Comprehensive Assessment of Prognostic Factors in Post-Stroke Dysphagia: A Post-Print Umbrella Review

Authors: Li Yibing, Jia Hongbo, Fan Xiaonong, Zhao Wenjun, Liu Wei, Ge Wenyi, Li Songjiao, Lei Kangchen, Zhang Menglong, Zhang Weiwei, Chen Yang, Li Li, Fan Xiaonong

Date: 2025-07-04T17:54:40+00:00

Abstract

Background Post-stroke dysphagia is one of the common and serious complications of stroke, which can significantly reduce patients' quality of life and increase mortality risk. Current research suggests that multiple factors are associated with the prognosis of post-stroke dysphagia, but the quality of relevant evidence lacks systematic evaluation.

Objective To systematically evaluate the risk and protective factors affecting the prognosis of post-stroke dysphagia and clarify the evidence quality of each factor.

Methods Eight databases including PubMed, Web of Science, Cochrane, Embase, CNKI, Wanfang, VIP, and Chinese Biomedical Literature Database were searched from inception to November 3, 2024. Systematic reviews regarding prognostic factors of post-stroke dysphagia were included. The AMSTAR 2 scale was used to assess literature quality, and a grading method based on four-level criteria was employed to evaluate the evidence quality of influencing factors. Data from all relevant primary studies in existing systematic reviews were integrated, and STATA 16 and Review Manager 5.4 software were used for re-statistical analysis.

Results Five systematic reviews (39 primary studies) were ultimately included, involving 45 factors affecting the prognosis of post-stroke dysphagia. Among them, only one factor (disturbance of consciousness) represented strong evidence, nine factors including age, sex, cognitive impairment, severity of dysphagia, malnutrition, bilateral stroke, activities of daily living, NIHSS score, and mRS score represented highly suggestive evidence, while the remaining factors represented weak evidence.

Conclusion The influencing factors of post-stroke dysphagia prognosis can be divided into reversible and irreversible factors. Clinical interventions may prioritize improving reversible factors to promote rehabilitation of post-stroke dysphagia. Additionally, more high-quality studies are still needed in the future to further validate the effects of these factors.

Full Text

Abstract

Background: Post-stroke dysphagia (PSD) is a common and severe complication of stroke, significantly reducing patients' quality of life and increasing mortality risk. Although multiple factors have been proposed to correlate with PSD prognosis, the quality of evidence supporting these associations remains systematically underevaluated. **Objective:** To systematically evaluate risk and protective factors influencing PSD prognosis and assess the quality of evidence for each factor. **Methods:** Eight databases (PubMed, Web of Science, Cochrane, Embase, CNKI, Wanfang, VIP, and SinoMed) were searched from their inception to November 3, 2024 to identify systematic reviews investigating prognostic factors for PSD. The methodological quality of the included reviews was appraised using the AMSTAR 2 checklist. A four-tiered evidence grading system was applied to evaluate the certainty of the prognostic factors. Data from all relevant original studies within the systematic reviews were synthesized and re-analyzed using STATA 16 and Review Manager 5.4. **Results:** Five systematic reviews (encompassing 39 original studies) were included, identifying 45 prognostic factors associated with PSD. Only one factor (impaired consciousness) was supported by strong evidence. Nine factors—age, sex, cognitive impairment, dysphagia severity, malnutrition, bilateral stroke, activities of daily living, NIHSS score, and mRS score—demonstrated highly suggestive evidence, while the remaining factors were supported by weak evidence. **Conclusion:** Prognostic factors for PSD can be categorized into reversible and irreversible determinants. Clinical interventions should prioritize modifiable factors to optimize rehabilitation outcomes. Further high-quality studies are warranted to validate these associations and refine evidence-based management strategies.

