11-2023

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Matthew Dumican

Zoë Thijs Ph.D.

Kaitlynn Harper

Received: 15 November 2022 | Accepted: 6 June 2023

DOI: 10.1111/1460-6984.12921

International Journal of Language & Communication Disorders

RESEARCH REPORT

Clinical practice patterns of speech-language pathologists for screening and identifying dysphagia

Matthew Dumican[1] | **Zoe Thijs**[2] | **Kaitlynn Harper**[1]

[1]Department of Speech, Language, and Hearing Sciences, Western Michigan University, Kalamazoo, Michigan, USA

[2]Molloy University, New York, New York, USA

Correspondence
Matthew Dumican, Western Michigan University, Kalamazoo, MI, USA.
Email: matthew.dumican@wmich.edu

Abstract

Purpose: To identify how speech-language pathologists (SLPs) in the United States are screening for and identifying dysphagia. To do this, we examined the approaches most often used to screen for dysphagia and the influence of contextual factors such as setting, continuing education and means of staying up to date with the most current literature on screening approaches.

Method: A web-based survey composed of 32 questions was developed and field tested for content, relevance and workflow. The survey was distributed online, via social media, online SLP forums and through the American Speech-Language-Hearing Association's Special Interest Group 13 (swallowing disorders). One hundred and thirty-seven clinicians from the United States completed the survey and were included for analysis using descriptive statistics and linear regression modelling to assess associations of continuing education and years practicing with screening protocols and consumption of evidence.

Results: Respondents worked in a variety of settings, including acute care, skilled nursing facilities, and inpatient rehabilitation. Most respondents worked with adult populations (88%). The most common screening protocols reported were a volume-dependent water swallow test (74%), subjective patient report (66%), and trials of solids/liquids (49%). Twenty-four percent (24%) reported using a questionnaire, the Eating Assessment Tool (80%) being most common. How clinicians consume their evidence was significantly associated with the types of screening approaches used. Continuing education hours were significantly associated with dysphagia screening protocol choice ($p < 0.001$) and how clinicians stayed up to date with evidence ($p < 0.001$).

Conclusions: Results from this study provide an in-depth look at the choices clinicians are making in the field regarding how to effectively screen patients for the presence of dysphagia. Contextual factors such as evidence base consumption patterns should serve researchers to continue seeking alternative ways to share evidence with clinicians, accessibly. Associations between continuing

education and protocol choice show the need for continued evidence-based and high-quality continuing education opportunities.

KEYWORDS
dysphagia, evidence-based practice (EBP), screening, survey

WHAT THIS PAPER ADDS

- This study provides an in-depth look at the choices clinicians are making in the field regarding effective dysphagia screening practices. Clinician screening choices are examined with contextual factors such as evidence base consumption patterns and continuing education. This paper increases knowledge of the most used dysphagia screening practices and context for clinicians and researchers to improve use, evidence and dissemination of best practices.

INTRODUCTION

Screening for swallowing impairment or difficulties (dysphagia) is a vital first step in identifying individuals who may be at an elevated risk for dysphagia. The definition of "screening" swallow function is generally recognized as a quick, minimally invasive protocol that identifies if an individual is likely to have dysphagia and if they require further in-depth assessment or evaluation (Han et al., 2018; Swigert et al., 2007; Walshe et al., 2017). Screening is not designed to determine the underlying cause of the potential dysphagia or assess other contributing factors to dysphagia such as motor or cognitive function (Logemann et al., 1999; Walshe et al., 2017). These limitations dictate that screening for those at risk for dysphagia is inherently different from a clinical swallowing evaluation that includes components such as a case history or cranial nerve testing (Speyer et al., 2022; Suiter et al., 2020). Screening should therefore be used only as a first step in identifying those at risk for dysphagia and in determining the next steps in terms of assessment, management and treatment (Speyer et al., 2022).

The benefits of early and rapid screening for the presence of dysphagia are numerous, including reducing aspiration, pneumonia, and malnutrition risks, as well as improving long-term healthcare outcomes while potentially reducing costs and length of stay in healthcare facilities (Bray et al., 2017; Daniels et al., 1998; Ickenstein et al., 2010; Martino et al., 2005; Perry et al., 2019; Ramsey et al., 2003; Smithard et al., 1996; Yeh et al., 2011). Importantly, as a quick and non-invasive protocol, swallow screening may be performed by various healthcare professionals aside from speech-language pathologists (SLPs) or speech-language therapists (SLTs) such as nurses or physicians, or during facility-wide admission or intake (Suiter et al., 2020). This versatility in screening administration consequently requires protocols to not only be fast and non-invasive, but also to be simple and uncomplicated for a range of clinicians to administer, while simultaneously being effective at accurately detecting those that need assessment (Kertscher et al., 2014; Suiter et al., 2020).

Screening for dysphagia may involve one or more of different approaches, including questionnaires (which can be validated and/or normed) such as the Eating Assessment Tool-10 (EAT-10; Belafsky et al., 2008), water swallow screenings (examining volume, speed, or both) including the 3-oz water swallow screening test (Suiter & Leder, 2008) and the Toronto Bedside Swallowing Screening Test (TOR-BSST; Martino et al., 2009), or bolus trials of various consistencies (Bours et al., 2009; Clave et al., 2008; Kertscher et al., 2014). SLPs' decisions on the use of these tools are dependent on many factors including cost, time, resources, and confidence in the screenings used (Speyer et al., 2022; Walshe et al., 2017). Despite the importance and benefits of swallow screening, the types of swallow screenings that are performed and their rationale and implementation have not been well studied. Similarly, and more important, evidence is lacking on how clinicians obtain and employ evidence-based information throughout the swallowing screening process (Rumbach et al., 2018; Walshe et al., 2017).

