

Review Article

Assessment, Diagnosis, and Treatment of Dysphagia in Patients Infected With SARS-CoV-2: A Review of the Literature and International Guidelines

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Purpose: Speech-language pathologists are playing a crucial role in the assessment and management of patients infected with severe acute respiratory syndrome coronavirus 2. Our goal was to synthesize peer-reviewed literature and association guidelines from around the world regarding dysphagia assessment and management for this specific population.

Method: A review of publications available in the PubMed database and official guidelines of international groups was performed on May 23, 2020. The information was synthesized and categorized into three content areas for swallowing: clinical evaluation, instrumental assessment, and rehabilitation.

Results: Five publications were identified in the PubMed database. Following title, abstract, and full-text review, only three publications met inclusion criteria: two reviews and one narrative report. Additionally, 19 international guidelines were reviewed. To assess swallowing, a modified clinical evaluation was recommended and only following a risk

assessment. Instrumental assessments were often considered aerosol generating, especially transnasal procedures such as endoscopy and manometry. For this reason, many associations recommended that these examinations be performed only when essential and with appropriate personal protective equipment. Guidelines recommended that intervention should focus on compensatory strategies, including bolus modification, maneuvers/postural changes, and therapeutic exercises that can be conducted with physical distancing. Respiratory training devices were not recommended during rehabilitation.

Conclusions: International associations have provided extensive guidance regarding the level of risk related to the management of dysphagia in this population. To date, there are no scientific papers offering disease and/or recovery profiling for patients with dysphagia and coronavirus disease 2019. As a result, research in this area is urgently needed.

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Coronavirus disease 2019 (COVID-19) originated in Wuhan City, China, in December 2019 (Lu et al., 2020). This disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; Gorbalenya et al., 2020), a virus of animal origin (Chen et al., 2001) belonging to the B strain of the *Betacoronavirus* family (Chan et al., 2020), which represents a high potential for human-to-human transmission (Munster et al., 2020) including transmission by pre- and asymptomatic individuals (Han & Yang, 2020).

Recent reviews with meta-analyses revealed that the main clinical signs of COVID-19 include fever, dry cough, and evident lung changes on chest computed tomography scans. Some patients may also experience muscle pain, fatigue, and loss of smell and taste. Cases of greater severity may progress to acute respiratory distress syndrome, multi-organ failure (Durvasula et al., 2020; Lovato & de Filippis, 2020; Sun et al., 2020; Tong et al., 2020; Wang et al., 2020; Zhu et al., 2020), and/or neurological sequelae such as stroke or Guillain Barré syndrome (Alberti et al., 2020; Beyrouti et al., 2020; Padroni et al., 2020). At the time of writing this review article, there is no treatment targeting SARS-CoV-2, nor a vaccine. Currently available treatments are used to combat the symptoms and may include antiviral drugs, antibiotics, corticosteroids, renal replacement therapy, nutritional support, and/or respiratory support (Li et al., 2020; Yan et al., 2020). The latter is used in more severe cases and is provided as a supportive treatment to decrease symptoms of hypoxemia and prevent further damage to vital organs (Yan et al., 2020). Patients with impaired lung function secondary to oxygen deficiency and/or acute respiratory distress syndrome frequently require oxygen therapy, including nasal cannula, high-flow nasal cannula, noninvasive mechanical ventilation, invasive mechanical ventilation, and/or extracorporeal membrane oxygenation (Yan et al., 2020).

Breathing and swallowing are closely interrelated and highly coordinated functions (Martin-Harris et al., 2005). Sedative medications administered during critical care and respiratory support strategies used for the treatment of COVID-19 may contribute to swallowing impairment (Gemma et al., 2016; Hårdemark Cedborg et al., 2015). While options such as high-flow oxygen have not been shown to be a risk factor for oral feeding in adults in intensive

