Research Article

A Survey of Clinician Decision Making When Identifying Swallowing Impairments and Determining Treatment

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Purpose: Speech-language pathologists (SLPs) are the primary providers of dysphagia management; however, this role has been criticized with assertions that SLPs are inadequately trained in swallowing physiology (Campbell-Taylor, 2008). To date, diagnostic acuity and treatment planning for swallowing impairments by practicing SLPs have not been examined. We conducted a survey to examine how clinician demographics and swallowing complexity influence decision making for swallowing impairments in videofluoroscopic images. Our goal was to determine whether SLPs' judgments of swallowing timing impairments align with impairment thresholds available in the research literature and whether or not there is agreement among SLPs regarding therapeutic recommendations.

Method: The survey included 3 videofluoroscopic swallows ranging in complexity (easy, moderate, and complex). Three hundred three practicing SLPs in dysphagia management participated in the survey in a web-based format (Qualtrics, 2005) with frame-by-frame viewing capabilities. SLPs' judgments

of impairment were compared against impairment thresholds for swallowing timing measures based on 95% confidence intervals from healthy swallows reported in the literature.

Results: The primary impairment in swallowing physiology was identified 67% of the time for the easy swallow, 6% for the moderate swallow, and 6% for the complex swallow. On average, practicing clinicians mislabeled 8 or more swallowing events as impaired that were within the normal physiologic range compared with healthy normative data available in the literature. Agreement was higher among clinicians who report using frame-by-frame analysis 80% of the time. A range of 19–21 different treatments was recommended for each video, regardless of complexity.

Conclusions: Poor to modest agreement in swallowing impairment identification, frequent false positives, and wide variability in treatment planning recommendations suggest that additional research and training in healthy and disordered swallowing are needed to increase accurate dysphagia diagnosis and treatment among clinicians.

Speech-language pathologists (SLPs) are the primary health care providers who manage dysphagia. A report from the American Speech-Language-Hearing Association (ASHA) indicates that the caseload of SLPs working in health care settings primarily involves management of swallowing disorders (ASHA, 2007, 2015). Swallowing is also a required competency in the curriculum for

accredited academic programs in speech-language pathology (Communication Sciences and Disorders; ASHA, 2015). Thus, as primary providers of dysphagia care, SLPs should be among the most knowledgeable practitioners on swallowing physiology in both health and disease. Nonetheless, the role of SLPs as the primary service provider in dysphagia has been challenged, with some assertions that SLPs are inadequately trained in swallowing physiology (Campbell-Taylor, 2008). Experts in the field have further raised concerns regarding the efficacy of dysphagia rehabilitation outcomes (Langmore, 1995; Logemann, 2012; Rosenbek, 1995). Given current health care standards in the United States and abroad, if dysphagia management is not considered to be a skilled, physiology-based behavioral intervention, financial reimbursement could be reduced or denied. This could have serious negative effects on the SLPs' scope of practice and significantly impact the availability of dysphagia care for patients.

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Investigating the current state of dysphagia management and SLP practice patterns is both sensitive and controversial. The notion that SLPs might lack the necessary training and preparedness to make accurate diagnoses and appropriate treatment recommendations has not been directly examined among practicing SLPs, possibly due to a fear of generating negative characterizations of the profession and controversy surrounding the current state of dysphagia management (Rosenbek, 1995). Although concerns regarding the lack of evidence-based practice in dysphagia management have been identified, few have proposed possible causes or solutions. We consider three factors to represent significant contributors to this dilemma.

Insufficient Training in Swallowing

In healthy humans, swallowing is frequent, fast, and seemingly simple, occurring in less than 1 s (Rudney, Ji, & Larson, 1995). Yet, research shows that swallowing is a highly complex act requiring sensorimotor integration and coordination with other physiologic functions (i.e., respiration, mastication; Matsuo & Palmer, 2009). To achieve this act safely and efficiently, swallowing requires rapid and precise coordination of more than 25 muscle pairs and six cranial nerves (V, VII, IX, X, IX, and XII). In addition, there are several cortical, subcortical, and brainstem structures that play a critical role in the sensorimotor integration of swallowing in the central nervous system (CNS; Hamdy et al., 1999; Kendall, McKenzie, Leonard, Goncalves, & Walker, 2000).

According to an ASHA SLP Health Care Survey based on 2005–2015, SLPs from general medical and long-term acute care hospitals who worked with adults spent most (57%–59%) of their time treating patients with swallowing disorders (ASHA, 2015). Despite the fact that it represents most SLP caseloads in hospitals, the undergraduate curriculum in Communication Sciences and Disorders programs does not require a full course on swallowing and most graduate level curricula offer only one course in swallowing. Furthermore, some programs only offer a course in swallowing as an elective or in combination with a related topic, such as voice disorders. It is likely that one graduate-level course in swallowing does not adequately provide enough education and training to delve deeply into complex but essential concepts required to be proficient in this area. For instance, an essential skill involves connecting images seen on instrumental evaluation (videofluoroscopy or fiberoptic endoscopic evaluation of swallowing [FEES]) to a sensorimotor swallowing pathophysiology diagnosis and to prescribe a treatment plan that addresses the specific pathophysiologies. One graduate course may not offer sufficient access to and practice with interpreting images of swallowing, nor the critical thinking skills and training in objective swallowing analysis needed to accurately describe swallowing physiology or pathophysiology. After graduate school, practicing clinicians may be able to advance their knowledge base via continuing education units on the topic of swallowing or by becoming a board-certified specialist

in swallowing. However, it is unknown whether any of these forms of education (university level, continuing education) can influence clinical decision making in swallowing.

We propose that the complexity of swallowing and limited training prohibits regular and accurate implementation of physiology-based clinical decisions into dysphagia management. One of the primary goals of the SLP is to detect, diagnose, and treat swallowing pathophysiologies that contribute to unsafe or inefficient swallowing (ingested material enters the trachea; postswallow residue in the pharynx). An incomplete understanding of the typical swallowing process of safe and efficient swallowing therefore poses a significant barrier to this goal.

Health Care System Barriers

Limited training in healthy and disordered swallowing is compounded by a health care system that limits SLPs' access to the essential instrumentation and time needed to accurately diagnose pathophysiology. Access refers to the availability and frequent use of instrumental techniques such as videofluoroscopy and/or FEES to objectively assess physiology and make appropriate diagnoses. This is essential because clinical bedside evaluations, although quick and informative, are meant to screen for aspiration risk or determine the likelihood that pharyngeal dysphagia is present, not to diagnose pathophysiology or make objective decisions about bolus flow (McCullough, Wertz, & Rosenbek, 2001; O'Horo, Rogus-Pulia, Garcia-Arguello, Robbins, & Safdar, 2015; Rosenbek, McCullough, & Wertz, 2004). When SLPs are denied or given limited access to videofluoroscopy and/or FEES, they are denied the ability to evaluate pathophysiology and make accurate judgments about penetration/aspiration, and are unable to make physiology-based treatment decisions. This is analogous to a neurologist diagnosing and treating a stroke based on "signs or symptoms" noted by the patient, in place of utilizing appropriate imaging techniques (i.e., computed tomography scan or magnetic resonance imaging). In addition, to properly evaluate swallowing events during videofluoroscopy, a minimum temporal resolution of 30 frames per second is required. Poor access can include recording at reduced frame rates (i.e., 7 frames per second), which can be inadequate for capturing essential swallowing events (Bonilha et al., 2013). In some cases, clinicians may not have the ability to record videofluoroscopy for a secondary review due to lack of equipment or limited access to archived materials. Given the rapid nature of swallowing, reviewing swallowing studies in slow motion is essential. However, this requires recording equipment and access to materials for offline frame-by-frame viewing of videofluoroscopic swallow studies, and poor access can also be a significant barrier. We believe access to and frequent use of appropriate imaging techniques for SLPs should be standard care. Underutilization of these techniques is a barrier to SLPs' ability to accurately diagnose and treat dysphagia.

In addition to having access to appropriate imaging tools, sufficient time is necessary to analyze objective studies, make appropriate judgments about physiology and bolus flow, and then formulate a treatment plan for each patient. SLPs who practice dysphagia management are often faced with overwhelming caseloads and high productivity standards. According to the 2015 ASHA Health Care Survey, the average (mean) productivity requirement for SLPs was 86% for those working in skilled nursing facilities and 80% for those working in general medical hospitals, rehabilitation facilities, and long-term acute care hospitals. These productivity standards include only direct patient care/contact, and due to high volumes of patients who need to be evaluated, there may not be sufficient time in scheduling to allow for a critical review, an objective swallowing analysis, or a thorough documentation.

Limited Evidence in Dysphagia Treatment

The current evidence for efficacy of various treatment strategies for dysphagia management is limited with few well-designed studies that support the use of many common swallowing treatment strategies (Langmore & Pisegna, 2015). In fact, many studies in the swallowing literature report only immediate and not long-term effects, include only healthy subjects, and/or omit the use of a control group, thus limiting our ability to determine if specific treatments are truly effective in a dysphagic population (Langmore & Pisegna, 2015). An overemphasis on bolus-related and/or patient-reported primary outcome measures also exists. This has limited our understanding of how treatment and techniques influence swallowing physiology that is responsible for penetration, aspiration, or residue. Overall, the available evidence that supports the use of various treatment techniques for specific impairments is limited. As a result, the ability of SLPs to match pathophysiology to appropriate treatment techniques is hindered.