Introduction

Post-stroke dysphagia is a common and severe complication of stroke that often leads to malnutrition, dehydration, aspiration, and secondary pneumonia, prolonging hospital stays, increasing healthcare burden, and in severe cases, threatening patient survival [1-4]. Although significant progress has been made in the diagnosis and intervention of post-stroke dysphagia [1,5], its prognostic factors remain complex and diverse, and the specific effects of interactions between different factors on rehabilitation outcomes are not yet fully understood [6]. Therefore, identifying and understanding the risk and protective factors influencing recovery from post-stroke dysphagia holds important clinical significance for optimizing rehabilitation protocols and improving patient outcomes.

Existing literature indicates that the prognosis of post-stroke dysphagia is associated with multiple factors such as age, cognitive function, stroke severity, lesion location, and dysphagia severity [7-8]. However, the specific role of some factors in recovery from post-stroke dysphagia remains controversial [9], and there is currently a lack of systematic evaluation of the quality of relevant epidemiological studies. To further clarify the factors affecting the prognosis of post-stroke dysphagia and their evidence quality, this study employed an umbrella review approach to systematically evaluate the quality of relevant systematic reviews and the strength of evidence for different prognostic factors, aiming to provide evidence-based support for clinical management of risk factors for post-stroke dysphagia and thereby optimize rehabilitation management strategies. The study protocol was registered with INPLASY (2024120011).

Methods

1.1 Search Strategy

Eight databases were searched from inception to November 3, 2024: PubMed, Web of Science (WOS), Cochrane, Embase, China National Knowledge Infrastructure (CNKI), VIP, Wanfang, and Chinese Biomedical Literature Database (SinoMed). The search strategy was based on PICOS principles, using a combination of Medical Subject Headings (MeSH) and free-text terms. Chinese search terms included stroke, dysphagia, and systematic review. English search terms included: Deglutition Disorders, Strokes, Systematic Review, and meta-analysis. The CNKI search strategy, for example, was: TKA=('swallowing disorder'+'deglutition disorder'+'dysphagia') AND TKA=('stroke'+'cerebral apoplexy'+'hemorrhage'+'infarction'+'cerebral disease'+'infarction') AND TKA=('meta-analysis'+'systematic review'). The WOS search strategy was: #1: TS=(Deglutition Disorders OR Deglutition Disorder OR Disorders, Deglutition OR Swallowing Disorders OR Swallowing Disorder OR Dysphagia OR Oropharyngeal Dysphagia OR Dysphagia, Oropharyngeal OR Esophageal Dysphagia OR Dysphagia, Esophageal); #2: TS=(Strokes OR Cerebrovascular Accident OR Cerebrovascular Accidents OR CVA(Cerebrovascular Accident) OR CVAs(Cerebrovascular Accident) OR Cerebrovascular Apoplexy OR Apoplexy, Cerebrovascular OR Vascular Accident, Brain OR Brain Vascular Accident OR Brain Vascular Accidents OR Vascular Accidents, Brain OR Cerebrovascular Stroke OR Cerebrovascular Strokes OR Stroke, Cerebrovascular OR Strokes, Cerebrovascular OR Apoplexy OR Cerebral Stroke OR Cerebral Strokes OR Stroke, Cerebral OR Strokes, Cerebral OR Stroke, Acute OR Acute Stroke OR Acute Strokes OR Strokes, Acute OR Cerebrovascular Accident, Acute OR Acute Cerebrovascular Accident OR Acute Cerebrovascular Accidents OR Cerebrovascular Accidents, Acute); #3: TS=(Systematic Review OR meta analysis); #4: #1 AND #2 AND #3.

1.2 Inclusion Criteria

(1) Study type: Meta-analysis or systematic review; (2) Study content: Investigation of risk and protective factors influencing recovery from post-stroke dysphagia.

1.3 Literature Screening and Data Extraction

All retrieved literature was managed using Endnote X9. Two researchers independently screened the literature using a double-blind approach. Endnote X9 was first used to automatically identify duplicate studies by title and authors, followed by manual removal of remaining duplicates. Initial screening was performed by reading titles and abstracts, followed by full-text review to identify studies meeting inclusion criteria. Data independently extracted by the two researchers included: first author, country, publication year, and risk/protective factors examined in each systematic review. Additionally, specific effect estimates (OR or HR) and their 95% confidence intervals (CI) from original studies within each systematic review were extracted. Any disagreements during screening or data extraction were resolved through discussion involving a third researcher.