Moreover, existing literature also suggests that clinical practice patterns may be disconnected from the techniques used in research settings and published literature. A broad finding across medical and healthcare research indicates it may take up to 10 years for research to enter clinical practice (Morris et al., 2011). Field specific findings also indicate that time and content availability to clinicians

are substantial barriers to clinical implementation (Greenwell & Walsh, 2021; Roberts et al., 2020; Vallino-Napoli & Reilly, 2004). These barriers ultimately affect the uptake of potentially more useful screening techniques for detecting individuals at higher risks of airway invasion such as cough reflex testing (CRT) (Curtis & Troche, 2020; Holmes, 2016; Miles, 2013; Reyes et al., 2018). Watts et al. (2016) provide an overview of reported sensitivity (identifying a true positive) and specificity (identifying a true negative) for detecting airway invasion in CRT and screening approaches without cough function testing. They highlight that protocols without cough function testing may have higher sensitivity rates (up to 100%), whereas CRT may have higher specificity (up to 96%). This suggests that other screening techniques that are multifaceted but potentially time consuming can effectively rule in patients who may have airway invasion but lead to high rates of false positives. Conversely, CRT is seen as quick, simple, non-invasive, (Watts et al., 2016) and may be very successful at ruling out patients not having airway invasion but may have higher rates of false-negatives. Barriers and a lack of understanding about tradeoffs in screening protocols may prevent clinicians from sufficiently updating their practice patterns and standards. As an example, clinicians continue to use screening tools such as pulse oximetry (Artiles et al., 2021; Drulia & Hodges, 2021) and cervical auscultation (Speyer et al., 2022) in various populations despite a lack of sufficient evidence for either (Britton et al., 2018; Lagarde et al., 2016). The lack of implementation of potentially effective dysphagia screening protocols and the continued usage of an approach without any robust evidence base emphasize the need for closer communication and collaboration between the clinical and research fields.

Aims

Consequently, the purpose of this study was to investigate current clinical practice patterns of SLPs and SLTs who screen for dysphagia. Moreover, our goal was to investigate what factors influencing dysphagia screening choices by clinicians. Under clinical practice patterns, the primary factors being examined were:

1. Types of screening procedures are being used in clinical settings to screen for dysphagia,
2. How SLPs/SLTs consume their evidence (e.g., research articles, websites, etc.) regarding screening for dysphagia to inform their clinical practice, and
3. How contextual factors including clinical setting, consumption of evidence, and continuing education (CE) practices relate to dysphagia screening practices.

Hypotheses

We hypothesized that the way clinicians consume their evidence base would influence the chosen types of screening protocols. Another hypothesis was that a clinician's practice setting would be associated with screening protocol choice, as different settings' contextual factors (e.g., resources, productivity standards) and experiences likely influence protocol choice. Finally, we hypothesized that the number of years practicing as a clinician and the amount of CE obtained would be related to the chosen screening protocols.

An underlying goal of this study was to inform researchers on what screening procedures are frequently used in a broad sample of clinicians as well as how they consume the evidence base underlying these choices, which are often also based on what is feasible within practice. Consequently, the results of this study will aid researchers in identifying and examining the clinical usage and feasibility of potential screening protocols and tools, thus improving the connection and reach between researchers and their intended clinical audience.

METHODOLOGY

Survey development and content

A cross-sectional electronic survey was developed and approved by the institutional review board of the first author. The survey comprised 32 questions designed to explore the clinical settings and contexts in which SLPs/SLTs are working. Questions focused on several practice contexts such as clinical setting, typical demographics served (e.g., adult vs. paediatric; neurodevelopmental vs. neurological) and productivity standards. The questionnaire was also designed to explore clinicians' consumption of the evidence base, the types of screenings used and the factors influencing their screening choice.

The development and design of this survey were based on recent literature involving SLP/SLT dysphagia practice pattern surveys (Desai & Namasivayam-MacDonald, 2020; Rumbach et al., 2018; Walshe et al., 2017). Survey items were tested by three SLPs unaffiliated with the design and implementation of this study, but with experience and knowledge of common screening, assessment, and practice patterns of dysphagia. Each SLP completed the initial survey questionnaire to provide feedback on question-and-answer construction, ease of use and readability, and general layout of the survey. Feedback obtained from the SLPs for the initial survey revealed no elimination of questions necessary; however, the order, presentation,

and wording of some questions were adjusted based on feedback. The final survey consisted of the same initial 32 questions with improved usability and readability for potential respondents.

The survey broadly collected information regarding:

1. Demographic information (e.g., gender, age, years practicing as an SLP/SLT).
2. Education and training (e.g.., how they consume evidence base, CE hours per year in dysphagia. dysphagia training in graduate school).
3. Practice setting and dysphagia screening practices.

The full survey can be found in Appendix A. Demographic and education/training allowed the exploration and description of dysphagia practice patterns by age, years of practice, and the respondents' ongoing dysphagia education. Collection of practice settings and dysphagia screening practices afforded the opportunity to further analyse how different populations, different settings, and educational/training factors influenced the screening protocols implemented.

Questions were structured in various ways, including multiple-choice style with a single answer, multiple select, and sliding scales. Sliding scale questions were set with a minimum choice of '0' and a maximum choice of '100'. Participants were able to utilize a digital slider to identify how confident they were in their current screening protocols for identifying dysphagia and the need for further assessment. Numbers chosen on the slider closer to '0' indicated they were less confident in their protocol, and scores closer to '100' indicated more confidence. Most questions that addressed screening practices specifically in the survey were multi-select options, as well as questions regarding practice setting as it is common for clinicians to work in or 'float' to different settings. Many questions also afforded respondents open-text options to provide an alternative response or to describe specific screening protocols not listed or expand upon their response.

Participants

Convenience sampling was used to recruit a target sample of national (United States) and international (e.g., United Kingdom) SLPs and SLTs. Snowball sampling was employed by encouraging individuals who had already taken the survey or knew of the survey being circulated to disseminate the survey to others whom they thought may be interested. The survey was constructed and administered using Qualtrics (2020; Qualtrics, Provo, UT; https://www.qualtrics.com/). It was distributed via social media to target international audiences and increase visibility and participation opportunities for non-US clinicians, to various university SLP alumni groups, as well as to the American Speech–Language–Hearing Association (ASHA) Special Interest Group 13 (Swallowing and Swallowing Disorders). Participants were made aware that, by taking the survey, they are affirming they are certified as SLPs/SLTs in their current country and state/region/territory of practice at the time of taking the survey, and that they actively engage in the screening and assessment of individuals with dysphagia as part of their caseload. Therefore, to qualify for participation, at the time of the study they must have been (1) screening patients with dysphagia on a weekly basis, (2) certified SLPs or SLTs in the country and/or state of residence where legally allowed to practice, (3) able to complete the survey online, and (4) able to read/write in English. Conditions for exclusion from the study were (1) any clinician who did not regularly screen for dysphagia in practice, (2) an inability to provide basic demographic information vital to the study as these were required questions, and (3) an inability to fully complete the survey at time of study closing.