Currently, it is unclear what factors influence SLPs' judgments of swallowing impairments or whether or not SLPs select treatments that are supported by an appropriate physiologically based rationale. An important goal of this study was to determine whether SLPs' judgments of swallowing impairments align with the research literature where there are established swallowing events and timing measures with norms that have specific measurement criteria (i.e., laryngeal vestibule closure [LVC] duration, hyoid movement, duration of upper esophageal sphincter opening [dUESO]).

This is significant for two reasons: (a) If SLPs are using subjective measures to identify impairments that can be identified with more objective methods, there is an opportunity to improve standardization of impairment analysis and prevent excessive false positives. An example is determining swallow onset delay by the time of swallow onset related to bolus head position (more subjective and used frequently in the clinic) versus determining swallow reaction time (SRT; time between the first frame of hyoid burst and the first frame when bolus head passes the ramus

of the mandible). (b) SLPs need to make judgments on the function of muscle hydrostats that are difficult to measure (i.e., tongue, velum, pharynx); thus, research is needed to identify objective means for measuring these structures.

The first goal of the study was to determine whether swallowing complexity or reported education and training on the topic of swallowing impact clinical decision making. We hypothesized that SLP judgments of swallowing impairments would align with the research literature to a greater degree in swallows that have fewer and more obvious impairments compared with complex swallows and would also be higher among respondents who report having had more university-level education and continuing education certifications that focused on swallowing. Another objective was to determine whether frequency in use of instrumentation influences clinical decision making. We hypothesized that limited access to instrumental techniques and training in frame-by-frame analysis poses an additional barrier to SLPs' ability to diagnose pathophysiology.

The second goal of this study was to determine if there is an agreement among SLPs regarding treatment decisions for specific pathophysiologies and if treatment rationales are physiologically based. Previous investigations have reported a great variability in treatment planning by SLPs and that the use of exercise-based dysphagia interventions is limited (Carnaby & Harenberg, 2013). We hypothesized that treatment decisions and rationales would be extraneous to the pathophysiology and focus more on bolus outcomes (aspiration or penetration) and diet recommendations when swallows were more complex and when respondents reported less education on the topic of swallowing. We also hypothesized that a lack of research for the treatment of swallowing pathophysiology, especially for timing impairments, forces SLPs to rely on anecdotal evidence and clinical experiences, which results in a wide variability in clinical decisions regarding treatment approaches among practicing SLPs.

Method

Survey Development

Researchers first disseminated a pilot survey study using Survey Monkey to develop hypotheses and refine questions that were ultimately used in the final distributed survey. The pilot survey also allowed us to assess the feasibility of the proposed survey methods. Results from the pilot testing were only used to finalize questions for the final distributed survey; thus, details regarding methods and results of pilot testing are beyond the scope of this article. Responses from each pilot study question were carefully reviewed, and several questions were added to the final distributed survey to better delineate SLP practice patterns and understand rationales. The wording of questions for the final distributed survey was chosen based on published methods for reducing bias in survey development (Bowden, Fox-Rushby, Nyandieka, & Wanjau, 2002; Kelley, Clark, Brown, & Sitzia, 2003; Schleyer & Forrest, 2000). The final

distributed survey was reformatted for distribution using Qualtrics software (Qualtrics, 2005), rather than Survey Monkey, because it offered a secure, Internet-based software program with detailed response filtering capabilities for descriptive statistical analyses.

Before launching the final distributed survey, the survey was distributed to four content expert SLPs with 2–12 years of clinical experience in dysphagia management to assess face and content validity. All four SLPs provided feedback for the survey, and after incorporating their comments, a final survey of 18 items (six identical questions for three different videofluoroscopic swallows) was constructed. Twelve demographic questions were also included, based on feedback, to better delineate what factors may influence SLP practice patterns.

Information obtained in this survey was recorded in such a manner that the participants could not be identified, directly or through identifiers linked to the subjects. Therefore, it was exempt from institutional review board review at the Johns Hopkins University and University of Florida.

Survey Items

The following introductory message was displayed to each participant before starting the survey: “Thank you for choosing to participate in our survey! We are conducting evidence-based research on clinical decision making in dysphagia practice. Your participation will help us to better understand clinical practice patterns for those who diagnose and treat individuals with dysphagia. You will be watching videofluoroscopic swallows from 3 separate patients (1 swallow each). You will be asked to answer a series of questions for each swallow. Answers are completely anonymous and the survey should take between 15–25 minutes to complete. Thank you!”

The survey began with 12 demographic questions to determine professional setting, educational background, years of clinical experience, and other factors that can influence clinical decision making (see Table 1). After the demographics section, three videofluoroscopic swallowing clips that were categorized as easy, moderate, and complex were presented (further detailed below). The videos were always presented in the order of easy, moderate, and then complex; however, there was no indication to the participants that the degree of difficulty varied in this survey. Six identical questions regarding diagnosis and treatment were presented in a fixed order after each video (see Appendix).

The first two questions were presented to target identification of swallowing impairments: “Please identify all problems that you have identified in the swallow (choose all that apply)” (Question 1) and “Which impairment was the most significant (choose one option)” (Question 2). The intent of asking respondents to identify the “most significant” impairment was to capture the respondent’s impression of “primary” impairment. Twenty percent of the participants in the pilot study chose to only treat the bolus (i.e.,

Table 1. Summary of survey demographics

Gender	
Male	20%
Female	80%
Years spent treating dysphagia	
< 1	3%
1–5	34%
6–10	23%
11–20	24%
21+	16%
Current and previous practice settings (select all that apply)	
Medical hospital	77%
Rehabilitation hospital	55%
Pediatric hospital	6%
Skilled nursing facility	54%
Home health	34%
Outpatient	60%
Private practice	10%
Research laboratory	7%
Other	5%
Number of VFSSs performed each week (average)	
< 1	32%
1–2	25%
3–5	25%
6–10	13%
11+	5%
Frequency of frame-by-frame analysis for VFSS reviewing	
Never	32%
20%	15%
40%	19%
60%	18%
80%	11%
100%	5%
Highest degree status	
PhD	7%
MA/MS/MEd	93%
Certifications	
CCC-SLP	87%
MBSImP	20%
BCS-S	10%
Country	
United States or Canada	94%
Other	6%
Had a dedicated swallowing course	
Yes	75%
No	25%

Note. VFSS = videofluoroscopic swallowing study; CCC-SLP = Certificate of Clinical Competence in the field of Speech-Language Pathology; MBSImP = Modified Barium Swallow Impairment Profile; BCS-S = Board-Certified Specialist in Swallowing and Swallowing Disorders.

penetration, aspiration, or residue); therefore, we purposefully did not ask participants to choose the “primary pathophysiology” to avoid selection bias toward participants choosing a physiologic impairment versus bolus flow outcome. Respondents were able to choose from a list of 21 different physiologic impairments and bolus flow outcomes. Physiologic impairments were chosen by the authors to represent pharyngeal impairments that may cause or increase the risk of airway safety or pharyngeal inefficiency; therefore, impairments exclusive to the oral phase (i.e., lip closure) were

not included. The list included 10 items from the Modified Barium Swallow Impairment Profile (MBSImP; Martin-Harris et al., 2008). These events included initiation of pharyngeal swallow, velopharyngeal function (soft palate elevation), anterior hyoid excursion, epiglottic inversion, LVC (amount), pharyngeal stripping wave, upper esophageal sphincter (UES) or pharyngoesophageal segment opening (amount), base of the tongue to pharyngeal wall contact (tongue base retraction), esophageal clearance, and residue. An additional nine items were included to capture timing abnormalities, bolus flow outcomes, and other physiologic impairments that are not included in the MBSImP (Martin-Harris et al., 2008), to provide a comprehensive list of the possible impairments respondents might choose. These included tongue control during posterior propulsion, premature spillage, hyoid superior movement, dUESO, LVC duration, LVC reaction time (LVCrt), penetration, aspiration, and poor sensation. To avoid forcing respondents to choose an impairment when it is unknown or not present, the options “nothing is wrong” and “something is wrong, but I don’t know what it is” were also included (see Appendix).

The next four questions focused on treatment decisions: “Which of the options listed below would you target first in treatment (choose one option)?” (Question 3), “Provide a brief rationale (free-text response)” (Question 4), “List the treatments you would recommend to address the problem you chose to target first (choose all that apply)” (Question 5), and “Provide a brief rationale for your treatment choice (free-text response)” (Question 6). The list of treatment options was chosen to represent traditional compensatory strategies and rehabilitative/exercise techniques as well as other options such as recommendations for *nil per os* (NPO) or “nothing by mouth,” alternative nutrition, oral swabs, referrals, none, or other (Vose, Nonnenmacher, Singer, & Gonzalez-Fernandez, 2014). The list of questions and all possible responses as seen in the survey is shown in the Appendix. The order of the questions remained fixed for all participants; however, the order of response options was randomized by Qualtrics randomizing software for each participant, which was needed to eliminate order effect.

Operationally Defining Swallowing Complexity

In the medical field, complexity measures are operationally defined by specific subspecialties. For example, for surgical oncologists, an increased complexity for liver resection (hepatectomy) has been defined in the literature as cases requiring left subclavian artery coverage, visceral aortic debranching, or brachiocephalic aortic debranching (Muangkaew et al., 2016). However, no definition of patient complexity has been established in the swallowing literature. Several studies in the medical field, however, agree that case complexity is multifaceted and defining complexity based merely on frequency measures (i.e., the number of medical conditions present, the number of medications needed) is not sufficient for capturing or defining patient complexity (Grant et al., 2011; Higashi et al., 2007).

