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## Research Paper

## Implementation strategies to improve evidence-based practice for post-stroke dysphagia identification and management: A before-and-after study

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## ABSTRACT

**Objectives:** Even though guidelines are available to guide dysphagia identification and management practice, there is still a gap between evidence and practice, which requires improvement. The purpose of this study was to determine the effect of using tailored, multifaceted strategies to improve evidence-based post-stroke dysphagia identification and management practice in a community hospital.

**Methods:** Guided by the Knowledge to Action framework, the tailored, multifaceted strategies were developed and implemented for 5 months in a community hospital using a before-and-after study design. These strategies consisted of training intervention, policy intervention, and audit and feedback intervention. Nurses' level of knowledge and adherence, were collected in March 2019 and again in January 2020. Patients' quality of life and satisfaction were evaluated during the pre-intervention period (between February 2019 and April 2019) and the post-intervention period (between November 2019 and January 2020).

**Results:** A total of 55 patients with post-stroke dysphagia (28 in the pre-intervention period and 27 in the post-intervention period) and 17 registered nurses were recruited. Following implementation, there were statistically significant improvements in patients' outcomes (quality of life and satisfaction) and nurses' outcomes (level of knowledge and adherence).

**Conclusions:** This study assists in closing the research-practice gap by using tailored, multifaceted strategies to increase the use of evidence-based nursing care for dysphagia identification and management practices.

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## What is known?

- There is still a big gap between evidence and clinical practice for post-stroke dysphagia identification and management, which requires improvement.
- Tailored multifaceted strategies might help to promote evidence-based practice implementation.

## What is new?

- This study provides positive evidence of the significant effects of tailored, multifaceted strategies on patients' quality of life and satisfaction, as well as nurses' level of knowledge and adherence.
- This study proposes effective strategies for community hospitals to improve evidence-based practice and nursing quality through tailored, multifaceted strategies including training intervention, policy intervention, and audit and feedback intervention, which can also be implemented in other implementation studies.

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## 1. Introduction

Dysphagia, is common and life-threatening comorbidity after acute stroke, affecting up to 78% of all stroke patients [1]. Dysphagia remains a chronic disorder in nearly half of post-stroke patients and it may result in increased mortality, mobility, and institutionalization due to aspiration pneumonia and malnutrition. The dysphagia patients are approximately five times more likely to develop pneumonia than the nondysphagia patients [2,3]. Pneumonia is one of the leading causes of post-stroke mortality [4]. Most stroke-related pneumonia is due to dysphagia and the subsequent aspiration of oropharyngeal food material. In addition, patients with dysphagia demonstrate significantly greater dehydration than patients without dysphagia [5]. Dysphagia is an independent risk factor for prolonged hospital stay and hospitalization, and also is independently associated with a poorer functional capacity [6]. There is moderate evidence suggestive of higher costs (an increase of US\$3,950–US\$15,300) in patients who develop oropharyngeal dysphagia after stroke [7]. A critical challenge for the treatment of dysphagia is that dysphagic stroke patients rarely perceive that they have a swallowing problem, which exposes them to a high risk of aspiration and its associated consequences.

Early identification and management of dysphagia could significantly reduce complications, improve patients' quality of life, and improve patient outcomes, which should be of high priority [8]. Currently, most interventions focus on treatment led by doctors and fail to actively involve nurses who are available on a 24-h basis in hospitals and who are in a prime position to conduct dysphagia identification and management [9]. There is strong evidence that training nurses on dysphagia screening can increase the screening frequency and accuracy, thereby effectively lowering the risk of the patients' chest infections [8]. Furthermore, following the clinical practice guidelines for dysphagia may reduce the death rate and chest infections in hospitalized patients, and consequently, improve patient prognosis [8,10]. However, despite the fact that multiple authoritative evidence-based guidelines are available and clearly recommend standard [screening tools](#), [treatment](#), and nursing care for dysphagia, there is a gap between clinical nursing practice and the best evidence, given that nurses underutilize important dysphagia indicators and use potentially harmful nursing practices such as syringe feeding [11]. Evidence-based interventions that have not been implemented require improvement.