1.4 Literature Quality Assessment Method

The AMSTAR 2 scale was used to assess the quality of included meta-analyses and systematic reviews [10]. This tool comprises 16 items, among which items 2, 4, 7, 9, 11, 13, and 15 are critical domains. Each item can be rated as Yes (Y), Partial Yes (PY), No (N), or Not Applicable (NA). The overall quality is classified into four levels: high, moderate, low, and critically low, based on the following criteria [11-12]: High quality: all critical domains meet requirements with at most one non-critical item not meeting requirements; Moderate quality: more than one non-critical item does not meet requirements; Low quality: one critical domain does not meet requirements regardless of non-critical items; Critically low quality: more than one critical domain does not meet requirements regardless of non-critical items.

1.5 Evidence Quality Assessment Method

This study employed a four-tiered grading system to evaluate the quality of evidence for different influencing factors, with categories: strong (robust/convincing), highly suggestive, suggestive, and weak [13]. This evaluation method comprehensively assesses evidence strength based on number of cases, random-effects P-value, between-study heterogeneity (I^2), 95% CI, small-study effects bias, and excess significance bias. Specific criteria were: (1) Strong evidence: supported by more than 1,000 cases, random-effects model $P \leq 10^{-6}$, no significant heterogeneity between studies ($I^2 < 50\%$), 95% CI does not include zero, and no evidence of small-study effects or excess significance. (2) Highly suggestive evidence: more than 1,000 cases with highly significant association (random-effects $P \leq 10^{-6}$) and significant P-value in the largest study included in the meta-analysis ($P < 0.05$). (3) Suggestive evidence: random-effects $P \leq 0.01$ with more than 1,000 cases. (4) Weak evidence: other significant associations ($P < 0.05$) were rated as weak evidence [14-15].

1.6 Data Analysis Method

In umbrella reviews, original studies may be included in multiple systematic reviews with similar research objectives, leading to literature overlap. Directly synthesizing these results could increase bias risk and affect evidence quality assessment. To avoid substantial literature overlap, this study integrated data from all relevant original studies within existing systematic reviews and re-analyzed them [16-17]. Statistical analysis was performed using STATA 16 and Review Manager 5.4 software.

Results

2.1 Search Results

A total of 1,286 systematic reviews related to post-stroke dysphagia were retrieved from databases. After excluding 515 duplicate papers, 760 studies were excluded through title and abstract screening for not meeting inclusion criteria. Following full-text review, 5 systematic reviews investigating prognostic factors for post-stroke dysphagia (encompassing 39 original studies) were ultimately included [Figure 1: see original paper].

2.2 Basic Characteristics of Included Studies

This study included systematic reviews published between 2021-2024 on prognostic factors for post-stroke dysphagia. Each systematic review included 11-28 original studies, covering a total of 45 prognostic factors (Table 1).

2.3 Quality Assessment Results of Included Studies

All systematic reviews failed to report funding information for included studies. D'NETTO et al. [6] and WANG et al. [20] were rated as high-quality studies as they only had this single non-critical deficiency. The remaining three systematic reviews had deficiencies in critical items: failure to register or develop a priori protocols. Additionally, ZHANG et al. [18] and MAO et al. [21] did not adequately explain and discuss heterogeneity among included studies; MAO et al. [21] also did not assess the impact of individual study bias risk on meta-analysis results; and LIU et al. [19] did not specify search dates, making the literature screening process irreproducible. These three reviews each had only one critical item deficiency (with remaining deficiencies being non-critical), and were therefore rated as low-quality studies (Table 2).

2.4 Evidence Strength Evaluation

2.4.1 Strong Evidence Impaired consciousness was evaluated as strong evidence for influencing post-stroke dysphagia prognosis. Relevant studies included 151,521 cases. Random-effects model results showed impaired consciousness was a risk factor for post-stroke dysphagia prognosis (OR = 0.09, 95%CI = 0.08~0.09, $P \leq 10^{-6}$), with extremely low heterogeneity between studies ($I^2 < 0.001$) and no evidence of small-study effects or publication bias.