For the purposes of this study, a modified Delphi exercise was conducted for content validation and operationalization of case complexity criteria. Swallowing complexity was determined by three factors: (a) the number of impairments present in the swallow (i.e., delayed SRT, reduced duration of LVC [dLVC]); (b) the transient nature of the swallowing impairment(s; i.e., < 600 ms), requiring frame-by-frame analysis; and (c) the degree to which the swallowing event is out of normal range. Three swallows (described in detail below) were chosen to represent different levels of swallowing complexity (easy, moderate, and complex).

Objective and Subjective Analyses of Swallowing Videos

Each of the three swallowing videofluoroscopy clips underwent subjective and objective swallowing analyses conducted by two independent experienced reviewers to ensure accuracy and allow for the calculation of interrater reliability. Five swallowing events for Questions 1–3 could be objectively measured, meaning a number could be ascribed to quantify the phenomenon (i.e., duration of swallow onset delay). The remaining 16 other response items are primarily subjectively rated because objective measures were not used to quantify the phenomenon (i.e., lingual propulsion). Subjective ratings were independently rated and judged as 1 = *impaired* or 0 = *not impaired*.

Three swallows were specifically chosen that had one or more primary impairments that could be objectively measured based on techniques, rules, and impairment thresholds from healthy swallows available in the research literature. To adhere to these criteria and maintain objectivity, all primary pathophysiologies included impairments of swallow timing (delayed SRT and delayed LVCrt). These impairments were deemed appropriate as they are recognized as one of the major causes of aspiration in patients with neurological impairment (Cabib et al., 2016; Park, Kim, Ko, & McCullough, 2010; Kahrilas, Lin, Rademaker, & Logemann, 1997). Because agreement between SLP judgments and norms available in the research literature (described below) was a primary outcome in this study, we required perfect intrarater and interrater reliability of objective measures by the reviewers.

Swallowing timing and durations were calculated using frame-by-frame, blinded analyses with Quicktime7 (Apple Inc., 2016) to calculate five parameters of interest:

1. SRT also known as stage transition duration: time between hyoid burst and the first frame that the bolus passes the ramus of the mandible (Daniels, Schroeder, DeGeorge, Corey, & Rosenbek, 2007; Molfenter & Steele, 2012)
2. dLVC: time between the first frame of LVC and reopening (Molfenter & Steele, 2012)
3. LVCrt: time between hyoid burst and the first frame of LVC (Guedes et al., 2017)
4. Duration to maximum hyoid elevation: time between hyoid burst and the first frame of hyoid at

the maximum superior position (Molfenter & Steele, 2012)

5. dUESO: time between the first frame when the UES opens and the first frame when the UES closes (Dantas et al., 2009; Molfenter & Steele, 2012)

Swallowing safety was recorded based on the worst score obtained on the Penetration–Aspiration Scale (PAS) for each video clip. The PAS considers the severity of airway protection (i.e., depth of penetration vs. aspiration) as well as the presence and effectiveness of expulsion in the case of airway invasion (Rosenbek, Robbins, Roecker, Coyle, & Wood, 1996).

Primary Impairment Identification

The primary impairment for each video, which was defined as the event that was most responsible for causing aspiration, residue, or penetration, was identified for the easy, moderate, and complex videos. For instance, if a patient aspirated only before swallowing onset and was found to have both a delayed swallowing onset (SRT) and a short dUESO, then the delayed swallowing onset would be considered the primary impairment that was responsible for aspiration. Secondary impairments were those that were out of normal range but did not cause the aspiration, residue, or penetration in that swallow. Primary and secondary impairments that caused or contributed to airway safety or efficiency were determined by consensus.

Agreement Criteria

Cohen's κ was run to determine if there was an agreement between the two raters' judgments on whether or not a subjective component of swallowing was (a) impaired or (b) not impaired. There was an excellent agreement between the raters' judgments for all three swallows, $\kappa = 1.0$ ($p < .05$). Interrater and intrarater reliability of objective measures (durations in seconds) were calculated using an intraclass correlation coefficient. Both interrater and intrarater reliability of objective measures had perfect intraclass correlation coefficients of 1 for all three swallows. All physiological variables that were measured were compared with published normative data (Daniels et al., 2007; Dantas et al., 2009; Guedes et al., 2017; Molfenter & Steele, 2012). The timing measures that are outside the reference range threshold and thus increase the risk of aspiration for each of the three swallows are in bold (see Table 2). These measures were used as a reference standard for each video (described in detail below) to determine agreement.

Easy Video

This video was characterized as “easy” because delayed SRT was the only physiologic impairment and was well outside the reported upper confidence interval (CI) for a 10-ml thin liquid bolus. This patient had accumulation of the bolus in the valleculae and pyriform sinuses after the bolus was propelled into the pharynx because the swallow

did not initiate for 27 s (26.46 s outside the upper 95% CI [0.54]; Daniels et al., 2007; Molfenter & Steele, 2012; see Table 2). Given the long swallow onset delay, slow-motion frame-by-frame viewing was not needed to detect this impairment. This patient penetrated immediately before the swallow with material entering the airway (above the vocal folds) that was ejected; thus, the PAS score was 2 (Rosenbek et al., 1996; see Figure 1).

Moderate Video

This patient aspirated and ejected the bolus before the swallow was initiated (PAS of 6; Rosenbek et al., 1996). The bolus entered the airway because of swallow onset delay (1.46 s outside the upper 95% CI [0.54]; Daniels et al., 2007; Molfenter & Steele, 2012). In addition to the delay, this patient also had reduced LVC duration and reduced UES opening amount and duration (Martin-Harris et al., 2008; Molfenter & Steele, 2012; see Table 2). However, neither of these contributed to the aspiration as they occurred after the bolus was aspirated and then ejected from the airway. Compared with the easy video, this swallow had more than one physiologic impairment with a primary impairment (swallow onset) that was, to a much lesser degree, outside the reported upper CI for SRT and thus was classified as moderate (see Figure 1).

Complex Video

This patient was classified as complex because, among several impairments, aspiration occurred due to a primary impairment of LVCrt, a swallowing event that occurs rapidly (less than 0.22 s) and is difficult to diagnose without viewing frame-by-frame (Guedes et al., 2017). In addition, LVCrt is a swallowing event that is not frequently described in the literature and thus likely not thoroughly trained in formal courses or in clinical settings. In this swallow, LVCrt was 0.67 s, three times longer than the upper 95% CI (0.22) for healthy swallows (Guedes et al., 2017; see Table 2). Still, 0.67 s is difficult to differentiate from 0.22 s without viewing frame-by-frame. SRT was within normal limits occurring in 0.47 s (upper 95% CI [0.54]) but can often be confused with LVCrt. This patient also had a reduced amount of UES opening and reduced dLVC (Martin-Harris et al., 2008; Molfenter & Steele, 2012). However, neither of these contributed to aspiration as they occurred after the bolus was already aspirated due to delayed closure of the laryngeal vestibule (see Figure 1).

Because the goal of this investigation was to determine an agreement between SLP identification of swallowing impairments when compared with objective normative data in the research literature, we did not provide patient history or demographics to the participants. Our working theory was that swallowing impairments in this survey could be identified regardless of etiology (i.e., stroke, head and neck cancer).

Table 2. Timing measurements for each videofluoroscopic swallow.

Objective timing parameter (threshold in seconds)	Easy	Moderate	Complex
Swallow reaction time or SRT (> 0.54 s) Daniels et al. (2007), Molfenter & Steele (2012)	27.0	2.0	0.47
Duration of LVC or dLVC (< 0.31 s) Molfenter & Steele (2012)	0.37	0.20	0.07
LVC reaction time or LVCrt (< 0.22 s) Guedes et al. (2017)	0.20	0.10	0.67
Duration to maximum hyoid bone elevation (> 0.29 s) Molfenter & Steele (2012)	0.17	0.20	0.07
Duration of UES open or dUESO (< 0.18 s) Dantas et al. (2009), Molfenter & Steele (2012)	0.57	0.10	0.37
Subjective parameter			
Penetration–Aspiration Scale score (1–8) Rosenbek et al. (1996)	2	6	7
Primary impairment (caused or increased aspiration risk)	SRT	SRT	LVCrt
Secondary impairments	None	dLVC, dUESO, amount UESO	dLVC, dUESO, amount UESO

Note. Thresholds based on 95% confidence intervals calculated from published literature; if multiple tasks were reported in the reference article, the authors chose the reference task most similar to the current study. The numbers in bold font indicate swallowing measures that are outside the reference range threshold and thus increase aspiration risk. Subjective primary and secondary impairments are also shown. LVC = laryngeal vestibule closure; UES = upper esophageal sphincter.

Figure 1. Normative ranges for swallow reaction time and laryngeal vestibule closure reaction time (LVCrt) are compared with the timing of airway invasion for the easy patient, the moderate patient, and (d) the complex patient.

All swallowing clips may be viewed online (Swallowing Systems Core, 2016).

Distribution and Recruitment

Survey enrollment was voluntary, and no incentives were offered to participants. Participants in the current study were obtained using five methods:

1. Advertisement in the listserve of the Special Interest Group 13 (SIG13), Swallowing and Swallowing Disorders (Dysphagia) of ASHA. This group was selected to target a population of clinicians who practice dysphagia management in various settings. The introductory message and web link to the online survey were posted on the SIG13 message board.
2. E-mail addresses of SLPs were collected from hospitals by contacting SLP departments and asking for potential participation. Nine hospitals were contacted, and 31 group e-mails were sent and distributed to acute care inpatient, inpatient rehabilitation, and outpatient departments within each hospital. Each e-mail included the survey description and link.
3. The introductory message and survey link were also posted on the following Facebook groups: Dysphagia Therapy Group–Professional Edition (8,776 members), Medical SLP Group (9,265 members), and Adult Rehab Speech Therapy (8,530 members). Once potential participants clicked on the embedded link in the Facebook post, they were redirected to the Qualtrics survey website.
4. Three SLP state associations permitted access to membership e-mails, allowing distribution of the introductory message and survey link to those members. The three state associations included Delaware (262 members), Hawaii (140 members), and Alabama (680 members).
5. Because survey links were not individualized, participants were able to share the link to other SLPs by forwarding e-mails or sharing via social media (i.e., Facebook, Twitter, listserves).