Participants were required to consent to participating prior to taking the survey and all data collected were de-identified. All participants who completed the survey were redirected to another, separate survey page away from the original survey to remain independent from their data. This allowed them to be entered into a raffle to receive a gift card equal to $25 for taking the survey. Participants were required to enter their name and primary email address to contact if they had been chosen. Those who received compensation were chosen completely at random after participation. Participants had the option to take the survey and not receive compensation, if they chose to do so and were made aware that taking the survey was completely voluntary.

STATISTICAL ANALYSIS

A priori power analysis was conducted using G*power (v. 3.1; Faul et al., 2009). Prior research (Desai & Namasivayam-MacDonald, 2020) indicated adequately powered ($1 - \beta = 0.99$) analyses and large effect sizes ($w = 0.59$) related to cross-tabulations of categorical data may be detected when using reported parameters of: $\alpha = 0.05$, a total sample size of 241 and degrees of freedom (Df) of 16. Power analysis based on detecting similar large effects from these results when w set to 0.50, $\alpha = 0.05$, $1 - \beta = 0.95$ and Df set to 14 based on maximum number of variables indicates a necessary sample size of $N = 109$ to detect similarly powered effects in this study. SPSS (v. 28) was used to perform all statistical analyses. Survey data were analysed descriptively utilizing frequency distributions and percentages of multi-select responses such as screening protocols implemented, state/region/territory practicing

in, etc. Means and SDs of continuous data were calculated including confidence in screening protocols used, age, years of experience and CE hours earned per year in dysphagia.

Cross-tabulations were used to explore the influence of items such as practice setting and evidence base consumption on screening choice. Point biserial correlations were performed to assess the relationship between continuous variables such as productivity percentages and categorical variables dealing with practice patterns such as practice setting and screening protocol choice. Lastly, forced multivariate linear regression models were produced to examine the relationships between (1) how years practicing and/or CE hours obtained are related to evidence base consumption modalities, and (2) how years practicing and/or CE hours obtained are related to dysphagia screening methodology choice. In these linear regressions, two models were produced examining how screening choice and evidence base consumption methods served as dependent variables and CE hours as the independent variable. All statistical tests were chosen a priori in conjunction with the research questions and α was set to 0.05 for rejecting the null hypothesis in all statistical tests.

TABLE 1 Survey respondent demographics.

Demographics	Mean (±SD)
Age	38 (±8.6) years
Total years practicing as an SLP	10 (±7.9) years
Years practicing in dysphagia setting	9 (±7) years
Gender	Distribution %
Female	82 ($N = 112$)
Male	16 ($N = 22$)
Non-binary	1 ($N = 1$)
Opted to not disclose	2 ($N = 2$)
Current practice state	Distribution %
California	10 ($N = 13$)
Georgia	10 ($N = 14$)
New York	9 ($N = 12$)
Texas	7 ($N = 10$)
Other	65 ($N = 88$)
Highest level of education	Distribution %
Master's degree	94 ($N = 129$)
Advanced degree (clinical doctorate; PhD)	6 ($N = 8$)

Abbreviation: SLP, speeh-language pathologist.

RESULTS

Clinician demographics

One hundred and thirty-seven SLPs currently practicing and screening for dysphagia from various locations within the United States. A limited number of international clinicians completed the survey (three respondents total). Due to this small response rate for international clinicians, responses from outside of the United States were excluded from data analysis. Results therefore represent only survey data from SLPs residing within the United States. Overall clinician demographics including gender, age and years practicing can be found in Table 1. The majority of respondents were currently practicing in California (10%), Georgia (10%), New York (8%) and Texas (7%). This distribution is generally in line with previous literature regarding the distribution of ASHA members (ASHA, 2022) and previous survey respondents (Desai & Namasivayam-MacDonald, 2020). The mean age (±SD) of those surveyed was 38 years (±8.6), and gender distribution was a majority female (81%).

Population and clinical setting demographics

Respondents identified working with adult populations most often (88%). The most common diagnoses associated with dysphagia included neurological (i.e., stroke) (88%; $N = 121$) and neurodegenerative (i.e., dementia) (78%; $N = 107$). More than half (54%; $N = 74$) of all those surveyed reported they work in an acute care setting, 31% ($N = 43$) indicated they provide clinical services in an inpatient rehabilitation setting, 33% ($N = 46$) in a skilled nursing facility (SNF) and 35% ($N = 48$) of all those surveyed indicated they provide at least some clinical work in an outpatient setting.

Regarding productivity standards, out of all survey respondents ($N = 137$), 74% ($N = 101$) reported having to meet productivity standards related to patient load and documentation at their facility. When asked to identify the percentage of the workday respondents must remain productive while balancing patient caseload and documentation, the mean percentage of productivity required was 82% (±20%). Productivity percentages ranged from 25% to as high as 130%.

Point biserial correlations were performed to examine the correlation between productivity standards and clinical setting. Inpatient rehabilitation ($r_{pb} = 0.31$, $p = 0.002$, 95% confidence interval [CI] = 0.12–0.47) displayed a significant, moderately positive correlation with higher productivity times. Conversely, acute care hospital settings displayed a significant, but small negative correlation with productivity times ($r_{pb} = -0.28$, $p = 0.005$, 95% CI = −0.45 to −0.09).

TABLE 2 Percentage of survey respondents choosing each dysphagia screening tool/protocol.

Screening tool/protocol	Percentage of survey respondents indicating use
Volume-dependent water swallow test	74 ($N = 101$)
Subjective patient report	66 ($N = 90$)
Trials of solids and/or liquids	49 ($N = 68$)
Subjective patient voluntary cough strength	25 ($N = 35$)
Questionnaire	24 ($N = 33$)
Time-dependent water swallow test	23 ($N = 32$)
Measures of airflow (e.g., peak cough flow, vital capacity)	16 ($N = 22$)
Cough reflex testing	12 ($N = 17$)
Pulse oximetry	10 ($N = 14$)
Cervical auscultation	4 ($N = 5$)

