

## Original Article

# Evidence summary on nutrition management for post-stroke dysphagia

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**Abstract:** Objective: To summarize and evaluate the relevant evidence on nutrition management of post-stroke dysphagia (PSD) to provide evidence-based basis for clinical staff. Methods: We searched evidence in BMJ Best Practice, Up To Date, Cochrane Library, PubMed and so on from their inception to May 31, 2021. The quality assessment was conducted by two researchers by using AGREE II for guidelines, JBI evidence-based health care center evaluate standards for systematic review and expert consensus. Results: An initial searching of 445 literatures resulted in 26 literatures that met inclusion criteria. Finally, a total of 38 pieces of evidence were summarized from 5 aspects including nutrition risk screening and assessment, nutrition support principles, enteral nutrition, parenteral nutrition, and hydration management. Conclusions: This study summarized the evidence of the nutrition management for PSD patients. Since evidences are from different countries, it's better to assess the clinical environment and other related factors before their application.

**Keywords:** Post-stroke dysphagia (PSD), nutrition management, nutrition support, evidence-based nursing, evidence summary

### Introduction

Stroke has become the second leading cause of death and disability in the world, threatening human health [1]. Stroke patients often suffer from dysphagia, disturbance of consciousness, cognitive impairment, emotional disturbance, etc. These brain dysfunctions can cause patients to have difficulty eating, insufficient nutrient intake, and/or increased nutrient consumption (such as fever, etc.), thereby causing malnutrition or increased nutritional risk after stroke [2]. Post-stroke dysphagia (PSD) is one of the most common complications, with an incidence of 45%-65% [3]. It can not only lead to aspiration, pneumonia, dehydration, electrolyte disorders, and nutritional disorders, but also greatly increase the risk of death and poor prognosis. Among these complications, malnutrition is one of the most important one after stroke dysphagia. Malnutrition caused by dysphagia accounts for 8%-34%, and 15% of stroke patients may suffer from malnutrition due to long-term dysphagia [4]. Malnutrition not

only affects the recovery of neurological function and living ability, but also significantly increases the risk of stroke complications such as stroke-related pneumonia, gastrointestinal bleeding and so on, prolongs the hospitalization time, and increases the risk of disability and mortality after stroke [2]. Although drugs can effectively prevent the occurrence and development of diseases, but the importance of nutrition is undeniable. Therefore, early detection of malnutrition and appropriate nutrition management have important clinical significance for PSD patients.

Nutrition management after stroke is an important part of organized stroke management and a potential intervention target for improving stroke prognosis. Although there are many guidelines on stroke that include nutrition management, most of them are comprehensive guidelines and target a large range of patients. So, this study retrieved, analyzed and summarized the relevant evidence of nutrition management for PSD patients, in order to provide theo-

retical guidance for clinical staff when providing nutrition interventions, to promote the implementation of nutrition support, and to improve their clinical outcome.

## Materials and methods

### *Question identification*

Using Problem Development Tool of Evidence-based Nursing Center of Fudan University, and identifying questions according to PICO principle [5]. The formed initial question was as follows: P (Population): Post-Stroke Dysphagia (PSD); I (Intervention): The content of the included literature involves the evaluation, management, and intervention of diet or nutrition; P (Professional): Medical staff; O (Outcome): Nutritional status, incidence of related complications, and clinical outcome; S (Setting): The Department of Internal Neurology and Neuro Intensive Care Unit; T (Type of evidence): Clinical decision, guidelines, systematic reviews, meta-analysis, expert consensus and evidence summary.

### *Retrieval strategy*

According to the “6S” evidence mode [6], we searched BMJ Best Practice, UpToDate, Cochrane Library, Joanna Briggs Institute (JBI) Library, National Institute for Health and Clinical Excellence (NICE), American Society for Parenteral and Enteral Nutrition (ASPEN), European Society for Clinical Nutrition and Metabolism (ESPEN), Chinese Society of Parenteral and Enteral Nutrition (CSPEN), PubMed, Web of Science, Medline, CNKI, Wanfang Database and Chinese Biomedical Literature Database to collect clinical decision, guidelines, systematic reviews, meta-analysis, expert consensus and evidence summary on nutrition management for PSD patients. The English search terms were “stroke/cerebral stroke/cerebrovascular accident\*/cerebrovascular apoplexy/cerebralinfarction/cerebral hemorrhage/apoplexy/cerebrovascular stroke\*/CVA\*”, “deglutition disorders/dysphagia/swallowing disorder”, “nutritional support/nutrition/diet/nutrition therapy/nutrition strategies/enteral nutrition/parenteral nutrition/nasogastric tube/nasointestinal tube/EEN”, and “meta-analysis/guideline\*/evidence/practical guidance\*/expert consensus/systematic review”. Retrieval time was from database establishment to May 31, 2021.