The survey was active between April 1, 2015, and July 16, 2015. The respondents were not required to complete the survey in one attempt, and no time limit was implemented. Respondents could also edit previously answered questions before submission. If respondents chose to do so, directions for watching the video frame-by-frame were provided under each video (see Figure 2). Thus, both the independent reviewers (authors) and the respondents could utilize the same procedures to make judgments about each video. The survey could be completed on a computer or on a mobile platform (i.e., cell phone, tablet). Respondents were only permitted to submit the survey once. To discourage respondents from participating in the survey more than once, the first question of the survey was “Have you taken this survey before?” A “yes” response prevented continued participation in the survey.

Figure 2. Instructions for participants, as seen in the survey, to view swallows frame-by-frame.

Data Analysis

Descriptive statistics (frequencies, percentages, and means) were used to report demographic data and to delineate and describe trends in SLP practice patterns for each survey question outlined below. Agreement was determined using descriptive statistics of SLP judgments of impairment identification and was compared against impairment thresholds based on 95% CIs from healthy swallows reported in the literature (Daniels et al., 2007; Dantas et al., 2009; Guedes et al., 2017; Molfenter & Steele, 2012). Logistic regression was used to identify the participant demographics that showed statistically significant higher odds for obtaining agreement between SLP judgments and literature norms when identifying a primary impairment. A Friedman test was used to test for differences in agreement based on patient complexity level (easy, moderate, and complex). Statistical analyses were completed using SPSS 24.

Question 1: “Please indicate all problems you have identified in the swallow”

This question allowed participants to select multiple response options, thus allowing the possibility of false and true positives. False positives occurred when a response option that was within the normal range was identified as impaired by respondents. True positives occurred when a response option that was truly impaired (outside the normal range) was correctly identified as impaired by respondents. Percentages of true and false positives were derived.

Question 2 (“Which impairment was the most significant?”) and Question 3 (“Which of the options listed below would you target first in treatment?”)

Both of these questions allowed selection of only one response item; thus, response percentages were calculated for Questions 2 and 3. The responses to Questions 2 and 3 were compared to determine the percentage of respondents who chose to treat an impairment (Question 3) that was not identified as the most significant (Question 2).

Question 4: “Provide a brief rationale (for selecting the impairment you chose to target first in treatment)”

Rationales were obtained in an open text format and reviewed by four independent reviewers to determine if rationales were based on physiology (binary: yes (1) = *physiologically based*, no (0) = *no mention of physiology*). Physiology-based answers were those (regardless of agreement with authors) that had a rationale that included a physiologic mechanism. If there was no mention of physiology and the impairment chosen was rationalized based on bolus flow or other extraneous reasons, then a “0” was ascribed to the rationale (physiology not present). An example of a “0” response is as follows: “I would target aspiration because it leads to pneumonia.” Conversely, if a rationale included any physiology, then a “1” was ascribed to the rationale. An example of a “1” response is as follows: “Swallow onset (hyoid burst) occurred many seconds after the bolus head passed the ramus of the mandible and resulted in aspiration before the swallow” as a rationale for choosing “swallow onset delay” as the most significant impairment.

Question 5: “List the treatments you would recommend to address the problem you chose to target first”

This question allowed participants to select multiple postural, rehabilitative, bolus modifications or an “other” treatment response. The percentage of respondents who chose each treatment option was calculated.

Question 6: “Provide a brief rationale (for your treatment choice[s])”

The methodology for determining if rationales were physiologically based was the same as Question 4.

Results

Demographics

Five hundred eight respondents opened or initiated the survey; however, 205 did not complete the demographic questions and thus did not view any patient videos or questions and were omitted from data analysis. Data were collected from respondents who completed all diagnostic

questions ($n = 303$) and therapeutic questions ($n = 212$) for the easy video, all diagnostic questions ($n = 191$) and therapeutic questions ($n = 176$) for the moderate video, and all diagnostic questions ($n = 168$) and therapeutic questions ($n = 162$) for the complex video. Of the 162 SLPs who completed the entire survey, 19 participants (11%) were recruited from an e-mail to local hospitals, yielding a response rate of 3.2% for that particular recruitment method. Although response rates could not be calculated for the other recruitment methods, 46 participants (27%) were recruited from ASHA SIG13 and 69 participants (41%) were recruited from Facebook groups. The remaining 35 participants (21%) were recruited by other means that could not be identified. These may include survey links that were forwarded or shared by other participants. The average time to complete the survey was 17 min.

In summary, 87% of the clinicians reported having ASHA’s Certificate of Clinical Competence, and 7% reported having a PhD. Sixty-three percent of the respondents reported having over five years of clinical experience treating dysphagia, and 37% of the respondents reported having five or fewer years of experience. Respondents were asked to indicate the setting(s) where they practice dysphagia management (choosing all that apply), and most indicated that they work in a general medical hospital (77%), a rehabilitation hospital (55%), and/or an outpatient clinic (60%). Half of the respondents reported performing one to five videofluoroscopic swallowing studies (VFSSs) each week on average, 32% performing zero to one, and 18% performing over six per week. Fifty-three percent of the participants reported using frame-by-frame for VFSS reviewing at least 40% of the time, and the remaining 47% reported never using frame-by-frame or using it less than 20% of the time (see Table 1).

Survey Responses

Question 1: “Please indicate all problems you have identified in the swallow.”

Easy video. Delayed swallow initiation, the primary physiologic swallowing impairment, was identified by 88% ($n = 267$) of the participants (true positive). Although swallow onset delay was the only physiologic impairment, 77% ($n = 233$) of the participants identified five or more physiologic impairments and 27% ($n = 82$) chose 10 or more impairments that were not present in the swallow (false positives). Penetration was present in this swallow, which was identified by 63% ($n = 191$) of the participants (see Figure 3).

Moderate video. Swallow initiation, dLVC, dUESO, and amount of UES opening were impaired in this swallow. No participant identified only these four impairments; however, 59% ($n = 113$) identified amount of UES opening, 46% ($n = 88$) identified swallow initiation, 49% ($n = 94$) identified dUESO, and 39% ($n = 74$) identified dLVC as impaired (true positives). Among normal events that were identified as disordered, 82% ($n = 170$) of the participants chose five or more physiologic impairments and 43% ($n = 82$) chose 10 or more impairments that were not present in the swallow (false positives). There was residue postswallow, which

Figure 3. Percentage of participants who chose each response option for Question 1: “Please indicate all problems you have identified in the swallow (choose all that apply).” Total number of respondents for each patient: Patient 1 (easy), $n = 303$; Patient 2 (moderate), $n = 191$; and Patient 3 (complex), $n = 168$. LVC = laryngeal vestibule closure; UES = upper esophageal sphincter.

was identified by 72% ($n = 138$) of the participants, as well as aspiration, which was identified by 51% ($n = 97$) of the participants (see Figure 3).

Complex video. LVCrt, amount of UES opening, dUESO, and dLVC were impaired in this swallow. No participant identified only these four impairments; however, 68% ($n = 114$) identified amount of UES opening, 65% ($n = 109$) identified LVCrt, 54% ($n = 91$) identified dUESO, and 53% ($n = 89$) identified dLVC. For this complex swallow, 92% ($n = 155$) of the participants chose five or more impairments and 59% ($n = 91$) chose 10 or more impairments that were not impaired in the swallow (false positives). There was aspiration during the swallow, which was identified by 95% ($n = 160$) of the participants, as well as residue, which was identified by 64% ($n = 108$) of the participants (see Figure 3).

Question 2: "Which impairment was the most significant?"

Easy video. The primary impairment in this swallow was delayed swallow initiation, which was identified by 67% ($n = 203$) of the respondents. In total, 15% ($n = 45$) identified a bolus outcome as the primary impairment (9% premature spillage, 3% residue, and 3% penetration). The remaining 18% of the responses were distributed among seven different options, with none exceeding 5% (see Figure 4).

Moderate video. The primary impairment was SRT, which was identified by 6% ($n = 11$) of the respondents as the primary impairment. In total, 40% of the respondents identified a bolus outcome as the primary impairment (19% penetration, 9% aspiration, 9% premature spillage, 2% esophageal clearance, and 1% residue). The next most common responses included 12% ($n = 23$) for epiglottic inversion and 8% ($n = 15$) for tongue control during posterior propulsion. The remaining 34% of the responses were distributed among 11 other options, with none exceeding 6% (see Figure 4).

Complex video. The primary impairment in this swallow was LVCrt, which was identified by 6% ($n = 10$) of the respondents. In total, 41% ($n = 68$) chose a bolus outcome (27% aspiration, 9% premature spillage, 2% residue, 2% esophageal clearance, and 1% penetration) as the primary impairment. The most commonly identified physiologic impairment was 17% ($n = 29$) for size/amount of UES opening and 11% ($n = 18$) for LVC (amount). The remaining 25% of the responses were distributed over 12 different options, with none exceeding 6% (see Figure 4).

