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Elucidating inconsistencies in dysphagia diagnostics: Redefining normal

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Abstract

Speech–language pathologists (SLPs) are the primary healthcare providers responsible for the evaluation and treatment of dysphagia. Fundamental to this role is the ability to make accurate clinical judgements to distinguish between normal versus disordered swallowing for subsequent treatment planning. In this review, we highlight recent data collected from practising clinicians in the USA that reveal low levels of agreement across clinicians and poor to moderate levels of accuracy for making binary diagnostic ratings (normal vs. disordered). We then propose and discuss barriers that may represent challenges to practising SLP's understanding of normal swallowing physiology. Proposed barriers include: (1) an educational focus on the disordered system; (2) system 1 processing; (3) complexity of the swallowing system; (4) inability to directly visualise the swallowing process; (5) degree of variability of normal swallowing; and (6) high clinical productivity requirements. This article concludes with suggestions for reducing identified educational and clinical barriers to ultimately improve diagnostic decision-making practices and to benefit patient-related outcomes in dysphagia management.

Keywords: *Deglutition*; *swallowing*; *diagnostic*

Introduction

The speech–language pathologist (SLP) represents the primary healthcare provider responsible for the assessment, treatment planning and management of dysphagia. It is therefore important that clinicians possess an in-depth knowledge of both normal and disordered swallowing. An understanding in normal anatomy and physiology of deglutition provides the needed foundation for accurate diagnostics and appropriate treatment planning in dysphagia (Logemann, 1998). Recent criticisms, however, have been raised that SLPs possess inadequate training and knowledge of normal swallowing physiology (Campbell-Taylor, 2008). Although the field has rallied to defend and dismiss these published claims (Coyle et al., 2009), a clear need to demonstrate competency in this fundamental knowledge base exists since an incomplete understanding of normal swallowing physiology could lead to: (1) misdiagnosis; (2) over-referral patterns; (3) incorrect treatment targets; (4) misuse of patients' money, insurance allocation and time; and (5) unethical treatment of normal function or normal variations in function (Ernster, 2018).

Survey of practising clinicians' ability to identify normal swallowing function

Given these recent criticisms, we wished to examine practising clinicians' understanding of normal swallowing physiology and their accuracy in assessing and differentiating normal versus disordered swallowing function. We conducted an interactive survey of 188 practising SLPs in the USA who specialise in dysphagia management and who were attending a specialised training course in dysphagia. IRB approvals for this study were obtained from both John Hopkins University and the University of Florida. Survey data were collected in an anonymous and de-identified fashion under a funded clinical grant from the American Speech and Hearing Foundation. Clinicians watched de-identified videofluoroscopic clips of five different healthy research participants swallowing a single bolus

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presentation of either a 20 mL cup sip of thin liquid barium or a teaspoon of barium pudding (Varibar®, Bracco Diagnostics Inc., Monroe Township, NJ). Testing stimuli provided in this survey consisted of swallows from healthy volunteers who had agreed to participate in a healthy swallowing study. Volunteers had no history of dysphagia, had a normal oral mechanism exam and consumed a full oral diet. Further, they demonstrated swallowing physiology that was radiographically confirmed to fall within previously established normal ranges (Molfenter & Steele, 2011, 2012). Clinicians participating in the survey viewed each swallowing clip in real time (100%) and at half speed (50%) on four separate occasions. They were then asked to make a binary judgement about whether they considered the swallow viewed to be *normal* or *disordered*. Each clinician was provided with an individual iClicker response remote (iClicker, Macmillan Learning©) to enter a response (normal or disordered) for each survey item. The iClicker system afforded anonymous ratings so that individual clinicians' responses would not be identifiable and to also allow for blinded ratings across respondents to exclude the possibility that a clinician might be influenced by responses from other SLPs (such as a verbal response or raising of a hand). For each of the five swallowing clips, 188 binary ratings were submitted from participants, for a total of 940 ratings across the 5 swallow stimuli presented in the survey. Simple descriptive analyses were completed (frequency count and percentages) to examine consistency across clinicians of ratings as well as the accuracy of binary ratings (see Table I).