care units (Leder et al., 2016), the physiological impact of continuous positive airway pressure on the upper aerodigestive tract as delivered through these modalities has yet to be fully investigated. Emerging evidence suggests that noninvasive mechanical ventilation can affect oral and enteral feeding (Singer & Rattanachaiwong, 2018), and the use of bilevel positive airway pressure may increase the risk of aspiration (Hori et al., 2016). Forms of invasive mechanical ventilation, such as prolonged orotracheal intubation, can lead to laryngeal injury and/or dysphagia in up to 94% of cases (Brodsky et al., 2020; Brodsky, Levy, et al., 2018; Colton House et al., 2011; Macht et al., 2011; Shinn et al., 2019; Skoretz et al., 2010). Heavy sedation needed for prolonged intubation increases the risk of pharyngeal dysfunction and uncoordinated breathing and swallowing (Hårdemark Cedborg et al., 2015). In addition, prolonged intubation has been associated with disorders in the sensorimotor swallowing mechanism, with characteristic laryngeal injuries (Ambika et al., 2019; Brodsky, De, et al., 2018; Colton House et al., 2011; Miles et al., 2018; Ng et al., 2019). Prolonged intubation also leads to oral and pharyngeal swallowing impairments including the presence of laryngeal penetration and/or aspiration, contributing to adverse outcomes including pneumonia (Brodsky et al., 2020; Brodsky, Levy, et al., 2018; Kunigk & Chehter, 2007; Mota et al., 2012; Scheel et al., 2016) prolonged feeding tube use, length of stay, and increased hospital costs (Tsai et al., 2016). Furthermore, prolonged need for invasive ventilation may lead to tracheostomy (Zielske et al., 2014). Tracheostomy is also a risk factor for dysphagia (Coghlan & Skoretz, 2017; Hernandez et al., 2013; Pannunzio, 1996; Skoretz et al., 2020; Tolep et al., 1996), leading to aspiration and increasing the risk of pulmonary infections (Elpem et al., 1994; Hernandez et al., 2013; Miles et al., 2018).

Severe COVID-19 can lead to sepsis, altered status of consciousness, and/or delirium (Beach et al., 2020), which may increase the risk of dysphagia. In those without COVID-19, sepsis has been shown to be an independent predictor of dysphagia, increasing its odds by 13 to one (Sasegbon et al., 2018; Skoretz et al., 2014). Furthermore, decreased levels of alertness have adverse implications for safety during mealtime consumption or dysphagia assessments, and may consequently place the patient at further risk. Hence, international associations (American Speech-Language-Hearing Association [ASHA], 2020; Japanese Society of Dysphagia Rehabilitation [JSDR], 2020; Royal College of Speech and Language Therapists [RCSLT], 2020; South African Speech-Language-Hearing Association, 2020; Speech Pathology Australia [SPA], 2020) recommend caution against any dysphagia intervention when a patient is not fully alert or conscious, as it may lead to an increased risk of adverse outcomes, including aspiration. Malnutrition and muscle wasting are also frequent complications of COVID-19 that can also contribute to dysphagia (Li et al., 2020).

The speech-language pathologist (SLP) is often the primary professional involved in treating dysphagia in a range of health care settings, although other disciplines

may take the leading role in some countries. Although the mission of SLPs has long been established in critical care (Brotsky et al., 2020), it was only on April 28, 2020, that the World Health Organization recognized the role of SLPs in the treatment of patients with COVID-19 and emphasized that all members of the multidisciplinary team (MDT) are extremely important for the rehabilitation of patients as they recover their functional status and autonomy (World Health Organization/Europe, 2020). In the context of this pandemic, SLP associations around the world have generated guidelines aimed at SLP management of COVID-19 positive patients with dysphagia. The aim of these guidelines is to support optimal health care to patients and also support the health and safety of SLPs across care environments. These guidelines have been created by specialists in the area of dysphagia of each academic community, guided by the most current medical research and under the advice of other health societies. This review aims to synthesize current evidence regarding the assessment management of dysphagia in patients infected with SARS-CoV-2 through the review of peer-reviewed publications and international associations guidelines.

Method

A review of publications in the PubMed database on management of dysphagia in infected patients with SARS-CoV-2/COVID-19 and 19 official guidelines of several groups (institutions, societies, and associations) was performed.

Database Search

A review in PubMed database was performed on May 23, 2020, using the following strategies with the terms *COVID-19 OR SARS-COV-2 AND Dysphagia OR Deglutition Disorders*. After the results were obtained from the database, the 2020 publications that contained relevant information to the objectives of this work in title and abstract were selected for further review. Two authors assessed all potential publications for inclusion (J. V. and S. E. L.). Included were English publications that described assessment and management of dysphagia (clinical evaluation, instrumental assessment, and rehabilitation) in patients with COVID-19. Excluded were non-COVID-19 publications and non-English language publications.

Review of International Groups

The current guidelines and position papers of 19 institutions, scientific societies, and professional associations/bodies from several countries from all continents were reviewed on May 23, 2020, in order to identify other possible evidence not indexed in PubMed at the time of our search. The selection of these groups was determined according to the history of publications and development in the field of dysphagia in those countries (Plowman et al.,

2013). An overview of these societies, organizations, and professional bodies is provided in Table 1. The information was synthesized according to the aims of this review. Inclusion criteria established that only the documents, pronouncements, guidelines, and official notes of the academic groups previously established, whose central theme is the assessment and management of dysphagia in patients infected with SARS-CoV-2, were reviewed. Documents on the management of other areas of SLP and pronouncements by groups other than those already mentioned were excluded from this study. Furthermore, we disregarded other sources of information from unofficial websites or blogs. Videos, conferences, and webinars related to dysphagia during the COVID-19 pandemic, published on the official websites of the scientific groups, were not included in this study because they are outside the methodology of this review, which was limited to analyzing recommendations from written communications.