2.4.2 Highly Suggestive Evidence Nine influencing factors were evaluated as highly suggestive evidence. Among these, eight factors—including age, sex, cognitive impairment, dysphagia severity, malnutrition, activities of daily living, NIHSS score, and mRS score—included more than 1,000 cases each, with random-effects models showing highly significant associations ($P \leq 10^{-6}$). However, they were downgraded to highly suggestive evidence due to significant heterogeneity between studies ($I^2 > 50\%$). Bilateral stroke, despite low heterogeneity ($I^2 = 20\%$), was also rated as highly suggestive evidence due to publication bias (P = 0.049). Specific data were: (1) Age (n = 3,405, OR = 1.29, 95%CI = 1.26~1.32, $I^2 = 98\%$); (2) Male sex (n = 151,430, OR = 1.34, 95%CI = 1.31~1.38, $I^2 = 77\%$); (3) Dysphagia severity (n = 1,211, OR = 1.12, 95%CI = 1.08~1.16, $I^2 = 75\%$); (4) Cognitive impairment (n = 1,398, OR = 1.10, 95%CI = 1.09~1.12, $I^2 = 97\%$); (5) Malnutrition (n = 152,418, OR = 1.07, 95%CI = 1.04~1.10, $I^2 = 81\%$); (6) Activities of daily living (n = 1,234, OR = 1.04, 95%CI = 1.02~1.06, $I^2 = 85\%$); (7) High NIHSS score (n = 3,553, OR = 1.19, 95%CI = 1.15~1.23, $I^2 = 90\%$); (8) mRS score = 0 (n = 153,072, OR = 0.79, 95%CI = 0.77~0.82, $I^2 = 64\%$); (9) Bilateral stroke (n = 1,192, OR = 2.89, 95%CI = 2.09~1.00, $I^2 = 20\%$, Egg's test P = 0.049).

2.4.3 Weak Evidence Thirty-five influencing factors showed statistical significance (random-effects model $P < 0.05$) but were rated as weak evidence due to fewer than 1,000 included cases, failing to meet criteria for suggestive or higher evidence levels (Table 3).

Discussion

This umbrella review systematically evaluated prognostic factors for post-stroke dysphagia, identifying 45 different factors, among which 10 had strong or highly suggestive evidence. The following sections elaborate on how these factors influence prognosis.

Elderly patients exhibit reduced contraction strength of orofacial muscles and delayed response to food stimuli, affecting swallowing coordination [22]. Regarding sex differences, estrogen has been demonstrated to have neuroprotective effects, but males lack estrogen's role in immune regulation [23]. Additionally, smoking history is more prevalent among males, leading to impaired ciliary function and decreased lung capacity, which increases the incidence of stroke-associated pneumonia [24]. These factors collectively affect swallowing function recovery. Furthermore, cognitive impairment significantly impacts post-stroke dysphagia prognosis, as patients with cognitive deficits have poor treatment compliance and cannot effectively execute rehabilitation training, hindering recovery.

Impaired consciousness, activities of daily living, NIHSS score, and mRS score all reflect stroke severity, which is significantly associated with slower swallowing recovery [25]. Patients with bilateral stroke typically have higher stroke severity and more complex swallowing function recovery because the central swallowing pathway is bilateral. While unilateral lesions can achieve functional compensation through reorganization of swallowing cortical areas in the unaffected hemisphere, bilateral lesions substantially increase recovery difficulty [26].

Malnutrition increases the incidence of post-stroke complications, leading to patient deterioration and worsening dysphagia [27-28]. Particularly in patients with severe dysphagia upon admission, inadequate nutritional intake due to swallowing difficulties further deteriorates overall health status, creating a vicious cycle that ultimately results in poor prognosis for post-stroke dysphagia [29].