Results of this survey revealed two main findings: (1) a surprisingly low level of agreement or consistency amongst SLPs on binary ratings and (2) a moderate to poor level of accuracy for classification of normal versus disordered swallowing. Specifically, accuracy of binary ratings ranged between 46% and 94%, with an average accuracy rating across all five clips of 66% (see Table I) and a high degree of false positives for disordered swallowing. Although only 6% of participants rated the first presented swallowing clip as disordered; 30.6–54.0% of SLPs responded that subsequent swallows shown were "disordered" and presumably many would want to treat this individual. When interpreting these data, several limitations exist that should be highlighted. First, there is the potential that respondents had an implicit assumption that some samples would be disordered which may have contributed to the high false positive rate observed. Second, although raters had eight opportunities to view the clip in both real and half speed for binary ratings, they did not have the ability to individually control the swallowing clip (pause, slow down, speed up). Finally, given the importance of anonymity during clinician rating, we could not investigate the potential impact of years of clinical experience on rating responses or accuracy. Although we feel these data do highlight a potential knowledge gap in the clinicians surveyed, further research is needed in a larger group of clinicians and across an international landscape to validate these preliminary findings.

Table I. Percentage of speech–language pathologists' selecting binary ratings for five videofluoroscopic clips of normal swallowing ($n = 188$).

Clip	Rated normal swallow as within normal limits (%)	Rated normal swallow as disordered (%)
1	94.0	6.0
2	46.0	54.0
3	69.4	30.6
4	58.3	41.7
5	62.2	37.8
Average	66.0	34.0

In efforts to understand the knowledge base for the range of normal swallowing timing and kinematic measures in practising clinicians, we conducted a second survey in 40 practising SLPs who specialise in dysphagia management residing in the USA. For this survey, clinicians were presented with six proposed physiologic swallowing metrics (see Table II) and asked to rate if each fell within or outside the established range of normal. Rated swallowing metrics included: swallowing reaction time, duration of laryngeal vestibule closure, upper oesophageal sphincter (UES) opening duration, pharyngeal transit time and hyoid displacement. Clinicians used the iClicker survey response system previously described to anonymously and blindly rate each swallowing metric presented as either: (a) within normal range, (b) outside of normal range, or (c) I don't know. Results of this survey are presented in Table II and denote that between 9% and 34% of respondents knew if proposed timing or kinematic swallowing events fell within or outside of published normal ranges, with an average accuracy rating of 18.3%. Interestingly, on average, 69.5% of SLPs choose the "I don't know" selection across the six presented swallowing metrics; highlighting a knowledge gap in this cohort of clinicians.

Vose and colleagues (in press) investigated whether SLPs' judgements of swallowing impairments align with impairment thresholds available in the research literature (Molfenter & Steele, 2011, 2012). In this study, SLPs were presented with three videofluoroscopic swallows ranging in complexity of swallowing impairment (easy, moderate or complex) and tasked to identify the most significant impairment that caused or increased risk of aspiration. Clinician's identified the most significant impairment 67%, 6% and 6% of the time for easy, moderate or complex swallows respectively. Vose and colleagues (in press) reported poor to modest levels of accuracy and a high false positive rate. On average, SLPs mislabelled 8 or more swallowing

Table II. Speech–language pathologists ($n = 40$) ratings and rating accuracy on six temporal and kinematic physiologic swallowing metrics.

			Participant response			
Swallowing metric	Proposed value	Normative range[a]	WNL (%)	ONL (%)	IDK (%)	Rating accuracy (%)
Temporal metric						
Swallow reaction time	0.44 s	(−0.22 to 0.54 s)	25	13	63	25
Laryngeal vestibule closure	0.25 s	(−0.16 to 0.02 s)	22	9	69	9
UES opening duration	0.3 s	(0.21 to 0.67 s)	16	3	81	16
Pharyngeal transit time	0.3 s	(0.31 to 1.07 s)	19	13	69	13
Kinematic metric						
Superior hyoid excursion	6 mm	(5.8 to 25.0 mm)	16	13	72	16
Anterior hyoid excursion	6 mm	(7.6 to 18.0 mm)	3	34	63	34

WNL: within normal limits; ONL: outside normal limits; IDK: I don't know; UES: upper oesophageal sphincter.
[a]Range based on published reviews by Molfenter and Steele (2011, 2012).

bolus parameters and physiological events as disordered that fell within the normal physiologic range (out of a possible 21). These authors concluded that additional education and training in normal and disordered swallowing is needed to improve dysphagia diagnostics.

When examining and interpreting these data from the USA, we believe a set of barriers exist that may negatively impact some practising clinicians understanding of normal deglutition. These identified barriers may hinder the SLP's ability to accurately diagnose a swallowing disorder and lead to excessive variability amongst clinical providers, misdiagnosis, incorrect treatment targets and misuse of patients' time and insurance dollars. We acknowledge that although the data presented here may not be representative of every clinical setting or practising SLP, a discussion of these data and examination of potential barriers (and ways to reduce these) is warranted to advance the field and promote best clinical practices.

