Dysphagia
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REVIEW

Best Practice Recommendations for Stroke Patients with Dysphagia: A Delphi-Based Consensus Study of Experts in Turkey-Part I: Management, Diagnosis, and Follow-up

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Abstract
Dysphagia is one of the most common and important complications of stroke. It is an independent marker of poor outcome after acute stroke and may become chronic after the acute period and continues to affect all aspects of the patient's life. Patients with stroke may encounter any of the medical branches in the emergency room or outpatient clinic, and as in our country, there may not be specialists specific for dysphagia, such as speech-language pathologists (SLP), in every hospital. This study aimed to raise awareness and create a common opinion of medical specialists for stroke patients with dysphagia. This recommendation paper has been written by a multidisciplinary team and offers 45 recommendations for stroke patients with dysphagia. It was created using the eight-step Delphi round via e-mail. This study is mostly specific to Turkey. However, since it contains detailed recommendations from the perspective of various disciplines associated with stroke, this consensus-based recommendation paper is not only a useful guide to address clinical questions in practice for the clinical management of dysphagia in terms of management, diagnosis, and follow-up, but also includes detailed comments for these topics.

Keywords Dysphagia · Stroke · Recommendation · Delphi study · Management · Diagnosis · Follow-up

Introduction

Dysphagia defines any disturbance in the swallowing process during bolus transport from the oral cavity to the stomach and it is one of the common complications of stroke [1].

Dysphagia is an independent marker for poor outcome following acute stroke and it continues to be effective for many years [2]. Dysphagia may cause a number of problems such as dehydration, malnutrition, aspiration pneumonia, and even death. Aspiration pneumonia is the most severe complication of dysphagia and occurs in about half of all patients with stroke during the first year; 40–70% of these aspirations are "silent" and the mortality rate is high [1].

There is a wide range of pathophysiological complications associated with dysphagia. Dysfunction related to the manifestation of post-stroke dysphagia is consistently reported. In particular, complications in the pharyngeal phase of swallowing are quite common [3]. Furthermore, it has been reported that oral phase dysfunction has an effect on dysphagia and aspiration in stroke patients [4]. Therefore, it is important to define oropharyngeal dysphagia (OD). Recent studies have shown that early diagnosis of OD is correlated with improved functional status, quality of life, and decreased mortality and morbidity in patients with stroke [5, 6].

Stroke management guidelines consider dysphagia as a mostly reversible complication of acute stroke and details such as diagnosis, treatment, and follow-up are neglected.

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This is because doctors view stroke from a wide medical perspective; while stroke is a condition that involves many problems from cognitive problems to hemiplegia, dysphagia is just a drop in this ocean. The specialized speech-language pathologists (SLP) in most countries only provide dysphagia management.

However, patients with stroke may encounter any of the medical specialists in the emergency room or outpatient clinic at any time and SLP may not be available in every hospital as in our country, namely Turkey. There is no paper in our country or in the world that includes detailed opinions and comments of medical specialists on dysphagia management, including management, diagnosis, and follow-up.

Hence, this recommendation paper aims to raise awareness for stroke patients with dysphagia and to create consensus among medical professionals as well as to respond to the problems and questions we may encounter regarding dysphagia in clinical practice with a multidisciplinary approach from the perspective of experienced specialists.

Methods

This project was carried out by the *Turkish Society of Physical Medicine and Rehabilitation (PMR)-Dysphagia Working Group* between October 2019 and February 2020 by a 3-round Delphi questionnaire/survey via e-mail.

Purpose and Focus of Recommendations

For this recommendation document, dysphagia is defined as any difficulty during the passage of the bolus from mouth to esophagus [1]. Therefore, an OD-specific study was primarily performed, as OD is frequently observed in stroke patients and causes severe morbidity and mortality. No specific recommendations were done for esophageal dysphagia. Recommendations in this study were planned considering all patients with stroke and dysphagia, including acute, subacute, and chronic periods. For patients with stroke and dysphagia, recommendations including general principles, management, diagnosis, and follow-up were created. The recommendations are structured for patients with stroke over 18 years of age, so they cannot be applied to patients under 18 years of age.

The Methodology of Recommendation Development

The recommendations were created by a multidisciplinary medical doctor group. Firstly, task force members with 4 experts (PMR medical doctor) were created from the Turkish Society of PMR-Dysphagia Working Group, and then consultant experts were selected [7, 8]. In the selection of consultant experts, it was required to be experienced in stroke patients for at least 10 years and/or to do studies related to stroke or dysphagia. Additionally, experts from the north, south, east, and west regions of the country were also invited to have a general view of the whole country.

To form this consultant expert group and to create an agreed single view of our country with recommendations, an invitation e-mail was sent to 22 PMR specialists (members of the dysphagia working group) and 10 otolaryngology, 5 geriatric medicine, 10 neurology, 2 gastroenterology, and 3 internal medicine specialists (35 centers in 15 cities in Turkey) experienced both in dysphagia and stroke patients from various geographic regions of Turkey.

The consultant group consisted of 31 experts from 52 invited specialists, who agreed to answer each questionnaire from their own perspective as an experienced professional in stroke and dysphagia patients. However, the number of consultant expert did not remain the same throughout the entire study. The 1st Delphi round of study started with 31 experts (20 PMR, 3 otolaryngology, 2 geriatric medicine, 4 neurology, 1 gastroenterology, and 1 internal medicine specialists) in 26 centers in 12 cities, who responded to the invitation e-mail and agreed to participate. While 28 experts participated in the 2nd Delphi round, the 3rd Delphi round of study was completed with 22 experts (14 PMR, 2 otolaryngology, 1 geriatric medicine, 4 neurolog, and 1 gastroenterology specialists).

The consensus recommendations were developed through a seven-step process. *In the first step*, 2 task force members searched and identified the relevant published guidelines (NICE, SIGN, ESPEN, IASLT, WGO, AHA, SASLHA, CSBPR,…); after this initial review, we searched for the main Bibliographic Databases (Pubmed, EMBASE, and Cochrane Library) for recent systematic reviews and meta-analyses [9–38]. In case of their absence, we looked for other indirect systematic reviews and meta-analyses, randomized or nonrandomized comparative studies, respectively. In addition, updated literature research was conducted to obtain further comparative studies. The screening was done by reading the abstract, followed by the entire article when necessary. The literature review included the last 10 years until September 2019. Finally, the literature results were evaluated and 16 open-ended questions were created by 4 task force members under the main headings of general principles, management, diagnosis, and follow-up according to the criteria for creating open-ended questionnaires in the literature [39].

In the second step, the 16 open-ended questions were sent to the consultant expert group (1st Delphi round). The aim of this 1st Delphi round was to determine the general principles, management, diagnosis, and follow-up of dysphagia in stroke, to understand potential problems and to make recommendations. Therefore, experts were asked to submit detailed and unlimited opinions and suggestions within a week.

In the third step, the task force group gathered the answers and additional suggestions of the experts and created 108 items under the main headings of general principles, management, diagnosis, and follow-up.

In the fourth step, the 2nd Delphi round was performed, the draft of the questionnaire containing the opinions of the majority was sent back to the consultant group and feedback was requested within one week (the consultants were surveyed to assess their opinions on the feasibility of implementing the consensus).

In the fifth step, the questionnaire was revised and 71 questions were formed in line with the answers.

In the sixth step, the last version of the recommendations was shared with the consultant group by a 3rd Delphi round; they were asked to reconsider the questions that were close to compromise.

In the seventh-step, all available information was used to build consensus within the task force group to finalize the recommendations. Recommendations containing 45 items have been created; 4 items for general principles, 7 items for management, 29 items for diagnosis, and 5 items for follow-up.

Finally, in order to make the study more universal, an invitation was sent to specialized disciplines in dysphagia and nutrition (5 SLPs and 5 dietitians). A SLP and 2 dietitians agreed to participate in the study. Their opinions were also included in the study.

Strength and Classification of Recommendations

All recommendations were rated by consultant expert group members with a 10-point scale (0–10), 0 point reflected "I totally disagree", and 10 reflected "I totally agree". This 10-point scale was divided into three terms that show the strength of agreement in response to each statement. While many different methods were used to evaluate the strength of the recommendations in the literature, three measurements (percent (%), median value, and interquartile range (IQR)) were used to increase the strength of recommendations for each of the items [40–42]. Strength of recommendations was classified as *overall consensus* (OC) (agreement rate in between 8 and 10 points is $\geq 80\%$ and the median value is between 9 and 10 and IQR is ≤ 2), *approaching consensus (AC)* which means there is no OC but there is considerable support (agreement rate in between 8 and 10 points is 65%–79% and the median value is between 8 and 10 and IQR is ≤ 3) and *overall divergence (OD)* which means there is significantly divergent views within the group (agreement rate in between 8 and 10 points is $< 65\%$ or median value is < 8 or IQR is > 3). In the 1st and 2nd rounds of Delphi, the OD statements were removed and the AC statements were revised with comments and/or details.

In this study, "recommended and should" were used for OC (strong recommendation), "considered and may" were used for AC (weak recommendation), and "not recommended and should not" for OD. "The highest level of agreement" (agreement rate is 100%, the median value is 10 and IQR is 0 point) expressed "strong recommendation" in full sense of consensus.

Statistical Analysis

Descriptive statistics of SPSS version 22.0 (SPSS Inc., Chicago, IL, USA) software was used for statistical analysis. The strength of agreements (SOA) was calculated for each item and strong agreement was presented in proportions (response of 8–10%), median values, and IQR with Kappa method [43, 44].

Results

A questionnaire consisting of 108 items was prepared in line with the answers and suggestions of the expert group to 16 open-ended questions created by the task force group. In the 2nd Delphi round, 65.7% of these items were accepted in accordance with the overall and approach consensus and 37 items were removed. In the 3rd Delphi round, 63.4% of 71 items were accepted as compatible with the overall and approaching consensus, and the final form of the survey was formed with 45 items. The recommendations consisting of 45 items are presented in Table 1, and the distributions of the strength of the recommendations in the 2nd and 3rd Delphi rounds are presented in Table 2.

The recommendations in 4 sections were 35 strong and 3 weak recommendations and 7 were not recommended. While one recommendation for each subdivision had the highest level of agreement in the general principles and management subdivisions, 2 recommendations had the highest level agreement in the diagnostic section.

The SLP expert agreed 100% for 41 of the 45 questions (Table 2). The rate of agreement in 1 recommendation from the management subsection and 2 from the diagnosis subsection was 50%. The rate of agreement in the "team coordination in subacute/chronic period" recommendation in the management subsection was 10%.

The dietitian' opinions for the nutritional recommendations are shown in Table 3. The rate of agreement with the 3 recommendations was 100%. The agreement for the formal test was 80%.