These factors can be further categorized into reversible and irreversible determinants. Age, sex, and bilateral stroke are irreversible factors, while impaired consciousness, cognitive impairment, dysphagia severity, malnutrition, activities of daily living, mRS score, and NIHSS score are reversible. Irreversible factors indicate relatively poor prognosis that cannot be modified clinically, whereas reversible factors can be improved through active clinical intervention to promote swallowing function recovery. For example, cognitive impairment primarily relates to the oral preparatory phase of swallowing, and improving cognitive function can enhance patient compliance and promote effective execution of swallowing rehabilitation training. Malnutrition is the most easily modifiable factor clinically, as nutritional status can be improved through dietary modifications, feeding routes (nasogastric tube, etc.), or parenteral nutritional support. Factors such as impaired consciousness, activities of daily living, NIHSS score, and mRS score are associated with stroke severity, and can be improved through rehabilitation therapy that promotes neural plasticity and compensation mechanisms, thereby accelerating swallowing function recovery [30]. Therefore, when managing patients with post-stroke dysphagia, clinicians should not only assess and treat swallowing function itself but also emphasize early identification and intervention of other relevant functional deficits, implementing comprehensive rehabilitation strategies to improve overall outcomes [31].

In this study, intervention factors (timing of intervention and electrical stimulation) were both weak evidence, primarily because some original studies explored factors affecting post-stroke dysphagia prognosis without intervention, while others investigated different factors affecting prognosis based on certain interventions and specific timing. Only a few studies evaluated timing of intervention or intervention measures as independent influencing factors, resulting in weak evidence strength. However, early intervention is believed to maximize the utilization of the post-stroke neuroplasticity window, facilitating faster recovery of swallowing function [32-33].

In summary, this study evaluated the quality and strength of evidence from multiple systematic reviews, providing a basis for clinical identification and management of high-risk factors for post-stroke dysphagia. However, most evidence in this study was weakly suggestive, indicating that current research on prognostic factors for post-stroke dysphagia is of variable quality with issues such as small-sample bias and high heterogeneity. Additionally, this study is limited by the small number of systematic reviews on prognostic factors for post-stroke dysphagia, which may have resulted in insufficient evaluation of certain influencing factors. Therefore, more high-quality studies are needed in the future to further validate these factors' effects.

References

[1] DZIEWAS R, MICHOU E, TRAPL-GRUNDSCHOBER M, et al. European Stroke Organisation and European Society for Swallowing Disorders guideline for the diagnosis and treatment of post-stroke dysphagia[J]. Eur Stroke J, 2021, 6(3): LXXXIX-LXXCXV. DOI: 10.1177/23969873211039721.

[2] PATEL D A, KRISHNASWAMI S, STEGER E, et al. Economic and survival burden of dysphagia among inpatients in the United States[J]. Dis Esophagus, 2018, 31(1): 1-7. DOI: 10.1093/dote/dox131.

[3] SUNTRUP-KRUEGER S, MINNERUP J, MUHLE P, et al. The effect of improved dysphagia care on outcome in patients with acute stroke: trends from 8-year data of a large stroke register[J]. J Parenter Enteral Nutr, 2020, 44(5): 864-872. DOI: 10.1002/jpen.1727.

[4] MACIEJEWSKA O, KĘPCZYŃSKA K, POLIT M, et al. Dysphagia in ischaemic stroke patients: one centre retrospective study[J]. Nutrients, 2024, 16(8): 1196. DOI: 10.3390/nu16081196.

[5] BURGOS R, BRETÓN I, CEREDA E, et al. ESPEN guideline clinical nutrition in neurology[J]. Clin Nutr, 2018, 37(1): 354-396. DOI: 10.1016/j.clnu.2017.09.003.

[6] D'NETTO P, RUMBACH A, DUNN K, et al. Clinical predictors of dysphagia recovery after stroke: a systematic review[J]. Dysphagia, 2023, 38(1): 1-22. DOI: 10.1007/s00455-022-10491-6.

[7] LEE W H, LIM M H, SEO H G, et al. Development of a novel prognostic model to predict 6-month swallowing recovery after ischemic stroke[J]. Stroke, 2020, 51(2): 440-448. DOI: 10.1161/STROKEAHA.119.027439.