Results

The PubMed database search generated a total of five peer-reviewed journal articles related to dysphagia management in patients with COVID-19. After the analysis of title and abstract, two articles were excluded (one was a publication in Spanish and the other had no relevant information to our study goal); therefore, a total of three full texts were selected to be included in this review (Carda et al., 2020; Ku et al., 2020; Mattei et al., 2020; see Figure 1).

Of the publications reviewed in this work, two were review articles and one was a narrative report of the author's clinical experience. A review of the guidelines of 19 international groups was performed. Of these, two societies (Brazilian Society of Speech Therapy, 2020; International Association of Communication Sciences and Disorders, 2020) were excluded because they did not offer official guidelines and simply cited the recommendations of other societies and medical organizations. The first author (J. V.) read the 19 associations guidelines. These were fully read, categorized, and synthesized in expedited fashion, without double-blind review. The presentation and analysis of the results were organized thematically post hoc into three categories: (a) clinical swallowing evaluation, (b) instrumental assessment of swallowing, and (c) swallowing rehabilitation.

Clinical Swallowing Evaluation

Screening for and the assessment of dysphagia in critically ill patients with COVID-19 is considered a necessary and mandatory procedure (Carda et al., 2020). Some recommendations prior to patient contact were put forth. These included obtaining a thorough clinical history and a team-based discussion in order to review potential limitations and/or adaptations required during the evaluation (Ku et al., 2020; The Irish Association of Speech and Language Therapists [IASLT], 2020). Furthermore, it is recommended that only conscious patients with stable respiratory status

Table 1. Societies, associations, and institutions included in the systematic search.

Countries	Society, association, or institution
Australia	Speech Pathology Australia (SPA)
Brazil	Brazilian Association of Intensive Care Medicine (AMIB) ^a
Brazil	Brazilian Society of Speech Therapy (SBFa)
Canada	Speech-Language and Audiology Canada (SAC-OAC)
Europe	European Society for Swallowing Disorders (ESSD)
International	International Association of Communication Sciences and Disorders (IALP)
Ireland	The Irish Association of Speech and Language Therapists (IASLT)
Japan	Japanese Society of Dysphagia Rehabilitation (JSDR)
New Zealand	New Zealand Speech-language Therapists' Association (NZSTA)
South Africa	South African Speech-Language-Hearing Association (SASLHA)
Spain	Biomedical Research Center in Network of Liver and Digestive Diseases (CIBERehd), Societat Catalana de Digestologia (SCD) and Hospital de Mataró (HM)
United Kingdom	Royal College of Speech and Language Therapists (RCSLT)
United States	American Speech-Language-Hearing Association (ASHA)
United States	Dysphagia Research Society (DRS)
United States	American Society for Gastrointestinal Endoscopy (ASGE)
United States	American Gastroenterological Association (AGA)
United States	Digestive Health Physicians Association (DHPA)
United States	American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS)
United States	American Neurogastroenterology and Motility Society (ANMS)

^aThe specific guidelines of the Department of Speech-Language Pathology of this association were reviewed.

should be evaluated (Biomedical Research Center in Network of Liver and Digestive Diseases [CIBERehd], Societat Catalana de Digestologia [SCD] and Hospital de Mataró [HM], 2020). In the clinical swallowing evaluation, eight documents (ASHA, 2020; Dysphagia Research Society [DRS], 2020; JSDR, 2020; Ku et al., 2020; RCSLT, 2020; Speech-Language and Audiology Canada [SAC-OAC], 2020; SPA, 2020; IASLT, 2020) considered this assessment an aerosol-generating procedure, due to the increased likelihood of coughing during food and liquid trials in patients with dysphagia (Ku et al., 2020; RCSLT, 2020). Small respiratory droplets generated from the cough can remain suspended in the air and may be a potential source of transmission for the clinician (Ku et al., 2020). Thus, the use of appropriate personal protective equipment (PPE), such as N95 or FFP2-3 mask, gown, face shield/goggles, and gloves was considered mandatory throughout the procedure, in many of the documents (CIBERehd, 2020; IASLT, 2020; JSDR, 2020; Ku et al., 2020; Mattei et al., 2020; RCSLT, 2020; SPA, 2020).