Across all respondents for Question 2, as noted above, agreement was achieved by 67% for the easy patient, 6% for the moderate patient, and 6% for the complex patient. There was a statistically significant difference in agreement when identifying a primary impairment depending on the level of complexity of the case, $\chi^2(2) = 180.512$, $p < .005$. Post hoc analysis with Wilcoxon signed-ranks tests was conducted with a Bonferroni correction applied, resulting in a significance level set at $p < .017$. There was a statistically significant increase in agreement for the easy patient compared with the moderate patient ($Z = -9.878$, $p < .001$) and the complex patient ($Z = -10.262$, $p < .001$). There were

no significant differences between the moderate and complex patients ($Z = -0.229$, $p = .819$).

Clinicians who reported utilizing frame-by-frame analysis in clinical practice at least 80% of the time yielded the highest agreement rates (90% easy, 52% moderate, and 42% complex). Overall, agreement did not increase across the easy, moderate, and complex categories for groups with specialized training such as board-certified specialization in swallowing (82% easy, 0% moderate, and 11% complex) or those who were MBSImP (Martin-Harris et al., 2008) certified (86% easy, 3% moderate, and 7% complex). The 75% of the respondents who reported having taken a dedicated swallowing course in their academic training were similar to all respondents (61% easy, 7% moderate, and 7% complex).

A logistic regression was performed to ascertain the effects of number of years treating dysphagia, number of MBS studies performed per week (average), frequency of use of frame-by-frame analysis, and whether or not the participant was MBSImP (Martin-Harris et al., 2008) certified or a Board-Certified Specialist in Swallowing and Swallowing Disorders, to examine the likelihood that participants might have a higher agreement when identifying primary impairments. The logistic regression model was statistically significant, $\chi^2(6) = 58.09$, $p < .0005$. The model explained 44.2% (Nagelkerke R^2) of the variance in impairment identification and correctly classified 81.1% of the cases. Those who reported using frame-by-frame analysis at least 80% of the time were 11 times more likely to identify the most significant impairment. Years spent treating dysphagia, the amount of MBS performed each week, and whether one was MBSImP (Martin-Harris et al., 2008) certified or a Board-Certified Specialist in Swallowing and Swallowing Disorders were not independent predictors for agreement in impairment identification.

Question 3: "Which of the options listed below would you target first in treatment?"

Easy video. For the easy swallow, 58% ($n = 176$) of the respondents indicated that they would treat the primary impairment, which was delayed swallow initiation. The next most common treatment focus was tongue control during posterior propulsion (8%, $n = 24$). Nine percent ($n = 27$) of the respondents chose to treat a bolus outcome: premature spillage ($n = 21$), residue ($n = 3$), and penetration ($n = 3$). The remaining 27% ($n = 82$) of the responses were distributed across 13 different treatment targets (see Table 3).

Moderate video. Delayed swallow initiation was the primary impairment in this swallow, and 7% ($n = 13$) chose to treat that impairment. Instead, 23% ($n = 44$) chose to treat LVCrt, and 8% ($n = 15$) chose to treat tongue control during posterior propulsion. Twenty percent chose to treat a bolus outcome: premature spillage ($n = 13$), aspiration ($n = 10$), penetration ($n = 11$), residue ($n = 2$), and esophageal clearance ($n = 2$). The remaining 54% ($n = 103$) of the responses were distributed across 17 different treatment targets (see Table 3).

Figure 4. Percentage of participants who chose each response option for Question 2: “Which impairment was the most significant?” Total number of respondents for each patient: Patient 1 (easy), *n* = 303; Patient 2 (moderate), *n* = 191; and Patient 3 (complex), *n* = 168. LVC = laryngeal vestibule closure; UES = upper esophageal sphincter.

Table 3. Question 2 (Q2) and Question 3 (Q3) responses

Response options	Patient 1 (easy), n = 303		Patient 2 (moderate), n = 191		Patient 3 (complex), n = 168	
	Q2	Q3	Q2	Q3	Q2	Q3
Tongue control during posterior propulsion	2%	8%	8%	8%	5%	9%
Premature spillage	9%	7%	9%	7%	9%	11%
Initiation of pharyngeal swallow/swallow onset time	67% ^a	58%	6% ^a	7%	5%	7%
Velopharyngeal function	0%	1%	1%	1%	2%	1%
Pharyngeal stripping wave	0%	1%	2%	1%	0%	0%
Hyoid superior movement	0%	3%	3%	5%	4%	7%
Hyoid anterior movement	0%	2%	6%	7%	2%	6%
Epiglottic inversion	0%	0%	12%	6%	1%	2%
Size/amount of UES opening	1%	0%	6%	3%	17%	12%
Duration of UES opening	0%	1%	4%	1%	2%	2%
Base of tongue to pharyngeal wall contact	4%	5%	2%	3%	1%	1%
Laryngeal vestibule closure (amount)	2%	2%	6%	6%	11%	12%
Laryngeal vestibule closure (duration)	1%	0%	2%	1%	1%	1%
Laryngeal vestibule closure (reaction time)	3%	3%	0%	23%	6% ^a	7%
Residue	3%	1%	1%	1%	2%	1%
Penetration	3%	1%	19%	6%	1%	1%
Aspiration	0%	0%	9%	5%	27%	17%
Esophageal clearance	0%	0%	2%	1%	2%	1%
Poor sensation	5%	5%	0%	1%	1%	0%
"Nothing is wrong"	0%	1%	1%	3%	0%	0%
"Something is wrong, but I don't know what it is"	0%	1%	1%	4%	1%	2%

Note. Question 2: "Choose the most significant impairment." Question 3: "Which option would you target first in treatment?" UES = upper esophageal sphincter.

^aTrue primary impairment (please refer to the Method section for a detailed description of impairment identification for each video clip).

Complex video. LVCrt was the primary impairment, and 7% ($n = 12$) chose to treat that impairment. Instead, 32% ($n = 53$) chose to treat a bolus outcome: aspiration ($n = 29$), premature spillage ($n = 18$), penetration ($n = 2$), residue ($n = 2$), and esophageal clearance ($n = 2$). The most common physiologic impairments chosen were 12% ($n = 20$) for size/amount of UES opening and 12% ($n = 20$) for LVC amount. The remaining 37% ($n = 62$) of the responses were distributed across 11 different treatment target options (see Table 3).

Question 4: "Provide a brief rationale (for the impairment you chose to treat first)."

Most respondents (although not all) provided a free-text response describing their rationale regarding the impairment they chose to treat first including the easy video ($n = 212$), the moderate video ($n = 176$), and the complex video ($n = 162$). The percentage of respondents who based their rationale on a bolus outcome (with no mention of a physiologic rationale) included 23% ($n = 49$) for the easy video, 35% ($n = 62$) for the moderate video, and 44% ($n = 71$) for the complex video. Examples of rationales included "I would target aspiration first to ensure the patient can be on a safe diet" and "I would want to avoid an NPO status."

Question 5: "List the treatments you would recommend to address the problem you chose to target first."

Easy video. Regardless of which impairment respondents chose to treat first, the most commonly recommended

treatments for this swallow were 47% ($n = 100$) for thermal tactile stimulation, 46% ($n = 97$) for effortful swallow, 43% ($n = 91$) for bolus temperature modification (hotter/colder), and 36% ($n = 76$) for chin tuck (see Figure 5). Collectively, each of the 21 treatment options was recommended for this patient by the respondents (see Figure 5). In addition, respondents had the option to indicate their treatment option in a free text field if they selected "other." Among the free-text responses, six additional treatments were added including finding a certified neuromuscular electrical stimulation user, chin tuck against resistance, sour bolus, lingual resistance exercises, oral bolus hold, and biofeedback. When isolating by primary impairment, among the 58% ($n = 176$) of the respondents who indicated that they would treat initiation of the pharyngeal swallow first, the most frequently listed treatments were thermal tactile stimulation (58%, $n = 102$), bolus temperature modification (hotter/colder; 52%, $n = 92$), and effortful swallow (40%, $n = 70$; see Table 4).

Moderate video. The most commonly recommended treatments for this swallow were 41% ($n = 73$) for chin tuck, 36% ($n = 63$) for supraglottic swallow, 35% ($n = 62$) for Mendelsohn maneuver, and 35% ($n = 62$) for Shaker exercise. Again, each of the 21 treatment options was recommended for this patient when collective responses were reviewed (see Figure 5). An additional eight treatments were recommended (free text) in "other," including expiratory muscle strength training, volitional swallow, submandibular electrical stimulation, infrahyoid electrical stimulation, botox to the cricopharyngeus muscle, "base of the tongue"

Figure 5. Percentage of participants who chose each response option for Question 5: “List the treatments you would recommend to address the problem you chose to target first.” Total number of respondents for each patient: Patient 1 (easy), $n = 212$; Patient 2 (moderate), $n = 176$; and Patient 3 (complex), $n = 162$. NDT = nasoduodenal tube; NGT = nasogastric tube; PEG = percutaneous endoscopic gastrostomy tube; IV = intravenous; NPO = nothing by mouth.

elevation exercises (/k/ and /g/), bolus trials with SLPs, and bolus hold. Although LVCrt was not impaired for this patient, most (23%, $n = 44$) chose to treat this impairment first. Of those, the most frequently listed treatment was super-supraglottic swallow (55%, $n = 24$), supraglottic swallow (45%, $n = 20$), and chin tuck (40%, $n = 18$; see Table 4).