Discussion

This study involves the presentation of the opinions and recommendations of experts from many regions of Turkey who have the knowledge and experience in "dysphagia and

stroke" using a Delphi study. Experts' opinions were collected and analyzed according to the Delphi method in order to determine the extent to which there was consensus regarding the content and effectiveness of management methods in stroke patients with dysphagia. The scope of this subject is divided into sections as general principles, management, diagnosis and follow-up, and all sections are detailed. The 45-item recommendations were prepared in a way to shed light on almost all questions and problems that may be encountered in clinical practice.

General Principles

In the "General Principles" section, 4 recommendations were discussed and accepted by the expert panel. One of the suggestions had the highest level of agreement (1c).

Recommendation 1 In stroke patient, dysphagia is seen approximately 20–70% in the acute period, 10–40% in the subacute period, and 5–25% in the chronic period

Dysphagia is a common complication after a stroke. It has been presented in the literature that the prevalence in the acute period is 40–90%. Although this rate decreased in the following periods, it was reported that it continued at rates such as 11–33% in the chronic period [13, 22, 45–47]. Although many studies have been conducted on dysphagia, it has been stated that the prevalence rates are in a wide range due to the variety of methods used in almost all studies and a lack of standardization. In our country, there are no standard protocols for diagnosis similar to the literature, and no prevalence studies have been performed. Therefore, there was a weak consensus for this recommendation in all three Delphi rounds and experts have stated that additional explanation "there is no accurate data in Turkey" and "rates can vary depending on the method used" is required for this recommendation.

Recommendation 2 Dysphagia is a poor prognostic factor for stroke patients regardless of other factors

Recommendation 3 Dysphagia can cause complications such as dehydration, malnutrition, weight loss, sarcopenia, increased risk of infection, aspiration, and aspiration-induced pneumonia, especially aspiration-induced pneumonia may increase mortality and morbidity such as prolonged

Table 1 Recommendations

A. GENERAL PRINCIPLES

1. Dysphagia is seen approximately 20–70% in the acute stroke period, 10-40% in the subacute stroke period, and 5–25% in the chronic stroke (Explanation: There are no accurate data in Turkey and these rates may change according to the methods used. Therefore, this item was accepted as "approaching consensus").
2. Dysphagia is a poor prognostic factor independent of other factors for patients with stroke.
3. Dysphagia has complications of dehydration, malnutrition, weight loss, sarcopenia, an increased risk of infection, aspiration, and aspiration-induced pneumonia. Especially aspiration-induced pneumonia may increase mortality and morbidity such as increased complications including prolonged hospital stay and pressure ulcer development, and increased psychological problems, reduced in treatment participation and response, and decreased quality of life, as a result, an increase in health expenditures and sudden death rates might be seen.
4. Silent aspiration rate can be seen between 5 and 50%, especially in the acute period.

B. MANAGEMENT

1. *Management Components* Dysphagia management in stroke patients should be performed with a multidisciplinary team.
2. *Team definition*The team should include all healthcare professionals (neurology, physical medicine and rehabilitation, otolaryngology, geriatric medicine, gastroenterology, radiology and anesthesia specialists, speech-language pathology (SLP), dentist, nurse, physiotherapist, dietitian, psychologist, occupational therapist, ergo therapists, home care services staff, and social worker) working from the first diagnosis of stroke in the emergency room to the last step of rehabilitation *(*Explanation: All branches mentioned in the conditions of our country may not be available everywhere, especially SLP. Other branches that are available according to hospital conditions can be added to the core team consisting of neurology, physical medicine and rehabilitation, and otolaryngology specialists, which is closely related to stroke and dysphagia. If there is SLP in the center, this should be included in the core team).
3. The multidisciplinary team should include the patient and the caregiver/family of patients. All of them should be informed and ensured to take a supportive and active role in diagnosis, treatment, and follow-up.
4. *Application* A team related to diagnosis and treatment should be formed with available branches at each center (Explanation: Under the conditions of our country, this team may not be formed in every center. Teams should be established in as many centers as possible, primarily in rehabilitation centers).
5. *Team Management* Since the swallowing function examination is part of the neurological examination, management in the acute period should be at the neurology specialist. The neurologist should ensure coordination with other relevant units.
6. Physical medicine and rehabilitation specialists should take an active role in the team to coordinate the rehabilitation program of each patient with medical stabilization (Explanation: The specialist training of Physical Medicine and Rehabilitation physicians should be increased in this direction).
7. Although dysphagia is a condition with serious mortality and morbidity but it is not included in the main topics in the education process, all healthcare personnel should be trained in the diagnosis and evaluation of dysphagia management, starting with emergency physicians, who may encounter stroke patients.

Table 1 (continued)

C. DIAGNOSIS

C.1. Evaluation of Swallowing

1. To reduce the risk of aspiration and pneumonia in all stroke patients, the risk of dysphagia before oral intake should be considered and all patients should be evaluated.
2. Dysphagia in stroke patients should be evaluated as soon as possible in the acute period (Explanation: The evaluation time should be decided by considering the patient's conditions that will affect swallowing, such as medical stabilization and cognitive functions. This time may vary for each patient).
3. Stroke patients in the subacute and chronic period (whether patients have taken oral or not/treated or untreated) should also be evaluated for dysphagia.
4. Evaluation should be performed by a trained physician (Explanation: Although evaluations are performed by speech-language pathologists (SLP) and specialized nurses almost all over the world, this item is specific to our country. The number of SLP in our country is low and they are not employed in health policies for the time being. Also, due to the lack of specialized nursing education/program systems in our country, though the evaluation is predicted to be done by the physician at present. This situation can change with the organization of nursing education and, an increase in the number of speech-language therapists and their employment within the health system).
5. Dysphagia evaluation in stroke patients with acute, subacute, and chronic period should include screening tests and detailed history (medical history with predictive and risk factors for dysphagia and aspiration) and physical examination.

C.1.1 Screening Tests

1. A questionnaire containing the following symptoms and signs can be used as a screening test for all stroke periods. This survey should include the following symptoms and signs.

-Voice change, wet voice, hoarse voice
-Need to clean the throat
-Multiple swallowing movement, delay in pharyngeal swallowing
-Presence of oral residue
-Coughing/choking during feeding
-Decreased laryngeal elevation
-Facial flushing during feeding

2. Standardized screening tests only in the questionnaire form that evaluate the risk of dysphagia are not suitable and they are not recommended for stroke patients in acute, subacute, and chronic periods.
3. Water swallow tests alone or combined with pulse oximeter are not suitable and they are not recommended.
4. Standardized tests involving water swallow tests combined with the questionnaire form are not suitable and they are not recommended.
5. The use of single food texture, such as semi-solid alone, tests containing the combination with the questionnaire are not suitable and they are not recommended.
6. Standardized tests including all three types of food texture (solid, semi-solid, and liquid) combined with a standardized questionnaire should be used and they are recommended.

C.1.2. Medical History-Physical Examination

1. To all stroke patients, the oropharyngeal region, respiratory system, and musculoskeletal system in particular detailed medical history and physical examination should be done after dysphagia screening tests.
2. Recommended predictive and risk factors for medical history and physical examination, findings, and supporting laboratory/imaging:

Medical History

Premorbid properties

-Age,
-Respiratory system diseases such as chronic obstructive pulmonary disease,
-Additional neurodegenerative diseases such as Parkinson's Disease,
-Head and neck cancer history,
-Previous pneumonia history,
-Previous malnutrition history,

Features related to stroke

-Location of stroke,
-Stroke severity,
-Medical procedures (tracheostomy, intubation tube, mechanical ventilation, etc.)

Symptoms

-Complaint of swallowing difficulty
-Need to clean the throat
-Weight loss

Physical Exam, Findings, and Supportive Laboratory/Imaging

Physical Exam and Findings

-Consciousness level
-Head control and sitting balance
-Voluntary coughing ability

Table 1 (continued)

D. FOLLOW-UP
1. Follow-up times and intervals should be arranged as patient-specific.
2. In the acute period, patients should be followed daily until stability is achieved in terms of dysphagia.
3. When stability is achieved in the acute period, dysphagia should be followed weekly during hospitalization.
4. Dysphagia should be followed monthly in the subacute period (3–6 months) and bimonthly in the chronic period (6–12 months).
5. Follow-up should be done according to the protocols used in diagnosis.

hospital stay, pressure ulcer development, increased psychological problems, decreased treatment participation and response, and decreased quality of life, resulting in an increase in health expenditures and sudden death rates. (the highest level of agreement-oc).

It has been reported that dysphagia causes an increase in mortality and morbidity especially in the acute period of stroke. Moreover, it has been suggested that the risk of death increases 8.5 times compared to patients with normal swallowing, and dysphagia is an independent risk factor for hospitalization [1, 22, 45, 48, 49]. It was noted that especially the risk of pneumonia increased 8 times, and the quality of life was affected in almost half of the patients, and the mortality rate increased by 11–16% [13, 46, 48, 50–56].

In these recommendations, the opinion that dysphagia is a poor prognostic factor was accepted as a strong recommendation, especially its effect on mortality and morbidity was accepted as the highest level of agreement.

Recommendation 4 Silent aspiration rate can be seen between 5–50%, especially in the acute period

Aspiration in stroke patients occurs with the damage of reflex mechanisms that prevent the passage of oropharyngeal and gastric contents into the larynx and lower respiratory tract. Aspiration has been reported in 40% of patients with acute stroke [57, 58]. The number of studies on the prevalence of silent aspiration is low. In the review by Ramsey et al., this rate was reported to be 2–25% in the acute period [59]. There is no prevalence study in our country. Considering the clinical experience of our experts working in hospitals with the most stroke patients in our country, we can say that there are similar rates for our country.

Management

In the "Management" section, 7 recommendations were discussed and accepted by the expert panel with OC. One of the suggestions had the highest level of agreement (item#1).

Management Components

Recommendation 1 Dysphagia management should be performed with a multidisciplinary team in stroke patients. (the highest level of agreement-oc)

Recommendation 2 The team should include all healthcare professionals (neurology, pmr, otolaryngology, geriatric medicine, gastroenterology, radiology and anesthesia specialists, dentist, nurse, physiotherapist, slp, dietitian, psychologist, occupational therapist, ergo therapists, home care services staff, and social worker) working in the emergency department from the initial diagnosis of stroke through to the final stage of rehabilitation.

Explanation: All branches mentioned in the conditions of our country may not be available everywhere, especially SLP. Other branches that are available according to hospital conditions can be added to the core team consisting of neurology, physical medicine and rehabilitation, and otolaryngology specialists, which is closely related to stroke and dysphagia. If there is SLP in the center, this one should also be included in the core team.