### *Inclusion and exclusion criteria*

Inclusion criteria: (i) the objects comprised PSD ( $\geq 18$  years old); (ii) the content involves nutrition screening, nutrition assessment, enteral nutrition support, parenteral nutrition support and oral nutrition support; (iii) outcome indicators include the nutritional status, the incidence of related complications, and the clinical outcome; (iv) type of evidence includes clinical decision, guidelines (nearly 10 years), expert consensus, systematic reviews, meta-analysis, and evidence summary and (v) the article was published in the Chinese or English language. Exclusion criteria: (i) the literature was a direct translation of foreign guidelines or duplicate guidelines; (ii) clinical practice guidelines or systematic reviews with incomplete information and (iii) full text cannot be obtained.

### *Literature quality evaluation*

(i) Guidelines: the “Appraisal of Guidelines for Research and Evaluation (AGREE II)” updated in 2017 [7] was used for evaluation, including 6 fields, 23 items and 2 comprehensive evaluation items. According to the degree of consent, each item is scored from 1 (very disagreeable) to 7 (very agreeable). And the two comprehensive evaluation items are scored on a 7-point system (1 the article quality may be the lowest, 7 the article quality may be the highest). After standardizing the total score of each item in a certain field, the final score obtained is the score in this field. The score determines the quality of the guideline [8].

(ii) Expert consensus, meta-analysis and systematical review were evaluated by the relevant evaluation tools of the Australian JBI Evidence-based Health Care Center (2016 Edition) [9].

(iii) For clinical decision and evidence summary included, we traced the original literature, and then evaluated the quality according to the type of the original literature.

### *Literature quality evaluation process*

Two researchers trained by the JBI Collaborating Center for Evidence-based Care at Fudan University independently evaluated the literatures in accordance with the above criteria. The researchers discussed the evaluation results of each literature together. If a dispute arose, the issue was discussed with a 3rd researcher

who decided whether to include or exclude the literature. If there were any conflicts about the conclusions drawn for different sources of evidence, this study followed the principle of evidence priority, high-quality evidence priority and the latest published authoritative literature priority.

### Results

#### *General characteristics of included literatures*

In this study, we initially obtained 445 literatures. After removing duplicate literatures, reading abstracts and further reading the full text, deleting the guidelines and including the corresponding latest version and evaluating the quality of the literatures, 26 literatures were obtained, including 12 guidelines [10-21], 9 systematic reviews [22-30], 4 expert consensus [31-34], and 1 evidence summary [35]. The general characteristics of the included literatures are shown in **Table 1**. Screening flow chart for literatures is shown in **Figure 1**.

#### *Quality evaluation results of the included literatures*

*Quality evaluation results of the guidelines:* In this study, 12 guidelines were included. **Table 2** is the quality evaluation results of the guidelines.

*Quality evaluation results of systematic reviews:* In this study, 9 systematic reviews were included. **Table 3** is the quality evaluation results of systematic reviews.

*Quality evaluation results of expert consensus:* In this study, 4 expert consensus were included. **Table 4** is the quality evaluation results of expert consensus.

*Quality evaluation results of evidence summary:* In this study, 1 evidence summary was included. After tracing the original literature, we got 3 guidelines, one of which is not a recent 10-year guideline, so it was excluded; one was a duplicate of this study included [13]; the other one was also excluded because we had included its latest version [19].

#### *Evidence summary and description*

The Australian JBI Evidence-based Health Care Centre Evidence Recommendation Level

System (2014 edition) was used to grade the included evidence (grades 1 to 5). Using the FAME evaluation principle to evaluate the feasibility, suitability, clinical significance and effectiveness of the evidence, and give recommendations (A is a strong recommendation, and B is a weak recommendation). Finally, a total of 38 pieces of evidence were summarized from 5 aspects including nutrition risk screening and assessment, nutrition support principles, enteral nutrition, parenteral nutrition, and hydration management, as shown in **Table 5**.