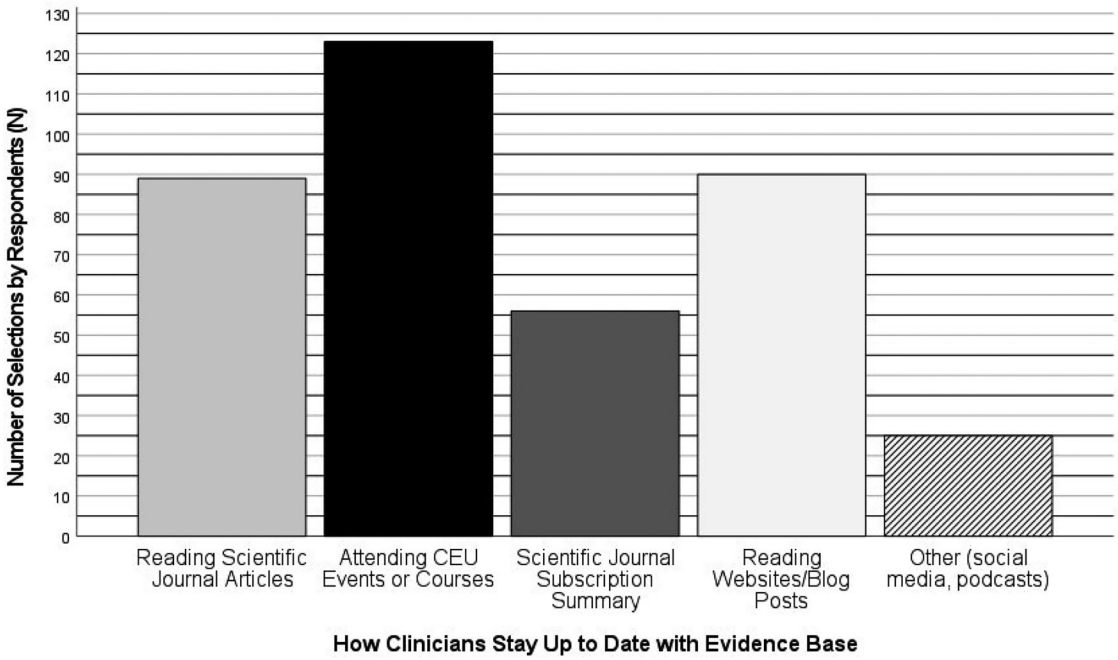

FIGURE 1 How clinicians stay up to date with evidence base.

Relationships of screening methodologies with setting, clinical experience, and evidence base

A full description of reported dysphagia screening tools used can be found in Table 2. The most common screening tools/protocols reported were the use of a volume-dependent water swallow test (WST; 74%; $N = 101$) such as the 3-oz water swallow screen test (Suiter & Leder, 2008), followed by subjective patient report (66%; $N = 90$). Twenty-four percent ($N = 33$) indicated the use of a questionnaire and of those who listed which tool was used, 80% ($N = 20$) indicated the use of the EAT-10 (Belafsky et al., 2008). A summary of evidence base choice by number of respondents can be found in Figure 1. Survey respondents indicated the most common way they perceive staying up to date with the current literature and evidence base in dysphagia was attending events where they earned continuing education units (CEUs) (90%; ($N = 124$). Eighteen percent ($N = 25$) of respondents indicated within the "Other" open-text selection various other ways through which they stay current in their evidence-based knowledge of dysphagia. Examples of answers include 'podcasts', 'preparing for presentations', 'social media', and 'colleagues'. These results suggest that clinicians are seeking out and using multiple resources to inform their clinical practice.

Crosstabulations were performed to examine associations between how clinicians consume their evidence and the types of screening tools they implemented when screening for dysphagia. Crosstabulations displayed

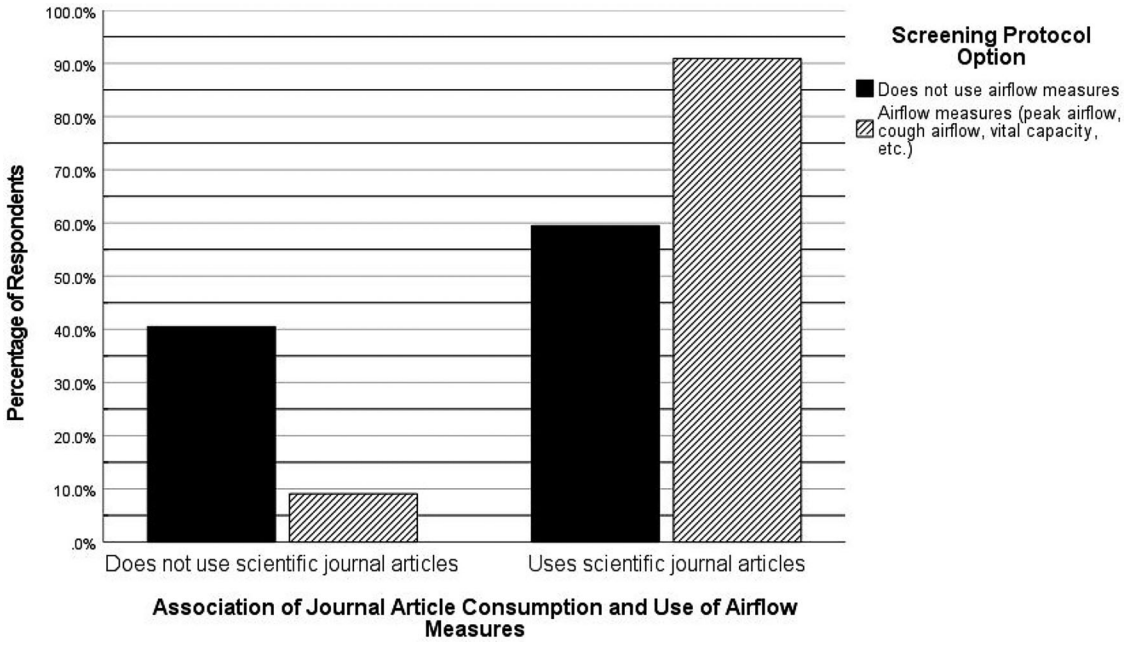

FIGURE 2 Association of journal article consumption and use of airflow measures.

significant associations between how clinicians consume their evidence-based information regarding dysphagia and the types of screening protocols/tools used. The use of a volume-dependent WST such as the 3-oz water swallow screen test (Suiter & Leder, 2008) was significantly associated with clinicians who indicated they read scientific journal articles to inform their practice ($\chi^2 = 5.54$, $p = 0.019$). Utilizing airflow measures (i.e., peak expiratory flow, peak cough flow rates, etc.) was also associated with reading scientific journal articles ($\chi^2 = 7.97$, $p = 0.005$) (Figure 2), as well as with those who indicated they used a subscription journal service that curates evidence-based information for them ($\chi^2 = 8.60$, $p = 0.01$). There was also an association with the use of time-dependent WSTs ($\chi^2 = 9.55$, $p = 0.002$) and cough reflex testing ($\chi^2 = 5.32$, $p = 0.021$) being implemented by these clinicians.

