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REVIEW

Moving Forward with Dysphagia Care: Implementing Strategies during the COVID-19 Pandemic and Beyond

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Abstract
Growing numbers of SARS-CoV-2 cases coupled with limited understanding of transmissibility and virulence, have challenged the current workflow and clinical care pathways for the dysphagia provider. At the same time, the need for non-COVID-19-related dysphagia care persists. Increased awareness of asymptomatic virus carriers and variable expression of the disease have also focused attention to appropriate patient care in the context of protection for the healthcare workforce. The objective of this review was to create a clinical algorithm and reference for dysphagia clinicians across clinical settings to minimize spread of COVID-19 cases while providing optimal care to patients suffering from swallowing disorders. Every practitioner and healthcare system will likely have different constraints or preferences leading to the utilization of one technique over another. Knowledge about this pandemic increases every day, but the algorithms provided here will help in considering the best options for proceeding with safe and effective dysphagia care in this new era.

Keywords COVID-19 · SARS-CoV-2 · Dysphagia · Assessment · Treatment · Telemedicine

Introduction

As of June 5, 2020, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has infected over 6.7 million people worldwide and caused more than 393,600 related deaths [1]. Growing numbers of SARS-CoV-2 cases coupled with limited understanding of transmissibility and virulence, have challenged the current workflow and clinical care pathways for the dysphagia provider. Clinical features of coronavirus disease 2019 (COVID-19) including respiratory compromise, microvascular thrombosis and neurologic dysfunction as well as prolonged ICU care in severe cases yield patients particularly susceptible to swallowing impairment [2–6]. At the same time, the need for non-COVID-19-related dysphagia care persists. Increased awareness of asymptomatic virus carriers and variable expression of the disease, have focused attention to appropriate patient care and protection for the healthcare workforce [7–9].

On December 31, 2019, the World Health Organization (WHO) first became aware of a cluster of pneumonia cases,

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and COVID-19 was declared a pandemic 71 days later [10]. Three months following their declaration, the WHO defined aerosol generating procedures (AGPs) in March 2020 to include such things as endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, and tracheostomy [11]. On April 13, 2020 the Centers for Disease Control and Prevention (CDC) updated their guidance to include as AGPs any medical procedures that are "more likely to generate higher concentrations of infectious respiratory aerosols than coughing, sneezing, talking or breathing" [12]. Due to lack of evidence and practice variability, development of a comprehensive list of definite AGPs is elusive. Given the evolving evidence for transmission and our limited understanding of super-spreading events [13], best practices for dysphagia care must be considered in the context of the COVID-19 pandemic. Our objective was to create a clinical algorithm and reference for dysphagia clinicians across clinical settings to minimize spread of COVID-19 while providing optimal care to patients suffering from swallowing disorders. This document and the recommendations within were created based on best available information as we understand it at the time of publication.

Clinicial Considerations

Safety of the healthcare workforce is critical during this pandemic. In simulated environments of orotracheal intubation and forceful cough, generation of droplets up to 2 m away were demonstrated [14]. In other simulations, nasal endoscopy, speech, and sneezing generated 1–10 μm airborne aerosols, despite the use of a surgical mask.[7, 15]. Moreover, speech in a stagnant air environment emits oral fluid droplets 12-21 μm in diameter that remain in the air 8–14 min before dehydration [16]. In light of such findings, some investigators proposed an estimated risk adjustment of AGPs in asymptomatic patients [17]. Dysphagia clinicians must carefully consider their practices in the context of transmissible disease.