### Discussion

#### *Nutrition risk screening and assessment*

Evidence 1-4 summarized the timing, tools, screening personnel and precautions of nutritional risk screening for PSD patients. Davis' study [36] reported that among 185 patients with acute stroke, 30 (16%) were already malnourished at the time of admission. Therefore, it is necessary to carry out early admission nutrition risk screening for stroke patients, in order to determine the nutrition assessment and support program. Nutrition risk screening 2002 (NRS-2002) is an objectively basal nutrition risk screening tool established by the ESPEN expert group in 2002 on the basis of 128 randomized controlled clinical studies [37]. Beginning in 2005, the National Collaboration Group of the CSPEN branch had carried out specific work on nutrition risk screening, except that the BMI adopted domestic standards (18.5 kg/m<sup>2</sup>), the rest of the nutrition screening tools were consistent with the European [34]. Therefore, it is recommended to use NRS-2002 for nutrition risk screening in hospitalized stroke patients in China. Indeed, there are many guidelines recommending that nutrition assessment be performed by a dietitian, however, the number of dietitians is not always accessible in China, therefore, we think that trained medical personnel can perform it.

#### *Enteral nutrition management*

Evidence 8-33 summarized the relevant recommendations of enteral nutrition for PSD patients, of which 8-22 pieces of evidence are feeding tube; 23-27 are oral feeding; 28-33 are percutaneous endoscopic gastrostomy (PEG). Nearly half of stroke patients have difficulty swallowing, which hinders oral nutrient intake

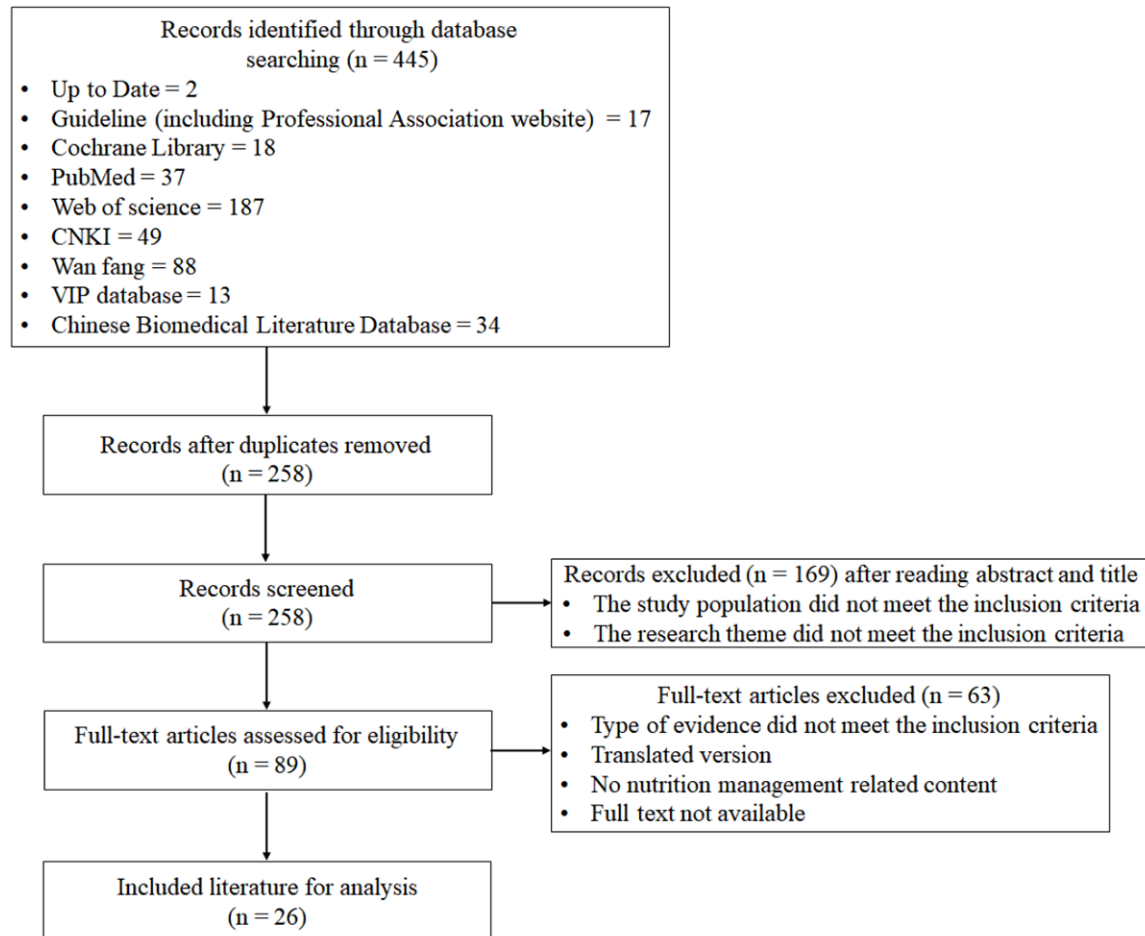
## Evidence summary for post-stroke dysphagia

