Review

A Comprehensive Literature Review Of Dysphagia Screening Protocols for Stroke

Jamir Pitton Rissardo * and Ana Letícia Fornari Caprara

Posted Date: 12 December 2024

doi: 10.20944/preprints202412.1055.v1

Keywords: dysphagia; screening; acute stroke; protocols; aspiration pneumonia; standardized tools; bedside assessment; patient outcomes; multidisciplinary care; healthcare implementation

 doi:10.20944/preprints202412.1055.v1

Review

A Comprehensive Literature Review of Dysphagia Screening Protocols for Stroke

Jamir Pitton Rissardo * and Ana Letícia Fornari Caprara

Neurology Department, Cooper University Hospital, NJ 08103, USA
* Correspondence: jamirrissardo@gmail.com

Abstract: Dysphagia is a common complication in acute stroke patients, affecting up to 50% of cases. Timely identification and management of dysphagia are critical to prevent adverse outcomes such as aspiration pneumonia, malnutrition, dehydration, and prolonged hospital stays. This literature review examines the effectiveness and implementation of dysphagia screening protocols for acute stroke patients in various healthcare settings. Key components of dysphagia screening protocols, including timing, tools, and multidisciplinary involvement, are discussed. The review highlights the benefits of using standardized screening tools such as the Bedside Swallowing Assessment and the Toronto Bedside Swallowing Screening Test, which have demonstrated reliability and accuracy in detecting dysphagia. Barriers to effective screening, including lack of trained personnel, inconsistent protocol application, and resource limitations, are also explored. Evidence suggests that early dysphagia screening—ideally within 24 hours of stroke onset—significantly reduces the risk of complications and improves patient outcomes. The integration of dysphagia screening into stroke care pathways and the role of training and education for healthcare professionals are emphasized as critical for successful implementation. This review concludes with recommendations for practice, including adopting validated tools, ensuring timely screening, and fostering interprofessional collaboration to enhance the quality of care for acute stroke patients. Further research is recommended to address gaps in knowledge, particularly concerning the long-term impact of dysphagia screening on patient recovery and healthcare costs.

Keywords: dysphagia; screening; acute stroke; protocols; aspiration pneumonia; standardized tools; bedside assessment; patient outcomes; multidisciplinary care; healthcare implementation

1. Introduction

Stroke is one of the leading causes of disability and mortality globally, significantly impacting individuals and healthcare systems [1]. A critical focus of nursing care for stroke patients is ensuring proper nutrition while preventing complications related to swallowing difficulties, such as aspiration. Dysphagia, which may range in severity from mild to severe, is a common consequence of stroke and requires careful assessment and management to mitigate associated risks. Recent studies underscore the profound effects of dysphagia on patient outcomes, highlighting its role in dehydration, malnutrition, and the development of aspiration pneumonia. Aspiration pneumonia, in particular, is a serious complication linked to longer hospital stays, worsened functional recovery, and higher mortality rates among stroke patients [2]. Therefore, early identification and implementation of appropriate interventions, such as swallow evaluations, dietary modifications, and specialized feeding techniques, are essential to optimizing recovery and reducing adverse outcomes.

Dysphagia is defined as difficulty in the passage of food or liquids from the mouth, through the pharynx, and into the esophagus, ultimately reaching the stomach. It is a common complication of stroke, with approximately 65–90% of affected individuals experiencing issues during the oropharyngeal phase [3]. These disturbances can lead to changes in lung function, increased risk of aspiration, nutritional challenges, and a reduced quality of life. While dysphagia may resolve spontaneously within one week for some patients, about 50% of cases persist for up to six months,

 doi:10.20944/preprints202412.1055.v1

and a small proportion may experience permanent difficulties [4]. A study by Paiva et al. highlighted the significant impact of dysphagia in stroke patients. The findings revealed that individuals with dysphagia requiring a nasogastric tube faced nearly a 15-fold increased risk of disability compared to those without dysphagia ($p = 0.002$, OR = 14.97) [3]. This emphasizes the importance of timely assessment and intervention to minimize long-term complications and improve patient outcomes.

Dysphagia screening is a crucial step in the early detection of swallowing problems in acute stroke patients, helping to prevent complications such as aspiration, dehydration, and malnutrition. The American Heart Association (AHA) recommends that dysphagia screening be performed before administering any food, water, or oral medications to stroke patients [5]. This ensures that potential swallowing difficulties are identified and managed promptly. Stroke patients with dysphagia are significantly more likely to develop pulmonary infections (13.1% vs. 1.9%), face greater challenges in performing activities of daily living (52.4% vs. 18.0%), and experience prolonged hospital stays (14.0% vs. 4.3%) [6]. The AHA also advises that dysphagia screenings be conducted by speech therapists or other trained healthcare professionals. However, because nurses are available in emergency departments and stroke units, they are often the ones performing these assessments. A qualitative study by Couto and Oliveira revealed variability in how nurses perceive and conduct dysphagia screenings, with differences in the protocols and tools used [7]. This highlights the need for standardized training and consistent use of evidence-based screening methods to ensure the effective identification and management of dysphagia in stroke patients.

Dysphagia is strongly associated with worse functional outcomes, including a lower quality of life and extended hospital stays [8]. Various screening methods for dysphagia have been developed, many of which demonstrate satisfactory sensitivity and specificity. However, to ensure timely and effective screening, hospital management must establish standardized protocols and policies for dysphagia screening in the emergency room and stroke units. Timely dysphagia screening in acute stroke patients is critical. Nurses, who are present in these settings, play a pivotal role in conducting these assessments as early as possible. Early screening not only prevents patients from being unnecessarily kept nil by mouth but also facilitates the timely initiation of appropriate interventions, reducing the risk of complications and improving overall outcomes [9]. Implementing a structured dysphagia screening process can ensure consistency and enhance the quality of care for stroke patients.

The aim of this review is to evaluate the effectiveness of dysphagia screening protocols in acute stroke patients, focusing on the tools and practices used to ensure safe and accurate swallowing assessments. Given the significant risks associated with dysphagia, including dehydration, malnutrition, and aspiration pneumonia, it is critical to identify the most effective screening methods to prevent these complications. Additionally, the review aims to explore the barriers to successful implementation of dysphagia screening, such as insufficient training, resource constraints, and inconsistent protocol use, and to recommend strategies for improving dysphagia management. The goal is to enhance patient outcomes through early identification and timely intervention, thereby reducing the risk of severe complications and optimizing recovery.