To bridge the evidence-practice gap, intervention studies aimed at effective implementation strategies have been gaining growing attention in the literature. Implementation strategies constitute the “how to” of integrating evidence-based interventions into routine clinical practice in health care. In our study, implementation strategies were defined as methods or techniques used to support and enhance the adoption, implementation and sustainability of evidence-based practice [12]. The most successful implementation strategies are multimodal and tailored to local determinants (ie., barriers and facilitators). Several studies have also noted that tailored, multifaceted implementation strategies may be more effective than a single strategy [13–15]. An improved understanding of how implementation strategies affect patients' and nurses' outcomes will facilitate the selection of the most appropriate implementation strategies for a particular determinant. Hence, the aim of our study was to evaluate the effects of tailored, multifaceted strategies in community health care on patients' quality of life and satisfaction, as well as nurses' level of knowledge and adherence to best practice recommendations on nurse-led dysphagia identification and management.

## 2. Methods

### 2.1. Design and context

We conducted a before-and-after study in a rehabilitation unit of a community hospital in China. This unit has more than 21 registered nurses. On average, about 400 stroke patients are admitted to the unit annually. Before our study, there were no resources available to educate nurses on dysphagia, and no formal nursing pathways or policies for dysphagia management were available in this unit. The Knowledge to Action (KTA) framework [16] provided overall guidance for this study. The KTA framework is one of the most frequently cited conceptual frameworks used in healthcare settings to support researchers and clinicians in implementing evidence-based practice. Guided by the KTA framework, researchers engage with end-users to identify gaps in practice and align best practice recommendations to the local context, which informs implementation strategies to embed evidence-based practice. This framework comprises two components: knowledge creation and an action cycle, each of which contains multiple phases. Knowledge creation is the production of forming the required knowledge for best practice. In previous studies [17,18], we systematically searched the guidelines website, stroke professional associations website, and databases for the best-practice recommendations for post-stroke dysphagia; conducted a rigorous quality evaluation using AGREE II; and selected best-practice recommendations appropriate for the Chinese community context according to the evidence's FAME attributes (feasibility, appropriateness, meaningfulness, and effectiveness). The action cycle from the KTA framework guided knowledge translation. In this study, we focused on “assessing barriers to knowledge use,” “selecting, tailoring, and implementing interventions,” “monitoring knowledge use,” and “evaluating outcomes” phases in the action cycle.

### 2.2. Participants

All nurses and patients were recruited by purposive sampling. Registered nurses who worked in this Unit for at least 3 months and signed the informed consent were included. Nurses who were unable to finish the pre-/post-test due to leave arrangements were excluded. Stroke patients, aged above 18 years, who signed the informed consent were included. We excluded stroke patients who took intermittent oral-esophageal/gastric feeding; had other throat diseases; had severe complications such as heart, liver, and kidney comorbidities, respiratory failure, malignant tumor; or suffered from conscious and cognitive impairment.

### 2.3. Interventions

In this study, barriers that may impede or limit the uptake of the best practice recommendations were identified through root-cause analysis with the nursing staff. The root cause analysis team consists of six members, one head nurse, one nursing manager, one nursing educator, and three clinical nurses. All members have over three years of clinical experience and received root cause analysis training. Based on the clinical experience, the team members conducted a root-cause analysis using brainstorming to identify barriers from three aspects (the knowledge to be adopted, the adopters, and the context) in May 2019. Then, all team members rated the barriers using a 5-level Likert score ranging from 1 (not at all important/feasible) to 5 (extremely important/feasible) according to their importance to research questions and feasibility to address. The identified barriers and their scores can be found in

**Table 1.** Implementation strategies were based on these priority barriers with both importance and feasibility scores >3 points. These priority barriers included inadequate training for nurses, unclear organizational processes, and a lack of motivation for dysphagia identification and management. Tailored, multifaceted implementation strategies included training intervention, policy intervention, and audit and feedback intervention.

### 2.3.1. Training intervention for nurse

The training intervention was informed by the priority barrier of “inadequate training for nurses”. The intellectual content of the intervention for nurses was adapted from the best-practice recommendations. We chose two different educational approaches (WeChat public platform and booklet) to maximize the dissemination scope. The WeChat public platform-based MOOCs involved audio-visual delivery and an interactive format, while the booklet comprised visual information alone. The education content comprised the following three modules:

*Module 1. Building evidence-based practice capacity.* This module provided an introduction to evidence-based nursing. It described databases that are available to find research, and explained how to conduct a search, how to appraise a research paper, and how to use the available evidence in making an informed choice about dysphagia nursing.