Barriers to our understanding of normal swallowing

We have identified six existing and historical barriers to clinicians' understanding of normal deglutition. We acknowledge that not all identified barriers may apply to every clinical setting, country or individual clinician; however, we believe that each identified barrier has the potential to adversely impact learning and clinical judgements among practising SLPs. Identified barriers to be discussed include: (1) an educational focus on the disordered system; (2) System 1 processing; (3) complexity of the swallowing system; (4) inability to directly visualise the swallowing process; (5) inherent variability of swallowing; and (6) high clinical productivity requirements. Each of these identified barriers will be discussed. It is our hope, that by identifying and beginning a discussion here we may begin to acknowledge and address these in efforts to advance patient care and associated outcomes.

Barrier 1: Cart before the horse: an educational focus on the disordered system

Although the SLP represents the primary healthcare provider responsible for the assessment and management of dysphagia; it was not until the turn of the twenty-first century that courses in dysphagia were a requirement in the curriculum for accredited academic programmes in speech–language pathology in the USA (ASHA, 2007). Therefore, many practising clinicians in the USA did not complete a single class dedicated to swallow physiology, function and dysphagia during their formal education. According to Standard IV-C of the 2014 Standards and Implementation Procedures for the Certificate of Clinical Competence in Speech-Language Pathology (2014), the applicant for certification after graduate school must demonstrate knowledge of swallowing (oral, pharyngeal, oesophageal, and related functions, including oral function for feeding, orofacial myology). However, as data we present in this section denote, many SLP students or graduates trained in the USA are only offered a single course on swallowing disorders (at the most) during their formal graduate level educational training in speech–language pathology.

In efforts to obtain information regarding level of training, level of preparedness and educational experiences, we surveyed 70 practising SLP clinicians specialising in dysphagia management in the USA. SLPs completed a four-item multiple-choice electronic survey. Question 1 asked clinicians "Did you receive a dedicated course in dysphagia during your graduate studies?" with the majority (77%) responding "yes" and 23% responding "no". Question 2 asked "Where did you learn about normal swallowing?" The majority (40%) responded "in graduate school"; 25% responded "I didn't"; 20% stated they learnt about normal swallowing "on the job"; while 15% affirmed they were "self-taught". Question 3 asked "How many hours of formal training in graduate school did you receive on normal swallowing?" Responses, in rank order, were: less than 5 hours (70%); none (22%); 5–15 hours (6%); and an entire course (2%). Question 4 asked

Table III. Review of dysphagia textbooks commonly used in university educational programmes and the relative text devoted to normal swallowing function versus disordered swallowing.

Authors	Textbook title	Chapters on normal	Chapters on disordered	Percentage on normal (%)
Logemann (1998)	*Evaluation and Treatment of Swallowing Disorders*, 2nd edition	1	12	7.7
Groher (1997)	*Dysphagia: Diagnosis and Management*, 3rd edition	1	14	6.7
Leonard and Kendall (2014)	*Dysphagia Assessment and Treatment Planning*, 3rd edition	1	17	5.6
Groher and Crary (2015)	*Dysphagia: Clinical Management in Adults and Children*, 2nd edition	2	13	13.3
Corbin-Lewis and Liss (2014)	*Clinical Anatomy & Physiology of the Swallowing Mechanism*, 2nd edition	1	8	11.1
Cichero and Murdoch (2006)	*Dysphagia: Foundation, Theory and Practice*	4	12	25.0
Perlman and Schulze-Delrieu (1997)	*Deglutition and its Disorders: Anatomy, Physiology, Clinical Diagnosis, and Management*	2	14	14.3
Carrau and Murry (1999)	*Comprehensive Management of Swallowing Disorders*	2	52	3.7

"Did you feel prepared to assess and treat swallowing disorders upon graduation?" An overwhelming 92% of clinicians responded "no" to this final question.

We then queried 15 current university professors who teach in the USA regarding their choice of text book for teaching dysphagia and examined the contents of the most commonly used texts. Upon examination of these nine dysphagia texts we observed that, on average, only 10.9% of chapters are devoted to the process of normal deglutition (see Table III). Typically, only 1 or 2 chapters discuss normal swallowing function despite the anatomical and physiologic complexity of normal deglutition. In our collective experience, texts typically serve as the framework for an associated course and in essence dictate, to a large degree, specific class topics and time spent learning about each. A caveat to interpreting these data is the potential that for many texts, there is an implicit assumption that normal anatomy and physiology is already known and therefore not covered in the needed detail in the dysphagia specific text.