Recommendation 3 The multidisciplinary team should include the patient and the caregiver/family of patients. All of them should be informed and ensured to take a supportive and active role in diagnosis, treatment, and follow-up.

Recommendation 4 A team related to diagnosis and treatment should be formed with available branches at each center.

Explanation: Under the conditions of our country, this team may not be formed in every center. Teams should be established in as many centers as possible, primarily in rehabilitation centers.

Swallowing is a sensorimotor complex behavior controlled by numerous components that range from the central nervous system to bulbus and provides the passage of the food from the mouth to the stomach. Therefore, many medical branches such as neurology, otolaryngology, PMR, and geriatric medicine may encounter such patients in clinical practice. In almost all guides on dysphagia management, the need for multidisciplinary teamwork is emphasized [9, 13, 22–27, 60]. These guidelines agree that not only physicians (medical team) but also almost all healthcare professionals, who may encounter with the stroke patient, should be involved in this management. SLP is specialized in dysphagia management and is at the center of dysphagia management almost all over the world. However, due to the low number of SLPs in our country and not being included in the national health system, the core team consists of medical experts. This is a phenomenon peculiar to Turkey. Therefore, a sentence "If there is a SLP in the center, this one should be included in the core team" was added to the 2nd recommendation item.

Table 2 Distribution of the strength of the recommendations after 2nd –3rd rounds and SLP's opinion

	2nd round			3rd round			SOA	*
	8–10%	IQR	median	8–10%	IQR	median	2./3.round	%
A. General Principles								
1. Frequency	87.6	2.84	8.77	85.5	2.92	8.81	AC	100
2. Prognostic factor	89.28	1.52	9.27	90.90	0.60	10.00	OC	100
3. Morbidity–mortality	96.42	0.76	9.87	100	0.0	10.00	OC	100
4. Silent aspiration	85.71	1.54	9.68	100	1.00	10.00	OC	100
B. Management								
1.Multidisciplinary team	96.4	0.77	9.45	100	0	10	OC	100
2. Medical members	82.2	1.11	9.33	100	1.00	10	OC	50
3. Patient/relatives of patient members	96.42	0.75	9.89	95.45	0.10	10	OC	100
4. Team application	82.1	1.73	9.65	95.45	0.4	10	OC	100
5. Coordination-acute period	75	2.48	9.00	81.81	2.0	10	AC/OC	100
6. Coordination-subacute/chronic periods	82.14	2.18	9.00	95.45	0.20	10	AC/OC	10
7. Education	96.42	0.78	9.83	95.45	0.35	10.00	OC	100
C. Diagnosis								
C.1. Evaluation of Swallowing								
1. All stroke patients	89.28	1.37	9.85	100	0	10	OC	100
2. time for acute period	67.85	2.70	9.83	95.45	0.75	10.00	AC/OC	100
3. time for subacute–chronic periods	92.85	1.43	9.65	95.45	0.60	10.00	OC	100
4. Evaluation team	82.14	1.86	9.96	86.36	1.00	10.00	OC	50
5. Content of diagnosis	96.29	1.69	9.53	95.45	0.20	10.00	OC	100
C.1.2. Screening Tests								
1. Most symptom-finding questionnaire	53.57	4.24	7.66	95.45	1.00	9.90	OD/OC	100
2. Standardized questionnaire test	81.30	2.01	9.88	45.45	5.35	7.35	AC/OD	100
3. Water swallow test	77.78	2.25	8.90	72.72	2.75	9.00	AC/AC	100
4. Water swallow test + questionnaire form	70.37	2.47	9.28	52.38	3.60	8.40	AC/OD	100
5. One consistency + questionnaire test	40.74	7.88	6.62	41.68	6.52	5.94	OD	100
6. Three consistency + questionnaire test	69.27	2.99	9.56	85	1.38	9.40	AC/OC	100
C.1.2.Medical History-Physical Examination								
1. History examination	70.37	2.47	9.28	89.28	1.60	9.89	AC/OC	100
2. Predictive-risk factors	53.57	4.24	7.66	95.45	1.00	10.00	OD/OC	100
C.1.3. Instrumental Methods								
1. Instrumental screen test	66.74	2.43	8.75	60.90	3.10	7.40	AC/OD	100
ENMG	66.67	3.16	9.00	55.55	3.27	7.00	OD	100
VF	74.07	2.44	9.66	77.27	2.15	10.00	AC	100
FEES								
2. Instrumental first-line	46.42	4.81	7.68	50.00	3.88	7.90	OD	100
ENMG	64.28	2.92	9.00	45.45	3.88	6.75	OD	100
VF	81.48	2.01	9.68	90.47	1.38	9.50	AC/OC	100
FEES								
3. Definition of aspiration	85.71	1.54	9.68	95.45	1.00	10.00	OC	100
4. Definition of high-risk patient	88.46	1.48	9.57	95.45	0.00	10.00	OC	100
5. Instrumental second line	92.85	0.35	9.92	95.45	0.0	10.00	OC	100
6. Instrumental treatment and following	89.28	0.44	9.90	95.45	0.15	10.00	OC	100
7. Ultrasonography	85.71	1.71	9.81	95.45	1.00	10.00	OC	100
8. Accelerometer/manometry	85.71	1.33	9.82	95.45	1.00	9.90	OC	100
C.2. Evaluation of Nutrition								
1. All patients	92.85	0.35	9.92	100	0.0	10.00	OC	100
2. Formal test	92.85	0.92	9.71	86.36	0.50	10.00	OC	100
3. Suitable tests	86.36	1.88	9.00	86.36	1.88	9.00	OC	100
4. Evaluation team	89.28	1.00	9.88	100	0.20	10.00	OC	50

Table 2 (continued)

	2nd round			3rd round			SOA	*
	8–10%	IQR	median	8–10%	IQR	median	2./3.round	%
D. Follow-up								
1. Individualized	96.29	0.82	9.72	90.90	0.50	10.00	OC	100
2. Acute period-unstable	88.89	0.97	9.61	90.90	0.25	10.00	OC	100
3. Acute period-stable	76.92	2.50	9.67	80.95	2.00	9.50	AC/OC	100
4. Subacute–chronic periods	92.30	1.44	9.56	86.36	1.50	10.00	OC	100
5. Follow-up protocol	96.29	1.07	9.88	100	0.75	10.00	OC	100

IQR: interquartile range*; SOA:* strength of agreement*; AC:* Approaching Consensus*; OC:* Overall consensus*; OD:* overall divergence*; ENMG:* Electroneuromyography; *VF:* videofluoroscopy; *FEES:* fiberoptic endoscopic evaluation of swallowing*; SLP:* speech-language pathologist

*The speech-language pathologist's opinion for the final recommendations

Table 3 The dietitian' opinion for the nutritional recommendations

C. Diagnosis	Final Recommendations			
	8–10%	IQR	Median	SOA
C.2. Evaluation of Nutrition				
1. All patients	100	0	10	OC
2. Formal test	90	1.5	9.75	OC
3. Suitable tests	100	0	10	OC
4. Evaluation team	100	0	10	OC

IQR: interquartile range*; SOA:* strength of agreement*; OC:* Overall consensus

The guidelines also suggested that patients and their relatives/caregivers should be involved in management (between the strong and weak recommendation levels) [23–26]. This is because dysphagia affects not only the patient, but also a large community that includes their families and caregivers. In this study, it was discussed that almost all people interacting with the patient should participate in the management with the recommendations of the experts, but it was stated during the Delphi rounds that arrangements should be made to create a core team based on the view that not all healthcare professionals could be present in the same center.

Recommendation 5 Since the swallowing function examination is part of the neurological examination, management in the acute period should be done by a neurologist. The neurologist should ensure coordination with other relevant units.

Recommendation 6 PMR specialists should take an active role in the team to coordinate the rehabilitation program of each patient with medical stabilization.

Explanation: The specialist training of PMR physicians should be increased in this direction.

Stroke is a neurological clinical picture and contains many life-threatening medical causes other than dysphagia in the acute period. Therefore, it is predictable that neurologists will be the head of the team in the acute period. Although it is reported that some specialists such as SLP, geriatric medicine, and neurology physicians are primarily responsible in the acute period [2, 9, 13, 22–27, 61], neurology is the common branch in almost every center of our country that plays the most effective role in the acute period [49, 62, 63]. Our experts recommend that PMR physicians should take an active role in the management to provide specific approaches to dysphagia once medical stabilization is achieved. But the SLP, who contributed to this paper, stated that he did not agree with this item. This is an item unique to Turkey. The SLP training has increased in our country for the last 7 years, the number of SLP in our country is still low and they are not employed in health policies for now. For this reason, PMR specialists are considered for this task in our country since they are in almost every hospital. Within the scope of this recommendation, it was suggested by experts to increase the training of PMR specialists on dysphagia management. Since there is no program for dysphagia management in the education curriculum of PMR specialists in our country, we think that this recommendation may be a step towards eliminating this lack of education. As in the next recommendation (item#7), education should be for all healthcare professionals associated with a stroke patient. The training requirement (between weak and strong recommendations) has been emphasized in the review articles and guidelines [13, 21–25, 29, 63–65]. Although the content of the training is not available as a single model, it is recommended to include risk factors, early findings, screening tests, and nutritional support [13].

Recommendation 7 Although dysphagia is a condition with serious mortality and morbidity, it is not among the main topics in the education process; but all healthcare personnel should be trained in the diagnosis and evaluation of dysphagia management, starting with emergency physicians, who may encounter stroke patients.

Diagnosis

The "Diagnosis" section is discussed in two parts as the evaluation of swallowing and nutrition. A total of 2 items had the highest level of agreement, one in the swallowing assessment (item#1) and one in the nutritional assessment (item#1).

Evaluation of Swallowing

Recommendation 1 To reduce the risk of aspiration and pneumonia in all stroke patients, the risk of dysphagia before oral intake should be considered and all patients should be evaluated (the highest level of agreement).

Recommendation 2 Dysphagia in stroke patients should be evaluated as soon as possible in the acute period.

Dysphagia is a common consequence of stroke, a risk factor for aspiration pneumonia associated with higher mortality and disability rates. It is reported that early diagnosis decreases the rate of aspiration pneumonia but the 1-day delay in diagnosis increases the incidence by 1% [53, 66, 67]. Therefore, almost all stroke and dysphagia management guidelines recommend that the patient should be evaluated for dysphagia prior to oral intake at a strong recommendation level [10, 13, 19, 68]. In this study, it was accepted at the highest agreement level. Although there is an OC regarding the evaluation of patients before oral intake, there are different opinions about the time of screening. Studies have indicated that the probability of OD is over 50% in the first 72 h of stroke [69]. While some articles recommended that that screening should be performed within 4–6 h after hospital admission, and specific swallowing assessment within 72 h [10, 14, 22, 36, 62], some papers reported that the evaluation time should be within the first 24 h and should not exceed 72 h [16, 18, 24, 28, 29].