Table 1. Dysphagia Screening Protocols In Stroke.[a]

Reference	Description
Cassier-Woidasky et al. [10]	The implementation of nurse-led protocols for managing swallowing difficulties (FeSS) after acute stroke has been associated with reduced 90-day mortality and disability, as evidenced by the Australian Quality in Acute Stroke Care (QASC) Trial. An international study conducted in eight German stroke units from 2020 to 2022 evaluated the effects of FeSS implementation. Stroke nurses, together with a project team, organized multidisciplinary workshops to identify barriers, develop action plans, and provide ongoing education. Medical record audits were conducted before and three months post-implementation. The overall swallowing improvement adherence was from 52% to 61% ($p < 0.001$), and the swallow screenings pre and post FeSS within 24 hours (from 65% to 74%; $p < 0.001$).

 doi:10.20944/preprints202412.1055.v1

Chang et al. [11]	Out of 195 studies evaluating 165 tools, 20 candidates were assessed using the QUADAS-2 criteria, resulting in the identification of six high-quality, non-instrumental screening tools for identifying adult dysphagia in acute care: the Yale Swallow Protocol, the Gugging Swallowing Screen, the Toronto Bedside Swallowing Screening Test (both English and Portuguese versions), the Sapienza Global Bedside Evaluation of Swallowing, and the Two-Step Thickened Water Test. Most of these tools were designed for stroke patients, with the Yale Swallow Protocol being the only one tested on diverse populations, including individuals with multiple sclerosis and head-and-neck cancer.
Khat'kova et al. [12]	Older adults with cognitive impairment (CI) are at an increased risk of developing dysphagia, highlighting the importance of early diagnosis of its initial symptoms, known as presbyphagia. Recent research has significantly focused on the relationship between CI and dysphagia. It is vital to identify both cognitive impairment and swallowing disorders at the earliest possible stage in patients, particularly before and during all phases post-stroke. Furthermore, the development of comprehensive multidisciplinary rehabilitation protocols, accompanied by pharmacological support for these conditions, is essential for effective patient management.
Rowe et al. [13]	Research on nursing practices in acute care has emphasized difficulties in recognizing and managing stroke-related dysphagia in low- and middle-income countries (LMICs). Nurses with greater clinical experience demonstrated a better understanding of dysphagia care. There was a recognized necessity for training and avenues for collaboration with speech-language therapists. Challenges unique to LMICs, such as excessive workloads and shortages of staff, impeded the delivery of optimal care. In summary, eight studies focused on the need to enhance nurses' management of dysphagia in LMICs.
Trapl-Grundschober et al. [14]	Out of the 754 responses received, 195 nurses in stroke units were evaluated. Among these, 99 indicated that they utilized standardized screenings for swallowing issues, 10 employed unvalidated screenings, and 82 were pending specialist evaluations. The majority of nurses preferred administering non-oral medications for patients suspected of having dysphagia, with none giving whole oral medications. Approximately half stated they would alter medications if screenings suggested dysphagia. Those using the Gugging Swallowing Screen tailored medication intake according to severity levels, while a third of those awaiting specialist assessment provided modified medications in advance.
Saab et al. [15]	Utilizing voice as a biomarker alongside deep learning can improve patient access to screening and minimize subjectivity in identifying changes in voice. The models demonstrated a clip-level sensitivity for dysphagia screening of 71% and a specificity of 77% (F1 = 0.73, AUC = 0.80). At the participant level, the sensitivity and specificity were 89% and 79%, respectively (F1 = 0.81, AUC = 0.91).
Zhang et al. [16]	Participants will be randomly divided into two groups: the experimental group, which will undergo video-game-based swallowing training, and the control group, which will receive traditional training. Each group will participate in 30 minutes of training per day, five days a week, over a period of four weeks. The main outcome measure is swallowing ability, while secondary measures encompass quality of life, adherence to training, and overall satisfaction. Evaluations will take place at the beginning of the study, after the treatment period (4 weeks), and during a follow-up visit (8 weeks), with assessors unaware of the group allocations.

[a]Query search on Pubmed: ("deglutition disorders"[MeSH Terms] OR ("deglutition"[All Fields] AND "disorders"[All Fields]) OR "deglutition disorders"[All Fields] OR "dysphagia"[All Fields] OR "dysphagias"[All Fields]) AND ("diagnosis"[MeSH Subheading] OR "diagnosis"[All Fields] OR "screening"[All Fields] OR "mass screening"[MeSH Terms] OR ("mass"[All Fields] AND "screening"[All Fields]) OR "mass screening"[All Fields] OR "early detection of cancer"[MeSH Terms] OR ("early"[All Fields] AND "detection"[All Fields] AND "cancer"[All Fields]) OR "early detection of cancer"[All Fields] OR "screen"[All Fields] OR "screenings"[All Fields] OR "screened"[All Fields] OR "screens"[All Fields]) AND ("protocol"[All Fields] OR "protocol s"[All Fields] OR "protocolized"[All Fields] OR "protocols"[All Fields]) AND ("stroke"[MeSH Terms] OR "stroke"[All Fields] OR "strokes"[All Fields] OR "stroke s"[All Fields]).

 doi:10.20944/preprints202412.1055.v1

2. Dysphagia

Stroke is the leading cause of death in Asian countries, with lung infections, particularly aspiration pneumonia, being the primary cause of death among stroke patients, particularly those with dysphagia [17]. The mortality rate for stroke patients with dysphagia is 12.8% higher compared to those without [18]. Globally, about 8% of the population experiences dysphagia, with stroke patients showing an even higher incidence, approaching 80% [19]. Dysphagia refers to the difficulty in swallowing food or fluids, often caused by muscle weakness associated with stroke or the natural aging process. A study in Europe found that nearly half (47.4%) of individuals over the age of 70 had dysphagia, highlighting its prevalence in the elderly population [20]. Dysphagia can result in serious complications, such as aspiration pneumonia, malnutrition, dehydration, and psychological disorders, including stress, anxiety, and depression.

A study in Taiwan found that dysphagia is a critical factor in the development of aspiration pneumonia and malnutrition [21]. Aspiration pneumonia, a common consequence of dysphagia, is a leading cause of death in stroke patients, with aspiration of food, liquids, or oral secretions being the primary risk factor for developing pneumonia. Video fluoroscopy studies have shown that many stroke patients, even those undergoing assessment with 3 mL of water, exhibit aspiration during swallowing [22]. Despite some stroke patients recovering their swallowing abilities spontaneously, 11%-50% of them still experience dysphagia six months post-stroke, underscoring the persistent nature of this complication [23].