Given the propensity for dysphagia evaluation and management to elicit coughing, the American-Speech-Language Hearing-Association (ASHA) has designated non-instrumental swallowing assessment, instrumental swallowing assessment, and dysphagia treatment (among others) as AGPs [18]. In an effort to preserve personal protective equipment (PPE) and limit exposure of patients and clinicians to SARS-CoV-2, in combination with guidance from the Centers for Medicare & Medicaid Services (CMS), ASHA recommended delaying non-essential endoscopies in those with unknown transmission risk [19]. Dysphagia Research Society's *Statement on Dysphagia Interventions and AGPs*, supports similar precautions, including use of aerosol PPE (i.e., N95 respirator or powered air purifying respirator [PAPR]) for clinicians evaluating and treating dysphagia [20]. However, guidance from the American Academy of Otolaryngology-Head and Neck Surgery published on May 7, 2020 offers an updated and clarified view: "Nasal endoscopy and flexible nasal laryngoscopy in and of itself are presumably not AGPs. However, they may potentially increase the likelihood of cough, gag, and sneeze, with possible subsequent aerosolization, and therefore appropriate precautions should be considered based on individual clinical circumstances" [21]. In addition to navigating these PPE recommendations and reducing provider exposure, there is ambiguity in what constitutes essential work, especially for speech language pathologists (SLP). Offering even more complexity to the already difficult work equation is the frequently updated recommendations that stem from a rapidly developing scientific knowledge base. Knowing the significant risks of delaying care for patients with swallowing impairment, the importance of timely dysphagia assessment and management should not be underestimated.

Non-instrumental evaluations (e.g., bedside/clinical swallow evaluation) are used to identify patients at risk for swallowing impairment. Dysphagia instrumental evaluations, videofluoroscopic swallow study (VFSS) and flexible endoscopic evaluation of swallowing (FEES), are used to diagnose the impairment and determine treatment planning via any combination of exercises to improve swallowing physiology (i.e., strength, timing, coordination of swallowing events/movements), compensations to improve bolus flow for safety, and recommendations for diet consistencies/modifications by oral or non-oral routes. Herein, we offer suggested clinical guidelines, acknowledging that each institution or facility has its own resource limitations and implementation of an algorithm requires a multidisciplinary approach given individual system constraints and policy (Fig. 1).

Instrumental Evaluation

During the COVID-19 pandemic, FEES and flexible laryngoscopy are problematic due to possible aerosol and droplet generation due to cough, gag or sneeze. This is particularly concerning as the nasopharynx is where the viral load is highest in the early stages of infection [8]. Otolaryngologists have recommended that, in areas with high prevalence of SARS-CoV-2, infection should be suspected in asymptomatic patients, and flexible laryngoscopy should only be performed when findings would have an immediate impact on patient management [22]. In this situation, the VFSS is preferred as the first line tool for instrumental evaluation of swallowing in SARS-CoV-2 positive or suspected high-risk unknown patients (Fig. 2). Obviating the need for transnasal endoscopy, VFSS allows for greater overall physical distancing between the