As a result, no agreement has been reached in the literature. In this study, the first 24-h and the first 72-h options were presented to the experts in the first Delphi round. However, both recommendations failed to create a positive agreement and "OD" was noted. Experts suggested that the patient should be identified individually by adding the explanation "The evaluation time should be decided by considering the patient's conditions that will affect swallowing, such as medical stabilization and cognitive functions. This time may vary for each patient."

Recommendation 3 Stroke patients in the subacute and chronic period (whether patients have taken oral or not/treated or untreated) should also be evaluated for dysphagia.

The swallowing function becomes highly safe during the first 2 weeks of stroke. However, it is reported that 11% to 33% of patients may have prolonged dysphagia up to 3 to 6 months [6, 13, 22, 45, 46]. Silent aspirations have been reported in 8% of these patients, especially in the presence of abnormal pharyngeal sensations in the subacute and chronic period [6]. Therefore, we think that dysphagia is not only an acute period problem, but all stroke patients in outpatient clinics should be evaluated in terms of potential dysphagia. There is no recommendation regarding subacute and chronic periods in the guidelines or new papers. Since this study aims to evaluate dysphagia in stroke patients for all aspects and periods, it is reported as an OC that stroke patients should be evaluated in every stroke period.

Recommendation 4 Evaluation should be performed by a trained physician.

Studies indicated that dysphagia should first be screened by trained healthcare personnel, and then a detailed evaluation should be made by specialist personnel. However, there may be a difference in the personnel involved in stroke management due to the change in health and education policies from country to country [9, 22, 24–26, 29]. Although there are definitions for SLPs, specialist nurses and rehabilitation professionals who are in direct contact with the patient, the evaluation should be done by the trained physician since there is no special nursing education/program system to meet these definitions in our country. This item is specific for Turkey. The SLP author stated that he did agree in moderate level. Therefore, the recommendation was accepted by adding an explanation that "Although evaluations are performed by SLP and specialized nurses almost all over the world, this item is specific to our country." The number of SLP in our country is low and they are not employed in health policies for the time being. Also, due to the lack of specialized nursing education/program systems in our country, it is foreseen that the evaluation will be made by the physician at present. This situation can change with the regulation of nursing education, the increase in the number of SLPs, and the increase in their employment in the health system.

Recommendation 5 Dysphagia evaluation in stroke patients with acute, subacute, and chronic period should include screening tests, detailed history (medical history with predictive and risk factors for dysphagia and aspiration), and physical examination.

While the term clinical comprehensive functional evaluation includes the assessment of components that form a function, such as swallowing, as a whole, organized and targeted, the term screening is defined as a method that involves the identification of individuals who require further evaluation in a previously asymptomatic population, according to the World Health Organization [70]. In addition, Cochrane and Holland defined the screening test as an assessment method that can accurately determine the risk in the patient, shows sensitivity in the presence of risk, gives negative results with absolute accuracy in the absence of risk, is acceptable and easy to apply for patients, and requires minimal time and equipment without special training [71]. According to

these definitions, the goal of clinical evaluation methods and screening tests is to understand the nature of swallowing functions to develop patient-specific treatment strategies. When we adapt these definitions to the swallowing function, clinical comprehensive swallowing function evaluation and dysphagia screening tests are as follows: Clinical comprehensive swallowing function evaluation includes the patient's history; a detailed examination of oral, pharyngeal, and laryngeal region anatomy; sensory and motor functions; behavioral, language, and cognitive abilities; and observation of feeding. On the other hand, dysphagia screening tests include some diagnostic-effective symptoms and signs of dysphagia, unlike the comprehensive clinical evaluation that includes all the symptoms and signs of dysphagia.

Studies have been stated that screening tests are important initial steps for the diagnosis of dysphagia [2, 6, 18, 20–22, 24, 72–74]. However, recent reviews and guidelines emphasized that bedside screening tests should be supported by comprehensive anatomical and physiological examination [13, 23, 25, 30, 68]. Systems related to OD, patient's physical and functional status and learning ability should be evaluated from a wide perspective [18, 23–25]. Moreover, there is insufficient evidence that current dysphagia screening protocols reduce the risk of pneumonia, death or dependency after stroke [23, 75, 76]. In our study, the opinion that screening tests and detailed examination should be done was accepted as an OC.

Screening Tests

Aspiration is the most important consequence of dysphagia and its morbidity–mortality rates are high. For this reason, screening tests have been developed that predict the possibility or presence of aspiration. In stroke patients, the risk of developing aspiration pneumonia in the first month is reported to be 43–80%, 40–70% of them are silent aspirations, and the mortality rate is increased to 45% [77, 78]. Therefore, it should be the primary purpose of screening tests to detect the presence of aspiration as soon as possible and to apply appropriate nutritional and dietary modifications and swallowing rehabilitation.

In an ideal dysphagia bedside screening test, its specificity and sensitivity, as well as the ability to predict test performance, are important. Specificity and sensitivity should be 100% for a perfect test. Patients and healthy ones should be separated with zero errors, those who need further evaluation for dysphagia should be distinguished, and similar results should be obtained in different individuals and at different times. In addition, these tests should be inexpensive, minimally invasive, easy to perform and train, reproducible, and responsive to changes [79–81]. Edmiaston et al. [82] reported that the Kepner–Tregoe Decision Matrix [83] can be used in a center of any size and according to the current conditions of the center, to select the most reliable and appropriate screening test. It has been suggested in reviews that this method is effective in deciding the correct test suitable for the patient and hospital characteristics of each center [23, 75]. For these reasons, one of the open-ended questions we created at the beginning of the study was to elaborate on common symptoms and signs and/or markers that can be used as screening tests for dysphagia and aspiration. As the answer to this question, items that include oral apraxia, voice change, wet–hoarse voice, the need to clean the throat, multiple swallowing movements and delay in pharyngeal swallowing, the presence of oral residue, coughing/choking during feeding, decreased laryngeal elevation, facial flushing during feeding, increased respiratory rate, and fatigue are created in the 1st Delphi round. In the 2nd Delphi round, the following 7 parameters of them were accepted as OC, which can be used as a screening test.

*Recommendation 1*A Questionnaire containing the following symptoms and signs can be used as a screening test for all stroke periods. This survey should include the following symptoms and signs.

-Voice change, wet voice, hoarse voice.

-Need to clean the throat.

-Multiple swallowing movement, delay in pharyngeal swallowing.

-Presence of oral residue.

-Coughing/choking during feeding.

-Decreased laryngeal elevation.

-Facial flushing during feeding.

While some papers have reported that some findings/symptoms such as consciousness level, postural control, wet and hoarse voice, decreased laryngeal elevation, weak cough reflex, coughing or choking during drinking water can be evaluated as a screening test; although it has a level of evidence [13, 75], others have suggested to use standardized tests [14, 23, 24, 51]. This means that bedside screening test is not the right process, guidelines and reviews recommend that a multidisciplinary team should compare existing questionnaire and screening tools with strong psychometric properties and should identify better raters to ensure optimal testing based on their patient profiles and hospital conditions. These symptoms and findings can be used to identify dysphagia in our country.

Since our study aims to address dysphagia management in detail, the standardized tests available in the literature were also evaluated separately.

Recommendation 2 Standardized screening tests that only include the questionnaire form and evaluate the risk of dysphagia are not suitable and they are not recommended for stroke patients in acute, subacute, and chronic periods.

In the validity and reliability studies of standardized tests including only questionnaire forms, the sensitivity was

high (86–95%) and the specificity was low (55–68%) [76, 84–86]. Limitations of these tests are the need for training, and symptoms and signs have to be identified by the patient and/or caregiver. This article does not recommend the use of screening tests, which are only in the form of questionnaires.

Recommendation 3 Water swallow tests alone or combined with a pulse oximeter are not suitable and are not recommended.

Recommendation 3a3.1d Standardized tests involving water swallow tests combined with the questionnaire form are not suitable and are not recommended.

Water swallow tests are the first bedside screening tests with validity and reliability, and whose specificity and sensitivity are studied. Studies have been reported that these tests, which evaluate the findings of aspiration during drinking, have a wide range of sensitivity between 42and 85% and specificity between 14 and 76% when used alone [85, 87, 88]. If these tests were combined with a questionnaire form and/or pulse oximeter, the sensitivity for aspiration was reported between 47 and 97% and the specificity between 56 and 90% [76]. Some tests require special training. Some papers suggested at moderate level of evidence that the water swallow test can be used as part of assessing the risk of aspiration, rather than the use of tests alone [13]. The most important limitation of the water swallow test is that it increases the risk of aspiration-related pneumonia at a rate of 50–56.5%, especially in intensive care patients with impaired consciousness [89]. In this study, it is not recommended to use the water swallow test as a screening test alone or combined with a pulse oximeter, or a questionnaire.

Recommendation 4 The use of single food texture such as semi-solid alone, and combination tests with questionnaires are not suitable and they are not recommended.

Recommendation 5 Standardized tests including all three types of food texture (solid, semi-solid and liquid) combined with a standardized questionnaire (such as volume viscosity swallowing test and gugging swallowing screening test) should be used and are recommended.

The best dysphagia screening test is defined as a test that should evaluate the swallowing of liquids, semi-solid foods, and solid foods that are commonly consumed in daily life for an exact assessment of the swallowing action, and it should minimize our aspiration risk during the evaluation process [90]. Guidelines and reviews have been suggested at mid-level evidence that the use of tests containing three types of bolus (liquid, semi-solid, solid), and the increase of them gradually to minimize the risk of aspiration is recommended [13, 29, 85]. The validity and reliability of these tests were reported between 96–100% for sensitivity and between 69 and 76.2% for specificity [85, 91].

Consequently, the clinical effectiveness of dysphagia bedside screening tests depends not only on the accuracy and reliability of screening methods but also on the effectiveness of dysphagia management interventions [23]. For this reason, our experts recommend the use of standardized tests containing three types of bolus (liquid, semi-solid, solid) as an OC.

Medical History-Physical Examination

Recommendation 1 All stroke patients should have a physical examination of the oropharyngeal region, respiratory system, and musculoskeletal system (such as postural–structural deformity and muscle weakness in the neck, thoracic, and lumbar spine regions), and especially a detailed medical history should be taken after dysphagia screening tests.