*Module 2. Improving dysphagia-related knowledge.* This module provided scientific evidence related to post-stroke dysphagia-related risk factors, hazards, consequences, early signs, diet management, feeding techniques, rehabilitation treatment, psychological care, emergency measures for choking treatment, dehydration monitoring, and gastrointestinal nutrition care.

*Module 3. Improving dysphagia identification and management skills.* In this module, information was provided as to how to use dysphagia identification- and management-related tools including water swallow test (WST), malnutrition universal screening tool (MUST), swallowing function monitoring tools, and hierarchical identification and management process.

The nurses were invited to watch the three-module training materials by viewing the MOOCs on the WeChat public platform over 3 weeks. Each module took approximately 2 h to complete, and completion of one module per week was recommended. The nurses also received a booklet including the three-module intervention, and the QR code of the MOOCs links was printed on the corresponding module of the booklet to allow them to review the content whenever they want.

### 2.3.2. Policy intervention

This intervention focused on developing standardized procedures for the identification and management of post-stroke patients. The intervention was informed by the priority barrier “unclear organizational process”. The intellectual content of the intervention for the organizational process was adapted from the best-practice recommendations and routine work of community nurses. The post-stroke dysphagia hierarchical identification and management

standard process was developed (Fig. 1). Post-stroke dysphagia hierarchical identification- and management-related documents or materials, including dysphagia screening tools (e.g. WST), nutritional risk screening tools (e.g. MUST), swallowing function monitoring tools, a set of dysphagia grade designation cards (yellow means low risk, red means high risk), and dysphagia education leaflets, were also printed. The hierarchical identification and management standard process intervention was conducted by primary nurses.

### 2.3.3. Audit and feedback intervention

The intervention was informed by the priority barrier “a lack of motivation”. Audit-and-feedback is considered to be an effective method for improving the performance of professionals [19]. This strategy was provided iteratively (weekly), which allowed nurses to see improvement over time. To provide consistency, the head nurse was the only person conducting audit and feedback. Audit contents included the following: 1) whether the WST form for dysphagia screening, the swallowing function assessment form, and the MUST form for nutrition screening were filled in; 2) whether the training materials and records of dysphagia were complete and kept in the electronic database or paper database of the “Stroke Dysphagia Training Program”; 3) whether the WST for dysphagia screening was regulated and rigorous, and whether it was conducted as per the established operating procedures; 4) whether the MUST for nutritional screening was standardized and rigorous, and whether it followed the established operating procedures; 5) whether oral care of patients with dysphagia was conducted in strict accordance with the “High-quality Care Oral Care Flow Chart”; 6) whether the nurses provided health education for patients with dysphagia. Feedback was disseminated to staff via WeChat.

## 2.4. Measurements

We described three types of outcomes for knowledge translation used in this study. 1) patients’ satisfaction and quality of life: describing final goals; 2) nurse’s level of knowledge: describing changes in levels of knowledge and understanding; 3) nurses’ adherence to best-practice recommendations: describing changes in behavior or practice.