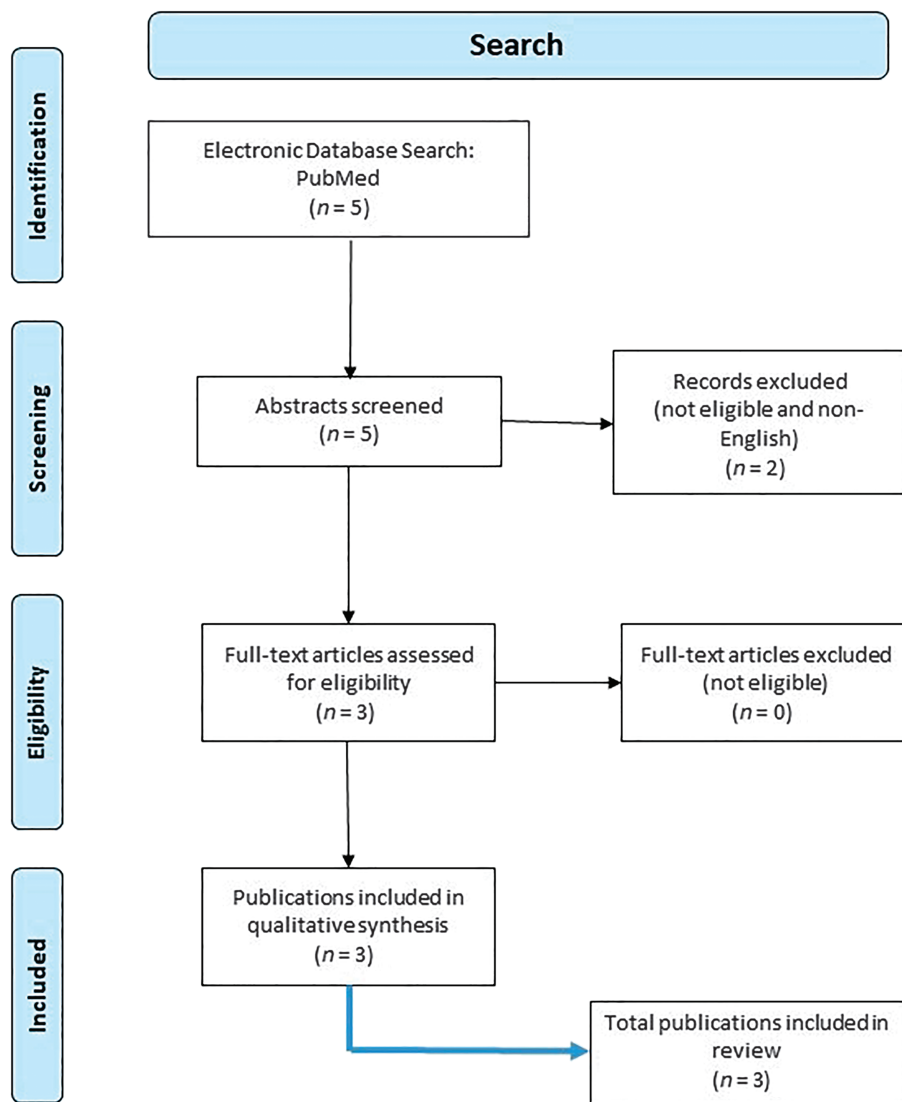
Other protective measures were also recommended for dysphagia clinical assessment. Following appropriate case preparation as described, the SLP can proceed with direct patient contact while maintaining a distance of between 1 and 2 m (3–6 ft; CIBERehd, 2020; Mattei et al., 2020; RCSLT, 2020; SPA, 2020) and be positioned to the side of the patient rather than face-to-face (IASLT, 2020; JSDR, 2020; SPA, 2020). Assessments of orofacial muscles and cranial nerves should be performed by observing the muscles at rest and during speech (IASLT, 2020). Assessing cough strength, gag reflex, and exhaustive oral cavity exams should be avoided (ASHA, 2020; CIBERehd, 2020; DRS, 2020; European Society for Swallowing Disorders [ESSD], 2020; IASLT, 2020; Ku et al., 2020; Mattei et al., 2020; RCSLT, 2020; SPA, 2020). In order to reduce the exposure

time during the evaluation, it was recommended that the fewest number of swallowing trials could be delivered while still providing the necessary diagnostic information (IASLT, 2020). Self-feeding by the patient should be encouraged (when possible; CIBERehd, 2020; JSDR, 2020; RCSLT, 2020; SPA, 2020) while the SLP assesses the relevant clinical domains, including the number of swallows, vocal quality changes, aspiration signs, respiratory rate, and oral stasis, all while maintaining the recommended distance as much as feasible (SPA, 2020). When possible, getting feedback from the patient on their perspective regarding their swallow is advocated (SPA, 2020). This assessment must be completed as quickly as possible, with guidelines recommending a maximum duration of 10–15 min (CIBERehd, 2020; RCSLT, 2020; SPA, 2020).