The presence of dysphagia in stroke patients carries a 12-fold higher risk of pulmonary complications such as aspiration pneumonia and an infection that increases the patient's catabolic status. Furthermore, it is associated with the highest mortality rate among all medical complications after stroke [31, 92]. After initial bedside screening tests, detailed medical history and physical examination are recommended to determine predictive and risk factors for aspiration and aspiration-induced pneumonia in stroke patients [13, 18, 23–25, 30, 68]. In this study, 48 factors were proposed for detailed evaluation and 18 of these proposed factors were removed due to OD during the Delphi rounds. Finally, the use of 30 sub-items was proposed as OC.

Recommendation 2 Recommended predictive and risk factors for medical history and physical examination, findings, and supporting laboratory/imaging (Table 1).

Apart from the recommended 30 predictive and risk factors, parameters including the type (hemorrhagic or ischemic) and side of stroke, history of recurrent stroke and/or transient ischemic attack (TIA), metabolic endocrine diseases such as diabetes mellitus and hypertension, cardiac diseases such as atrial fibrillation heart failure, gastrointestinal system diseases, degenerative musculoskeletal diseases such as cervical arthrosis, dental problems, use of a drug that can cause dysphagia (chemotherapeutics, antidepressants, anxiolytics, antiarrhythmics, etc.), surgical (except head and neck surgery) and radiotherapy interventions, psychological status, cognitive dysfunction, neglect, weakness, and fatigue were all evaluated by the experts. However, only those with OC were identified as predictive and risk factors that should be considered as priority.

There are many studies in the literature to predict aspiration and pneumonia, due to dysphagia. In recent studies, scoring systems have been developed to predict the risk of post-stroke aspiration-induced pneumonia, and factors that may predict the occurrence of pneumonia have been tried to be identified [93–98]. Older age, the presence of COPD and cardiac diseases, brainstem involvement, stroke severity, and the use of mechanical ventilation are factors defined with high sensitivity to predict the development of

aspiration-induced pneumonia [93–98]. In addition, findings such as pneumonia and malnutrition, the presence of another neurological disease, speech and language deficiencies, oral motor muscle weakness, impaired gag and cough reflexes, and impaired physical mobility have been associated with increased mortality and morbidity rates of dysphagia [99–104]. Similar to our recommendations, a guideline recommended an evaluation of medical history, behavioral variables, gross motor function, oral motor test results, and observation of feeding with different types of texture [13]. However, all studies reported that a single parameter could not predict aspiration and associated pneumonia, especially in patients with acute stroke. Because, dysphagia is a complicated condition and is associated with many variables, further studies are needed to investigate additional indicators [75]. In our study, the most predictive and risk factor for aspiration-induced pneumonia has been suggested at the recommendation level in more detail than the literature.

Instrumental Methods

Recommendation 1 It is not recommended to use electroneuromyography, videofluoroscopy (vf), and modified barium radiography as screening test depending on the hospital conditions, current device, and experienced personnel status in stroke patients with acute period. Flexible fiberoptic endoscopic evaluation of swallowing (fees) may be considered depending on the conditions.

Recommendation 2 Flexible fiberoptic endoscopic evaluation of swallowing (fees), one of the instrumental methods in the second-line evaluation methods, should be applied as a first-line method if there is doubt in the bedside screening test, or if there is a risk of silent aspiration, or if the patient is in high-risk patient for dysphagia. This is not recommended for vf, modified barium radiography, and electroneuromyography.

However, bedside screening tests, which are in the first-line in defining dysphagia, are advised by many articles and guidelines, they lack standardization and the probability of false-positive and negative results is high [105]. Therefore, VF, FEES, electrophysiologic methods, and modified barium radiography can be used to evaluate oropharyngeal anatomy and physiology comprehensively as second-line supplemental methods [20, 21, 25, 32, 68, 72–75]. Especially the use of VF and electrophysiologic methods is limited in the acute period, as they require transportation, special equipment, trained personnel, and patient compliance [106, 107]. Although special equipment and trained personnel are needed, FEES has more patient compliance and tolerability than VF and bedside applicability. We know that access to diagnostic imaging for dysphagia in hospitals of many countries is not easy [32]. Since this recommendation letter was created not only for physicians or comprehensive centers in our country, but also for those dealing with dysphagia all over the world, VF and electrophysiologic methods are not recommended as the first-line in the diagnosis of dysphagia. If the conditions of the center are suitable, use of the FEES as a screening test is recommended as AC. However, in our article, the use of FEES as a first-line method has been suggested as an OC in some cases. This is because FEES can reduce the incidence of pneumonia and improve other important factors associated with dysphagia recovery [75, 108]. It has been stated that FEES can be used in all stroke patients if there is doubt in the bedside screening test, or if there is a risk of aspiration/silent aspiration, or if the patient is at the high-risk patient for dysphagia.

In this study, detailed definitions for aspiration/silent aspiration and high-risk patient were created to facilitate clinical practice and to prevent unnecessary and excessive use of devices.

Recommendation 2 Definition of aspiration/silent aspiration

Recommended symptoms/signs/risk factors for aspiration/silent aspiration: (high median to low median value, respectively)

-Pneumonia findings.
-Hypoxia (decrease in oxygen saturation).
-Wet and hoarse voice during feeding.
-The presence of wet and hoarse voice.
-The presence of persistent cough.
-The absence of voluntary cough.
-Multiple pneumonia attacks in history.
-Increased breathing rate.
-Need to clean the throat.

Recommendation 3 Definition of high-risk patient

Recommended symptoms/findings/risk factors in patients to be identified as high-risk patients (high median to low median value, respectively)

-Comorbidities: Progressive degenerative neurological diseases such as Parkinson's disease, Alzheimer Disease and Multiple Sclerosis, and head and neck cancer.
-Medical procedures (tracheostomy, mechanical ventilation, intubation tube).
-The presence of dysarthria, dysphonia, apraxia.
-The absence of voluntary cough.
-The presence of coughing with feeding.
-Lack of oral sensation.

Several studies have attempted to identify independent risk factors such as age, COPD, poor oral health, dysarthria, aphasia, the absence of voluntary cough, and level of dependence for post-stroke aspiration pneumonia [23, 103, 109, 110]. On the basis of the guideline, the

American College of Chest Physicians (ACCP) has recommendations for the definition of aspiration pneumonia [111]. According to this guideline, some factors such as progressive neurological degenerative diseases, additional medical procedures, malnutrition, dysarthria, dysphonia, weak cough, reflexive cough, drooling, requirement for oral pharyngeal suction, or a history of coughing or choking with eating or drinking, wet voice, abnormal X-ray results, and increased respiratory rate can be used to define aspiration pneumonia at the mid-level evidence. In this study, 29 sub-items were created to define the aspiration/silent aspiration and high-risk patients; then 13 sub-items including cognitive dysfunction, tachycardia, cyanosis, facial flushing, weakness, fatigue, absence of gag reflex, movement of repeated swallowing, nausea/vomiting after/during feeding, weight loss, poor oral hygiene, chronic lung diseases, and gastroesophageal reflux were removed. Ultimately, 10 sub-items were defined for aspiration/silent aspiration and 6 sub-items for high-risk patients, similar to the ACCP guideline.

Recommendation 4 Videofluoroscopic (VF) and fees methods, and modified barium radiography should be used as second-line methods according to the patient's characteristics, hospital conditions, experience of specialists, and device status.

Also, surface electrophysiological methods can be used in suitable situations as second-line methods.

Recommendation 5 Videofluoroscopic (VF), fees and electrophysiological methods, and modified barium radiography should be used to determine the severity of dysphagia, to evaluate bolus consistency, texture and volume modifications, to evaluate compensation techniques, and to plan therapy as well as follow-up.

In almost all papers, instrumental methods are recommended as second-line diagnosis methods. By these methods, it is also possible to evaluate whether a safe swallow is provided with different bolus texture, volume, and maneuver modifications [32, 112]. In our article, it is reported as OC that these methods can be used for further diagnostic evaluation, treatment selection, and follow-up. Although there are three methods in which VF, FEES, and modified barium radiography have similar efficacy [106], electrophysiological methods are often defined as the third-line unlike these other three methods. In fact, it provides more detailed information about the supraglottic region and allows synchronous evaluation with respiration, unlike the other three methods [113–115]. The electrophysiological method recommended here is non-invasive surface EMG studies including dysphagia limit and swallowing intervals. In this case, we can say that it is unique to Turkey. Electrophysiological swallowing studies in our country are more than in other countries. The reason for this may be to provide training courses for swallowing electrophysiology in our country and to include 3 experts working on swallowing electrophysiology and stroke in this study. Moreover, electrophysiology studies are carried out in three major cities in our country.

Recommendation 6 Since Ultrasonography is not widely used and requires experience, it is a promising method currently used for research purposes to evaluate swallowing kinematics and anatomical structures.

Ultrasonography is a portable, non-invasive, and radiation-free technique and has been applied in recent years to evaluate oropharyngeal swallowing function [75, 116, 117]. However, there is insufficient data for the standardization of clinical applications. Therefore, a consensus has been formed as a promising method.

Recommendation 7 Cervical accelerometry and manometric studies are currently used for research purposes in stroke patients with dysphagia.

Pharyngeal manometry is a method that includes few studies because it is effective in a more restricted portion of swallowing and gives less information than VF, FEES, radiographic, and electrophysiological methods [118, 119].

The cervical accelerometer is the modernization of cervical auscultation methods and is based on recording swallowing signals. In recent years, different methods have been proposed as dual- and tri-axial, but there are few small-scale studies on them [120, 121]. For these reasons, it has been suggested that both methods should only be considered as research purposes.

Evaluation of Nutritional Status

Nutritional status recommendations were accepted as OC by both experts and 2 dieticians, who evaluated the final recommendations.

Recommendation 1 All stroke patients should be evaluated for nutrition as soon as possible (highest level of agreement).

Recommendation 2 An International Formal Test should be used for nutritional evaluation.

Recommendation 3 Mini Nutritional Test (MNT), Nutritional Risk Score (NRS-2002), and Malnutrition Universal Screening Tool (MUST) can be used for nutritional assessment.

Dysphagia is a risk factor for nutritional deficiency and dehydration in stroke patients [121–124]. Malnutrition occurs in approximately 24–90% of patients in the acute stroke period and 30–50% in the chronic period, depending on patients' characteristics and evaluation techniques [68, 122, 125]. Nutritional management guidelines for stroke patients reported that nutritional status should be evaluated as soon as possible, as a high-level recommendation similar to our recommendation [10, 14, 16, 20, 22, 33–36, 68].

The use of a formal test is an effective method for the diagnosis and follow-up of nutritional problems [14, 35, 36, 68]. Different tests such as NRS-2002 [14], MUST [14, 36, 38, 125], MNT, and subjective global assessment [35] have been proposed in the guidelines and reviews. The MUST test, which is one of these tests, has been reported as a predictive test to predict 6-month mortality [14, 121]. The experts were first asked to indicate the tests they defined as the most effective assessment methods, then these recommended tests were voted in the Delphi rounds. Finally, the use of MNT, NRS-2020, and MUST tests were recommended as OC.