**Table 1.** General characteristics of included literatures

Included literatures	Year	Source	Type of evidence	Topic
CSA [10]	2020	PubMed	Guideline	Clinical management of stroke rehabilitation
CSA [11]	2020	PubMed	Guideline	Clinical management of ischaemic cerebrovascular diseases
AHA/ASA [12]	2019	PubMed	Guideline	Early Management of Patients With Acute Ischemic Stroke
AHA/ASA [13]	2016	PubMed	Guideline	Adult Stroke Rehabilitation and Recovery
NICE [14]	2019	NICE	Guideline	Diagnosis and management of stroke
Burgos et al [15]	2017	ESPEN	Guideline	Clinical nutrition in neurology
NSF [16]	2017	Medlive	Guideline	Clinical Guidelines for Stroke Management
RCP [17]	2016	NICE	Guideline	National clinical guideline for stroke
Wirth et al [18]	2013	PubMed	Guideline	Clinical nutrition in patients with stroke
Teasell et al [19]	2019	BMJ	Best clinical practice guideline	Rehabilitation, Recovery, and Community Participation following Stroke
Boulanger et al [20]	2018	BMJ	Best clinical practice guideline	Acute Stroke Management: Prehospital, Emergency Department, and Acute Inpatient Stroke Care
Umay et al [21]	2021	PubMed	Best clinical practice guideline	Management, Diagnosis, and Follow-up for Stroke Patients with Dysphagia
Liu X et al [22]	2021	PubMed	Systematic review	Effect of probiotics on the nutritional status of severe stroke patients with nasal feeding
Geeganagee et al [23]	2012	Cochrane Library	Systematic review	Interventions for dysphagia and nutritional support in acute and subacute stroke
Sun et al [24]	2020	CNKI	Systematic review	Safety of quantifying food consistency in patients with dysphagia after stroke
Yuan et al [25]	2020	CNKI	Systematic review	Effects of intermittent tube feeding on stroke patients with dysphagia
Dong et al [26]	2020	CNKI	Systematic review	Effects of intermittent tube feeding on swallowing function and nutrition status of stroke patients with dysphagia
Luo et al [27]	2020	CNKI	Systematic review	The effect of enteral nutrition support on patients with acute stroke with dysphagia
Dang et al [28]	2019	CNKI	Systematic review	Effects of different nutrition therapies for dysphagia patients of stroke
Wang et al [29]	2016	CNKI	Systematic review	Enteral nutrition combined with parenteral nutrition in the treatment of patients with cerebral hemorrhage
Xu et al [30]	2017	CNKI	Systematic review	efficacy of intermittent oro-esophageal tube feeding on post-stroke dysphagia
CSPEN et al [31]	2015	Medlive	Expert consensus	Percutaneous endoscopic gastrostomy feeding for patients with nervous system diseases
CSPEN et al [32]	2019	Medlive	Expert consensus	Enteral nutrition support for neurological diseases
China Expert Consensus Group on Rehabilitation Evaluation and Treatment of Dysphagia [33]	2018	Medlive	Expert consensus	Evaluation and treatment of dysphagia
China Stroke Nutrition Standardization Management Expert Committee [34]	2020	Medlive	Expert consensus	Standardized nutrition management of stroke patients
Zhang et al [35]	2017	CNKI	Evidence summary	Nursing Management of Eating Difficulty after stroke

CSA: Chinese Stroke Association; AHA/ASA: The American Heart Association/American Stroke Association; NICE: The National Institute for Health and Care Excellence; ESPEN: The European Society for Clinical Nutrition and Metabolism; NSF: National Stroke Foundation; RCP: Royal College of Physicians; CSPEN: Chinese Society of Parenteral and Enteral Nutrition.