Complex video. The most commonly recommended treatments for this swallow were 49% ($n = 79$) for Shaker exercise, 48% ($n = 78$) for Mendelsohn maneuver, 47% ($n = 76$) for increased bolus viscosity, and 46% ($n = 75$) for chin tuck. Overall, 20 treatment options were recommended for this patient by the respondents (see Figure 5). An additional eight treatments were recommended in “other,” including double swallow, submandibular electrical stimulation, laryngeal adduction via vocal exercises, chin tuck against resistance, jaw opening against resistance, lingual resistance training, pitch glides, and bolus hold. Most (17%, $n = 29$) of the respondents chose to treat aspiration first. The most frequently listed treatments to target aspiration were increased bolus viscosity modification (70%, $n = 20$), chin tuck (48%, $n = 14$), effortful swallow (44%, $n = 13$), and Shaker exercise (44%, $n = 13$; see Table 4).

Question 6: “Provide a brief rationale for your treatment choice.”

Most respondents (although not all) provided a free text response describing their rationale regarding the impairment they chose to treat first including the easy video ($n = 212$), the moderate video ($n = 176$), and the complex video ($n = 161$). The percentage of respondents who based their rationale on a bolus outcome (with no mention of a physiologic rationale) included 35% ($n = 74$) for the easy video, 45% ($n = 79$) for the moderate video, and 73% ($n = 118$) for the complex video. Rationales that were not physiology-based

focused on treatment to target overall health outcomes such as “modify diet to decrease the risk of aspiration,” “prevent aspiration PNA [pneumonia] as much as possible,” and “attempt compensatory strategies to eliminate aspiration.”

Discussion

The overall goal of this study was to investigate practice patterns and SLP decision-making processes in dysphagia management. Results of this survey highlight suboptimal agreement with current research literature where objective criteria and normative data exist as well as a wide variability in diagnosis and treatment decisions for targeting swallowing pathophysiologies. In this group of SLPs, overidentification of swallowing impairments that were not present (false positives) was prevalent. Clinicians also infrequently isolated the specific impairment(s) responsible for unsafe swallowing, which was exacerbated as dysphagia complexity increased. A lack of agreement in impairment identification combined with an overemphasis on targeting bolus flow impairments (penetration, aspiration, and/or residue) led to a great variability when selecting treatments. We consider several factors that may contribute to each of these findings.

Frequent False Positives

Overdiagnosis of normal physiology as impaired was frequently reported in each video. Frequent false positives may lead to several consequences in dysphagia care, including providing unnecessary treatment for physiology that is not actually disordered. Overdiagnosis or misdiagnosis can lead to treatment that causes no benefit or is not medically necessary, which is costly and takes away from

the allocation of health care services that may be limited (i.e., “therapy caps”). Furthermore, providing treatment for a process that is functioning within normal limits may actually induce negative outcomes to swallowing (i.e., train maladaptive behaviors).

Despite these consequences, several factors predispose SLPs to overdiagnose. First, it is understood that an appropriate diagnosis theoretically leads to well-targeted treatment plans that will ultimately rehabilitate an impaired swallow function. Therefore, SLPs may feel pressure to overidentify impairment due to fear of missing a problem. Although the mindset of “not wanting to miss anything” is benevolent and reflects a strong desire by SLPs to see positive patient outcomes, this practice pattern could have unfortunate consequences.

Another factor that might contribute to overdiagnosis is a lack of exposure to an understanding of normal swallowing physiology. An emphasis on the complexity of swallowing cannot be overstated, as swallowing has been described as the most complex reflex elicited by the CNS (Doty, 1951). Not only is swallowing rapid and complex, there is marked intrasubject and intersubject variability in normal swallowing physiology that can be influenced by a variety of factors including bolus presentation, volume, and viscosity, to name a few (Lof & Robbins, 1990). A firm understanding of the physiology and variability in swallowing is essential to avoid misdiagnosing normal physiology as impaired. However, despite an appreciation for the complexity of swallowing and the significance of understanding normal physiology, a foundation in swallowing physiology is limited in formal academic training and clinical education units. Compared with other SLP domains such as language development, articulation, and phonology where a significant amount of time and coursework is devoted to typical development, swallowing training is meager, at best, in several undergraduate programs. Despite core prerequisite courses for entry into SLP graduate programs, these prerequisites do not require specific training or knowledge in swallowing physiology. Graduate level SLPs often have no exposure to normal swallowing physiology and are not introduced to swallowing until the graduate level. In a graduate course for a clinical degree such as speech pathology, the emphasis is on diagnosing and treating disorders without sufficient contrast to normal swallowing as a necessary foundation.

Many professionals argue that essential training in dysphagia management occurs “on the job” during the clinical fellowship year (CFY). The CFY is a 9-month supervised practice period where newly graduated SLPs work full-time under the supervision of an ASHA-certified clinician. Graduates must have successfully completed their master’s degree, passed the national board examination, and completed the required minimum clock hours of supervised clinical practicums to obtain their provisional license for their CFY position. According to ASHA, the purpose of the CFY is to refine clinical skills, bridge the gap between theory (classroom knowledge) and practice (clinical experience), and transition from constant supervision to practicing independently (ASHA, 2015). Given the complexity of care in dysphagia management, especially in medical

settings, it is not uncommon for hospitals to require 100% supervision for several months into their placement. Unfortunately, clinicians seeking to further their knowledge of dysphagia in medical placements often miss the opportunity due to lack of job openings. Medical facilities are not required to offer clinical fellowships, and given the requirements of supervision, a CFY position is not cost-effective to the institution when considering the loss in productivity and billable hours to avoid double billing a patient. To obtain their full SLP license (Certificate of Clinical Competence), clinicians sometimes complete CFY placements in facilities (skilled nursing facilities, school systems) where experience or supervision in dysphagia management is limited or inadequate.

Identifying Bolus Flow Impairments vs. Physiologic Impairments

Respondents tended to focus a greater emphasis on identification of bolus flow outcomes (aspiration, penetration, and residue) rather than physiologic impairments. Carnaby and Harenberg (2013) reported in their survey that most clinicians stated the primary outcome of dysphagia treatment is to return the patient to a safe and functional oral diet, but not to restore normal physiologic function. This may be due to an overemphasis in research studies where bolus (not physiologic) impairments or diet changes are often used as a primary outcome measure in treatment studies as a way to measure improvement. It is not surprising then to see SLPs emphasize their clinical practice toward targeting bolus outcomes and compensatory-based diet recommendations versus targeting treatments to rehabilitate physiological impairments. Although accurate identification of bolus flow impairments is important for promoting the general health of patients, it should be noted that, if treatments are targeted solely toward bolus or diet outcomes and not the physiologic cause, the result might be ineffective swallowing rehabilitation. The ability of the CNS to adapt and alter neuronal structures in response to impairment-specific exercise-based training is the foundation of rehabilitation and neuroplasticity (Warraich & Kleim, 2010). Kleim and Jones (2008) discussed 10 principles of plasticity, all of which emphasize targeting physiologic impairments to optimize neurorehabilitation. Dysphagia management that focuses merely on compensatory or bolus outcomes, and not on physiology-based behavioral intervention, could miss the opportunity to capitalize on neuroplasticity and limit the possibility of functional improvement for impaired pathophysiologies. This could lead to denial of financial reimbursement and significantly limit the availability of dysphagia care for patients.

Impact of Complexity on Diagnostic Accuracy

One goal of the study was to determine whether swallowing complexity impacted practice patterns and decisions regarding diagnosis and treatment. We demonstrated that, when swallows had increased complexity (i.e., increased number of impairments, those that required frame-by-frame

Table 4. Treatment recommendations for chosen impairment.

		Bolus modification					Compensatory ←				
		Bolus temperature modification (hotter/colder)	Bolus viscosity modification (increase)	Bolus volume modification (increase)	Bolus volume modification (decrease)	Bolus viscosity modification (decrease)	Head tilt	Chin tuck (head flexion)	Head rotation (head turn)	Supraglottic swallow	Super-supraglottic swallow
List the treatments you would recommend to address the problem you chose to target first											
Patient 1 (easy)											
Initiation of pharyngeal swallow/swallow onset time	58%	52%	27%	23%	15%	4%	1%	29%	2%	6%	9%
Tongue control during posterior propulsion	8%	38%	25%	19%	31%	13%	0%	44%	0%	25%	19%
Premature spillage	7%	27%	27%	7%	0%	0%	0%	73%	0%	13%	0%
Poor sensation	5%	91%	45%	36%	0%	0%	0%	9%	0%	27%	0%
Patient 2 (moderate)											
Laryngeal vestibule closure (delayed closure/reaction time)	23%	5%	10%	8%	13%	3%	0%	40%	5%	45%	55%
Tongue control during posterior propulsion	8%	29%	14%	0%	64%	21%	0%	43%	0%	36%	14%
Premature spillage	7%	8%	15%	8%	15%	8%	0%	54%	0%	15%	23%
Initiation of pharyngeal swallow/swallow onset time	7%	23%	8%	0%	38%	8%	0%	54%	0%	31%	46%
Hyoid anterior movement	7%	0%	25%	8%	33%	8%	0%	25%	17%	25%	25%
Penetration	6%	20%	20%	10%	20%	10%	10%	70%	10%	50%	10%
Epiglottic inversion	6%	9%	18%	0%	9%	0%	0%	45%	9%	18%	55%
Laryngeal vestibule closure (amount)	6%	0%	9%	0%	36%	0%	9%	55%	18%	36%	27%
Hyoid superior movement	6%	10%	10%	10%	30%	0%	0%	50%	0%	30%	40%
Aspiration	5%	11%	33%	0%	44%	0%	0%	67%	0%	67%	44%
Patient 3 (complex)											
Aspiration	17%	11%	70%	4%	30%	4%	4%	48%	0%	41%	41%
Size/amount of UES opening	12%	5%	20%	15%	30%	0%	0%	30%	15%	10%	20%
Laryngeal vestibule closure (amount)	12%	0%	68%	0%	32%	0%	0%	47%	26%	47%	74%
Premature spillage	11%	11%	61%	11%	28%	0%	0%	56%	6%	17%	17%
Tongue control during posterior propulsion	9%	13%	60%	7%	40%	7%	0%	67%	7%	33%	33%
Laryngeal vestibule closure (delayed closure/reaction time)	7%	9%	36%	0%	27%	0%	9%	45%	0%	27%	45%
Initiation of pharyngeal swallow/swallow onset time	7%	36%	64%	9%	82%	0%	0%	64%	0%	45%	27%
Hyoid superior movement	7%	0%	18%	0%	0%	0%	0%	27%	18%	27%	27%
Hyoid anterior movement	6%	0%	22%	0%	22%	0%	0%	22%	22%	22%	22%