Recommendation 4: Assessment of nutritional status should be done by a physician from a multidisciplinary team member, if possible, in the presence of a dietitian.

Nutritional management guidelines do not have a consensus for practitioner to assess nutritional status, and it is stated that one of the trained management team such as SLP, nutritional specialist, dietetian, nurse, physician and healthcare assistant, and professional and care worker can perform this [10, 11, 13, 35–38, 68, 103, 126]. In this study, it was recommended that the nutritional status of the patient should be evaluated by a physician and, if possible, a dietitian. This item is specific to Turkey. This is because in our country the number of SLPs and dietitians are not accessible in every center. Therefore, we think that the team that manages dysphagia is more focused on the patient and the disease.

Follow-Up

Recommendation 1 Follow-up times and intervals should be arranged as patient-specific.

Recommendation 2 In the acute period, patients should be followed daily until stability is achieved in terms of dysphagia.

Recommendation 3 When stability is achieved in the acute period, dysphagia should be followed weekly during hospitalization.

Recommendation 4 Dysphagia should be followed monthly in the subacute period (3–6 months) and bimonthly in the chronic period (6–12 months).

Recommendation 5 Follow-up should be done according to the protocols used in diagnosis.

There are different opinions about follow-up in the literature. Some papers have reported at a low-level recommendation that dysphagia should be followed daily in the first days of stroke, if dysphagia is persistent, it should be followed at least twice a week and before discharge by using diagnostic protocols [36, 68]. In addition, they reported that follow-up is important, especially in the acute period. On the other hand, some papers suggested different follow-up times, such as twice a week for the first week, once a week between 1 and 4 weeks, and at discharge, and then every 3–6 months [10, 14, 35, 36].

The general opinion in the guidelines was that the follow-up of patients should be patient-specific and individualized, as well as in management, diagnosis, and treatment [14, 36]. Since it is a metabolic instability and a catabolic process in the acute period, evaluation at short intervals can prevent complications. After medical stabilization, weekly follow-up should be performed as recommended in the guidelines. There were no precise data in the literature for subacute and chronic periods. Our experts recommended a follow-up monthly between 3 and 6 months and bimonthly between 6 and 12 months, an early intervention in possible nutritional deficiencies and related complications, and evaluation of the effectiveness of the rehabilitation methods applied.

Limitations

The most important limitation of this study is that these recommendations are made only by medical professionals in various disciplines. Unlike other countries, SLPs, specialized nurses, and dietitians are not accessible in any center in our country due to the fact that SLPs are not integrated into our health system and we do not have specialized nurse programs. In addition, the number of dietitians is less like SLPs. Therefore, every step of stroke management is carried out by the medical professional. However, we think that these recommendations can increase the awareness of dysphagia in every medical doctor who will deal with stroke patients and provide the application of early and correct diagnosis and management approaches. On the other hand, we think that this study will also lead to innovations in our health policies, as different medical disciplines formed a common opinion and revealed deficiencies and needs.

Conclusion

While there is a consensus in the world about the concept of multidisciplinary team and early diagnosis in dysphagia management, there are different opinions on subjects such as diagnosis and treatment. In addition, stroke patients may encounter any of the medical branches in the emergency room or outpatient clinic and, as in our country, there may not be specialists in every hospital for dysphagia, such as SLPs. Although some of the items are unique to Turkey, this study aimed to find answers to the most frequently asked questions in clinical practice for all management levels of dysphagia by examining different perspectives of a multidisciplinary team for the same purpose. As a result, all the issues were discussed in detail, and 45 recommendations

were created for stroke patients with dysphagia, considering the clinical status of Turkey.

Compliance with Ethical Standards

Conflict of interest All participants declared that there was no individual conflict of interest according to the rules of the International Committee of Medical Journal Editors (ICMJE).

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee (IRC:2018.03.47/19) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

References

1. Cohen DL, Roffe C, Beavan J, *et al*. Post-stroke dysphagia: A review and design considerations for future trials. Int J Stroke. 2016;11(4):399–411. https://doi.org/10.1177/1747493016639057.
2. Fairfield CA, Smithard DG. Assessment and Management of Dysphagia in Acute Stroke: An Initial Service Review of International Practice. Geriatrics (Basel). 2020. https://doi.org/10.3390/geriatrics5010004.
3. Kim TU, Hyun JK, Lee SJ. Differences in Videofluoroscopic Swallowing Study (VFSS) Findings According to the Vascular Territory Involved in Stroke. Dysphagia. 2014;29(4):444–9.
4. Umay EK, Yilmaz V, Gundogdu I, Ozturk E, Gurcay E, Karaahmet O, Saylam G, Ceylan T, Cakci A. What Happens To Swallowıng Muscles After Stroke?: A Prospectıve Randomısed Controlled Electrophysıologıcal Study. Neurol India. 2019;67(6):1459–66. https://doi.org/10.4103/0028-3886.273645.
5. Jauch EC, Saver JL, Adams HP, *et al*. Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2013;44(3):870–947. https://doi.org/10.1161/STR.0b013e318284056a.
6. Hebert D, Lindsay MP, McIntyre A, *et al*. Canadian stroke best practice recommendations: Stroke rehabilitation practice guidelines, update 2015. Int J Stroke. 2016;11(4):459–84. https://doi.org/10.1177/1747493016643553.
7. Skulmoski GJ, Hartman FT, Krahn J. The Delphi method for graduate research. Journal of Information Technology Education. 2007;6:257–81.
8. Ziglio E. The Delphi Method and its contribution to decision making. In: Adler M, Ziglio E, editors. Gazing into the oracle: The Delphi method and its application to social policy and public health. London: Kingsley; 1996. p. 3–33.
9. National Stroke Programme Working Group-Swallow Screen Sub-Group (2017). National Guideline for Swallow Screening in Stroke. CSPD007/2017 https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/national-guideline-for-swallow-screening-in-stroke-hse.pdf
10. National Institute for Health and Care Excellence (NICE) (2019) Stroke and transient ischaemic attack in over 16s: diagnosis and initial management. https://www.nice.org.uk/guidance/ng128
11. National Institute for Health and Care Excellence (NICE) (2012). Nutrition Support in Adults (QS24). https://www.nice.org. uk/guidance/qs24.
12. National Institute for Health and Care Excellence (NICE) (2018). Transcutaneous neuromuscular electrical stimulation for oropharyngeal dysphagia in adults. https://www.nice.org.uk/guidance/ipg634
13. Scottish Intercollegiate Guidelines Network (SIGN) (2010). Identification and management of dysphagia. A national clinical guideline 2010. http://www.sign.ac.uk/pdf/sign119. pdf.
14. Burgos R, Breton I, Cereda E, *et al*. ESPEN guideline clinical nutrition in neurology. Clin Nutr. 2018;37:354–96.
15. Bischoff SC, Austin P, Boeykens K, *et al*. ESPEN guideline on home enteral nutrition. Clin Nutr. 2020;39:5–22.
16. Irish Heart Foundation: Council for Stroke (2017) National Clinical Guidelines and Recommendations for the Care of People with Stroke and Transient Ischaemic Attack. http://irishheart.ie/wp-content/uploads/2017/04/guidelines.pdf
17. Irish Association of Speech and Language Therapists (IASLT) (2016). IASLT Position Statement on Swallow Screening. https://www.iaslt.ie/documents/public-information/IASLT/IASLT%20Position%20Statement%20on%20Swallow%20Screening%20FINAL19JULY%202016.pdf
18. Malagelada JR, Bazzoli F, Boeckxstaens G, *et al*. World gastroenterology organisation global guidelines: dysphagia–global guidelines and cascades update September 2014. J Clin Gastroenterol. 2014;49(5):370–8. https://doi.org/10.1097/MCG.0000000000000307.
19. Powers WJ, Rabinstein AA, Ackerson T, *et al*. 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke. 2018;49(3):e46–110. https://doi.org/10.1161/STR.0000000000000158.
20. National Stroke Foundation (2010). Clinical Guidelines for Stroke Management. https://informme.org.au/en/Guidelines/Clinical-Guidelines-for-Stroke-Management.
21. Management of Stroke Rehabilitation Working Group. VA/DOD Clinical practice guideline for the management of stroke rehabilitation. J Rehabil Res Dev. 2010;47(9):1–43.
22. Royal College of Physicians-Intercollegiate Stroke Working Party. National clinical guideline for stroke. 5th ed. UK: London; 2016.
23. Smith EE, Kent DM, Bulsara KR, Leung LY, *et al*. Effect of Dysphagia Screening Strategies on Clinical Outcomes After Stroke: A Systematic Review for the 2018 Guidelines for the Early Management of Patients With Acute Ischemic Stroke. Stroke. 2018;49(3):123–8.
24. Hebert D, Lindsay MP, McIntyre A, *et al*. Canadian stroke best practice recommendations: Stroke rehabilitation practice guidelines, update 2015. Int J Stroke. 2015;11(4):459–84.
25. McGinnis CM, Homan K, Solomon M, Taylor J, Staebell K, Erger D, Raut N. Dysphagia: Interprofessional Management, Impact, and Patient-Centered Care. Nutr Clin Pract. 2019;34(1):80–95.
26. National Stroke Foundation (2017). Clinical Guidelines for Stroke Management. https://informme.org.au/en/Guidelines/Clinical-Guidelines-for-Stroke-Management-2017.
27. Jauch EC, Saver JL, Adams HP Jr, *et al*. Guidelines for the early management of patients with acute ischemic stroke: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2013;44:870–947.
28. Summers D, Leonard A, Wentworth D, *et al*. Comprehensive overview of nursing and interdisciplinary care of the acute ischemic stroke patient: a scientific statement from the American Heart Association. Stroke. 2011;42(3):e357. https://doi.org/10.1161/STROKEAHA.109.192362.