The management of dysphagia in stroke patients requires a multidisciplinary team, including doctors, nurses, speech-language pathologists, occupational therapists, and nutritionists. Nurses play a pivotal role in assessing swallowing function through initial screening processes. However, research indicates that the documentation of dysphagia assessments is often inadequate, particularly when standardized screening tools or protocols are not used [24]. This highlights the importance of incorporating systematic and validated dysphagia screening protocols in stroke care to ensure early detection, prevent complications such as aspiration pneumonia, and improve long-term patient outcomes. The adoption of these protocols can enhance the quality of care, reduce health complications, and ultimately decrease mortality rates among stroke patients with dysphagia [25].

2.1. Basic Physiology of Swallowing and Its Neural Control

Swallowing, or deglutition, is a complex process that involves the coordinated action of the mouth, pharynx, and esophagus to move food or liquid from the mouth to the stomach. It is controlled by both voluntary and involuntary mechanisms, involving several brain regions, muscles, and nerves. The process can be divided into three main phases: the oral, pharyngeal, and esophageal phases. The oral phase begins in the mouth, where food is chewed and mixed with saliva to form a bolus. Voluntary control during this phase involves the tongue pushing the bolus to the back of the mouth, where it triggers sensory receptors in the pharynx. This phase is primarily controlled by the motor cortex and involves the cranial nerves V (trigeminal), VII (facial), IX (glossopharyngeal), and XII (hypoglossal), which control the muscles of mastication and tongue movements. Once the bolus reaches the back of the mouth, the pharyngeal phase begins. This phase is involuntary and involves the coordination of multiple muscles and reflexes. The bolus triggers mechanoreceptors in the pharynx, which send signals to the brainstem (specifically the medulla) to initiate the swallowing reflex. The soft palate elevates to seal the nasal cavity, the vocal cords close to protect the airway, and the upper esophageal sphincter (UES) relaxes to allow the bolus to pass into the esophagus. The pharyngeal phase is controlled by the brainstem, particularly the medullary swallowing center, and involves cranial nerves V, VII, IX, X (vagus), and XII. After passing through the UES, the bolus moves down the esophagus through peristalsis, a series of coordinated muscular contractions. The esophageal phase is involuntary and controlled by the vagus nerve (cranial nerve X) and the enteric nervous system. The lower esophageal sphincter (LES) relaxes to allow the bolus to enter the stomach [26].

 doi:10.20944/preprints202412.1055.v1

2.2. Types of Dysphagia in Stroke

Dysphagia in stroke patients can be categorized based on the phase of swallowing that is affected. Since stroke can impact various brain regions involved in the swallowing process, it often leads to different types of dysphagia, each with its own set of symptoms and complications. The two main types of dysphagia that can occur in stroke patients are oropharyngeal dysphagia and esophageal dysphagia [27].

Oropharyngeal dysphagia is the most common type of dysphagia in stroke patients and occurs when there is difficulty in the transfer of food or liquid from the mouth to the esophagus [28]. This type of dysphagia involves problems with the mouth and throat (pharynx), and it can manifest in several ways. Pharyngeal weakness is one example, where stroke may lead to weakness in the muscles of the pharynx, which are responsible for moving the food bolus into the esophagus. This can result in delayed swallowing or incomplete bolus clearance, leading to aspiration, or food or liquid entering the airway. Stroke can also disrupt the normal swallow reflex, which is triggered when food or liquid enters the back of the mouth. The absence of this reflex can lead to aspiration of food, increasing the risk of aspiration pneumonia. Upper esophageal sphincter (UES) dysfunction can also occur, as the UES is responsible for relaxing to allow the bolus to pass into the esophagus. Stroke can impair UES relaxation, leading to a feeling of food being "stuck" in the throat or difficulty initiating swallowing. Aspiration is one of the most concerning consequences of oropharyngeal dysphagia. Aspiration can lead to severe complications such as aspiration pneumonia, which is common in stroke patients with swallowing difficulties [29].

Esophageal dysphagia occurs when the problem lies in the esophagus, making it difficult for the bolus to move from the mouth to the stomach [30]. It is less common than oropharyngeal dysphagia in stroke patients but may still occur due to the following reasons. Impaired peristalsis, which refers to the smooth muscle contractions that push the bolus down the esophagus, may be weakened or uncoordinated due to stroke. This results in a condition known as achalasia, causing difficulty swallowing and the sensation of food being stuck in the chest. Lower esophageal sphincter (LES) dysfunction is another potential cause. Stroke can affect the LES, which normally relaxes to allow the bolus to enter the stomach. Dysfunction of this sphincter can lead to a sensation of food backing up into the esophagus or gastroesophageal reflux disease (GERD).

In some stroke patients, both the pharyngeal and esophageal phases of swallowing may be affected [31]. This combined dysfunction can make swallowing even more difficult, and patients may experience symptoms from both types of dysphagia, including the risk of aspiration and difficulty moving food down the esophagus.

Risk factors for different types of dysphagia include ischemic stroke, which occurs when a blood clot blocks a blood vessel in the brain and may affect the brain regions involved in the swallow reflex and muscle control, leading to oropharyngeal dysphagia. Hemorrhagic stroke, which involves bleeding in the brain, can lead to more widespread brain damage, affecting both the motor and sensory areas involved in swallowing, resulting in mixed dysphagia [32]. The location of the stroke is also important, as strokes affecting the brainstem are particularly associated with severe oropharyngeal dysphagia, as the brainstem is critical for coordinating the swallowing reflex [33].

In summary, dysphagia in stroke patients can vary significantly depending on the location, severity, and type of stroke. Early and accurate assessment is critical to prevent complications such as aspiration pneumonia and ensure safe feeding and recovery for stroke patients.

3. Dysphagia Screening

The purpose of dysphagia screening in stroke patients is to determine whether it is safe for them to eat, drink, or take oral medications, as swallowing difficulties can lead to serious complications like aspiration pneumonia, malnutrition, and dehydration. Dysphagia screening serves as an initial step in identifying individuals who need further evaluation, with the process typically being a pass/fail approach. If a patient fails the screening, they are assessed further by a specialist to confirm the severity of the swallowing dysfunction. According to the American Heart Association (AHA), dysphagia screening should be conducted for all stroke patients before they eat, drink, or receive oral

 doi:10.20944/preprints202412.1055.v1

medication [34]. This screening should ideally be performed within one hour of the patient's arrival in the emergency room (ER), allowing for the immediate establishment of safe feeding techniques and the prevention of aspiration.