Note. UES = upper esophageal sphincter; NDT = nasoduodenal tube; NGT = nasogastric tube; PEG = percutaneous endoscopic gastrostomy tube; IV = intravenous; NPO = nothing by mouth.

viewing due to the transient nature of the impairment), agreement in impairment identification greatly decreased. There are several potential explanations for poor agreement in relation to the complexity of the swallowing pathophysiology. In a demanding and fast-paced health care setting, one of the primary goals of SLPs is to accurately and efficiently diagnose and treat swallowing pathophysiologies. However, swallowing occurs very rapidly with the entire

sequence of events occurring in less than 1 s (Rudney et al., 1995). Evaluating the numerous individual swallowing events and weighing their impact on swallowing safety and efficiency are challenging because many of these events co-occur in less than 200 ms. Swallows that have an increased number of impairments and/or require frame-by-frame to be differentiated from normal variation can often require increased time for reviewing and access to equipment to

Table 4. (Continued).

List the treatments you would recommend to address the problem you chose to target first		→ rehabilitative strategies					Other					
		Mendelsohn maneuver	Tongue hold (Masako)	Effortful swallow	Shaker exercise	Thermal tactile stimulation	Oral swabs	Alternative nutrition (NDT/NGT/PEG/V nutrition)	NPO	I would refer to other specialty for treatment	None	Other
Patient 1 (easy)												
Initiation of pharyngeal swallow/swallow onset time	58%	10%	18%	40%	11%	58%	10%	7%	2%	5%	1%	25%
Tongue control during posterior propulsion	8%	38%	56%	63%	31%	19%	6%	13%	6%	0%	0%	31%
Premature spillage	7%	20%	40%	40%	13%	33%	7%	0%	0%	27%	0%	20%
Poor sensation	5%	0%	18%	45%	0%	91%	18%	0%	0%	9%	0%	0%
Patient 2 (moderate)												
Laryngeal vestibule closure (delayed closure/reaction time)	23%	35%	18%	30%	23%	13%	3%	3%	3%	10%	3%	13%
Tongue control during posterior propulsion	8%	21%	29%	21%	21%	14%	0%	7%	7%	7%	0%	14%
Premature spillage	7%	15%	31%	23%	8%	31%	8%	8%	8%	0%	15%	23%
Initiation of pharyngeal swallow/swallow onset time	7%	8%	0%	23%	15%	38%	15%	0%	15%	23%	0%	0%
Hyoid anterior movement	7%	58%	50%	58%	75%	0%	0%	17%	0%	8%	0%	0%
Penetration	6%	30%	30%	50%	50%	30%	0%	0%	0%	0%	0%	10%
Epiglottic inversion	6%	45%	18%	36%	55%	9%	0%	18%	18%	0%	0%	18%
Laryngeal vestibule closure (amount)	6%	36%	18%	36%	45%	9%	9%	27%	36%	9%	0%	9%
Hyoid superior movement	6%	90%	10%	30%	70%	10%	0%	10%	10%	10%	0%	0%
Aspiration	5%	67%	67%	56%	67%	0%	0%	22%	11%	0%	0%	11%
Patient 3 (complex)												
Aspiration	17%	41%	37%	44%	44%	30%	4%	41%	15%	7%	0%	7%
Size/amount of UES opening	12%	50%	10%	45%	65%	5%	0%	20%	20%	35%	0%	10%
Laryngeal vestibule closure (amount)	12%	74%	32%	53%	63%	11%	0%	47%	21%	5%	0%	5%
Premature spillage	11%	17%	22%	39%	33%	33%	6%	22%	22%	0%	0%	6%
Tongue control during posterior propulsion	9%	40%	40%	47%	33%	27%	0%	27%	13%	0%	0%	20%
Laryngeal vestibule closure (delayed closure/reaction time)	7%	55%	9%	36%	27%	9%	9%	18%	18%	9%	0%	0%
Initiation of pharyngeal swallow/swallow onset time	7%	55%	36%	55%	36%	27%	0%	36%	45%	27%	0%	0%
Hyoid superior movement	7%	64%	27%	36%	73%	9%	0%	55%	64%	9%	0%	18%
Hyoid anterior movement	6%	67%	22%	33%	100%	22%	0%	0%	0%	22%	0%	22%

utilize frame-by-frame analysis. These can serve as significant barriers to SLPs in achieving accuracy in diagnosis of swallowing impairments, especially for more complex swallows.

Use of Frame-by-Frame Analysis Impacts on Diagnostic Accuracy

According to our survey, many clinicians do not use frame-by-frame analysis on a consistent basis in clinical practice, despite its potential for diagnostic accuracy. This

had an important impact on agreement for impairment identification. Notably, frequent and consistent use of frame-by-frame analysis was the only factor that resulted in a higher agreement when identifying a primary impairment. A higher agreement was especially clear in the complex swallow for which no other factor contributed to an increased agreement. The reported amount of clinical experience, work environment, specialty certifications, and formal academic training had no impact on agreement in identifying impairments in the complex swallow. This is likely because identifying

impairments that are in alignment with established normative data in research literature at this complex level is not solely related to training or knowledge but instead relies on the human visual system, which simply cannot distinguish and differentiate information moving at such a rapid rate without slowing down frame rates. Thus, it is not surprising that respondents reporting consistent use of frame-by-frame analysis were much more able to accurately differentiate complex swallowing events as either normal or impaired. Subgroups with the lowest accuracy ratings were those who reported never using frame-by-frame analysis, those who practice in a skilled nursing facility or home health setting, and those who practice outside the United States or Canada, where videofluoroscopy is sometimes much more limited in use. Although not explicitly tested, another explanation could be that those who frequently use frame-by-frame viewing are more familiar with swallowing timing impairments and/or the research literature norms associated with these measures, thus increasing accuracy and agreement.

SLPs are often faced with managing complex patient caseloads at high volumes. Comprehensive care of patients with dysphagia is essential to ensuring positive outcomes; however, this remains difficult with overwhelming caseloads and high productivity standards. Management of these patients is not limited to screening and instrumental evaluation but also includes time spent for chart reviews, case histories, counseling, report writing, and communication with the interdisciplinary team (including physicians, nurses, other rehabilitation and/or consulting services, dietitians, and pharmacists, to name a few). The consequences include pressure to shorten (or omit) time necessary for reviewing, analyzing, and accurately diagnosing pathophysiology. This includes the potential for an overreliance on techniques such as clinical swallow evaluation and reducing or omitting the use of instrumental techniques such as videofluoroscopy and/or FEES. Our study shows that use of frame-by-frame analysis influences impairment identification, yet the use of frame-by-frame requires additional time and equipment. Better access to instrumental techniques and access to frame-by-frame capabilities will allow clinicians to increase diagnostic precision and thus improve patient outcomes.

Variability in Dysphagia Diagnosis and Treatment Selection

Our data show that respondents were highly variable in primary impairment identification and treatment selection. Identifying a primary impairment or pathophysiologies that directly cause or increase the risk of airway safety is critical for creating treatment plans individualized to each patient's specific impairments (avoiding a "one size fits all" treatment paradigm). In our survey, overemphasis on bolus flow outcomes was prevalent, and the range of physiologic impairments chosen was distributed among almost all possible swallowing pathophysiologies. When SLPs were instructed to "choose all that apply" to identify impairments in Question 1 ("Please indicate all problems you have identified in

the swallow"), agreement was likely influenced by the respondents' tendency to choose all possible impairments—often 10+ impairments that were not present in the swallow—thereby increasing the likelihood of agreement. However, when respondents were asked to hone in on the primary impairment, agreement was greatly reduced.

Our data also highlight a great variability in treatment decisions among clinicians who manage patients with dysphagia. Previous literature has shown that clinicians commonly use swallowing therapy techniques that do not directly correspond to a patient's specific symptoms or physiologic abnormality seen with videofluoroscopic data (Carnaby & Harenberg, 2013). These authors showed that, when clinicians were provided specific cases, 96 different combinations of therapy techniques were recommended, with no single combination exactly repeated across the sample of respondents. More than 58% of the techniques recommended did not match the patient's specific dysphagic symptoms, as seen in the clinical/VFSS report (Carnaby & Harenberg, 2013). Our data support the Carnaby and Harenberg (2013) study. This highlights the lack of uniformity and consistency in treatment recommendations, even for single impairments. A review of rationales regarding treatment decisions demonstrates a lack of evidence-based practice supporting treatments that are based on physiology. Many clinicians chose to target bolus outcomes and diet recommendations over the physiologic impairments that result in these consequences. Furthermore, many of the impairments that respondents identified were actually within the normal range.