The research for cervical auscultation and laryngeal palpation are controversial, and recommendations for their use during swallowing evaluations varied across the reviewed publications. Although one document suggested that cervical auscultation may still be conducted during the evaluation of those with COVID-19 (SPA, 2020), with the SLP positioned next to the patient and not face-to-face, four documents recommended avoiding this practice (Brazilian Association of Intensive Care Medicine [AMIB], 2020; ESSD, 2020; RCSLT, 2020; IASLT, 2020). Similarly, for laryngeal palpation, one document suggests not performing this procedure (IASLT, 2020) and one recommended its use with the SLP positioned next to the patient, using all PPE (SPA, 2020).

Although the current literature offers varied guidelines for conducting the clinical evaluation of swallowing in patients with COVID-19, we need to be cognizant of the limitations of this noninstrumental assessment (Ku et al., 2020). Consequently, several previously validated

Figure 1. Study selection flow diagram.



instruments (Belafsky et al., 2008; Clavé et al., 2008; Dwivedi et al., 2010; Suiter et al., 2014; Ward & Conroy, 1999) have been recommended, to improve the validity and reliability of clinical evaluation (see Table 2; CIBERehd, 2020; Carda et al., 2020; IASLT, 2020; Ku et al., 2020; RCSLT, 2020). However, each tool/protocol has been validated on different patient populations, not including those with COVID-19.

Standardized rating scales that indirectly measure swallowing, such as diet scales and patient-reported quality of life scales, may provide a more robust measurement of function problems. For example, scales such as the Food Intake Level Scale (Kunieda et al., 2013), the Functional Oral Intake Scale (Crary et al., 2005), and/or the International Dysphagia Diet Standardisation Initiative Functional Diet Scale (Steele et al., 2018) were recommended tools to guide

therapeutic planning until instrumental examination is more feasible (Ku et al., 2020).

Instrumental Assessment

Flexible Endoscopic Evaluation of Swallowing

The nose and nasopharynx are the access routes to flexible endoscopic evaluation of swallowing (FEES); however, infected patients have a high viral load in this region (Zou et al., 2020). The publications reviewed suggest that FEES represents a potential transmission risk for the SLP (ASHA, 2020; CIBERehd, 2020; AMIB, 2020; DRS, 2020; IASLT, 2020; JS DR, 2020; Ku et al., 2020; South African Speech-Language-Hearing Association, 2020; SAC-OAC, 2020; SPA, 2020). In addition, coughing, gagging, and sneezing caused by direct stimulation and irritation of

Table 2. Examples of validated clinical assessments tools and protocols.

Instruments
Eating Assessment Tool (EAT-10)
The Volume-Viscosity Swallow Test (V-VST)
Sydney Swallow Questionnaire (SSQ)
Royal Brisbane Hospital Outcome Measure for Swallowing (RBHOMS)
Yale Swallow Protocol (YSP)

the mucosa during insertion and removal of the flexible endoscope can generate aerosols increasing contamination risk (Ku et al., 2020; RCSLT, 2020). Should FEES be required, it should be conducted with caution (ESSD, 2020; New Zealand Speech-language Therapists' Association [NZSTA], 2020; RCSLT, 2020; SPA, 2020). Its use is recommended only when (a) the clinical evaluation has failed to provide sufficient and conclusive information regarding dysphagia severity and the condition of the airway (ESSD, 2020; RCSLT, 2020); (b) the patient has a previous history of aspiration pneumonia (NZSTA, 2020); (c) a recent increase in symptoms such as fever, cough, and weight loss (Ku et al., 2020); and/or (d) poor secretion management and/or suspected silent aspiration (RCSLT, 2020). In the event that the exam cannot be postponed or an alternative route of feeding is unavailable, the SLP should discuss the feasibility of the exam with the MDT with its conduct completed using appropriate PPE regardless of the patient's viral status (ESSD, 2020; Ku et al., 2020; Mattei et al., 2020; NZSTA, 2020; RCSLT, 2020; SPA, 2020) and with the minimum number of professionals present (RCSLT, 2020; SPA, 2020).

The patient and testing environment should meet some minimal prerequisites for FEES to be conducted (RCSLT, 2020). As with all patients prior to the COVID-19 pandemic, an agitated, hemodynamically unstable patient who is unable to maintain oxygenation will not be a good candidate (RCSLT, 2020). In addition, the examination must be performed in an isolated, closed room (RCSLT, 2020; SPA, 2020), ideally with negative pressure and air filtration to reduce environmental contamination (Ku et al., 2020). The equipment and video monitor must be positioned on the patient's side and not face-to-face to minimize contamination, and disposable scopes are advised, if available (RCSLT, 2020). Following the examination, the room will need to be disinfected (SPA, 2020).