An informal comparison of the dysphagia graduate education requirements to other health-related educational programmes reveal large imbalances. Other clinical training programmes such as physical therapy, occupational therapy, medicine, and veterinary medicine dedicate between 40% and 60% of curricula to learning normal physiologic processes before advancing to diagnostics, disorders and treatments. Our profession's educational requirements for speech and language may be comparable to these requirements; however our preliminary data, collected in the USA, suggest that requirements for the core area of dysphagia are clearly lagging behind, with graduates feeling unprepared upon placement into the workplace. It is unclear how graduates from SLP programmes in other countries view their level of preparedness and educational experiences in dysphagia management and this represents an area for future examination. We may then learn from those programmes whose graduates feel most prepared to enhance training programmes where this may not be the case.

Understanding normal anatomy and physiology provides the crucial foundation for accurate diagnosis and meaningful treatment planning in dysphagia (Logemann, 1998). It has been argued however that professional training provides a cursory, at best, education on normal deglutition with the majority of the university dysphagia course and associated texts focused on disorders of swallowing and their treatments (Campbell-Taylor, 2008). That is, some educational programmes in dysphagia put the "cart before the horse". We recommend thoughtful consideration of university dysphagia curricula that includes an in-depth examination of normal swallowing anatomy and physiology across the age span if not already featured. We believe that allocating a greater proportion of time specifically dedicated to normal swallowing physiology and its inherent variability is essential to improving dysphagia practice patterns.

Barrier 2: System 1 processing

Critical thinking is often under-emphasised during formal clinical training (Bate, Hutchinson, Underhill, & Maskrey, 2012). The Dual Process Theory argues that humans process information using two distinct systems that include System 1 and System 2 processing (Croskerry, 2009a, 2009b). System 1 involves intuitive, automatic thinking that is derived over time by developing rules of thumb, shortcuts and patterns for a specific cognitive process. Among clinicians in other fields, it has been shown that System 1 processing is developed through experience, formal academic training, and observing the behaviours of other clinicians (Bate et al., 2012). Conversely, System 2 processing involves analytical and strategic thinking based on rational evaluation of available evidence. Bate et al. (2012) argues that critical thinking, based in System 2 processes, is generally missing from formal healthcare professions clinical training. Croskerry (2009a) found that humans prefer to use System 1

whenever possible, including in clinical situations, especially given the high productivity demands placed on clinicians in medical settings. However, a balance between System 1 and System 2 processing might lead to better clinical decision-making, avoiding costly errors in care (Bate et al., 2012). It is our assumption that System 1 processing is common among SLPs who are afforded limited time to make clinical decisions and are offered minimal training on swallowing function. Given reports that have elucidated inconsistencies in dysphagia management as well as healthcare-enforced regulations, System 2 processing may be limited in guiding clinical decision-making (Carnaby & Harenberg, 2013; Garcia, Chambers, & Molander, 2005; Mathers-Schmidt & Kurlinski, 2003; Smith, 2006).

Inclusion of critical thinking and problem-based learning approaches that include interactive case studies have been adopted in some formal SLP educational programmes that likely provide enriched learning opportunities for trainees. In this setting, students develop, learn and apply a Systems 2 approach to a clinical situation or problem that they are more likely to use when they enter the clinical workforce. We believe that the widespread adoption of such critical thinking problem-based learning models will enhance the clinical decision-making skills of future clinicians.

Barrier 3: Complexity of swallowing and consequences of impairment

Swallowing requires the precise coordination of over 25 pairs of muscles and 6 cranial nerves to safely and efficiently transport food and liquid from the mouth to the stomach. This process occurs in under 2 seconds and cannot be directly observed without imaging. Additionally, given that dysphagia is a symptom of an underlying disorder its presentation can vary considerably. These factors represent significant challenges for junior clinicians who are expected to learn, evaluate and appropriately identify physiologically based treatment targets in a productivity-driven model of clinical care. Overshadowing these facts is also the knowledge that diagnostic mistakes (false negatives – not identifying a disorder) in the swallowing evaluation can carry significant sequela including aspiration pneumonia, malnutrition and death. It is possible that this later consideration contributes to the noted high rate of false positives (i.e. designating a normal behaviour as disordered) observed in practising clinicians who may be fearful of missing a pathology and who operate from an overly risk adverse approach to care given the growing potential for litigation in dysphagia management that has been observed in the USA (Ernster, 2018; Vose et al., in press). Therefore, the diagnostic demands placed on the junior clinician practising in dysphagia carry significant health-related consequences.