A study by Fairfield and Smithard found that most dysphagia screenings (93%) were conducted within 24 hours of a stroke diagnosis, with 34% completed within 4 hours [20]. Early screening is crucial, as prompt intervention can reduce the risks of complications. The AHA recommends that dysphagia screenings be performed by speech-language pathologists (SLPs) or other trained healthcare professionals [35]. However, there is some variability in practice, especially in the ER setting, where the specific roles and responsibilities for dysphagia screening are not universally agreed upon. In countries like the US, UK, Canada, and Australia, there is no clear consensus on whether nurses, SLPs, or other professionals should be responsible for conducting dysphagia screening in acute stroke care [36].

Nurses, who are available in the ER and stroke units, are in an ideal position to perform initial dysphagia screenings. Since they play a central role in patient care, it is crucial that they are trained to identify and manage swallowing difficulties early on. Research suggests that nurses can perform dysphagia screening as effectively as SLPs and other healthcare providers. A study by Oliveira et al. found that nursing-led dysphagia screenings were just as valid as those conducted by other professionals [7]. Similarly, studies by Immovilli et al. and Knight et al. have shown that there is excellent agreement between screenings performed by nurses and those conducted by SLPs or occupational therapists, with a reliability score greater than 0.8. Additionally, a study by Knight et al. demonstrated that allied health assistants (AHAs) can also successfully conduct dysphagia screenings in some settings [37,38].

Despite this evidence supporting the role of nurses in dysphagia screening, other studies have highlighted the need for further training. Knight et al. found that while many nurses care for stroke patients with swallowing difficulties, only 26.9% had received specific training in stroke care, including dysphagia management [38]. This gap in knowledge may limit the effectiveness of dysphagia screenings and subsequent interventions. As a result, improving nurse education and providing consistent training in dysphagia screening techniques are essential steps to ensure timely and accurate assessments in acute stroke care. Additionally, fostering collaboration between nurses, SLPs, and other multidisciplinary team members can help ensure that patients receive comprehensive and coordinated care to reduce the risk of complications and improve outcomes.

4. Dysphagia Screening Methods and Instruments

Dysphagia screening in stroke patients is essential for ensuring safe swallowing and preventing complications such as aspiration pneumonia, malnutrition, and dehydration. However, there is no universally agreed-upon screening method, leading to variability in the use of protocols and instruments across hospitals. Several different screening tools are commonly employed, each with its strengths and weaknesses, depending on the clinical context.

4.1. Water Swallowing Test

The Water Swallowing Test (WST) is one of the oldest and most widely used dysphagia screening methods. It involves providing the patient with a specific amount of water (typically between 3 mL and 60 mL) to swallow. This test is often performed by nurses at the bedside and is considered sensitive and reliable. However, the WST carries inherent risks, including the potential for aspiration and oxygen desaturation. To mitigate these risks, healthcare providers must monitor the patient using pulse oximetry and ensure that oxygen is available during the test. While WST is relatively quick and simple, its primary limitation is the risk of aspiration, which can be dangerous for stroke patients with impaired swallowing [39].

 doi:10.20944/preprints202412.1055.v1

4.2. Four-Question Test

The Four-Question Test (4QT) is a brief questionnaire that asks the patient or family members about common signs of dysphagia, such as coughing or choking after eating, prolonged eating times, changes in meal consistency, and changes in voice after eating or drinking. While this method is highly sensitive, it lacks specificity for diagnosing dysphagia in stroke patients. As a result, the 4QT may identify patients who appear at risk of dysphagia but may not necessarily have clinically significant swallowing difficulties. This method is simple and quick, but it may lead to false positives or missed cases [40].

4.3. Oropharyngeal Dysphagia Screening Test for Patients and Professionals

The Oropharyngeal Dysphagia Screening Test for Patients and Professionals (ODS-PP) is a more detailed tool that includes 18 questions assessing various symptoms related to dysphagia, including coughing, choking, breathlessness, and voice changes during or after eating or drinking. This method is designed to screen for oropharyngeal dysphagia specifically. It has demonstrated high reliability and concurrent validity, making it an effective and evidence-based tool for identifying swallowing difficulties in stroke patients. However, while it provides more detailed information than the 4QT, it may still be limited by the patient's ability to respond to the questions accurately, particularly in the acute phase of stroke [41].

4.4. Volume-Viscosity Swallow Test

The Volume-Viscosity Swallow Test (V-VST) is a more complex, bedside screening tool that assesses both the safety and efficacy of swallowing. It involves providing the patient with liquids of varying viscosities (starting with nectar-thick liquids) and progressively increasing the volume and viscosity of the boluses. This test evaluates the patient's ability to handle liquids of different thicknesses and volumes, checking for signs of aspiration, including cough, voice changes, and oxygen desaturation (≥3%). If a patient passes the nectar-thick liquid series without complications, the test progresses to more challenging liquids and ultimately to a pudding viscosity series. The V-VST is considered both quick and reliable, with a sensitivity of 88.2% and specificity of 64.7%. It is an effective method for detecting subtle signs of dysphagia, but it requires careful observation and appropriate equipment, including pulse oximetry, to ensure patient safety [42].

4.5. Eating Assessment Tool

The Eating Assessment Tool (EAT-10) is a widely used, symptom-specific tool designed to evaluate the severity of swallowing problems in clinical practice. It consists of 10 questions related to the patient's ability to swallow solids, liquids, and pills, as well as the impact of swallowing difficulties on quality of life. The questions cover a range of symptoms, including pain, choking, and changes in the pleasure of eating. Each item is rated on a scale from 0 to 4, with a total score of 3 or higher suggesting a potential swallowing problem. The EAT-10 is easy to administer and provides a comprehensive assessment of dysphagia-related symptoms. It is particularly useful for tracking the progression of swallowing difficulties over time and is often employed in both inpatient and outpatient settings. However, like other subjective measures, it may be influenced by the patient's perceptions and may not directly assess the physical aspects of swallowing dysfunction [43].

5. Discussion

5.1. Pros and Cons of Each Screening Method

Dysphagia in stroke patients can be screened using a variety of methods, each with its own advantages and disadvantages. The Water Swallowing Test (WST) is a simple and quick method where the patient swallows a small amount of water, and the clinician observes for signs of aspiration or difficulty [44]. One of the main advantages of this method is its simplicity and the ability to perform it at the bedside without requiring specialized equipment. However, it has some risks, such as the

 doi:10.20944/preprints202412.1055.v1

possibility of aspiration during the test, which could lead to complications like oxygen desaturation or aspiration pneumonia. Additionally, the results can be subjective, depending on the clinician's experience, and it may not be sensitive enough to detect more subtle swallowing difficulties.