## Evidence summary for post-stroke dysphagia



**Figure 1.** Screening flow chart for literatures.

and worsens their nutrition status. In addition, severely ill stroke patients will experience disturbances in consciousness and strong stress responses, leading to loss of oral nutrition, change in gastrointestinal motility, and intestinal barrier dysfunction. Nutrients given through the gastrointestinal tract are easier to be absorbed and more in line with the physiological needs of the human body, which can help maintain intestinal mucosal structure and the integrity of intestinal barrier. Therefore, enteral nutrition is significant for PSD patients.

In the FOOD trial-2 [38], compared with delayed feeding tube, early initiation of feeding tube (within 7 days) reduced the mortality of the PSD patients by 5.8%. The FOOD trial-3 [38] showed that in the first 2-3 weeks after acute stroke, feeding by nasogastric feeding would achieve better functional results than feeding by PEG. So, we recommend early enteral nutrition, but

don't support early PEG feeding for PSD patients. At the same time, it is recommended that nasogastric tube is the first choice for short-term nutrition support, and the decision of feeding tube needs to be made as soon as possible. But, for patients with a high risk of aspiration, it is recommended to choose naso-intestinal tube feeding. Because, the ligament of flexion is involved in the feeding process of the naso-intestinal tube, making reflux difficult to occur. And the feeding process is more in line with the normal physiological process of people, and reduces the damage to the gastric mucosa, so the incidence of complications is low [39], and this result was also confirmed in a meta-analysis [40]. Enteral malnutrition caused by the repeated extubation of the nasogastric tube is a common problem in feeding tube. A study showed that the nasal loops were safe, well tolerated and provided adequate enteral nutrition [41], providing time for the patient to

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**Table 2.** AGREE II scores of the included guidelines

Guidelines	Scope and purpose	Involved personnel	Preciseness of guideline development	Clarity of presentation	Applicability	Independence of writing	The overall quality score	Recommend using this guideline
10	72.2	63.9	20.8	77.8	41.7	100	5	7
11	73.4	64.6	34.4	80.2	57.6	100	5	7
12	92.4	69.2	88.4	93.2	48.3	95.9	6	7
13	89.8	76.4	88.1	91.1	64.5	85.6	6	7
14	80.5	75.3	64.8	94.3	60.4	100	7	7
15	85.4	66.1	72.8	80.2	54.3	89.2	6	7
16	85.7	69.2	67.7	92.8	57.1	92.1	6	7
17	92.3	80.1	85.9	93.2	73.3	100	6	7
18	83.2	65.6	80.7	90.2	47.5	82.3	6	7
19	90.4	67.6	89.3	85.6	56.4	100	6	7
20	84.3	78.6	75.3	88.3	60.2	100	6	7
21	75.9	69.5	52.5	79.5	55.8	93.2	6	7

**Table 3.** JBI scores of included systematic reviews

Items	22	23	24	25	26	27	28	29	30
1. Is the review question clearly and explicitly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Were the inclusion criteria appropriate for the review question?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Was the search strategy appropriate?	Yes	Yes	Yes	Yes	No	No	Yes	No	No
4. Were the sources and resources used to search for studies adequate?	Yes	Yes	No	Yes	No	No	Yes	No	No
5. Were the criteria for appraising studies appropriate?	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes
6. Was critical appraisal conducted by two or more reviewers independently?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes
7. Were there methods to minimize errors in data extraction?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8. Were the methods used to combine studies appropriate?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Were the methods used to combine studies appropriate?	Yes	No	Unclear	No	Unclear	Unclear	Unclear	Yes	Yes
10. Were recommendations for policy and/or practice supported by the reported data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11. Were the specific directives for new research appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Table 4.** JBI scores of included expert consensus