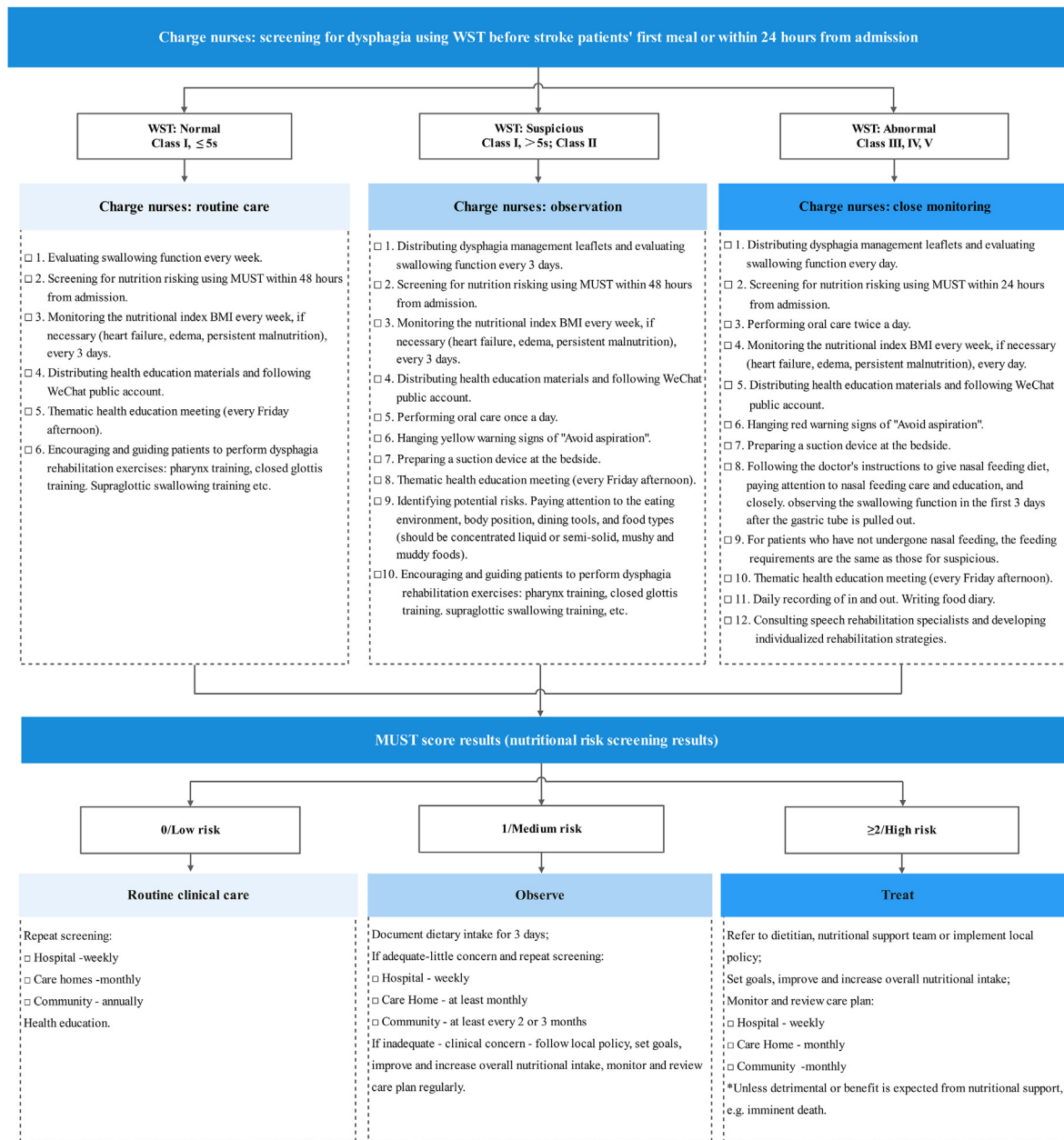
### 2.4.1. Patient-related outcomes

*2.4.1.1. Quality of life.* Quality of life was determined using the Swallowing Quality-of-Life Questionnaire (SWAL-QOL) [20]. The SWAL-QOL consists of 10 scales (30 items) and a 14-item dysphagia symptom battery (DSB). The 10 scales were designed to estimate eight concepts of dysphagia-related quality of life and two concepts of generic quality of life. The DSB items were designed for assessing the severity of dysphagia symptoms. The responses to each SWAL-QOL item were scored on a scale of 1–5. The sum of the item scores for each subdomain was then converted to a score ranging from 0 (extremely impaired QoL) to 100 (no impairment). Nine scales had a Cronbach’s  $\alpha$  coefficient from 0.75 to 0.86, and one scale

**Table 1**  
Barriers that may impede or limit uptake of the best practice recommendations.

Barrier	Importance ( $n = 6$ )	Feasibility ( $n = 6$ )
Inadequate training for nurses	5.00 $\pm$ 0.00	5.00 $\pm$ 0.00
Unclear organizational process	5.00 $\pm$ 0.00	4.67 $\pm$ 0.47
A lack of motivation for dysphagia identification and management	4.67 $\pm$ 0.47	3.50 $\pm$ 0.50
Insufficient financial support	4.17 $\pm$ 0.90	1.83 $\pm$ 0.69
Shortage of human resources and heavy workload in nursing	4.83 $\pm$ 0.37	2.33 $\pm$ 0.47
Without multidisciplinary teams	3.83 $\pm$ 0.69	2.67 $\pm$ 0.75

Note: Data are Mean  $\pm$  SD.