The Four-Question Test (4QT) is another method that involves asking the patient or caregiver about symptoms such as coughing, choking, and difficulty swallowing food or liquids. This method is quick, non-invasive, and easy to administer. It also doesn't require specialized equipment, making it convenient in many clinical settings. However, it relies on the patient or caregiver's self-reporting, which may not always be accurate. Furthermore, it is not as specific for diagnosing dysphagia, as these symptoms may occur without a true swallowing disorder [4].

The Oropharyngeal Dysphagia Screening Test for Patients and Professionals (ODS-PP) is a more detailed questionnaire that asks patients about symptoms like coughing, choking, or changes in voice. This method is more comprehensive than simpler tests and has high reliability and concurrent validity. However, it can be time-consuming, and it also relies on the patient's self-reporting, which may not always be accurate. Additionally, it may be challenging to use in patients who are unable to communicate effectively, such as those with severe stroke [41].

The Volume-Viscosity Swallow Test (V-VST) involves assessing the patient's ability to swallow liquids of varying viscosities and volumes to evaluate both the safety and efficiency of swallowing. One of the key benefits of this method is that it provides a more detailed and objective assessment of swallowing function, including the risk of aspiration. However, it is more complex and time-consuming than simpler tests and requires trained personnel to perform the test. It may not be feasible in emergency or acute care settings due to the time and resources required [42].

The Eating Assessment Tool (EAT-10) is a self-reported questionnaire with ten questions about symptoms of swallowing difficulty. This method is easy to administer and can be used in both inpatient and outpatient settings. It provides valuable insights into the patient's perceived quality of life regarding swallowing issues. However, it relies on patient self-reporting, which may not always be accurate, and it is not as comprehensive as other methods like the V-VST or Video-Fluoroscopy. Fiberoptic Endoscopic Evaluation of Swallowing (FEES) involves inserting a flexible endoscope into the patient's nose to visually assess the swallowing process. This method provides a detailed and direct view of swallowing, including the presence of aspiration. It allows for real-time adjustments to the swallowing strategy and is highly accurate. However, it requires specialized equipment and trained personnel, and it can be uncomfortable for the patient. It is also not always feasible in emergency or acute care settings [45].

Video-Fluoroscopy (VFS) is an imaging technique in which the patient swallows a contrast material while X-rays are taken to visualize the swallowing process. This method offers a detailed, dynamic view of the swallowing process from the mouth to the esophagus, allowing for the identification of aspiration risk and subtle swallowing difficulties. However, it requires specialized equipment and personnel, and involves radiation, which limits its use in certain situations. It is also more time-consuming and costly compared to bedside tests.

Each dysphagia screening method has its strengths and weaknesses. Simpler tests like the Water Swallowing Test and the 4QT are quick and easy to administer but may lack specificity and sensitivity. More comprehensive methods like the V-VST, FEES, and VFS provide a more detailed understanding of swallowing function but may require specialized training, equipment, and more time [46]. The selection of a screening method should depend on the patient's condition, the available resources, and the specific needs of the clinical setting.

While each of these methods has its strengths, the lack of a universal consensus on the best screening tool underscores the complexity of dysphagia assessment in stroke patients. Each method varies in its sensitivity, specificity, and ease of use. For example, the WST is quick but carries some risks, the 4QT is sensitive but lacks specificity, and the EAT-10 offers a comprehensive symptom assessment but is subjective. The V-VST provides a more detailed and objective evaluation of swallowing safety and efficacy but requires more time and equipment.

In practice, a combination of these methods may be used to enhance diagnostic accuracy [47]. For instance, a nurse might initially perform a simple screening using the 4QT or WST, and if a

 doi:10.20944/preprints202412.1055.v1

problem is suspected, a more thorough assessment such as the V-VST or EAT-10 could be performed. Moreover, the involvement of a multidisciplinary team, including speech-language pathologists, nurses, and physicians, ensures that patients receive appropriate care and follow-up, reducing the risks associated with dysphagia and improving patient outcomes.

In summary, while there is no single "gold standard" for dysphagia screening, combining multiple screening tools and methods can improve the early detection of swallowing difficulties in stroke patients, preventing aspiration, malnutrition, and other complications that may hinder recovery and contribute to long-term morbidity and mortality.

5.2. Nurse-Driven Dysphagia Screening

Nurse-driven dysphagia screening is an approach in which nurses take on the responsibility of identifying swallowing difficulties in patients, particularly those who have suffered a stroke [44]. This approach is increasingly recognized as vital due to the central role nurses play in patient care, especially in acute settings such as emergency rooms or stroke units where timely identification of dysphagia can significantly impact patient outcomes [48]. Nurses are typically the first healthcare providers to interact with patients, making them well-positioned to conduct initial screenings and identify early signs of swallowing difficulties [49]. By performing these screenings, nurses can quickly alert the healthcare team to potential risks, thereby preventing complications like aspiration pneumonia, which is common among stroke patients with dysphagia.

One of the key advantages of nurse-driven dysphagia screening is its ability to facilitate early detection, which is crucial for minimizing the risk of aspiration and ensuring that safe swallowing practices are established. Nurses can perform these screenings shortly after a stroke patient's admission to the hospital, often within an hour, which aligns with best practice recommendations for preventing aspiration and other related complications [50].

Nurse-driven screening protocols typically involve the use of simple, easy-to-implement tools, such as the Water Swallowing Test or the Four-Question Test, which are effective in detecting patients who may need further evaluation. In some cases, nurses may also collaborate with speech-language pathologists or other specialists to conduct more detailed assessments if the screening results indicate a potential swallowing issue. This collaborative approach enhances the overall effectiveness of dysphagia management, ensuring that stroke patients receive timely and appropriate interventions.

However, there are challenges associated with nurse-driven dysphagia screening [51]. One of the main concerns is that not all nurses may have received adequate training in recognizing the signs and symptoms of dysphagia. A lack of proper training can lead to missed diagnoses or incorrect assessments, which could result in unsafe feeding practices or delayed interventions [52]. Additionally, while nurse-driven screening can help identify patients at risk, it may not be sufficient for a comprehensive evaluation of swallowing function. In some cases, more specialized assessments such as video-fluoroscopy or fiberoptic endoscopic evaluation may still be necessary to fully evaluate the patient's swallowing capabilities.

Despite these challenges, nurse-driven dysphagia screening remains a critical component of stroke patient care. With appropriate training and the use of evidence-based screening protocols, nurses can play a key role in improving the early identification and management of dysphagia, ultimately contributing to better patient outcomes. Moreover, as the nursing role continues to evolve in the multidisciplinary care of stroke patients, the integration of dysphagia screening into nursing practice can help reduce the incidence of aspiration pneumonia and other complications, supporting overall recovery and quality of life for stroke survivors.