For the conduct of the examination, the most recent RCSLT guideline (RCSLT, 2020) recommends a stepwise approach to assist prioritization and utilizes an abbreviated nasendoscopy procedure for those with the SARS-CoV-2 virus. This format allows the assessment of those patients in greatest need, in particular, for those with airway problems (RCSLT, 2020). It is recommended that the procedure be conducted by a skilled SLP with extensive experience in endoscopic procedures to ensure expedited and accurate insertion of the fiber-optic endoscope, allowing for good quality image capture, and the procedure should be

video-recorded (RCSLT, 2020). Laryngeal sensitivity tests with air pulse stimulators are contraindicated, as it is a procedure that can induce cough thereby generating droplets and aerosols (Ku et al., 2020; SPA, 2020).

Fluid trial testing and food testing should also be condensed to reduce procedure duration (RCSLT, 2020), including up to two food consistencies (Level 0 and Level 4 on the International Dysphagia Diet Standardisation Initiative scale; Cichero et al., 2017) or using two levels of viscosity (250 and 800 mPas; CIBERehd, 2020; Costa et al., 2019), with a maximum of two attempts per consistency (RCSLT, 2020). Observations and events, including secretions, residue, and airway compromise (e.g., penetration and/or aspiration), should be assessed using standardized scales (available in Table 3; RCSLT, 2020). If excess secretions and/or signs of pharyngolaryngeal reflux are observed, they should be managed in consultation with the MDT in order to avoid further complications (RCSLT, 2020). To finish the exam, the flexible endoscope must be removed carefully to avoid coughing and sneezing and the findings should be documented and communicated to the patients, carer, and MDT (RCSLT, 2020).

Videofluoroscopic Swallowing Studies

Due to the concerns with FEES, the videofluoroscopic swallowing studies (VFSS) has been considered a safer evaluation method, since it does not involve invasive instrumentation and it enables one to maintain some distance between the assessor and the patient during the procedure (Ku et al., 2020). Nevertheless, the VFSS must also be used with caution. Eleven documents considered this procedure to be an aerosol-generating procedure due to the coughing events that may be seen during oral trials (ASHA, 2020; AMIB, 2020; CIBERehd, 2020; DRS, 2020; ESSD, 2020; IASLT, 2020; JS DR, 2020; Ku et al., 2020; NZSTA, 2020; SAC-OAC, 2020), and RCSLT recommended the decision to proceed with VFSS should be risk assessed (RCSLT, 2020). The transport of the patient to and from the radiology suite also poses a transmission risk, potentially contaminating frequently accessed locations such as elevators and corridors (AMIB, 2020; CIBERehd, 2020; SPA, 2020). In order to best inform rehabilitation, VFSS may be warranted in patients who are at high risk of adverse outcomes secondary to dysphagia (e.g., respiratory complications, malnutrition, dehydration; SPA, 2020), and videofluoroscopy may be required to provide necessary information that was not possible with the clinical evaluation (ESSD, 2020). As a result, study planning should be discussed with the MDT

Table 3. Examples of rating scales for flexible endoscopic evaluation of swallowing evaluation.

Protocols	Authors
New Zealand Secretion Scale (NZSS)	Miles et al., 2018
Yale Residue Scale (YRS)	Neubauer et al., 2015
Penetration Aspiration Scale (PAS)	Rosenbek et al., 1996

(ASHA, 2020). During the VFSS, precautionary measures can be taken to minimize transmission risk including the PPE utilization by the examiner (ESSD, 2020) and self-feeding by the patient (SPA, 2020). Many guidelines described environmental requirements. The radiology room where the exam is to be performed should have an efficient air filtration system (Ku et al., 2020) and will need to be disinfected after use (SPA, 2020). Thus, it is recommended that the VFSS be completed at intervals where cleaning would have minimal impact on workflow (e.g., last procedure of the assessment period; SPA, 2020).

Pharyngoesophageal Manometry

Eight documents considered pharyngoesophageal manometry a transmission risk procedure due to the nasopharyngeal access route (American Gastroenterological Association [AGA], 2020; American Society for Gastrointestinal Endoscopy [ASGE], 2020; CIBERehd, 2020; DRS, 2020; ESSD, 2020; Sultan et al., 2020; IASLT, 2020; JSDR, 2020). The guidelines for manometry are similar to those of FEES. The main concerns are the clinicians' exposure and the spread of SARS-CoV-2 outside the procedure room. The guidelines of the ASGE suggest that manometry be prioritized for urgent cases (ASGE, 2020). The AGA and Digestive Health Physicians Association issued a joint statement on April 27, 2020, that allowed elective procedures, whether patients test positive or negative for COVID-19, to resume with due care (AGA, 2020; Sultan et al., 2020). A COVID-19 task force organized by the American Neurogastroenterology and Motility Society issued a statement on May 17, 2020, offering guidelines for endoscopy and manometry procedures and included pre-procedure examinations and recommendations for the use of PPE. They further recommended the use of the guidelines for all motility studies (American Neurogastroenterology and Motility Society, 2020).