**Fig. 1.** Standardized process for post-stroke dysphagia identification and management. WST = Water swallow test. MUST = Malnutrition universal screening tool. BMI = Body mass index.

(eating desire,  $\alpha = 0.48$ ) failed to attain the reliability standard of 0.70. Test-retest reliability was 0.303–0.887.

**2.4.1.2. Patients' satisfaction questionnaire.** Patients' satisfaction questionnaire related to dysphagia identification and management was developed by the research team based on literature reviews and included 15 items. The questionnaire covered the environment, facilities, nursing technology, dysphagia screening and management, health education, nurse-patient communication, and patient's wishes. The responses to each satisfaction item were scored on a scale of 1–3. Satisfaction was determined as the sum of the item scores divided by the full score of all items, where a higher score indicated a higher patient's satisfaction. Five experts were invited to evaluate the content validity of the questionnaire; I-CVI: 0.832–1.000, S-CVI: 0.987. The Cronbach's  $\alpha$  coefficient was 0.864.

## 2.4.2. Nurse-related outcomes

**2.4.2.1. Nurse's level of knowledge.** It was measured using a self-developed 26-item Nurse Dysphagia Knowledge Test (NDKT), including eight fill-in-the-blank questions, six judgment questions, and 12 multiple-choice questions. The test covered post-stroke dysphagia-related risk factors, hazards, consequences, early signs, diet management, feeding techniques, rehabilitation treatment, psychological care, emergency measures for choking treatment, dehydration monitoring, and gastrointestinal nutrition care. Each correct answer to fill-in-the-blank questions, judgment questions, and multiple-choice questions was scored 2, 4, and 5, respectively. The total score was obtained as the sum of correct answer item scores. A higher score indicated a higher level of knowledge. The NDKT was reviewed by 5 stroke nursing experts; I-CVI: 0.733–1.00, S-CVI: 0.972. The Cronbach's  $\alpha$  coefficient was 0.752.

**2.4.2.2. Nurses' adherence to best-practice recommendations.** The research team developed a 14-item audit tool based on the best-practice recommendations for post-stroke dysphagia identification and management. All items, covering dysphagia identification and management, were determined by observation, checking medical records, or asking nurses about the items. The items were rated as "Yes" (satisfactory performance), "No" (unsatisfactory performance), or "NA" (not applicable to the situation). A higher number of "Yes" indicated better adherence to the best practice recommendations. Five experts were invited to evaluate the content validity of the audit form; I-CVI: 0.820–0.920; S-CVI: 0.960.

#### 2.4.3. Patients' and nurses' characteristics

The collected data included the patients' age, sex, educational level, marital status, type of stroke, stroke location, stage of stroke, presence or absence of other chronic diseases; and the nurses' age, sex, professional title, academic achievement, and years of experience.

#### 2.5. Data collection

Data were collected by the same researcher during the pre-intervention period (before implementation of the strategies) and the post-intervention period (after implementation of the strategies for 5 months). To be specific, each nurse took the measurements twice, once in March 2019 and again in January 2020. Each patient completed the measurements once on the day of discharge from the community hospital. The pre-intervention period variables were evaluated between February 2019 and April 2019 for patients, and the post-intervention period variables were measured between November 2019 and January 2020.

#### 2.6. Ethical consideration

Ethical approval for this study was received from the Ethics Committee of Dongzhimen Hospital affiliated to Beijing University of Chinese Medicine (DZMEC-KY-2019-175). All members provided written consent to participate.

#### 2.7. Data analysis

Statistical calculations were performed using IBM SPSS Statistics (version 22.0). The significance level was set at 5%. We reported the demographic data as frequencies and percentages for categorical or nominal variables, and as means and standard deviations for continuous variables. To assess the homogeneity of patient characteristics and differences in outcomes between the pre- and post-intervention periods, we performed the chi-square test or Fisher's exact test (if assumptions were not met) for the categorical variables and the *t*-test or the nonparametric test (if assumptions were not met) for the continuous variables. The nurses' NDKT scores in the pre- and post-intervention periods were compared using paired *t*-tests. Each audit criterion item was analyzed using McNemar's exact test for comparison to determine which areas or questions had been improved.