Perhaps, the most important factor influencing treatment variability is broader knowledge gaps that exist for the research efficacy of treatment options for swallowing impairments. The gold standard for dysphagia management should be physiology-based treatment approaches that are individualized to the patients and their specific swallowing impairment(s) that contribute to explain unsafe or inefficient bolus outcomes. Unfortunately, the available evidence that allows clinicians to match pathophysiology to treatment is minimal at best. Research studies that report positive treatment outcomes based solely on bolus outcome measures, diet changes, or patient reports limit our ability to understand how various treatment approaches influence pathophysiology. We believe that variability in treatment planning is centered around a lack of current literature that connects swallowing physiology seen in instrumental evaluations (fluoroscopy and/or FEES) with therapeutic options. Even with an accurate interpretation of swallowing pathophysiology by clinicians, variability in treatment selection by SLPs is mirrored by treatments that are poorly matched to a specific pathophysiology in research studies at large. Even when studies do report the influence of various stimuli, exercises, and maneuvers on swallowing physiology, they often omit timing measures (duration of laryngeal closure, SRT, etc.) as an outcome measure, thus limiting our understanding of how external factors influence timing events. Thus, it is not surprising, or even expected, that clinicians would have a uniform approach to targeting

timing impairments (such as those in the survey) given the insufficient knowledge in the literature on how various treatments impact timing in the first place. The MBSImP (Martin-Harris et al., 2008) promotes a standardized assessment of swallowing impairment and incorporates 17 essential physiologic components of swallowing, yet even this widely used clinical tool for MBS interpretation does not include any measures of LVC timing. We propose that a lack of mechanistic studies of swallowing treatments contributes to a wide variability in treatment planning. Encouraging scientists who study swallowing to include appropriate outcome measures that match treatment targets to pathophysiology and report both kinematic and timing outcomes might lead to new treatments that directly target those pathophysiology.

Conclusions

This survey targeted a large heterogeneous population of clinicians who practice dysphagia management. This article is the first to report a poor agreement in the identification of swallowing impairments when compared with techniques, rules, and impairment thresholds from healthy swallows available in the research literature. Overall, we have shown that a wide variability in identifying swallowing pathophysiology exists and worsens with an increased swallowing complexity. Furthermore, we report a wide variability in treatment decisions for targeting specific impairments. This is important because, to make effective treatment decisions that focus on restoring function to specific impairments, it is vital that the clinician is first able to accurately diagnose the impairment compromising airway safety and/or bolus inefficiency.

We have contributed data that are sensitive yet important in our goal to provide best practice in dysphagia management as SLPs. These data highlight the need for a cultural shift in our approach to dysphagia research methodology and the current model of SLP education of swallowing. One course in graduate school on dysphagia is not sufficient to prepare clinicians for the complexities and demands of dysphagia management, and thus a wide variability in dysphagia diagnosis and treatment planning is not surprising. Practicing clinicians should seek our references to increase their knowledge of healthy and impaired swallowing physiologies. In addition, we urge the research community as a whole to move toward rigorously designed studies for dysphagia treatment to emphasize the impact on pathophysiology. Advocating for SLPs (who are currently practicing) to have the necessary instrumentation, education, resources, and time to provide accurate diagnoses and individualized treatments is also critical. To keep up with the standards of an evolving health care system, we propose a stronger research foundation and a graduate curriculum that provide SLPs the evidence and training to connect images seen on MBS or FEES to sensorimotor swallowing pathophysiology diagnoses. In doing so, SLPs will better be able to implement treatment that addresses the specific pathophysiology using critical thinking skills.

Limitations

This study was limited in that only three videofluoroscopic swallows were used in this survey with only two different primary impairments (SRT and LVCrt). More swallows with a variety of primary impairments may have provided a more accurate description of SLP agreement and practice patterns in dysphagia management, but lengthening the survey might have led to a significant attrition.

Although objective analyses of swallowing pathophysiology were derived and compared with published normative data whenever possible, not all swallowing pathophysiology were able to be measured objectively. Many swallowing events (i.e., lingual propulsion) were measured subjectively, and thus, interpretation is subject to variability. Among these swallowing events without available norms, a lack of a clear definition of “normal or typical” may contribute to false positives among SLPs. To avoid subjective bias, all primary pathophysiology for judgments of agreement were those that have objective criteria and reported normative data in the literature. Of note, swallowing impairments were compared with current rules established in the literature. As such, normative data for LVCrt were extracted from a 2017 study, which was after the survey was conducted. Thus, for this particular measure, survey respondents would not have had the opportunity to be familiar with the results from this study. It should be noted that, although an objective swallowing analysis was completed, reference judgments were not those of the authors and reported agreement was dependent on reliable measures of swallowing timing measures.

It is important to note that asking participants to identify the “most significant impairment” was subject to interpretation by the participant. We asked respondents to identify which impairment was the most significant to capture the respondents’ impression of a primary impairment. We do not know how one interprets significant because we cannot pinpoint any bias a participant comes into the survey. Instead, our approach was to understand what SLP practice patterns are, and the goal of this article was to understand what “most significant” might mean to the participating SLPs. The basis of their interpretation is beyond the scope of this article.

The demographic section of this survey asked respondents to report on the frequency of frame-by-frame analysis use. It is unknown if participant interpretation of frame-by-frame analysis involved deriving a timing measure to compare with published normative data or to simply click through each frame, one-by-one, to pay closer attention to possible issues such as airway invasion. A varied interpretation may have impacted frequency reporting and should be noted a limitation to the interpretation of the data.

Finally, it should also be noted that 6% of the participants reported from outside the United States. Given our emphasis on improving graduate SLP education in the United States, the influence of this demographic on outcomes should be considered.

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Survey Questions

1. Please indicate all problems you have identified in the swallow (*click all that apply*)

- Respondents were permitted to choose unlimited options
→ ☒ Tongue Control during Posterior Propulsion	→ ☒ Base of Tongue to Pharyngeal Wall Contact
☐ Premature Spillage	☐ Laryngeal Vestibule Closure (Amount)
☐ Initiation of Pharyngeal Swallow/Swallow Onset Time	☐ Laryngeal Vestibule Closure (Duration)
☐ Velopharyngeal Function	☐ Laryngeal Vestibule Closure (Reaction Time)
→ ☒ Pharyngeal Stripping Wave	☐ Residue
☐ Hyoid Superior Movement	☐ Penetration
☐ Hyoid Anterior Movement	→ ☒ Aspiration
☐ Epiglottic Inversion	☐ Esophageal Clearance
☐ Size/Amount of UES Opening	☐ Poor Sensation
→ ☒ Duration of UES Opening	☐ Nothing is Wrong
	☐ Something is Wrong, But I Don't Know What It Is

2. Which impairment was the most significant? (*choose one option*)

- Respondents permitted to only choose one option
☐ Tongue Control during Posterior Propulsion	☐ Base of Tongue to Pharyngeal Wall Contact
☐ Premature Spillage	☐ Laryngeal Vestibule Closure (Amount)
☐ Initiation of Pharyngeal Swallow/Swallow Onset Time	☐ Laryngeal Vestibule Closure (Duration)
☐ Velopharyngeal Function	☐ Laryngeal Vestibule Closure (Reaction Time)
☐ Pharyngeal Stripping Wave	☐ Residue
☐ Hyoid Superior Movement	☐ Penetration
☐ Hyoid Anterior Movement	☐ Aspiration
☐ Epiglottic Inversion	☐ Esophageal Clearance
☐ Size/Amount of UES Opening	☐ Poor Sensation
→ ☒ Duration of UES Opening	☐ Nothing is Wrong
	☐ Something is Wrong, But I Don't Know What It Is

3. Which of the options listed below would you target first in treatment?

- Respondents permitted to only choose one option
☐ Tongue Control during Posterior Propulsion	☐ Base of Tongue to Pharyngeal Wall Contact
☐ Premature Spillage	☐ Laryngeal Vestibule Closure (Amount)
☐ Initiation of Pharyngeal Swallow/Swallow Onset Time	☐ Laryngeal Vestibule Closure (Duration)
☐ Velopharyngeal Function	☐ Laryngeal Vestibule Closure (Reaction Time)
☐ Pharyngeal Stripping Wave	☐ Residue
☐ Hyoid Superior Movement	☐ Penetration
☐ Hyoid Anterior Movement	☐ Aspiration
☐ Epiglottic Inversion	☐ Esophageal Clearance
☐ Size/Amount of UES Opening	☐ Poor Sensation
→ ☒ Duration of UES Opening	☐ Nothing is Wrong
	☐ Something is Wrong, But I Don't Know What It Is

4. Provide a brief rationale.

Insert text here

5. List the treatments you would recommend to address the problem you chose to target first

- Respondents were permitted to choose unlimited options
☐ Head Tilt	→ ☒ Bolus Temperature Modification (hotter/colder)
☐ Chin Tuck (Head Flexion)	☐ Bolus Viscosity Modification (Increase)
☐ Head Rotation (Head Turn)	☐ Bolus Viscosity Modification (Decrease)
→ ☒ Supraglottic Swallow	☐ Bolus Volume Modification (Increase)
☐ Super-Supraglottic Swallow	→ ☒ Bolus Volume Modification (Decrease)
☐ Mendelsohn Maneuver	☐ Oral Swabs
→ ☒ Tongue Hold (Masako)	☐ Alternative Nutrition (NDT/NGT/PEG/IV Nutrition)
☐ Effortful Swallow	☐ NPO
☐ Shaker Exercise	☐ I would refer to other specialty for treatment
→ ☒ Thermal Tactile Stimulation	☐ None
	☐ Other

6. Provide a brief rationale for your treatment choice.

Insert text here

UES = upper esophageal sphincter; NPO = nothing by mouth; NDT = nasoduodenal tube; NGT = nasogastric tube; PEG = percutaneous endoscopic gastrostomy tube; IV = intravenous.