Swallowing Rehabilitation

Guidelines have been provided by many associations to adapt rehabilitation of patients with COVID-19 (CIBERehd, 2020; DRS, 2020; ESSD, 2020; IASLT, 2020; JSDR, 2020; NZSTA, 2020; RCSLT, 2020). While some have recommended ceasing and/or postponing active dysphagia treatment involving contact with the patient's aerodigestive tract (CIBERehd, 2020; DRS, 2020; IASLT, 2020), some modifications to treatment approaches have been suggested. These include alteration to the frequency and/or duration of treatment sessions (CIBERehd, 2020), the type of intervention provided (CIBERehd, 2020; Carda et al., 2020; ESSD, 2020; RCSLT, 2020), and/or modifications to the treatment environment (Ku et al., 2020; SPA, 2020). Treatment session duration reduction (CIBERehd, 2020) and the use of compensatory rather than active strategies as appropriate (e.g., thickened liquids, texture modified food, nutritional support, postural changes, and/or other maneuvers)

may reduce transmission risk (CIBERehd, 2020; Carda et al., 2020; ESSD, 2020; RCSLT, 2020).

Postponement and/or avoidance of active rehabilitation approaches have been recommended as many involve direct contact with the upper aerodigestive tract (and its secretions) and/or are considered aerosol-generating procedures (DRS, 2020), thereby increasing transmission risk. These include procedures that require the manipulation of the oral cavity (e.g., thermal tactile stimulation; ESSD, 2020; IASLT, 2020) along with expiratory muscle strength training and inspiratory muscle strength training. While some consider expiratory muscle strength training/inspiratory muscle strength training beneficial for select patients (RCSLT, 2020), five associations considered their use contraindicated in patients with COVID-19 due to their aerosol-generating risk (AMIB, 2020; DRS, 2020; ESSD, 2020; NZSTA, 2020; IASLT, 2020). Other techniques that induce coughing (e.g., super-supraglottic swallow) should also be avoided (ESSD, 2020). While many patients require frequent exercises to maintain and stimulate swallowing (IASLT, 2020), wherever possible, the SLP may prescribe other selective exercises.

Alterations to the rehabilitation environment and/or hygiene practices may reduce transmission. Wherever possible, patients who require oxygen masks may be appropriate to be switched to nasal cannulas during oral intake and self-feeding could be promoted (CIBERehd, 2020). As with all patients, oral care is essential to reduce the risk of aspiration pneumonia (IASLT, 2020) and should be promoted where possible. Transmission risk reduction may be afforded by ensuring that the patient engages in oral cavity cleaning independently (e.g., teeth brushing, oral washes before/after oral intake; CIBERehd, 2020; DRS, 2020; ESSD, 2020; NZSTA, 2020) and/or utilizes suction toothbrushes to reduce the need for expectoration. If the patient has difficulty performing any of these tasks independently and needs the help from the professional, appropriate PPE is recommended (CIBERehd, 2020).

Nutritionists should be consulted for the need of oral nutritional supplements during the acute phase (CIBERehd, 2020). In cases where recovery is poor and oral feeding is not possible, the use of alternative, long-term feeding routes should be discussed with the MDT (CIBERehd, 2020; Mattei et al., 2020; RCSLT, 2020). However, it should be taken into account that the insertion of nasogastric tubes in infected patients can represent a scenario of high risk of contamination for professionals (Mattei et al., 2020). In cases where this procedure is necessary, the appropriate use of PPE is mandatory and the number of professionals involved in the procedure should be minimized (Mattei et al., 2020). When the placement of a gastrostomy tube is considered necessary, this procedure should be postponed (when possible) until the viral load is reduced (ESSD, 2020).

Other medical treatments can support the rehabilitation process; for example, the use of pharmacological treatments can reduce secretions and facilitate rehabilitation (RCSLT, 2020). The need to perform surgical procedures

to improve swallowing such as vocal fold medialization can be used when necessary and discussed with the MDT (RCSLT, 2020). After hospital discharge, it is recommended that patients continue therapeutic follow-up with the SLP. The use of telehealth strategies and applications may be very useful at this stage (Ku et al., 2020), and guidelines for the SLP in delivering this intervention are available (RCSLT, 2020).

Discussion

The SARS-CoV-2 pandemic is still evolving. There is a continuing need for investigations focused on the impact of the virus on swallowing in infected patients, and the assessment and management of this patient population. To date, there have been no publications showing disease and recovery profiles for COVID-19 patients with dysphagia and its prevalence is unknown, although some reports suggest it may be frequent (Carda et al., 2020), and initial results from an ongoing study at Mataró Hospital, Catalonia, Spain, during the pandemic is showing prevalence of dysphagia among hospitalized patients with COVID-19 disease is above 50% (Clavé, 2020). Furthermore, the recommendations summarized herein may be applied to non-COVID-19 hospitalized patients during the pandemic situation, given the virus incubation and lack of detectable symptoms for several days following infection (Pan et al., 2020). A conservative approach is needed, particularly where a viral outbreak has occurred.