[8] GALOVIC M, STAUBER A J, LEISI N, et al. Development and validation of a prognostic model of swallowing recovery and enteral tube feeding after

ischemic stroke[J]. JAMA Neurol, 2019, 76(5): 561-570. DOI: 10.1001/jamaneurol.2018.4858.

[9] OH H M, KIM T W, PARK H Y, et al. Role of rs6265 BDNF polymorphisms and post-stroke dysphagia recovery-a prospective cohort study[J]. Neurogastroenterol Motil, 2021, 33(1): e13953. DOI: 10.1111/nmo.13953.

[10] SHEA B J, REEVES B C, WELLS G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both[J]. BMJ, 2017, 358: j4008. DOI: 10.1136/bmj.j4008.

[11] GE L, PAN B, PAN J X, et al. Interpretation of AMSTAR-2: a quality assessment tool for systematic reviews based on randomized and/or non-randomized controlled trials[J]. Chin J Drug Eval, 2017, 34(5): 334-338.

[12] TAO H, YANG L T, PING A, et al. Interpretation of AMSTAR 2: a quality assessment tool for systematic reviews of randomized or non-randomized therapeutic studies[J]. Chin J Evid Based Med, 2018, 18(1): 101-108. DOI: 10.7507/1672-2531.201711005.

[13] PAPATHEODOROU S. Umbrella reviews: what they are and why we need them[J]. Eur J Epidemiol, 2019, 34(6): 543-546. DOI: 10.1007/s10654-019-00505-6.

[14] BELLOU V, BELBASIS L, TZOULAKI I, et al. Risk factors for type 2 diabetes mellitus: an exposure-wide umbrella review of meta-analyses[J]. PLoS One, 2018, 13(3): e0194127. DOI: 10.1371/journal.pone.0194127.

[15] MITROGIANNIS I, EVANGELOU E, EFTHYMIOU A, et al. Risk factors for preterm birth: an umbrella review of meta-analyses of observational studies[J]. BMC Med, 2023, 21(1): 494. DOI: 10.1186/s12916-023-03171-4.

[16] MA N, PAN B, DENG X Y, et al. Evaluation and handling of literature overlap in umbrella reviews[J]. Chin J Evid Based Med, 2024, 24(10): 1212-1218.

[17] XIE Y F, XU J G, ZHOU D, et al. Micronutrient perspective on COVID-19: umbrella review and reanalysis of meta-analyses[J]. Crit Rev Food Sci Nutr, 2024, 64(19): 6783-6801. DOI: 10.1080/10408398.2023.2174948.

[18] ZHANG X M, ZHU Y Q, ZHANG Y H, et al. Meta-analysis of factors affecting prognosis in stroke patients with dysphagia[J]. J Chengde Med Coll, 2021, 38(4): 281-287. DOI: 10.15921/j.cnki.cyxb.2021.04.003.

[19] LIU C H, HUO M, QIN H H, et al. Critical prognostic factors for poststroke dysphagia: a meta-analysis[J]. Eur Rev Med Pharmacol Sci, 2022, 26(2): 610-622. DOI: 10.26355/eurrev_{{{202201}}_{{27888}}}.

[20] WANG L, QIAO J, SUN F, et al. Demographic and clinical factors associated with recovery of poststroke dysphagia: a meta-analysis[J]. Brain Behav, 2023, 13(6): e3033. DOI: 10.1002/brb3.3033.

[21] MAO Y J, XUE C H, FAN H, et al. Meta-analysis of factors associated with poor recovery of dysphagia in stroke patients[J]. J Neuropsychiatry, 2024, 24(3): 190-198. DOI: 10.3969/j.issn.1009-6574.2024.03.007.

[22] DE SIRE A, GIACHERO A, DE SANTI S, et al. Screening dysphagia risk in 534 older patients undergoing rehabilitation after total joint replacement: a cross-sectional study[J]. Eur J Phys Rehabil Med, 2021, 57(1): 131-136. DOI: 10.23736/S1973-9087.20.06321-8.