Significant associations were also present between the use of subjective patient reports ($\chi^2 = 4.95$, $p = 0.026$) (Figure 3) and implementing their own personalized screening protocol ($\chi^2 = 4.06$, $p = 0.044$) and clinicians who indicated they read websites and/or blog posts to inform their clinical practice. This indicated that, of those surveyed who responded to reading websites/blog posts for evidence, there was an increase in the association of using these screening practices. Examples of responses provided by clinicians who indicated they utilize their own protocol included open-text answers including 'oral motor exercises', 'observation during meals', and 'informal questions related to function'. Finally, the use of trials of solids/liquids as a screening practice for dysphagia was significantly more likely to be used by individuals who attended/used CEU courses to inform their evidence base ($\chi^2 = 4.83$, $p = 0.028$) (Figure 4).

When examining the associations of practice setting and dysphagia screening tool/protocol choice, several associations were present. Cough reflex testing was significantly more likely to be used by clinicians who indicated they worked in university clinic ($\chi^2 = 19.80$, $p < 0.001$) and inpatient rehabilitation ($\chi^2 = 4.29$, $p = 0.038$) settings. Similarly, subjective voluntary cough as a protocol was associated with inpatient rehabilitation settings ($\chi^2 = 11.69$, $p < 0.001$). Clinicians reporting their practice setting as a university clinic reported a negative association with subjective reports of dysphagia ($\chi^2 = 10.40$, $p = 0.001$), suggesting they were less likely to use this approach to screen for dysphagia. The use of a volume-dependent WST was associated with respondents who indicated they currently practiced in a SNF ($\chi^2 = 5.34$, $p = 0.021$).

Finally, forced entry multivariate linear regressions displayed significant relationships between CE hours obtained and both types of screening methodology used and evidence base modality. Inspection of collinearity diagnostics for the first model investigating the relationship between CE hours and dysphagia screening choice indicated no concerns for collinearity. All tolerance values were larger than 0.6, well above a 0.2 threshold, and variance inflation factors (VIF) were all well below 10 with no VIF > 2. These values indicated an extremely low likelihood of multiple independent variables influencing one another, and we therefore proceeded with the interpretation of the model. There was a significant overall model result ($F[13] = 6.52$, $p < 0.001$) with an

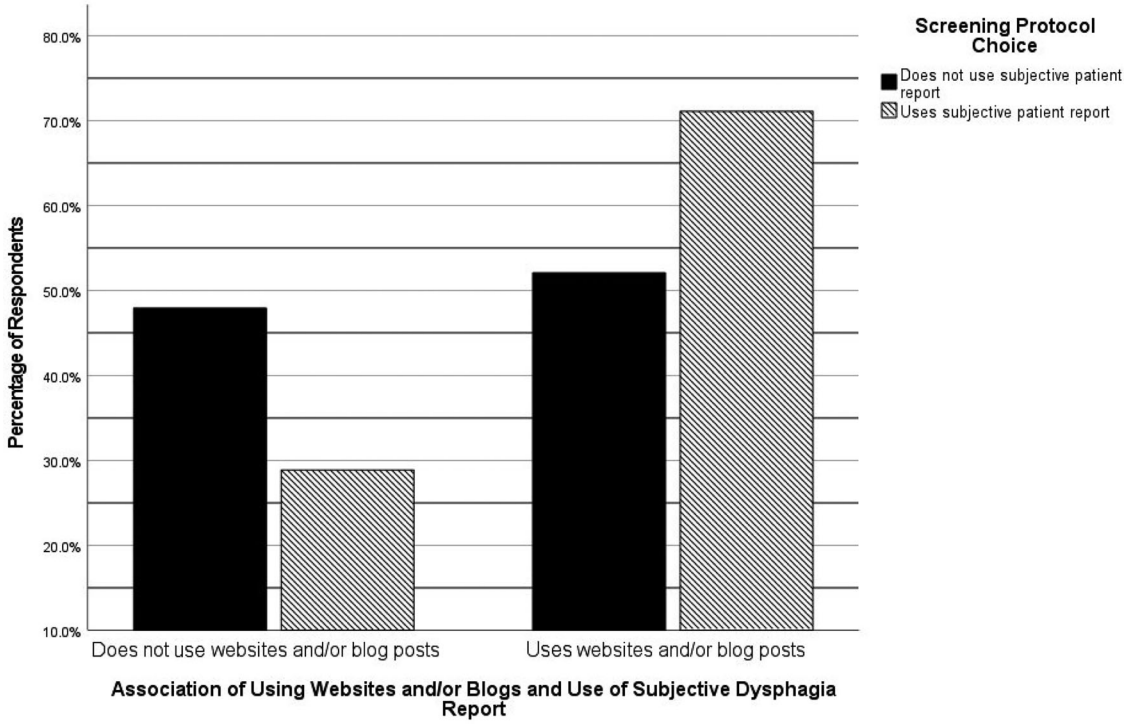

FIGURE 3 Association of using websites and/or blogs and use of subjective dysphagia report.

adjusted $R^2 = 0.35$, indicating the variables present in our model were accounting for 35% of the variance in our data. For predicting the relationship between CE hours and screening protocol choices, the use of time-dependent WSTs ($\beta = 16.69$, $p = 0.003$, CI = 5.79–27.45), voluntary cough strength ($\beta = 12.05$, $p = 0.017$, CI = 2.23–21.88) and cough reflex testing ($\beta = 23.39$, $p < 0.001$, CI = 9.69–37.09) displayed a significant relationship with CE hours. This indicated that as clinicians accumulated more CE hours, they were more likely to utilize these screening choices.