29. Donovan NJ, Daniels SK, Edmiaston J, Weinhardt J, Summers D, Mitchell PH, AHA Council on Cardiovascular Nursing and Stroke Council. Dysphagia screening: state of the art: invitational conference proceeding from the State-of-the-Art Nursing Symposium, International Stroke Conference 2012. Stroke. 2013;44(4):24–31.
30. O'Horo JC, Rogus-Pulia N, Garcia-Arguello L, Robbins J, Safdar N. Bedside diagnosis of dysphagia: a systematic review. J Hosp Med. 2015;10(4):256–65.
31. Finlayson O, Kapral M, Hall R, Asllani E, Selchen D, Saposnik G, Canadian Stroke Network, Stroke Outcome Research Canada (SORCan) Working Group. Risk factors, inpatient care, and outcomes of pneumonia after ischemic stroke. Neurology. 2011;77:1338–45.
32. Boaden E, Doran D, Burnell J, *et al*. Screening for aspiration risk associated with dysphagia in acute stroke (diagnostic test accuracy protocol). Cochrane Database Syst Rev. 2017. https://doi.org/10.1002/14651858.CD012679.
33. Stroke Foundation of New Zealand and New Zealand Guidelines Group. (2010). Clinical Guidelines for Stroke Management 2010. https://www.stroke.org.nz/
34. American Heart Association. Guidelines for Adult Stroke Rehabilitation and Recovery. A guideline for healthcare professionals from the American Heart Association/American. Stroke. 2016;47:98–169.
35. Arsava EM, Aydogdu I, Gungor L, Isıkay CT, Yaka E. Nutritional Approach and Treatment in Patients with Stroke, An Expert Opinion for Turkey. Turk J Neurol. 2018;24(3):226–42.
36. National Stroke Programme Nutrition Group (2019). Recommendations for the Management of Nutrition and Hydration in Patients with Stroke. https://www.hse.ie/eng/about/who/cspd/ncps/stroke/resources/recommendations-for-the-management-of-nutrition-and-hydration-in-patients-with-stroke.pdf
37. Scottish Stroke Care Audit (2013). 2013 National Report of Stroke Services in Scottish Hospitals. https://www.strokeaudit.scot.nhs.uk/Downloads/2013_report/SSCA-public-summary-2013-web.pdf
38. British Association for Parenteral and Enteral Nutrition (BAPEN (2016)). Malnutrition Universal Screening Tool. http://www.bapen.org.uk/pdfs/must/must_full.pdf
39. Harlacher JE (2016). An educator's guide to questionnaire development. https://ies.ed.gov/ncee/edlabs/projects/project.asp?projectID=4496
40. Kottner J, Audigé L, Brorson S, *et al*. Guidelines for Reporting Reliability and Agreement Studies (GRRAS) were proposed. J Clin Epidemiol. 2011;64(1):96–106.
41. American Society of Anesthesiologists. Practice guidelines for chronic pain management. Anesthesiology. 2010;112:1–24.
42. Nair R, Aggarwal R, Khanna D. Methods of formal consensus in classification/diagnostic criteria and guideline development. Semin Arthritis Rheum. 2011;41(2):95–105.
43. Kraemer HC, Periyakoil VS, Noda A. Kappa coefficients in medical research. Stat Med. 2002;21:2109–29.
44. Vach W. The dependence of Cohen's kappa on the prevalence does not matter. J Clin Epidemiol. 2005;58:655–61.
45. Rofes L, Muriana D, Palomeras E, *et al*. Prevalence, risk factors and complications of oropharyngeal dysphagia in stroke patients: A cohort study. Neurogastroenterology and motility: the official journal of the European Gastrointestinal Motility Society. 2018. https://doi.org/10.1111/nmo.13338.
46. González-Fernández M, Ottenstein L, Atanelov L, Christian AB. Dysphagia after Stroke: an Overview. Curr Phys Med Rehabil Rep. 2013;1:187–96.
47. Mozzanica F, Rosa S, Scarponi L, Schindler A. Prevalence of dysphagia, malnutrition and dehydration at admission in a Stroke Unit. Otorinolaringol. 2018;68:23–7.
48. Arnold M, Liesirova K, Broeg-Morvay A, *et al*. Dysphagia in Acute Stroke: Incidence, Burden and Impact on Clinical Outcome. PLoS ONE. 2016. https://doi.org/10.1371/journal.pone.0148424.
49. Aoki S, Hosomi N, Hirayama J, *et al*. The Multidisciplinary Swallowing Team Approach Decreases Pneumonia Onset in Acute Stroke Patients. PLoS ONE. 2016;11(5):e0154608. https://doi.org/10.1371/journal.pone.0154608.
50. Eltringham SA, Kilner K, Gee M, *et al*. Impact of dysphagia assessment and management on risk of stroke-associated pneumonia: a systematic review. Cerebrovasc Dis. 2018;46:97–105.
51. Attrill S, White S, Murray J, Hammond S, Doeltgen S. Impact of oropharyngeal dysphagia on healthcare cost and length of stay in hospital: a systematic review. BMC Health Serv Res. 2018;18:594. https://doi.org/10.1186/s12913-018-3376-3.
52. Pacheco-Castilho AC, Vanin GM, Dantas RO, Pontes-Neto OM, Martino R. Dysphagia and Associated Pneumonia in Stroke Patients from Brazil: A Systematic Review. Dysphagia. 2019;34(4):499–520.
53. Al-Khaled M, Matthis C, Binder A, *et al*. Dysphagia in patients with acute ischemic stroke: early dysphagia screening may reduce stroke-related pneumonia and improve stroke outcomes. Cerebrovasc Dis. 2016;42:81–9.
54. Kishore AK, Vail A, Chamorro A, *et al*. How is pneumonia diagnosed in clinical stroke research? A systematic review and meta-analysis Stroke. 2015;46(5):1202–9.
55. Kumar S, Selim MH, Caplan LR. Medical complications after stroke. Lancet Neurol. 2010;9:105–18.
56. Wilson RD. Mortality and cost of pneumonia after stroke for different risk groups. J Stroke Cerebrovasc Dis. 2012;21(1):61–7.
57. Yu KJ, Park D. Clinical characteristics of dysphagic stroke patients with salivary aspiration: A STROBE-compliant retrospective study. Medicine (Baltimore). 2019;98(12):e14977. https://doi.org/10.1097/MD.0000000000014977.
58. Chang CY, Cheng TJ, Lin CY, Chen JY, Lu TH, Kawachi I. Reporting of aspiration pneumonia or choking as a cause of death in patients who died with stroke. Stroke. 2013;44(4):1182–5.
59. Ramsey D, Smithard D, Kalra L. Silent Aspiration: What Do We Know? Dysphagia. 2005;20:218–25.
60. Zheng L, Li Y, Liu Y. The individualized rehabilitation interventions for dysphagia: a multidisciplinary case control study of acute stroke patients. Int J Clin Exp Med. 2014;7(10):3789–94.
61. Balamurali K, Sekar D, Thangaraj M, Kumar MA. Dysphagia in patients with stroke: a prospective study. IJCMSR. 2018;3(2):116–20.
62. Eltringham SA, Smith CJ, Pownall S, Sage K, Bray B. Variation in Dysphagia Assessment and Management in Acute Stroke: An Interview Study. Geriatrics (Basel). 2019;4(4):60. https://doi.org/10.3390/geriatrics4040060.
63. Bakhtiyari J, Sarraf P, Nakhostin-Ansari N, Tafakhori A, Logemann J, Faghihzadeh S, Harirchian MH. Effects of early intervention of swallowing therapy on recovery from dysphagia following stroke. Iran J Neurol. 2015;14(3):119–24.
64. Forough AS, Wong SYM, Lau ETL, *et al*. Nurse experiences of medication administration to people with swallowing difficulties living in aged care facilities: a systematic review of qualitative evidence. JBI Database System Rev Implement Rep. 2018;16(1):71–86.
65. Rhoda A, Pickel-Voight A. Knowledge of nurses regarding dysphagia in patients post stroke in Namibia. Curationis. 2015;38(2):1564. https://doi.org/10.4102/curationis.v38i2.1564.
66. Bray BD, Smith CJ, Cloud GC, *et al*. The association between delays in screening for and assessing dysphagia after acute stroke, and the risk of stroke-associated pneumonia. J Neurol Neurosurg Psychiatry. 2017;88(1):25–30.

