9]. At the same time, in the intention stage, the nutritionist formulated the individualized diet plan, the rehabilitation department developed the individualized swallowing training plan, and the nurses provided professional psychological counseling to improve the patient's physical and mental state and promote the development of a correct diet and training behavior [10]. In addition, in the action stage, the implementation of the patient's dietary behavior is supervised by the nurse, the dietician dynamically adjusts the dietary plan, and the rehabilitation physician regularly adjusts the training intensity, which can continuously strengthen and consolidate the patient's healthy behavior [11]. Through the abovementioned dynamic intervention and the integration of multidisciplinary resources, the correct eating behavior of patients and scientific swallowing training will help to accelerate the recovery of swallowing function and improve nutritional status. The HAPA model is particularly suitable for dysphagia management as its three-phase intervention (pre-intention-intention-action) specifically addresses patients' behavioral challenges: enhancing risk perception in the pre-intention phase, establishing individualized plans in the intention phase, and reinforcing behavior maintenance in the action phase. This progressive approach effectively overcomes common issues in dysphagia patients including insufficient cognition, lack of motivation, and poor adherence. This study compared complications during hospitalization, and the total incidence in the observation group was lower than that in the control group. The multidisciplinary collaborative nutritional management system based on the HAPA model helps reduce the risk of complications in stroke patients with swallowing disorders. This model promotes

the recovery of swallowing function, reduces the degree of swallowing dysfunction, improves the ability to eat, and improves the nutritional status of stroke patients with dysphagia through closed-loop management, thereby reducing the risk of malnutrition and aspiration [12]. The findings suggest that implementing this HAPA-based multidisciplinary nutrition management system requires establishing specialized teams (nutritionists, rehabilitation physicians, nurses), standardized cross-departmental protocols, and regular staff training to ensure intervention fidelity.

In summary, for stroke patients with dysphagia, the use of the HAPA model-based multidisciplinary collaborative nutritional management system can improve swallowing function, self-efficacy, nutritional status, and the incidence of complications. However, this study has some limitations. First, the quasi-experimental design based on admission time may introduce selection bias. Second, potential confounding factors such as patients' baseline nutritional status and severity of complications were not fully controlled. Future studies will address these limitations through improved study design.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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