6. Future Studies

Future studies on dysphagia screening in stroke patients should address several key areas to improve the detection, management, and outcomes of dysphagia in clinical settings. First, there is a need for research on the standardization and validation of dysphagia screening tools across diverse patient populations and healthcare settings. Many current screening methods lack universal consensus, and studies should focus on comparing different screening protocols in terms of their

 doi:10.20944/preprints202412.1055.v1

sensitivity, specificity, and practical applicability in acute care environments, such as emergency rooms and stroke units. This would help to determine the most effective and reliable tools for early identification of dysphagia in stroke patients. Additionally, future research should explore the training and education needs of healthcare professionals, particularly nurses, who play a pivotal role in dysphagia screening. While nurse-driven dysphagia screening has shown promise, studies should examine how best to train nurses in recognizing swallowing difficulties, using screening tools, and interpreting results to ensure timely and accurate identification of patients at risk. Research could focus on evaluating the impact of targeted training programs on screening accuracy and patient outcomes.

Another important area of investigation is the development of innovative, non-invasive, and user-friendly technologies for dysphagia screening. Advances in telemedicine and mobile health applications could be explored to offer remote screening capabilities or real-time feedback for healthcare providers. Studies should evaluate the feasibility, reliability, and cost-effectiveness of such technologies in comparison to traditional methods. Moreover, research should investigate the long-term effects of early dysphagia screening and intervention on stroke recovery. Longitudinal studies could assess how early identification and management of dysphagia impact long-term health outcomes such as hospital readmissions, functional recovery, quality of life, and mortality rates. These studies would help demonstrate the broader benefits of early dysphagia screening beyond the acute phase of stroke.

Finally, more research is needed on the cost-effectiveness of dysphagia screening programs in stroke care. Studies should examine how early screening and intervention can reduce healthcare costs by preventing complications like aspiration pneumonia, dehydration, and malnutrition. By quantifying the economic benefits of dysphagia screening, future research could help inform healthcare policies and resource allocation in stroke care.

7. Conclusions

Dysphagia, or difficulty swallowing, in stroke patients requires prompt and effective management, beginning with early detection through a dysphagia screening conducted as part of the nursing assessment. The primary goals of screening are to prevent aspiration, which can lead to severe complications, and to ensure safe and efficient oral intake for stroke patients. Screening should ideally be performed within the first hour of the patient's arrival in the Emergency Room to facilitate timely intervention. The screening methods and tools used should be simple to administer, quick, low-risk, and provide both high sensitivity (correctly identifying those with dysphagia) and high specificity (accurately ruling out those without it). This ensures that at-risk patients receive the appropriate care while minimizing unnecessary interventions.

Author Contributions: Conceptualization, J.P.R. and A.L.F.C.; methodology, A.L.F.C.; software, A.L.F.C.; validation, A.L.F.C. and J.P.R.; formal analysis, A.L.F.C.; investigation, A.L.F.C.; resources, A.L.F.C.; data curation, J.P.R.; writing—original draft preparation, J.P.R.; writing—review and editing, J.P.R.; visualization, A.L.F.C.; supervision, A.L.F.C.; project administration, A.L.F.C.; funding acquisition, J.P.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflicts of interest.