The second regression model examining the relationship between CE hours and how clinicians consume their evidence base also revealed a significant model ($F[5] = 6.42$, $p < 0.001$) with adjusted $R^2 = 0.17$. All collinearity diagnostics including tolerance (>0.2) and VIF (<10) were within appropriate ranges. For predicting the relationship between evidence base consumption and CE hours, there were significant findings of both reading scientific journal articles ($\beta = 9.12$, $p = 0.04$, CI = 0.36–17.88) and using a subscription journal service that summarizes evidence ($\beta = 17.57$, $p < 0.001$, CI = 8.99–26.16). This suggested that as clinicians reported accumulating more CE hours, they were more likely to utilize a service related to summarizing scientific evidence. Conversely, reading websites and/or blog posts displayed a significant negative relationship with yearly accumulated CE hours ($\beta = -9.14$, $p = 0.04$, CI = −17.90 to −0.37). This suggests that clinicians who accumulate fewer CE hours are more likely to utilize websites and/or blog posts to inform evidence-based practice.

DISCUSSION

The purpose of this study was to examine the clinical practice patterns of SLPs and SLTs who routinely screen individuals for dysphagia. Importantly, it was designed to determine what other contextual factors related to the clinician, including practice setting and CE, affect clinical decision-making for screening use. Despite not being able to recruit a sufficient international sample for this study, our results still report on the most commonly used approaches to screen patients at risk of dysphagia from a national sample of clinicians in the United States. These results also display associations between clinical setting and screening approach choice. Moreover, we found evidence consumption and CE influence screening choices. This study discusses the evidence base underlying the most clinician-used screening tools and how the improved dissemination and consumption of information can inform clinical practice.

Frequencies of most common screening approaches

This study was able to identify several of the most common screening approaches implemented by clinicians in a dysphagia setting. The most common approaches used by respondents were a volume-dependent WST such as the 3-oz water swallow screen test (Suiter & Leder, 2008),

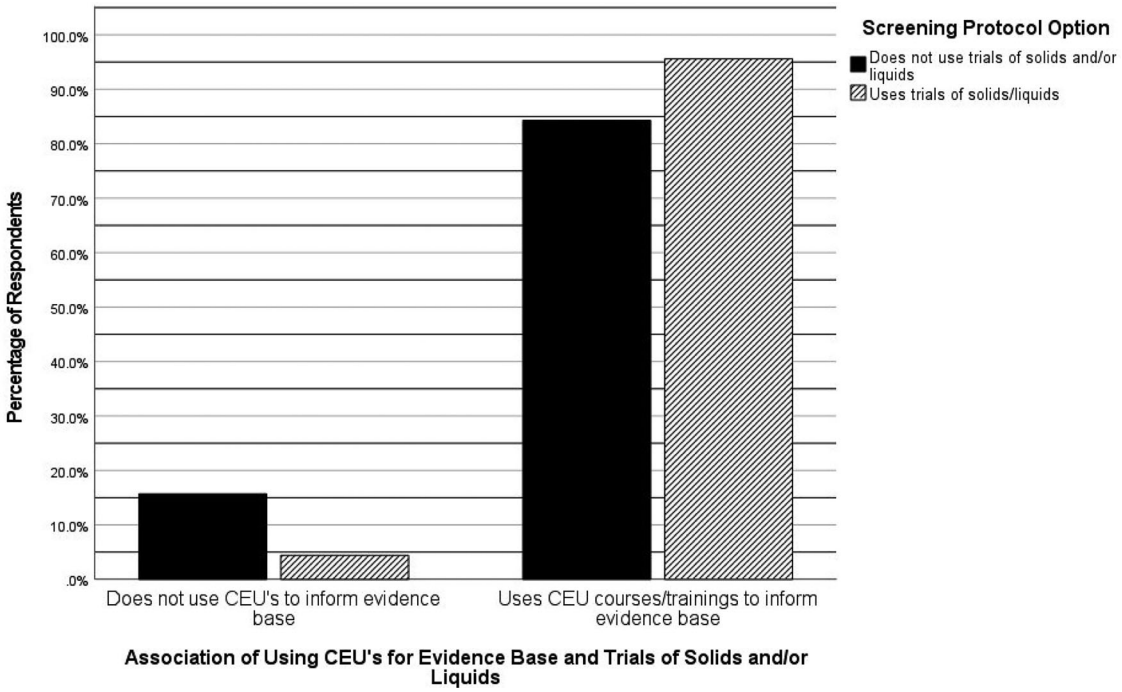

FIGURE 4 Association of using CEUs for evidence base and trials of solids and/or liquids. Abbreviation: CEU, continuing education unit.

a subjective patient report of swallow difficulty, trials of solids and/or liquids, and several different questionnaires. Knowing what screening tools clinicians use in practice provides researchers with foundational data and insights on the commonalities of these approaches (i.e., speed of administration, limited equipment setup, etc.). Consequently, researchers are informed on the characteristics of a functional swallow screening tool and what approaches need to be continually validated in multiple populations for clinicians to be confident in their screening approach.

Volume dependent water screening

In terms of volume-dependent water swallow screenings, some variation of a volume-dependent WST has been generally recognized as effective in acute and inpatient settings of mixed dysphagia aetiologies (Brodsky et al., 2016), as silent aspiration risk has been purported as being predominantly volume dependent (Leder et al., 2011). In a large cohort study, the 3-oz WST had high levels of accuracy to both detect (up to 100% sensitivity) and rule out dysphagia risk (up to 65% specificity), though this was dependent on the population receiving the test (Suiter & Leder, 2008). Therefore, caution should be exercised in specific populations where volume-dependent WSTs may not accurately rule out or detect dysphagia. As an example, a WST had the lowest sensitivity (87.5%) in oesophageal surgery patients but highest specificity (64.5%) for detecting dysphagia risk, whereas in cortical stroke patients WSTs had some of the highest sensitivity (96%) and lowest specificity (41% for left 38% for right cortical stroke, respectively) (Suiter & Leder, 2008). More recent evidence supports that in certain populations, such as in Parkinson's disease (Dumican & Watts, 2020) or post-cardiac surgery (Dallal York et al., 2022), volume dependent (i.e., drinking a specific amount of water) tests as a screening approach may not always be effective.