[23] DAI Y Y, ZHAO Y W, YAO S F, et al. Study on neuroprotective effects of estrogen mediated by mitochondrial pathway[J]. Acta Neuropharmacol, 2021, 11(3): 33-42. DOI: 10.3969/j.issn.2095-1396.2021.03.007.

[24] COLBERT J F, TRAYSTMAN R J, POISSON S N, et al. Sex-related differences in the risk of hospital-acquired sepsis and pneumonia post acute ischemic stroke[J]. J Stroke Cerebrovasc Dis, 2016, 25(10): 2399-2404. DOI: 10.1016/j.jstrokecerebrovasdis.2016.06.008.

[25] BROWN K, CAI C Y, BARRETO A, et al. Predictors of percutaneous endoscopic gastrostomy placement in acute ischemic stroke[J]. J Stroke Cerebrovasc Dis, 2018, 27(11): 3200-3207. DOI: 10.1016/j.jstrokecerebrovasdis.2018.07.022.

[26] BEHARRY A, MICHEL P, FAOUZI M, et al. Predictive factors of swallowing disorders and bronchopneumonia in acute ischemic stroke[J]. J Stroke Cerebrovasc Dis, 2019, 28(8): 2148-2154. DOI: 10.1016/j.jstrokecerebrovasdis.2019.04.025.

[27] WANG Z, SHI Y X, ZHANG L L, et al. Nomogram for predicting swallowing recovery in patients after dysphagic stroke[J]. JPEN J Parenter Enteral Nutr, 2022, 46(2): 433-442. DOI: 10.1002/jpen.2115.

[28] WAKABAYASHI H, SAKUMA K. Rehabilitation nutrition for sarcopenia with disability: a combination of both rehabilitation and nutrition care management[J]. J Cachexia Sarcopenia Muscle, 2014, 5(4): 269-277. DOI: 10.1007/s13539-014-0162-x.

[29] KOŠUTOVA P, MIKOLKA P. Aspiration syndromes and associated lung injury: incidence, pathophysiology and management[J]. Physiol Res, 2021, 70(Suppl 4): S567-583. DOI: 10.33549/physiolres.934767.

[30] LABEIT B, MICHOU E, HAMDY S, et al. The assessment of dysphagia after stroke: state of the art and future directions[J]. Lancet Neurol, 2023, 22(9): 858-870. DOI: 10.1016/S1474-4422(23)00153-9.

[31] DU Y H. Disease spectrum and strategic considerations for acupuncture treatment of encephalopathy[J]. Chin Acupunct Moxibustion, 2024, 44(4): 367-371. DOI: 10.13703/j.0255-2930.2024.04.001.

[32] DING L, LU L M, FAN X N. Research progress on application of assessment tools for common severe complications of dysphagia after stroke[J].

Chin J Phys Med Rehabil, 2024, 46(1): 75-80. DOI: 10.3760/cma.j.issn.0254-1424.2024.01.016.

[33] GUPTA H, BANERJEE A. Recovery of dysphagia in lateral medullary stroke[J]. Case Rep Neurol Med, 2014, 2014: 674751. DOI: 10.1155/2014/674751.

Author Contributions: LI Yibing conceived the research proposition and design, conducted research design and manuscript writing; JIA Hongbo was responsible for manuscript revision and literature quality assessment; FAN Xiaonong was responsible for quality control and review of the article, with overall responsibility and supervision; ZHAO Wenjun collected and organized raw data; LIU Wei and GE Wenyi conducted literature retrieval; LI Songjiao and LEI Kangchen performed literature screening; ZHANG Menglong and ZHANG Weiwei extracted data; CHEN Yang was responsible for manuscript proofreading; LI Li resolved disagreements in literature retrieval, screening, and data extraction.

Conflict of Interest Statement: The authors declare no conflicts of interest.

Received: 2025-04-10; **Revised:** 2025-05-28

Editorial Responsibility: MAO Yamin

Note: Figure translations are in progress. See original paper for figures.