### 3. Results

#### 3.1. Patient-related outcomes

Two independent groups of stroke patients were recruited before and after the implementation of the strategies. In total, 28 and 27 stroke patients were recruited in the pre-intervention period and the post-intervention period, respectively. The

response rate of both groups was 100%. No significant difference was found in the demographic and clinical characteristics of patients between the pre-intervention period and the post-intervention period. The demographic and clinical characteristics of dysphagia patients in both groups are shown in Table 2. The details of SWAL-QOL scores for the post-stroke dysphagia patients are shown in Table 3. The patients' total mean SWAL-QOL scores were  $120.43 \pm 25.23$  and  $143.78 \pm 22.44$  in the pre- and post-intervention periods, respectively ( $P < 0.05$ ). The patients' total mean satisfaction scores were  $97.22 \pm 2.47$  and  $98.68 \pm 2.56$  in the pre- and post-intervention periods, respectively ( $P < 0.05$ ).

#### 3.2. Nurse-related outcomes

Seventeen female nurses participated in the study and the response rate was 100%. Nurses were 22–45 years old ( $27.35 \pm 5.64$ ) and had an average of 5.65 years of nursing experience. Among the 17 nurses, 15 held a primary professional title and 11 had a bachelor's degree. The nurses' total mean NDKT scores were  $35.06 \pm 13.23$  and  $59.41 \pm 15.04$  in the pre- and post-intervention periods, respectively ( $P < 0.05$ ). The adherence change of each audit item in the pre- and post-intervention period are shown in Table 4. Significant differences ( $P < 0.05$ ) were identified in the adherence for 13 items of the audit tool involving screening time, screening tool, screening skills, swallowing function monitoring, management materials, training, and education.

### 4. Discussion

Translating evidence-based protocols into clinical daily practice has historically been difficult, resulting in a persistent gap between research and practice. In knowledge transfer studies, growing attention has been paid to multifaceted implementation strategies tailored to perceived local barriers or facilitators [12,13,15]. Our study used three implementation strategies of training intervention, policy intervention, and audit and feedback intervention to mitigate or diminish the perceived barriers of inadequate training for nurses, unclear organizational process, and the lack of motivation for dysphagia identification and management. Previous studies have observed improvements in nurses' level of knowledge and evidence-based practice after using training intervention and educational materials [13,21,22]. Several other studies have found that adherence to the best-practice recommendations can be improved through audit and feedback strategies [19,23]. Using policy intervention has also shown positive effects on improving the use of evidence-based practice by nurses [24]. This study also displayed positive evidence of the significant effects of tailored, multifaceted strategies on post-stroke dysphagia patients' quality of life and satisfaction, as well as nurses' level of knowledge and adherence to best-practice recommendations.

#### 4.1. Influence on patients' outcomes

With the completion of the tailored, multifaceted implementation strategies, the post-stroke dysphagia patients' SWAL-QOL scores increased from 120.43 to 143.78. In particular, notable differences were found in terms of burden, eating duration, eating desire, symptom frequency, food selection, fear, and mental health. The same trend was also found in the patients' satisfaction—an increment from 97.22 to 98.68. Policy interventions belong to compulsory strategies, and they involve duty and obligation (for example, standard dysphagia identification and management process can be enforced by nursing regulations). The nurses screened post-stroke patients for dysphagia using WST before patients' first meal or within 24 h from admission and provided different levels of

**Table 2**  
Demographic and clinical characteristics of the post-stroke dysphagia patients.

Items	Pre-intervention period (n = 28)	Post-intervention period (n = 27)	Value	P
Age	65.06 ± 9.79	65.02 ± 9.77	0.467 <sup>a</sup>	0.640
Sex				
Male	21	23	0.891 <sup>b</sup>	0.345
Female	7	4		
Educational level			0.162 <sup>b</sup>	0.922
Junior high school and below	7	6		
High school or technical secondary school	13	14		
Junior College and above	8	7		
Marital status			1.623 <sup>b</sup>	0.203
Married	22	17		
Unmarried	6	10		
Type of stroke			0.525 <sup>b</sup>	0.469
Cerebral hemorrhage	5	7		
Cerebral infarction	23	20		
Location of stroke			0.180 <sup>b</sup>	0.671
Unilateral	24	22		
Bilateral	4	5		
Stage of stroke			0.908 <sup>b</sup>	0.341
Restoration stage	13	16		
Sequel stage	15	11		
With chronic diseases			0.162 <sup>b</sup>	0.688
Yes	13	14		
No	15	13		

Note: Data are Mean ± SD or n. <sup>a</sup> t-test. <sup>b</sup> Pearson chi-square test.