Questionnaire and informal screening approaches

Mixed evidence is present in the literature using subjective reports and questionnaires to identify or screen for dysphagia. Subjective reports using patient perceptions of swallowing difficulty have been purported as being able to detect small, incremental changes in swallow function in head and neck cancer including residue and aspiration (Paulowski et al., 2002). However, many other studies show poor ability to accurately detect the presence of dysphagia in populations like Parkinson's disease with up to 80% of patients having dysphagia on instrumental assessment, yet approximately half of them perceiving symptoms (Kalf et al., 2012). These findings are coupled with heterogenous methodological approaches and outcomes, making generalizability of subjective patient reports across studies or within populations, difficult (Junior et al., 2018;

Kalf et al., 2012). Using 'informal' approaches or non-structured, subjective approaches to screen for dysphagia is suboptimal to detect at-risk patients in post-stroke populations (Sherman et al., 2018). However, structured and validated questionnaire use has increasingly gained recognition as a valuable screening tool to identify those at risk of dysphagia. Despite a number of other potential questionnaires purported to successfully screen for dysphagia that cover a multitude of domains (i.e., physical, social, emotional, etc.), evidence suggests that the EAT-10, which a large proportion of our respondents reported using when questionnaires are implemented, shows high discriminatory ability to detect those at risk of dysphagia in various aetiologies with sensitivity ranging from 71%–100% and specificity ranging from 43%–82%, respectively (Cheney et al., 2015; Printza et al., 2021; Rofes et al., 2014).

Food and liquid texture trial approaches

Finally, clinicians commonly chose to use liquid and/or solid food trials to screen for dysphagia risk. Certain approaches using varying liquids or solid consistencies may have sufficient evidence to identify patients at elevated risk of dysphagia. These approaches include utilizing administering differing volumes and/or viscosities of liquids (e.g., V-VST) or solid food testing (e.g., The Test of Masticating and Swallowing Solids [TOMASS]) in distinct and structured ways or hierarchies to detect pharyngeal stage dysphagia risk (Riera et al., 2021; Rofes et al., 2014) or decreased oral stage function with solid foods (Todaro et al., 2021). Approaches such as the V-VST may have clinical utility, with sensitivity (94%) and specificity (88%) reported as relatively high (Rofes et al., 2014) and supported in a recent meta-analysis with pooled sensitivity and specificity of 93% and 81%, respectively (Riera et al., 2021). However, none of the respondents in this survey indicated utilizing structured or algorithmic approaches in their clinical practice, simply identifying 'trials of liquids/solids'. While clinicians may be inherently following validated and structured approaches, advocacy for and further understanding of the precise protocols being implemented in practice is vital. Furthermore, clarification is needed on what phase/impairment of swallowing is being assessed with liquids or solids. As an example, the TOMASS is validated against fibreoptic endoscopic evaluation of swallowing (FEES) but only for certain oral or pharyngeal stage parameters (Todaro et al., 2021) and not for predicting penetration or aspiration risk. Though no sensitivity or specificity data are reported, Lamvik-Gozdzikowska et al. (2019) report high sensitivity for the TOMASS to detect disordered oral stage physiology related to number of masticatory cycles ($p = 0.016$) and duration of ingestion ($p = 0.006$). However, empirical data on how swallowing performance on solid foods or texture-modified foods affects pharyngeal stage outcomes such as aspiration appear limited (Ballesteros-Pomar et al, 2020).

Relationship of dysphagia screening tools and clinical setting

The findings in this study indicate distinct associations of certain clinical settings and the types of screening approaches SLPs prefer to utilize. As an example, the implementation of less well-known screening techniques such as CRT was associated with employment in university clinics and inpatient rehabilitation. On the other hand, usage of WSTs to assess dysphagia risk was related to SNF settings. This finding again highlights the need for researchers to prioritize screening for clinicians in specific settings for specific populations. However, these findings also highlight a probable divide in the time, resources, exposure and knowledge of available screenings, and skills that are required of clinicians to implement advanced screening approaches in different settings. As an example, working in an inpatient rehabilitation/hospital setting may require higher productivity rates, yielding less time to examine best practice, yet these SLPs were more likely to utilize screening approaches with better specificity to rule out airway invasion as a dysphagia symptom needing to be evaluated, such as CRT (Watts et al., 2016). The reason for clinicians having higher productivity standards than others, such as a SNF, yet utilizing more advanced approaches is unclear. A potential reason, as noted previously, may be greater resource allocation in inpatient rehab/hospital settings (Hong et al., 2019).

Our results also display a strong association between SLPs working in a university clinic and screening choice in the United States. The stronger association of university clinic-based SLPs and the use of techniques that require more equipment, financial resources, and setup time may reasonably be linked to not having a 'productivity standard'. While university-based clinics may still provide fee-for-service screening and assessment either billed to the client privately or through Medicare (Nikjeh, 2019), these settings are not necessarily designed to incur a profit-margin, but to provide SLP services to clients in an educational or trainee model. This likely allows for greater freedom of setup time and greater access to equipment or resources not tied to clinical profit, such as academic faculty funding. Additionally, a university clinic rooted in training and educating students may choose to provide their students greater direct exposure and education in

approaches that may be less commonly known or used yet rooted in strong evidence bases.

These findings display clear contextual barriers to clinician's usage of and access to screening approaches with the most sufficient evidence bases. This barrier becomes apparent when considering the (lack of) usage of tools with long histories of evidence such as CRT. As an example, Trimble and Patterson (2020) found that only nine clinicians (8% of total respondents) surveyed in acute care hospitals in the United Kingdom were implementing CRT as a screening approach for dysphagia risk, representing only 4 stroke-focused units out of 45 total units surveyed. When considering our findings' implications for future research, there is a need to validate screening tool efficacy against other screening approaches to determine which may be most effective on a continuum, rather than as a binary decision. As an example, in a broad sample of oropharyngeal dysphagia, Rofes et al. (2014) found relatively comparable sensitivity (detecting true positive states of dysphagia) and specificity (ruling out true negative states of dysphagia) between the EAT-10 (0.89 and 0.82 sensitivity and specificity, respectively) and V-VST (0.94 and 0.88 sensitivity and specificity, respectively). In a smaller sample, previous work from our lab has compared a 3-oz WST to a questionnaire to determine predictive ability for penetration or aspiration in Parkinson's disease. Results suggest greater predictive ability of penetration or aspiration with a questionnaire over the 3-oz WST when screening for dysphagia (Dumican & Watts, 2020).

Continuing education and evidence base consumption influences on screening choice

Resources or revenue alone, however, likely account for only a small portion of the reasoning behind dysphagia screening protocol choice. As an example, in the same study, Trimble and Patterson (2020) found that 13% of those surveyed who had never used CRT were unaware of what CRT was or had never heard of it. This underscores that other contextual factors, such as CE and where clinicians consume evidence to inform their practice, likely greatly influence clinicians' screening choices. Overall, the associations between evidence base consumption and screening use can be broken down into two major findings: (1) the type of resource clinicians use to obtain and consume evidence is associated with the types of screening approaches used, and (2) the more CE hours that were obtained by respondents, the more likely they were to use specific evidence-based screening approaches and consume evidence derived from scientific journals.