The etiology and pathophysiology of dysphagia in those with COVID-19, regardless of the need for invasive ventilation, requires further investigation. Due to prolonged orotracheal intubation and the high rates of reintubation in patients with COVID-19 (McGrath et al., 2020), the presence of laryngeal complications may decrease laryngeal sensitivity while impairing airway protection (RCSLT, 2020). In infected patients requiring mechanical ventilation, it is likely that dysphagia is secondary to several comorbidities associated with intubation and consequent alterations in the sensorimotor swallowing mechanism. Furthermore, considering that 30% of infected patients require critical care admission with respiratory support (Grasselli et al., 2020), the swallowing of those who do not require these measures needs consideration. The probable neurological sequelae associated with this new disease may also complicate dysphagia care (RCSLT, 2020). However, studies are needed to clarify these and other viral consequences, and their impact on swallowing physiology.

Several international associations have provided extensive guidance on virus transmission risk for procedures related to the assessment and management of dysphagia in patients with COVID-19. It is important to highlight that these procedures may lead to contamination and thereby pose a transmission risk to clinicians and others due to the aerosols released by infected patients (ASHA, 2020; DRS, 2020; IASLT, 2020; JS DR, 2020; Ku et al., 2020; RCSLT, 2020; SAC-OAC, 2020; SPA, 2020; Zou et al., 2020). It behooves the clinical community

to continually update practice according to the available evidence while calling for studies to guide researchers and clinicians.

Alterations to assessment approaches have been recommended. Due to restrictions in the use of instrumental assessment methods, it is necessary, however, to consider aspects such as validity and quality of the diagnostic and intervention procedures and potential impact on patients. Instrumentation can provide detailed information to inform clinical practice and educate patients while enhancing care delivery. However, the criteria for performing instrumental evaluations need to be more specific and restricted, and we believe that these criteria must be considered and described in detail to avoid exposure of professionals. We recommend that associations and institutions review these guidelines regularly in order to respond to new knowledge in minimizing the risk of viral transmission to both health care professionals and to other patients, so that we can continue to expand the options for assessing and treating dysphagia in the context of the pandemic. Furthermore, more in-depth guidelines on clinical evaluation procedures are needed, especially in areas where instrumentation is not easily accessible. For the time being, a thorough case history, the use of valid rating scales and/or classification tools during the clinical evaluation, and effective communication with the MDT can mitigate some of the disadvantages posed by decreased use of instrumentation (Crary et al., 2005; Fritz et al., 2020; Ku et al., 2020; Kunieda et al., 2013; Steele et al., 2018).

We recognize that the high risk associated with procedures related to dysphagia care in patients with COVID-19 and this topic will continue to be salient for the foreseeable future. As before the pandemic, SLPs should continue to base their practice on the best available evidence while considering the recommendations of local, national, and international health authorities (Mattei et al., 2020). These recommendations are continually evolving, and through our enhanced understanding, we will not only protect ourselves, but also patients, in the hopes of slowing virus spread while optimizing patient outcomes.

Limitations

While we have done our utmost to ensure that our review is thorough and timely in order to support practice, it does possess inherent limitations. Firstly, our search was restricted to a single language, English, subjecting it to language bias, thereby potentially limiting the findings. We believe, however, that the many organizations cited in the extended search, most in agreement, result in reasonably stable conclusions. A second limitation is that the search was completed during a time when COVID-19 cases in many countries were peaking and recommendations were continuing to evolve. Moreover, at the time of this writing, we were aware of active revisions to policies and guidelines being made by several societies. Even with these ongoing changes, this review amasses strong evidence for recommendations for the protections needed for clinicians worldwide.

Conclusions

To date, there are no scientific articles that offer disease and recovery profiles for patients with dysphagia and COVID-19. International groups have provided extensive guidance on the risk level of procedures related to the management of dysphagia in patients with COVID-19. Clinical evaluation is the most frequently recommended method of swallowing assessment for patients with COVID-19. However, a reduced and very selected group of patients may benefit greatly from instrumental evaluations such as FEES and VFSS. When indicated, they should be used with caution, making use of the appropriate PPE and reducing procedure time. The rehabilitation process is based on a primary dependence on compensatory strategies, mainly including fluid thickening, texture modified foods, and postural changes, avoiding the use of direct therapy that requires close proximity between the SLP and the patient's aerodigestive tract. Telehealth may be a strategy to facilitate rehabilitation of patients with COVID-19. Observational cohort studies are urgently needed to guide clinicians in the field.

Author Contributions

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