Items	31	32	33	34
1. Is the source of the opinion clearly identified?	No	Yes	Yes	Yes
2. Does the source of opinion have standing in the field of expertise?	Yes	Yes	No	Yes
3. Are the interests of the relevant population the central focus of the opinion?	Yes	Yes	Yes	Yes
4. Is the stated position the result of an analytical process, and is there logic in the opinion expressed?	Yes	Yes	Yes	Yes
5. Is there reference to the extant literature?	Unclear	Yes	Yes	Unclear
6. Is any incongruence with the literature/sources logically defended?	Yes	No	Yes	No

resume normal swallowing, thereby avoiding PEG. Therefore, the guidelines recommend that when patients accidentally extubate the gastric tube repeatedly, it can be fixed with a nasal loop. PEG can prevent the stimulation of nasopharynx caused by long-term catheterization, avoid damage to esophageal mucosa, preserve anti-reflux ability, reduce the risk of reflux and aspiration, and the incidence of complications [42]. A meta-analysis [23] also showed that PEG was superior to nasogastric in PSD patients with long-term enteral nutrition. Therefore, the

guidelines suggest that if a longer period (> 28 days) of enteral nutrition may be required, PEG should be selected. However, a survey study in China showed that the actual utilization rate of PEG was less than 2% in patients with PEG indications [43]. Therefore, for these patients, they and their families should be fully informed of PEG and its benefits of the feeding.

For PSD patients, the primary goal of rehabilitation is to restore oral eating and improve the quality of life [44]. Therefore, patients who are



# Evidence summary for post-stroke dysphagia

**Table 5.** Evidence summary of nutrition management for PSD

Evidence item	Content of evidence	Evidence level	Recommendation level
Nutrition risk screening and assessment	All PSD patients should receive nutrition risk screening within 48 hours of admission [15, 16, 18, 19, 21, 32, 34].	5	A
	Nutrition risk screening should be performed by trained medical personnel [14].	4	A
	NRS-2002 is recommended for nutrition risk screening [15, 32].	3, 5	A
	Stroke patients at nutrition risk and/or with dysphagia should be referred to an Accredited Practising Dietitian for further assessment [16, 18].	3	B
Nutrition support principles	It is reasonable to provide nutritional supplements for PSD patients [11-13].	1	A
	To patients at risk of malnutrition, nutrition support including oral nutrition supplements, therapeutic diets and/or tube feeding should be offered according to their wishes. If they lack mental capacity, offered in their best interests [17, 23].	1-3	B
	It is suggested to form a nutrition management team involving professional nutritionists [33].	5	B
Enteral nutrition	Enteral nutrition is preferred if there is no contraindication [27, 28, 32, 33].	1	A
	Enteral nutrition is initiated within 7 days and nasogastric feeding tube is preferred [11, 16, 18, 32, 34].	2	A
	Nasointestinal tube is appropriate for those with high risk of aspiration [34].	1	A
	Continuous infusion is recommended when adopting nasojejunal or duodenal feeding tube [18].	3	B
	Enteral nutrition combined with parenteral nutrition is preferred for postoperative patients with cerebral hemorrhage [29].	1	A
	During feeding tube, the bed head should be continuously raised $\geq 30^\circ$ [32].	4	A
	The amount of feeding tube should be from less to more and reach the full amount as early as possible (within 3 days) [32].	3	B
	Tube feeding speed should be slow to fast, that is, the infusion volume on the first day was 20-50 ml/h, and that on the next day was 80-100 ml/h. If possible, adopting a infusion pump to control the speed [32].	5	A
	Flushing the tube with 20-30 ml warm water every 4 h [32].	5	A
	For PSD patients, the decision of enteral nutrition should be made as early as possible (within 3 d of admission) in cooperation with the patients, families and the interdisciplinary team [19, 20].	2	A
	If the patient unexpectedly removes the gastric tube repeatedly, and he/she needs enteral nutrition for more than 14 days, a nasal loop can be adopted to fix it [15].	2	A
	The position of nasogastric tube should be controlled endoscopically in patients with unexplained worsening of dysphagia [15].	3	A
	Intermittent feeding tube is preferred during the recovery period of PSD patients [25, 26, 30].	1	B
	Nasointestinal tube should replace nasogastric tube, if patients need to prolong enteral nutrition time [19].	1	B
	Probiotics can be added to enteral nutrition [22].	1	B
	Encourage quantified food or liquid consistency such as thickening agents for PSD patients [16, 24].	1	A
	Different types of thickening agents should be offered for choice [15].	1	A
	Nutrition assessment, guidance and monitoring of patients who need to change the texture of food or fluid viscosity should be conducted by the dietitian [17].	5	A
	Additional oral feeding should be given to conscious PSD patients, according to the kind and severity of dysphagia [18].	3	B
	It's suggested to monitor regularly the intake and tolerance of PSD patients with altered food texture or fluid viscosity [16].	2, 3	A
	If enteral nutrition lasts more than 28 days, PEG should be used after the patient's clinical condition is stable (14-28 days) [10-12, 15, 18, 31, 32].	2	B
	PEG feeding is not recommended for acute stroke patients with dysphagia (within 7 days) [31].	1	A
	If the patient refuses or doesn't tolerate the nasogastric tube (after many attempts) and the nasal cage is not feasible or the patient is intolerant of it, but medical nutrition may take more than 14 days, PEG can be started early [15].	2	A
	If the patients have no obvious complications after PEG operation, enteral feeding can be started after 4 h [31].	1	A
	Upright or Fowler's positions should be adopted during PEG feeding [31].	5	B
	For patients with PEG and long bed time, it is best to adopt an infusion pump to control the speed [31].	1	A