Barrier 4: Inability to directly visualise the swallowing process and limited exposure to normal

Compounding Barrier 3 is the fact that, unlike many other processes that rehabilitation specialists focus on in the human body, deglutition is not visible. While this has obvious implications for clinical diagnostics, it also negatively impacts training and learning experiences and opportunities to view normal swallowing. A physical therapist, for example, can observe gait patterns or sit-to-stand transfers during everyday interactions to build up an internal repertoire or catalogue of normal temporal and kinematic patterns and variations in healthy individuals across the lifespan. Indeed, in most physical therapy programmes, students attend weekly laboratories where they practice measuring kinematic, timing and range of motion measurements on other healthy students for different movements such as elbow or knee extension and flexion range of motion. The SLP student who is learning about swallowing and swallowing disorders, however, is typically not afforded the same exposure to observe or measure the variability of the normal swallowing process since visualisation and measurement of swallowing kinematics and timing requires an instrumental exam (e.g. videofluoroscopy or fiberoptic endoscopic evaluation of swallowing). Consequently, not all educational programmes or clinical sites may have a comprehensive library of *healthy* swallowing examples already collected and saved for SLP trainees or clinicians to view. Further, in some clinical settings access to perform or observe instrumental examination of swallowing is non-existent or extremely limited (such as a nursing home or assisted living facility).

Thus, the junior clinician may have a limited exposure, catalogue or repertoire of normal swallowing and variability in healthy individuals to aide in their learning. There is, however, an increasing number of electronic educational resources available to educators, students and clinicians to view and practice making ratings of normal and disordered instrumental swallowing exams and as more programmes adopt these resources this barrier could be reduced.

Barrier 5: Inherent variability of swallowing in healthy individuals

Variability of swallowing physiology has been previously identified as a potential barrier to distinguishing between normal and disordered swallowing (Ernster, 2018). Indeed, published literature detailing kinematic and temporal physiologic swallowing measurements in healthy young and old individuals documents an inherent variability in normal swallowing. Molfenter and Steele (2011) conducted a meta-review of hyoid and laryngeal kinematics in healthy swallowing and determined that a large

Table IV. Temporal and kinematic ranges in healthy adults[a].

Swallowing metric	Aggregate mean range	Mean range	Data based on
Temporal metric			
Hyoid movement duration	0.6 s	0.79 to 1.39 s	8 reports
Laryngeal closure to UES opening	0.18 s	−0.16 to 0.02 s	9 reports
UES opening duration	0.46 s	0.21 to 0.67 s	20 reports
Laryngeal closure duration	0.76 s	0.31 to 1.07 s	14 reports
Stage transition duration	0.76 s	−0.22 to 0.54 s	14 reports
Pharyngeal transit time	0.84 s	0.35 to 1.19 s	14 reports
Kinematic metric			
Anterior laryngeal excursion	4.8 mm	3.4 to 8.2 mm	5 reports
Anterior hyoid excursion	10.4 mm	7.6 to 18.0 mm	13 reports
Superior laryngeal excursion	12.8 mm	21.1 to 33.9 mm	5 reports
Superior hyoid excursion	19.2 mm	5.8 to 25.0 mm	13 reports

UES: upper oesophageal sphincter.
[a]Adapted by permission from Springer: Springer Nature. (1) Dysphagia, physiological variability in the deglutition literature: hyoid and laryngeal kinematics (Molfenter and Steele, 2011). (2) Dysphagia, temporal variability in the deglutition Literature (Molfenter and Steele, 2012).

degree of variability exists in swallow-related movement across structures. Data from this meta-analysis are summarised in Table IV and specifically reveal that the superior movement plan for hyoid and laryngeal movement demonstrates the highest degree of variability. Molfenter and Steele (2012) followed this with another meta-analysis that focused on the degree of variability in the six most commonly reported temporal parameters in healthy adults (i.e. three durational and three interval measures). Table III summarises results depicting substantial variability across parameters, with differing degrees across each of the swallowing measures. Specifically, UES opening duration and the time interval between laryngeal closure to UES opening interval demonstrated the least variability, reflected by small ranges for mean values and tight confidence intervals (Molfenter & Steele, 2012). Pharyngeal transit time, stage transition duration and laryngeal closure duration, however, demonstrated the highest degree of variability, with wide confidence intervals around the obtained means in healthy individuals (see Table IV). Molfenter and Steele (2012) concluded that swallowing is highly variable, particularly across varying bolus volumes, thus clinicians need to be aware of variability in swallow function during videofluoroscopic study of swallowing and its impact on treatment planning. A lack of understanding of the normal variability in healthy swallowing could lead to a misdiagnosis of "disordered" swallowing and subsequently lead to inappropriate treatment targets for swallowing physiology that falls within the established wide range of normal healthy swallowing. This later point might represent an explanatory factor for the high diagnostic false positive rates previously presented.