67. Palli C, Fandler S, Doppelhofer K, *et al*. Early Dysphagia Screening by Trained Nurses Reduces Pneumonia Rate in Stroke Patients: A Clinical Intervention Study. Stroke. 2017;48(9):2583–5.
68. Wirth R, Smoliner C, Jäger M, Warnecke T, Leischker AH, Dziewas R, DGEM Steering Committee. Guideline clinical nutrition in patients with stroke. Exp Transl Stroke Med. 2013. https://doi.org/10.1186/2040-7378-5-14.
69. Ickenstein GW, Höhlig C, Prosiegel M, *et al*. Prediction of outcome in neurogenic oropharyngeal dysphagia within 72 hours of acute stroke. J Stroke Cerebrovasc Dis. 2012;21(7):569–76.
70. Wilson JMG, Jungner G. Principles And Practice of Screening For Disease. Geneva: World Health Organization; 1968. p. 11–4.
71. Jaeschke R, Guyatt G, Sackett DL. Users' guides to the medical literature: III. How to use an article about a diagnostic test. A. Are the results of the study valid? JAMA. 1994;271:389–91.
72. Baijens LW, Clavé P, Cras P, *et al*. European Society for Swallowing Disorders - European Union Geriatric Medicine Society white paper: oropharyngeal dysphagia as a geriatric syndrome. Clin Interv Aging. 2016;11:1403–28.
73. Archer SK, Wellwood I, Smith CH, Newham DJ. Dysphagia therapy in stroke: a survey of speech and language therapists. Int J Lang Commun Disord. 2013;48(3):283–96.
74. Armstrong JR, Mosher BD. Aspiration pneumonia after stroke: intervention and prevention. Neurohospitalist. 2011;1(2):85–93.
75. Teasell R, Foley N, Martino R, Richardson M, Benton B, Janssen S, Orenczuk R (2018). Dysphagia and Aspiration Following. Stroke. http://www.ebrsr.com/sites/default/files/v18-SREBR-CH15-NET.pdf
76. Umay E. Screening Test. In: Eyigor S, Aydogdu I, Bilge O, Bor S, Demirag K, Ozturk K, editors. Dysphagia: Multidisciplinary Approach from Diagnosis to Treatment. Izmir: Us Academy Intertip Publisher; 2019. p. 1–22.
77. Poorjavad M, Jalaie S. Systemic review on highly qualified screening tests for swallowing disorders following stroke: validity and reliability issues. J Res Med Sci. 2014;19:776–85.
78. Li L, Zhang L, Xu W, Hu J. Risk assessment of iskemic stroke associated pneumonia. World Emerg Med. 2014;5(3):209–13.
79. Jiang JL, Fu SY, Wang WH, Ma YC. Validity and reliability of swallowing screening tools used by nurses for dysphagia: A systematic review. Tzu Chi Medical Journal. 2016;28:41–8.
80. Whiting PF, Rutjes AW, Westwood ME, *et al*. QUADAS 2: a revised tool for the quality assessment of diagnostic accuracy studies. Ann Intern Med. 2011;155:529–36.
81. Reitsma JB, Rutjes AWS, Whiting P, Vlassov VV, Leeflang MMG, Deeks JJ. Cochrane Handbook for Systematic Reviews of Diagnostic Test Accuracy Version 1.0.0. United Kingdom: Oxfordshire; 2009.
82. Edmiaston J, Connor LT, Loehr L, Nassief A. Validation of a dysphagia screening tool in acute stroke patients. Am J Crit Care. 2010;19(4):357–64.
83. Kepner CH, Tregoe BB. The Rational Manager: A Systematic Approach to Problem Solving and Decision Making. New York: McGraw-Hill; 1965.
84. Rofes L, Arreola V, Mukherjee R, Clavé P. Sensitivity and specificity of the Eating Assessment Tool and the Volume-Viscosity Swallow Test for clinical evaluation of oropharyngeal dysphagia. Neurogastroenterol Motil. 2014;26(9):1256–65.
85. Kertscher B, Speyer R, Palmieri M, Plant C. Bedside screening to detect oropharyngeal dysphagia in patients with neurological disorders: an updated systematic review. Dysphagia. 2014;29(2):204–12.
86. Bartlett RS, Moore JE, Thibeault SL. Temporal Analysis of Factors Associated with EAT-10 in Outpatients with Oropharyngeal Dysphagia from a Tertiary Care Clinic. Dysphagia. 2018;33(4):457–67.
87. Chen PC, Chuang CH, Leong CP, Guo SE, Hsin YJ. Systematic review and meta-analysis of the diagnostic accuracy of the water swallow test for screening aspiration in stroke patients. J Adv Nurs. 2016;72(11):2575–86.
88. Abu-Snieneh HM, Saleh MYN. Registered Nurse's Competency To Screen Dysphagia Among Stroke Patients: Literature Review. Open Nurs J. 2018;12:184–94.
89. Leder SB, Suiter DM, Green BG. Silent aspiration risk is volume-dependent. Dysphagia. 2011;26:304–9.
90. Oh JC, Park JH, Jung MY, Yoo EY, Chang KY, Lee TY. Relationship between Quantified Instrumental Swallowing Examination and Comprehensive Clinical Swallowing Examination. Occup Ther Int. 2016;23:3–10.
91. Guillén-Solà A, Marco E, Martínez-Orfila J, *et al*. Usefulness of the volume-viscosity swallow test for screening dysphagia in subacute stroke patients in rehabilitation income. NeuroRehabilitation. 2013;33(4):631–8.
92. Middleton S, McElduff P, Ward J, *et al*. Implementation of evidence-based treatment protocols to manage fever, hyperglycaemia, and swallowing dysfunction in acute stroke (QASC): a cluster randomised controlled trial. Lancet. 2011;378(9804):1699–706.
93. Gong S, Zhou Z, Zhou M, Lei Z, Guo J, Chen N, He L. Validation of risk scoring models for predicting stroke-associated pneumonia in patients with ischaemic stroke. Stroke Vasc Neurol. 2016;1(3):122–6.
94. Kalra L, Irshad S, Hodsoll J, *et al*. Prophylactic antibiotics after acute stroke for reducing pneumonia in patients with dysphagia (STROKE-INF): a prospective, cluster-randomised, open-label, masked endpoint, controlled clinical trial. Lancet. 2015;386(10006):1835–44.
95. Hoffmann S, Harms H, Ulm L, *et al*. Stroke-induced immunodepression and dysphagia independently predict stroke-associated pneumonia - The PREDICT study. J Cereb Blood Flow Metab. 2017;37(12):3671–82.
96. Hoffmann S, Malzahn U, Harms H, *et al*. Development of a clinical score (A2DS2) to predict pneumonia in acute ischemic stroke. Stroke. 2012;43(10):2617–23.
97. Harms H, Grittner U, Droge H, Meisel A. Predicting post-stroke pneumonia: the PANTHERIS score. Acta Neurol Scand. 2013;128(3):178–84.
98. Huang GQ, Lin YT, Wu YM, Cheng QQ, Cheng HR, Wang Z. Individualized Prediction Of Stroke-Associated Pneumonia For Patients With Acute Ischemic Stroke. Clin Interv Aging. 2019;14:1951–62.
99. Virvidaki IE, Nasios G, Kosmidou M, Giannopoulos S, Milionis H. Swallowing and Aspiration Risk: A Critical Review of Non Instrumental Bedside Screening Tests. Journal of Clinical Neurology (Seoul, Korea). 2018;14(3):265–74.
100. Xu Z, Gu Y, Li J, Wang C, Wang R, Huang Y, Zhang J. Dysphagia and aspiration pneumonia in elderly hospitalization stroke patients: Risk factors, cerebral infarction area comparison. J Back Musculoskelet Rehabil. 2019;32(1):85–91.
101. Ding R, Logemann JA. Pneumonia in stroke patients: a retrospective study. Dysphagia. 2000;15:51–7.
102. Yu KJ, Moon H, Park D. Different clinical predictors of aspiration pneumonia in dysphagic stroke patients related to stroke lesion: A STROBE-complaint retrospective study. Medicine (Baltimore). 2018;97(52):e13968. https://doi.org/10.1097/MD.0000000000013968.
103. Oliveira AR, Costa AG, Morais HC, Cavalcante TF, Lopes MV, Araujo TL. Clinical factors predicting risk for aspiration and respiratory aspiration among patients with Stroke. Rev Lat Am Enfermagem. 2015;23(2):216–24.

104. Joundi RA, Martino R, Saposnik G, Giannakeas V, Fang J, Kapral MK. Predictors and Outcomes of Dysphagia Screening After Acute Ischemic Stroke. Stroke. 2017;48(4):900–6.
105. Welch-West P, Faltynek P, Harnett A, Mirkowski M, Aubut JA, Teasell R (2019). Dysphagia, Aspiration, and Nutritional Interventions for Patients with Acquired Brain Injury. https://erabi.ca/wp-content/uploads/2019/09/Module-5-Dysphagia-and-Nutrition-V13.pdf
106. Fattori B, Giusti P, Mancini V, Grosso M, Barillari MR, Bastiani L, Molinaro S, Nacci A. Comparison between videofluoroscopy, fiberoptic endoscopy and scintigraphy for diagnosis of oro-pharyngeal dysphagia. Acta Otorhinolaryngol Ital. 2016;36(5):395–402.
107. Giraldo-Cadavid LF, Leal-Leaño LR, Leon-Basantes GA, Bastidas AR, Garcia R, Ovalle S, Abondano-Garavito JE. Accuracy of endoscopic and videofluoroscopic evaluations of swallowing for oropharyngeal dysphagia. Laryngoscope. 2017;127(9):2002–10.
108. Bax L, McFarlane M, Green E, Miles A. Speech-language pathologist-led fiberoptic endoscopic evaluation of swallowing: functional outcomes for patients after stroke. J Stroke Cerebrovasc Dis. 2014;23(3):195–200.
109. Smithard DG. Dysphagia Management and Stroke Units. Curr Phys Med Rehabil Rep. 2016;4:287–94.
110. Perry SE, Miles A, Fink JN, Huckabee ML. The Dysphagia in Stroke Protocol Reduces Aspiration Pneumonia in Patients with Dysphagia Following Acute Stroke: a Clinical Audit. Transl Stroke Res. 2019;10(1):36–43.
111. Smith Hammond CA, Goldstein LB. Cough and aspiration of food and liquids due to oral-pharyngeal dysphagia: ACCP evidence-based clinical practice guidelines. Chest. 2006;129(1):154–68.
112. Langmore SE. History of Fiberoptic Endoscopic Evaluation of Swallowing for Evaluation and Management of Pharyngeal Dysphagia: Changes over the Years. Dysphagia. 2017;32(1):27–38.
113. Umay EK, Unlu E, Saylam GK, Cakci A, Korkmaz H. Evaluation of dysphagia in early stroke patients by bedside, endoscopic, and electrophysiological methods. Dysphagia. 2013;28(3):395–403.
114. Ertekin C, Arici S, Gurgor N. Sequential water swallowing in normal adults and patients with neurogenic dysphagia: A review. Neurol Sci Neurophysiol. 2019;36(4):174–92.
115. Aydogdu I, Kiylioglu N, Tarlaci S, *et al*. Diagnostic value of "dysphagia limit" for neurogenic dysphagia: 17 years of experience in 1278 adults. Clin Neurophysiol. 2015;126(3):634–43.
116. Hsiao MY, Chang YC, Chen WS, Chang HY, Wang TG. Application of ultrasonography in assessing oropharyngeal dysphagia in stroke patients. Ultrasound Med Biol. 2012;38(9):1522–8.
117. Leite KKA, Mangilli LD, Sassi FC, Limongi SCO, Andrade CRF. Ultrasonography and swallowing: a critical review of the literature. Audiol Commun Res. 2014;19(4):412–20.
118. Knigge MA, Thibeault S, McCulloch TM. Implementation of high-resolution manometry in the clinical practice of speech-language pathology. Dysphagia. 2014;29:2–16.
119. Omari T, Schar M. High-resolution manometry: what about the pharynx? Curr Opin Otolaryngol Head Neck Surg. 2018;26(6):382–91.
120. Movahedi F, Kurosu A, Coyle JL, Perera S, Sejdić E. A comparison between swallowing sounds and vibrations in patients with dysphagia. Comput Methods Programs Biomed. 2017;144:179–87.
121. Gomes F, Emery PW, Weekes CE. Risk of malnutrition is an independent predictor of mortality, length of hospital stay, and hospitalization costs in stroke patients. J Stroke Cerebrovasc Dis. 2016. https://doi.org/10.1016/j.jstrokecerebrovasdis.2015.12.017.
122. Lim HJ, Choue R. Nutritional status assessed by the Patient-Generated Subjective Global Assessment (PG-SGA) is associated with qualities of diet and life in Korean cerebral infarction patients. Nutrition. 2010;26:766–71.
123. Sura L, Madhavan A, Carnaby G, Crary MA. Dysphagia in the elderly: management and nutritional considerations. Clin Interv Aging. 2012;7:287–98.
124. Nii M, Maeda K, Wakabayashi H, Nishioka S, Tanaka A. Nutritional improvement and energy intake are associated with functional recovery in patients after cerebrovascular disorders. J Stroke Cerebrovasc Dis. 2016;25:57–62.
125. Nishioka S, Okamoto T, Takayama M, *et al*. Malnutrition risk predicts recovery of full oral intake among older adult stroke undergoing enteral nutrition: Secondary analysis of a multicentre survey (the APPLE patients study). Clin Nutr. 2016;36:1089–96.
126. Ojo O, Brooke J. The Use of Enteral Nutrition in the Management of Stroke. Nutrients. 2016;8(12):827. https://doi.org/10.3390/nu8120827.

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