**Table 3**  
Post-stroke dysphagia patients' SWAL-QOL scores before and after intervention.

Items	Full marks	Pre-intervention period (n = 28)	Post-intervention period (n = 27)	t	P
SWAL-QOL	215	120.43 ± 25.23	143.78 ± 22.44	3.622	0.001
Burden	10	4.96 ± 1.45	6.19 ± 1.50	3.072	0.003
Eating duration	10	5.64 ± 1.28	6.93 ± 1.66	3.212	0.002
Eating desire	15	9.43 ± 1.67	10.44 ± 2.01	2.046	0.046
Symptom frequency	70	36.86 ± 11.46	45.89 ± 10.47	3.049	0.004
Eating desire	10	5.21 ± 1.57	6.70 ± 1.20	3.936	<0.001
Communication	10	6.43 ± 1.75	6.93 ± 1.38	1.165	0.249
Fear	20	10.25 ± 2.84	13.22 ± 2.76	3.934	<0.001
Mental health	25	15.43 ± 4.29	19.52 ± 3.47	3.895	<0.001
Social functioning	20	10.96 ± 3.54	11.85 ± 2.18	1.114	0.270
Sleep	10	6.54 ± 1.55	6.96 ± 1.51	1.036	0.305
Fatigue	15	8.71 ± 9.15	9.15 ± 1.70	8.75	0.386

Note: Data are Mean ± SD. SWAL-QOL = Swallowing quality-of-Life questionnaire.

dysphagia nursing (routine care, observation, and close monitoring) depending on the screening results. The trained nurses comprehensively and repeatedly educated patients and caregivers to stimulate the acceptance of knowledge and information, improved their awareness of the threat and severity of dysphagia, and informed them about the benefits of changing behaviors. The community nurses and patients repeated the same behavior and received different forms of the same information in a stable situation, which helped to establish clue-response associations [25]. In other words, this marked improvement demonstrated that the patients clearly benefited from the interventions.

We also noticed that the scores of SWAL-QOL domains, including communication, social functioning, sleep, and fatigue, were higher in the post-intervention period than those in the pre-intervention period, but the differences were not statistically significant. A possible reason is that post-stroke patients experience a variety of complications, such as dysarthria, anxiety, depression, pain, and hemiplegia, which often directly affect their language communication, social interaction, sleep, and fatigue.

#### 4.2. Influence on nurses' outcomes

Five months after implementation, there was a significant improvement in the nurses' level of knowledge and adherence to best-practice recommendations. The average increase in the NDKT score was 24.35 points. Multimodule training intervention was informed by the priority barrier "inadequate training for nurses". According to the categorizing strategies based on the underlying

assumptions and hypothesized mechanisms of change, the training intervention in our study was related to education (learning) and reinforcement (motivation through information). The training contents helped nurses to acquire post-stroke dysphagia identification- and management-related skills and knowledge. We also chose two different educational approaches (WeChat public platform and booklet) to maximize the dissemination scope of the knowledge. Similarly, Reynolds et al. [13] noted an increase in neuro intensive care unit nurses' knowledge of evidence-based bathing practices following similar implementation strategies.

Significant differences were also identified in the adherence for 13 items of the audit tool involving screening time, screening tool, screening skills, swallowing function monitoring, management materials, training, and education. Audit-and-feedback has been recommended as an effective intervention capable of increasing the uptake of evidence-based recommendations by clinicians [19,26]. Theories about audit and feedback to the implementation of healthcare-related behaviors suggest that audit and feedback may work in many ways, including changing individual awareness and beliefs about current clinical practice and subsequent consequences, changing perceived social norms, affecting self-efficacy, or by directing attention to a specific set of tasks, which results in the optimization of individual patient care or modification of care delivery across the organization [23,27]. In essence, audit and feedback also could spark internal and external sources of motivation (such as teamwork and support from leadership) and foster the development of additional implementation strategies. In addition, only item 11 (standardized oral care procedures) showed no