## Evidence summary for post-stroke dysphagia

Parenteral nutrition	Parenteral nutrition is recommended for patients with good nutrition status currently if enteral nutrition cannot meet their nutrition needs for more than 7 days [18].	5	A
	If enteral nutrition is contraindicated, not feasible, or cannot satisfy the patient to obtain sufficient hydration, parenteral nutrition should be applied immediately [18].	3, 5	A
Hydration Management	At regular follow-up, unthickened water can be given to patients at risk of aspiration in accordance with their wishes [15].	5	B
	Carbonated liquids are available for PSD patients with pharyngeal residue [15].	5	B
	Crystalloid solutions are preferred to colloid solutions for treatment or prevention of dehydration [16].	1	A

PSD = Post-stroke dysphagia; MUST = Malnutrition Universal Screening Tool.

conscious and highly cooperative should be encouraged to adopt the nutrition support method of oral feeding. The thickening agents and texture-modified foods have become a priority for such patients. However, because the resistance to them affects the patient's enthusiasm for fluid intake and increases the risk of dehydration, it is necessary to monitor fluid intake and tolerance to the thickening agents and texture-modified foods. There was evidence that different kinds of thickening agents differ in viscosity, texture, taste and appearance, causing differences in palatability and compliance of the patients [15]. In addition, another study [45] showed that various thickening agents had different popularity and taste in different patient groups. Therefore, in the process of providing thickening agents, the preferences of patients should be considered to improve their compliance.

### *Parenteral nutrition management*

Parenteral nutrition is a high-risk and complex feeding method. Improper implementation can lead to problems such as overfeeding, metabolic complications, catheter-related infections, and even serious adverse consequences due to incorrect liquid formulation [46]. In addition, long-term parenteral nutrition support will damage the patient's intestinal mucosal barrier function, cause translocation of bacteria, and increase the risk of infection. Therefore, parenteral nutrition is usually as a way of nutritional supplementation. For PSD patients, enteral nutrition is still the first choice.

### *Hydration management*

A meta-analysis [47] showed that there was no significant difference in the effect of colloids and crystalloids on the mortality of patients, but colloids were associated with greater odds of pulmonary oedema. Therefore, crystalloids

should be the choice to treat or prevent dehydration.

### **Conclusions**

This study summarized and evaluated the relevant evidence of nutrition management for PSD patients, involving five aspects: nutrition risk screening and assessment, nutrition support principles, enteral nutrition, parenteral nutrition, and hydration management. This provides practical guidance for medical staff when carrying out nutrition interventions. Since the great mass of guidelines included are foreign literatures, taking into account the differences in race, concepts and values, as well as the regional and cultural differences in the medical service system, it is recommended that medical staff should combine the clinical context and clarify facilitating and hindering factors in the process of applying evidence. On this basis, a personalized nutrition support program is developed to maximize the benefits of patients and improve the quality of life.

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### **Disclosure of conflict of interest**

None.

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