When examining our own survey data, swallow metrics with the lowest degree of established inherent variability in healthy individuals (anterior hyoid excursion and UES opening) tended to have a higher (although still sub-optimal) degree of accuracy. This suggests that in this group of SLPs, the less inherent variability and tighter the normal physiologic range, the easier it might have been to distinguish normal vs. disordered.

Barrier 6: Clinical productivity requirements and time on the job

In an ideal clinical setting, SLPs would have the opportunity to perform frame-by-frame analyses on videofluoroscopic swallowing exams and compare obtained metrics in an objective fashion to established normative ranges of swallowing (presented in Table IV). A clinician could then plot on a normal swallowing curve where the patients' temporal and kinematic swallowing metrics fall, similar to what a paediatrician might do for a child's height and weight. Indeed, Vose and colleagues (in press) determined that diagnostic accuracy was higher for SLPs who used frame-by-frame analysis 80% of the time. This scenario, however, is not realistic in all clinical settings given on the job demands for productivity. High productivity requirements for clinicians have risen over the past decade with current productivity standards for medical SLPs in the USA ranging between 80% and 90% (ASHA, 2015). Such limits typically leave little to no room to learn and complete a frame-by-frame level of analysis. The fee-for-service healthcare domain has focused on and rewarded clinicians who bill for the highest number of patients rather than the quality of service provided. Therefore, the SLP who is motivated to perform this type of analysis are likely to be penalised for being "slow" or less productive then other SLPs, given the time it takes to perform. Perhaps in these scenarios evidence of shorter treatment times resulting from more appropriately targeted treatment programmes, and with fewer adverse events, could provide a strong rationale in the fee-for-service climate.

Solutions

Hereafter we provide several suggestions for a way forward. A stronger educational programme in dysphagia is needed given that an incongruent amount of formal training exists between time spent on the job evaluating and treating dysphagia for medical SLPs, and time during formal educational training. An expanded programme in both normal and disordered swallowing (similar to course offerings in speech and language) would be desirable with the option for specialised electives to those students interested in working in medical settings. In existing university dysphagia coursework, a stronger focus on normal deglutition is suggested to serve as a strong foundation for dysphagia diagnostics that includes a discussion of variability of swallowing across the healthy age span. Inclusion of labs that allow students to view examples of the range of healthy swallowing and training students in frame-by-frame analytic techniques would also be desirable. Finally, educational programmes at large would benefit from a problem-solving learning approach to encourage critical thinking and a balance between System 1 and System 2 training (Bate et al., 2012).

In the USA, the profession has, to an extent, acknowledged the need for further specialised training in dysphagia management with the creation of the Clinical Specialty Certification programme in Swallowing and Swallowing Disorders. Offered through the American Board of Swallowing and Swallowing Disorders, practising clinicians can further their training and receive a board certificate specialised in swallowing (BCS-S).

Clinicians can attend continuing education courses where specialised training in normal swallowing physiology and analytics are offered. Although most continuing education programmes focus on disordered swallowing and treatment topics, there are new course offerings in normal swallowing as well as viewing libraries of normal healthy swallowing across the lifespan available for clinicians. Clinicians can also read, listen to podcasts and reach out to mentors in the field in the pursuit of knowledge.

Conclusion

Although SLPs are the primary healthcare provider for the evaluation and treatment of dysphagia, recent evidence highlights a potential knowledge gap for clinical judgements of normal and disordered swallowing. We have identified six barriers to the training and education in normal swallowing physiology offered to SLPs. We hope the outcomes of these survey data will identify challenges to our professional training programmes that will be met with constructive pathways toward improving professional standards in dysphagia management. Acknowledgement, accountability and a willingness to chip away at identified barriers in this article are required to advance our profession and ultimately the clinical care and lives of individuals with suspected swallowing impairment whom we evaluate and treat.

Declaration of interest

No potential conflict of interest was reported by the authors.

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