 doi:10.20944/preprints202412.1055.v1

References

1. Jambi, L.K.; Hamad, A.; Salah, H.; Sulieman, A. Stroke and Disability: Incidence, Risk Factors, Management, and Impact. *Journal of Disability Research* **2024**, *3*, 20240094.
2. Lidetu, T.; Muluneh, E.K.; Wassie, G.T. Incidence and Predictors of Aspiration Pneumonia Among Stroke Patients in Western Amhara Region, North-West Ethiopia: A Retrospective Follow Up Study. *Int J Gen Med* **2023**, *16*, 1303–1315, doi:10.2147/IJGM.S400420.
3. Souza, J.T.; Ribeiro, P.W.; de Paiva, S.A.R.; Tanni, S.E.; Minicucci, M.F.; Zornoff, L.A.M.; Polegato, B.F.; Bazan, S.G.Z.; Modolo, G.P.; Bazan, R.; et al. Dysphagia and Tube Feeding after Stroke Are Associated with Poorer Functional and Mortality Outcomes. *Clin Nutr* **2020**, *39*, 2786–2792, doi:10.1016/j.clnu.2019.11.042.
4. Tsang, K.; Lau, E.S.; Shazra, M.; Eyres, R.; Hansjee, D.; Smithard, D.G. A New Simple Screening Tool-4QT: Can It Identify Those with Swallowing Problems? A Pilot Study. *Geriatrics (Basel)* **2020**, *5*, doi:10.3390/geriatrics5010011.
5. Oliveira, I. de J.; Couto, G.R.; Santos, R.V.; Campolargo, A.M.; Lima, C.; Ferreira, P.L. Best Practice Recommendations for Dysphagia Management in Stroke Patients: A Consensus from a Portuguese Expert Panel. *Portuguese Journal of Public Health* **2022**, *39*, 145–162.
6. Powers, W.J.; Rabinstein, A.A.; Ackerson, T.; Adeoye, O.M.; Bambakidis, N.C.; Becker, K.; Biller, J.; Brown, M.; Demaerschalk, B.M.; Hoh, B.; et al. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke* **2019**, *50*, e344–e418, doi:10.1161/STR.0000000000000211.
7. de Jesus Oliveira, I.; Couto, G.R.; da Mota, L.A.N. Nurses' Preferred Items for Dysphagia Screening in Acute Stroke Patients: A Qualitative Study. *Nursing Practice Today* **2020**.
8. Vesey, S. Dysphagia and Quality of Life. *Br J Community Nurs* **2013**, *Suppl*, S14, S16, S18-19, doi:10.12968/bjcn.2013.18.sup5.s14.
9. Al-Khaled, M.; Matthis, C.; Binder, A.; Mudter, J.; Schattschneider, J.; Pulkowski, U.; Strohmaier, T.; Niehoff, T.; Zybur, R.; Eggers, J.; 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*, 81–89, doi:10.1159/000445299.
10. Cassier-Woidasky, A.-K.; Middleton, S.; Dale, S.; Coughlan, K.; D'Este, C.; McInnes, E.; Cadilhac, D.A.; Pfeilschifter, W. Quality in Acute Stroke Care (QASC) Germany: Improving Efficiency in Stroke Care with Nurse-Initiated FeSS-Protocols. *Neurol Res Pract* **2024**, *6*, 48, doi:10.1186/s42466-024-00352-1.
11. Chang, Y.-C.; Wu, M.-S.; Siao, S.-F.; Wang, M.-J.; Xu, Y.-J.; Chen, C.C.-H. Identifying High-Quality Non-Instrumental Dysphagia Screening Tools for Detection of Adult Dysphagia Case in Acute-Care Settings: A Systematic Review. *Clin Otolaryngol* **2024**, *49*, 687–698, doi:10.1111/coa.14194.
12. Khat'kova, S.E.; Pogorel'tseva, O.A. [Algorithms for the diagnosis and treatment of cognitive impairment and dysphagia in stroke patients]. *Zh Nevrol Psikhiatr Im S S Korsakova* **2024**, *124*, 100–107, doi:10.17116/jnevro2024124042100.
13. Rowe, K.; Du Toit, M.N.; Pillay, S.B.; Krüger, E. Nurses' Practices in Stroke-Related Dysphagia in Low- and Middle-Income Countries. *Curationis* **2024**, *47*, e1–e9, doi:10.4102/curationis.v47i1.2499.
14. Trapl-Grundschober, M.; Schulz, S.; Sollereder, S.; Schneider, L.; Teuschl, Y.; Osterbrink, J. Oral Intake of Solid Medications in Patients with Post-Stroke Dysphagia. A Challenge for Nurses? *J Clin Nurs* **2024**, doi:10.1111/jocn.17081.
15. Saab, R.; Balachandar, A.; Mahdi, H.; Nashnoush, E.; Perri, L.X.; Waldron, A.L.; Sadeghian, A.; Rubenfeld, G.; Crowley, M.; Boulos, M.I.; et al. Machine-Learning Assisted Swallowing Assessment: A Deep Learning-Based Quality Improvement Tool to Screen for Post-Stroke Dysphagia. *Front Neurosci* **2023**, *17*, 1302132, doi:10.3389/fnins.2023.1302132.
16. Zhang, B.; Guo, C.; Hui, V.; Wong, K.P.; Liu, Y.; Liu, Z.; Xu, Y.; Xiao, Q.; Chen, S.-C.; Qin, J. Evaluating the Effectiveness of Video-Game Based Swallowing Function Training in Patients with Dysphagia: Study Protocol for a Randomized Controlled Trial. *Trials* **2023**, *24*, 735, doi:10.1186/s13063-023-07738-7.
17. Wang, T.; Zhao, Y.; Guo, A. Association of Swallowing Problems with Frailty in Chinese Hospitalized Older Patients. *Int J Nurs Sci* **2020**, *7*, 408–412, doi:10.1016/j.ijnss.2020.09.005.
18. Melgaard, D.; Sørensen, L.R.; Lund, D.; Leutscher, P.; Ludwig, M. Systematic Dysphagia Screening of Elderly Persons in the Emergency Department-A Feasibility Study. *Geriatrics (Basel)* **2020**, *5*, doi:10.3390/geriatrics5040075.
19. Martino, R.; Foley, N.; Bhogal, S.; Diamant, N.; Speechley, M.; Teasell, R. Dysphagia after Stroke: Incidence, Diagnosis, and Pulmonary Complications. *Stroke* **2005**, *36*, 2756–2763, doi:10.1161/01.STR.0000190056.76543.eb.
20. Fairfield, C.A.; Smithard, D.G. Assessment and Management of Dysphagia in Acute Stroke: An Initial Service Review of International Practice. *Geriatrics (Basel)* **2020**, *5*, doi:10.3390/geriatrics5010004.