**Table 4**  
Nurses' adherence to the best practice recommendations audit criteria before and after intervention.

Best-practice recommendations audit criteria	Pre-intervention period (n = 17)		Post-intervention period (n = 17)		Value	P
	Y	N	Y	N		
1. The nurses screen stroke patients for dysphagia before the first meal or within 24 h from admission.	0	17	15	2	13.067	<0.001
2. The nurses use reliable and effective tools for screening dysphagia, such as SSA or WST.	0	17	14	3	12.071	<0.001
3. The nurses are skilled in using screening tools.	5	12	17	0	10.083	<0.001
4. The nurses monitor and record dysphagia patients' swallowing function within 24 h, 72 h, and one week after admission.	0	17	11	6	9.091	0.001
5. The nurses are aware that the Unit has swallowing function monitoring sheets and nursing records sheets (either in electronic or paper form).	0	17	17	0	15.059	<0.001
6. The nurses are aware that the Unit has post-stroke dysphagia hierarchical identification and management process and related materials (either in electronic or paper form).	0	17	17	0	15.059	<0.001
7. The nurses receive training on post-stroke dysphagia identification and management monthly.	7	10	17	0	8.100	0.002
8. Dysphagia knowledge test for nurses (score $\geq 60$ ).	2	15	8	9	4.167	0.031
9. The nurses provide oral education when inappropriate feeding behavior is detected.	1	16	13	4	10.083	<0.001
10. The nurses invite dysphagia patients to watch the videos on the WeChat public platform weekly.	9	8	16	1	5.143	0.016
11. The nurses are aware that the Unit has adopted standardized oral care procedures for post-stroke dysphagia (either in electronic or paper form).	17	0	17	0	NA	NA
12. The nurses educate patients on the methods of changing food consistency and using compensatory strategies after assessing the swallowing function.	6	11	16	1	8.100	0.002
13. The nurses assess stroke patients' nutritional status within 24 h from admission.	0	17	14	3	12.071	<0.001
14. The nurses inform dysphagia patients and families that acupuncture could be considered as an adjunctive treatment for dysphagia.	1	16	12	5	9.091	0.001

Note: Y = Yes. N = No. NA = Not applicable. SSA = Standardized swallowing assessment. WST = Water swallow test.

difference in both the pre- and post-intervention audits, because the daily practice of oral care matches the best-practice recommendation.

#### 4.3. Limitations

Our study does have some limitations. The sample size was small, and this study focused on a rehabilitation unit in a community hospital. Future studies would benefit from larger sample sizes and multiple investigations to ensure more generalizable results. Longer follow-up periods would help to identify whether positive results last for a year or more. Furthermore, since tailored, multifaceted implementation strategies were implemented together, it is difficult to determine which strategies are the most effective for improving evidence-based practice. We assessed the overall effects of these strategies on patients' SWAL-QOL and satisfaction, as well as nurses' NDKT and adherence, but the effects could not be attributed to specific implementation strategies (e.g., how much of the study's effects can be attributed to training interventions, policy interventions or audit and feedback intervention). Future studies would benefit from better study design (e.g. factorial design).

#### 5. Conclusion

Using tailored, multifaceted implementation strategies significantly increases the stroke dysphagia patients' SWAL-QOL and satisfaction, as well as nurses' NDKT and adherence rate to the best-practice recommendations. However, to maintain continuous improvement in nurses' knowledge and adherence to best-practice recommendations, the implementation strategies should be

conducted consistently and incorporated into the nurses' induction program. Future studies should focus on the mechanism by which these implementation strategies lead to successful implementation.

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#### Data availability statement

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

#### CRediT authorship contribution statement

**Xiaoyan Zhang:** Conceptualisation, Methodology, Investigation, Writing - original draft, Writing - review & editing, Supervision, Project administration. **Junqiang Zhao:** Conceptualisation, Methodology, Writing - review & editing. **Liping Zheng:** Methodology, Investigation, Formal analysis, Data curation, Writing - original draft. **Xuejing Li:** Investigation, Resources, Writing - review & editing. **Yufang Hao:** Investigation, Resources, Writing - review & editing, Supervision, Project administration.

#### Declaration of competing interest

The authors have declared no conflict of interest.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2022.06.010>.

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