These two major findings should be viewed in the context of both research/academic practices as well as clinical decision-making. While the majority of respondents indicated attending CEU events or courses as a way to stay up to date in dysphagia screening approaches, there was a near identical breakdown in the frequency of responses for reading scientific journal articles and reading websites/blogs to stay up to date on the current evidence base. This may indicate discrepancies in the quality of information and bias within the information they are adopting in their clinical approaches. Hazelwood and Pollack (2021) found that in review of online resources clinicians use in dysphagia management, there is a questionable level of reliability in the information available. They subsequently suggest that professional training for critically reviewing online information is needed.

Conversely, these findings also suggest there may be substantial barriers to consuming evidence through means of reading long, methodologically complex studies, which clinicians may have to pay to access, that may not provide relevant clinical explanations or applications for their findings. Vallino-Napoli and Reilly (2004) found in an Australian sample of speech therapists that the biggest barriers to evidence-based resources were access to reliable resources and time to either find or consume them. Large proportions of clinicians inform their practice via websites/blogs (64%) and other media (18% of respondents) such as podcasts, consequently showing a need for researchers to continuously update clinicians on their findings through routes other than publication in a peer-reviewed journal. Several SLP-specific website/blog and podcast initiatives are active in ensuring both researchers and clinicians have the platform to interact as well as consume and elaborate on current research and evidence.

In the context of clinicians' perceptions, Caesar and Kitila (2020) found that clinicians felt their academic graduate training left them inadequately prepared to treat dysphagia yet perceived themselves as delivering high-quality care. Though we found no connections with approaches or evidence base and age or years practicing, our findings likely display an application of clinical decision-making that draws on a combination of contextual factors throughout a clinician's career. This includes previous experiences by the clinician, available empirically supported options, available resources, and patient factors, all of which make up the foundation of evidence-based practice (EBP) (Tanner, 2012). Greenwell and Walsh (2021) found in a broad sample of SLPs regarding EBPs that the greatest barrier to implementation was time: either for research or for implementation. Furthermore, clinically based research is the least represented in ASHA journals, likely creating a further barrier to clinicians looking to implement best practices through EBP (Roberts et al., 2020).

LIMITATIONS

This study had several limitations and, as such, the results should be interpreted with caution. First, though our survey was adequately powered, our sample of respondents was still relatively small when considering the current number of practicing SLPs. For context, ASHA's current profile for certified and employed SLPs is greater than 170,000 members (ASHA, 2022), and the most recent ASHA healthcare survey received approximately 1,600 responses (ASHA, 2022). Given the majority of our respondents practiced in healthcare settings, it is therefore very likely we captured only a small percentage of clinicians who actively work in an environment where they screen for dysphagia.

Furthermore, our survey was developed with an aim to recruit and include international perspectives. However, only a small number of international participants completed the survey and were therefore excluded from data analysis. Perspectives and clinical practices in this manuscript are therefore limited to clinicians practicing in the United States. Additionally, though our survey design was modelled after previous clinician-based screening surveys and piloted on a small number of non-participating clinicians, wording, order and exclusion of survey contents will always affect participant answers and subsequent interpretations of results. As an example, our survey did not explicitly define what screening was for the participants. The intent in not doing so was to gather unbiased information about the screening protocols and/or tools clinicians use without second guessing their screening and assessment procedures or workflow. Despite this specific limitation, we believe our survey was constructed to allow clinicians to identify and understand the specific nature of the survey (i.e., screening, not clinical swallow evaluations/assessment).

Implications and future directions

This study and its implications highlight the need for researchers to focus on and/or improve the clinical utility of current dysphagia screening tools in general and/or specific populations. It is a call for researchers to consider commonly reported contextual barriers preventing clinicians from using screening tools suggested in literature and to design more clinically relevant screening approaches and studies.

Considering the available literature, the performance of the most often reported screening approaches from our survey are likely not appropriate for identifying those at risk for dysphagia in every population. Perhaps most important, researchers need to continue to develop and validate screening methodologies that are easy to administer, fast, low-cost, not equipment dependent and population sensitive. Future studies investigating screening tool efficacy may consider using a multi-tool approach to improve clinical application or validate the effectiveness of a screening approach against another as some prior research has done. These approaches then need to be effectively disseminated to clinicians in a fast, open-source, and easy to access method to allow quick adoption of appropriate screening approaches into their practice.

In the context of this manuscript's findings and the high proportion of clinicians using online resources, our results support a call for ensuring researchers are striving to provide easily accessible and consumable research. Researchers need to emphasize the clinical relevance of all studies that may potentially affect clinical decision-making equally as much as they emphasize methodological rigor and statistical analysis. Importantly, researchers need to begin rethinking how they can disseminate their findings and knowledge in an open, accessible way. Resources including social media and podcasts, with continuing effort to participate in them, may ensure clinicians are provided the highest quality and best interpretation of the current evidence. However, it needs to be ensured that clinicians can critically appraise the information they see or hear, and potentially adopt, from accessible sources. These results should facilitate researcher and clinician collaboration to develop screening methods that can quickly and efficiently identify those in need for comprehensive dysphagia evaluation in the appropriate populations.

CONCLUSIONS

Our findings taken together with the current literature on EBP and clinical decision-making show how vital it is to bridge disconnections between research and clinical practice. Clinicians' decisions regarding dysphagia screening are influenced by much more than evidence obtained in scientific journals. Rather than forcing clinicians to adopt an approach they may not need or be able to enact, it may be more clinically applicable to encourage and allow clinical input on what is needed and to validate in-use approaches in as many populations as feasible.

CONFLICT OF INTEREST STATEMENT

The authors have no relevant conflicts of interest to report.

DATA AVAILABILITY STATEMENT

Data are available upon reasonable request.

ORCID

Matthew Dumican https://orcid.org/0000-0001-5229-1223

Zoe Thijs https://orcid.org/0000-0002-3421-1207

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Dumican, M., Thijs, Z. & Harper, K. (2023) Clinical practice patterns of speech-language pathologists for screening and identifying dysphagia. *International Journal of Language & Communication Disorders*, 58, 2062–2076. https://doi.org/10.1111/1460-6984.12921