 doi:10.20944/preprints202412.1055.v1

21. Feng, M.-C.; Lin, Y.-C.; Chang, Y.-H.; Chen, C.-H.; Chiang, H.-C.; Huang, L.-C.; Yang, Y.-H.; Hung, C.-H. The Mortality and the Risk of Aspiration Pneumonia Related with Dysphagia in Stroke Patients. *J Stroke Cerebrovasc Dis* **2019**, *28*, 1381–1387, doi:10.1016/j.jstrokecerebrovasdis.2019.02.011.
22. Helliwell, K.; Hughes, V.J.; Bennion, C.M.; Manning-Stanley, A. The Use of Videofluoroscopy (VFS) and Fibreoptic Endoscopic Evaluation of Swallowing (FEES) in the Investigation of Oropharyngeal Dysphagia in Stroke Patients: A Narrative Review. *Radiography (Lond)* **2023**, *29*, 284–290, doi:10.1016/j.radi.2022.12.007.
23. Juan, W.; Zhen, H.; Yan-Ying, F.; Hui-Xian, Y.; Tao, Z.; Pei-Fen, G.; Jian-Tian, H. A Comparative Study of Two Tube Feeding Methods in Patients with Dysphagia After Stroke: A Randomized Controlled Trial. *J Stroke Cerebrovasc Dis* **2020**, *29*, 104602, doi:10.1016/j.jstrokecerebrovasdis.2019.104602.
24. Mathers-Schmidt, B.A.; Kurlinski, M. Dysphagia Evaluation Practices: Inconsistencies in Clinical Assessment and Instrumental Examination Decision-Making. *Dysphagia* **2003**, *18*, 114–125, doi:10.1007/s00455-002-0094-z.
25. Gandolfi, M.; Smania, N.; Bisoffi, G.; Squaquara, T.; Zuccher, P.; Mazzucco, S. Improving Post-Stroke Dysphagia Outcomes through a Standardized and Multidisciplinary Protocol: An Exploratory Cohort Study. *Dysphagia* **2014**, *29*, 704–712, doi:10.1007/s00455-014-9565-2.
26. Watts, A.G.; Kanoski, S.E.; Sanchez-Watts, G.; Langhans, W. The Physiological Control of Eating: Signals, Neurons, and Networks. *Physiol Rev* **2022**, *102*, 689–813, doi:10.1152/physrev.00028.2020.
27. Ershov, V.I. Dysphagia Associated with Neurological Disorders. In *Therapy Approaches in Neurological Disorders*; IntechOpen, 2021 ISBN 1-83968-669-3.
28. Rivelsrud, M.C.; Hartelius, L.; Bergström, L.; Løvstad, M.; Speyer, R. Prevalence of Oropharyngeal Dysphagia in Adults in Different Healthcare Settings: A Systematic Review and Meta-Analyses. *Dysphagia* **2023**, *38*, 76–121, doi:10.1007/s00455-022-10465-x.
29. Le Danseur, M. Stroke Rehabilitation. *Critical care nursing clinics* **2020**, *32*, 97–108.
30. Perlman, A.L. Dysphagia in Stroke Patients. *Semin Neurol* **1996**, *16*, 341–348, doi:10.1055/s-2008-1040992.
31. Smithard, D.G. Swallowing and Stroke. Neurological Effects and Recovery. *Cerebrovasc Dis* **2002**, *14*, 1–8, doi:10.1159/000063716.
32. Paciaroni, M.; Mazzotta, G.; Corea, F.; Caso, V.; Venti, M.; Milia, P.; Silvestrelli, G.; Palmerini, F.; Parnetti, L.; Gallai, V. Dysphagia Following Stroke. *Eur Neurol* **2004**, *51*, 162–167, doi:10.1159/000077663.
33. Horner, J.; Buoyer, F.G.; Alberts, M.J.; Helms, M.J. Dysphagia Following Brain-Stem Stroke. Clinical Correlates and Outcome. *Arch Neurol* **1991**, *48*, 1170–1173, doi:10.1001/archneur.1991.00530230078026.
34. Wilkinson, J.M.; Codipilly, D.C.; Wilfahrt, R.P. Dysphagia: Evaluation and Collaborative Management. *Am Fam Physician* **2021**, *103*, 97–106.
35. Schwarz, M. Expanding Speech Pathology Delegation Practices: Engaging Allied Health Assistants (AHAs) in Dysphagia Management in the Acute Hospital Setting. **2020**.
36. Fabro, M. Stroke Management: Dysphagia Screening Program. **2016**.
37. Immovilli, P.; Rota, E.; Morelli, N.; Marchesi, E.; Terracciano, C.; Zaino, D.; Ferrari, G.; Antenucci, R.; Guidetti, D. Diagnostic Accuracy of a Bedside Screening Tool for Dysphagia (BSTD) in Acute Stroke Patients. *J Stroke Cerebrovasc Dis* **2021**, *30*, 105470, doi:10.1016/j.jstrokecerebrovasdis.2020.105470.
38. Knight, K.; Pillay, B.; Van der Linde, J.; Krüger, E. Nurses' Knowledge of Stroke-Related Oropharyngeal Dysphagia in the Eastern Cape, South Africa. *S Afr J Commun Disord* **2020**, *67*, e1–e7, doi:10.4102/sajcd.v67i1.703.
39. Osawa, A.; Maeshima, S.; Tanahashi, N. Water-Swallowing Test: Screening for Aspiration in Stroke Patients. *Cerebrovasc Dis* **2013**, *35*, 276–281, doi:10.1159/000348683.
40. Howard, M.M.; Block, E.S.; Mishreki, D.; Kim, T.; Rosario, E.R. The Effect of Sensory Level Versus Motor Level Electrical Stimulation of Pharyngeal Muscles in Acute Stroke Patients with Dysphagia: A Randomized Trial. *Dysphagia* **2023**, *38*, 943–953, doi:10.1007/s00455-022-10520-7.
41. Mata, S.; Blánquez, B.; Serrano, F. The Oropharyngeal Dysphagia Screening Test for Patients and Professionals: Validation in Cognitive Impairment and in Severe Mental Illness. *Dysphagia* **2024**, 1–12.
42. Guillén-Solà, A.; Marco, E.; Martínez-Orfila, J.; Donaire Mejías, M.F.; Depolo Passalacqua, M.; Duarte, E.; Escalada, F. Usefulness of the Volume-Viscosity Swallow Test for Screening Dysphagia in Subacute Stroke Patients in Rehabilitation Income. *NeuroRehabilitation* **2013**, *33*, 631–638, doi:10.3233/NRE-130997.
43. Zhang, P.-P.; Yuan, Y.; Lu, D.-Z.; Li, T.-T.; Zhang, H.; Wang, H.-Y.; Wang, X.-W. Diagnostic Accuracy of the Eating Assessment Tool-10 (EAT-10) in Screening Dysphagia: A Systematic Review and Meta-Analysis. *Dysphagia* **2023**, *38*, 145–158, doi:10.1007/s00455-022-10486-6.
44. Brodsky, M.B.; Suiter, D.M.; González-Fernández, M.; Michtalik, H.J.; Frymark, T.B.; Venediktov, R.; Schooling, T. Screening Accuracy for Aspiration Using Bedside Water Swallow Tests: A Systematic Review and Meta-Analysis. *Chest* **2016**, *150*, 148–163, doi:10.1016/j.chest.2016.03.059.
45. 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*, e195-200, doi:10.1016/j.jstrokecerebrovasdis.2013.09.031.

46. Riera, S.A.; Marin, S.; Serra-Prat, M.; Tomsen, N.; Arreola, V.; Ortega, O.; Walshe, M.; Clavé, P. A Systematic and a Scoping Review on the Psychometrics and Clinical Utility of the Volume-Viscosity Swallow Test (V-VST) in the Clinical Screening and Assessment of Oropharyngeal Dysphagia. *Foods* **2021**, *10*, doi:10.3390/foods10081900.
47. Wilson, R.D.; Howe, E.C. A Cost-Effectiveness Analysis of Screening Methods for Dysphagia after Stroke. *PM R* **2012**, *4*, 273–282, doi:10.1016/j.pmrj.2011.09.006.
48. Meletis, S.; Bloom, L.; Pierce, N.L.; McKoy, C.; Brorson, J. Abstract TMP77: Nurse-Driven Bedside Swallow Screen Facilitates Identification of Dysphagia in Stroke Patients and Reduces Aspiration Pneumonia. *Stroke* **2019**, *50*, ATMP77–ATMP77.
49. Holmes, K.B. Encouraging Nurse Autonomy Through Skills Validation to Increase Dysphagia Screenings in Adults. **2022**.
50. Zhang, L.; Kamen, S.; Niles, J.; Goss, J.; Heslin, M.E.; Vigilante, N.; Thau, L.; Edwards, C.; Marden, K.R.; Thon, J.M. Resident-Driven Dysphagia Screening Protocol for Expedited Antithrombotic Delivery in Acute Ischemic Stroke. *The Neurohospitalist* **2022**, *12*, 467–475.
51. Nielsen, A.H.; Winding, R.; Busk, B.H.; Noe, L.; Husted, B.; Kristensen, G.J.; Svenningsen, H.; Ovesen, T. Nurse-Led Dysphagia Screening in the Intensive Care Unit – An Implementation Study. *Australian Critical Care* **2024**, 101100, doi:10.1016/j.aucc.2024.07.081.
52. Ebersole, B.; Lango, M.; Ridge, J.; Handorf, E.; Farma, J.; Clark, S.; Jamal, N. Dysphagia Screening for Pneumonia Prevention in a Cancer Hospital: Results of a Quality/Safety Initiative. *Otolaryngology–Head and Neck Surgery* **2020**, *162*, 220–229.