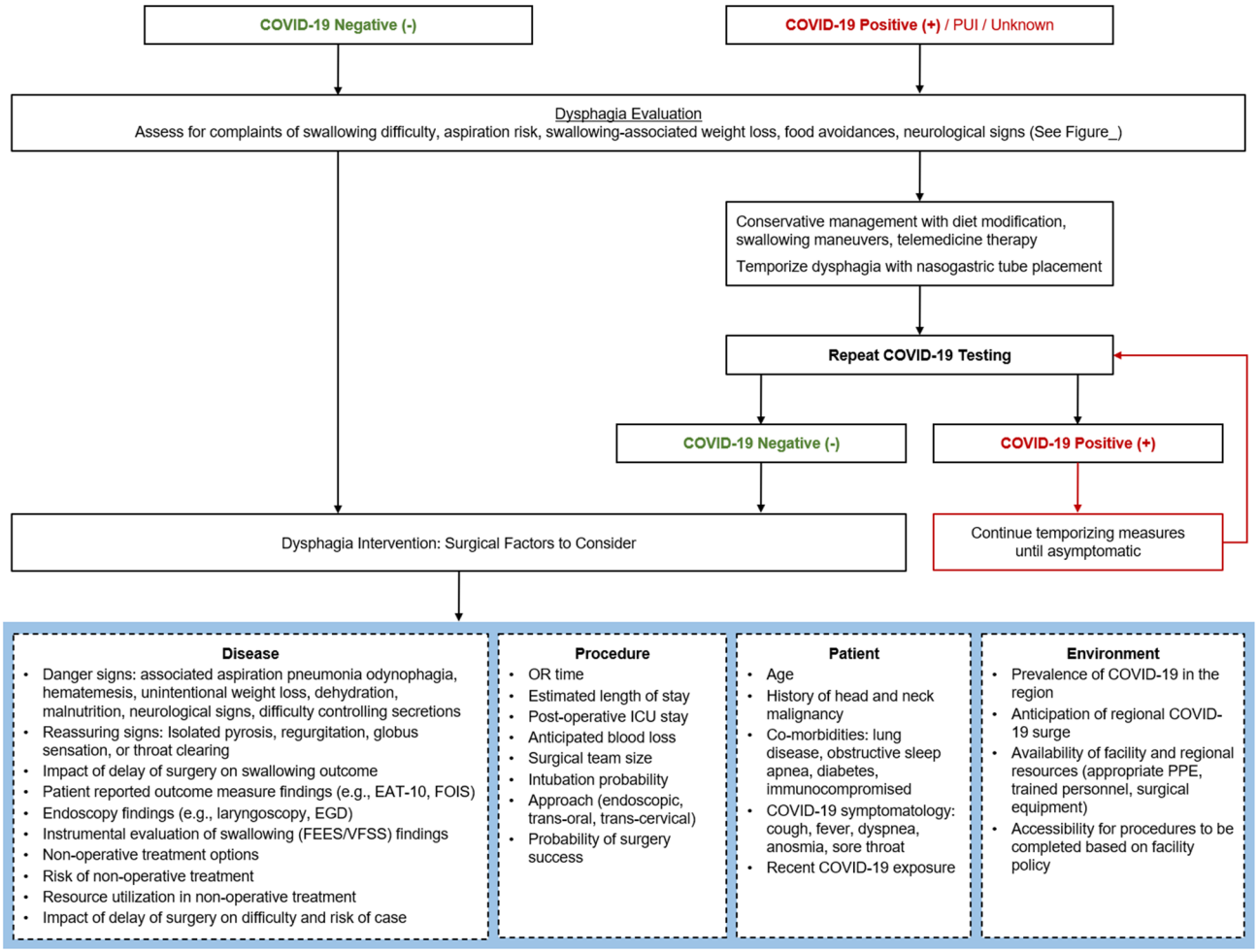

Fig. 1 Dysphagia Intervention Considerations

clinician and the patient. Disadvantages of VFSS include the need for patient transport to a fluoroscopy suite and generally more personnel (e.g. SLP, radiologist, radiology technician) [23]. If VFSS is unavailable, or if there is high suspicion for aspiration during the bedside/clinical swallowing evaluation in the presence of marked dysphonia or post-extubation stridor, FEES may be preferred [21] with appropriate precautions (Fig. 2).

– Pre-Procedure

  - o Perform maximum instruction and education to both the patient (and the radiology department staff) prior to patient arrival to optimize speed and efficiency of the study.
  - o Consider patient transport with a dedicated team.
  - o Consider using a larger room if possible so that personnel can stand away from patient. Use remote foot pedals for fluoroscopy initiation if available.
  - o Consider the availability of a negative pressure room.

– Personal Protective Equipment (PPE)

  - o For protection against infectious respiratory droplets and aerosols, personnel are recommended to wear N95 or a higher level of respirator, face shield, gloves, and a gown in a SARS-CoV-2 positive or suspected high risk unknown patient and at the provider's discretion in negative tested patients.
  - o Personnel should be proficient with safe donning and doffing procedures [24].
  - o Limit number of personnel to staff essential to complete the procedure only.

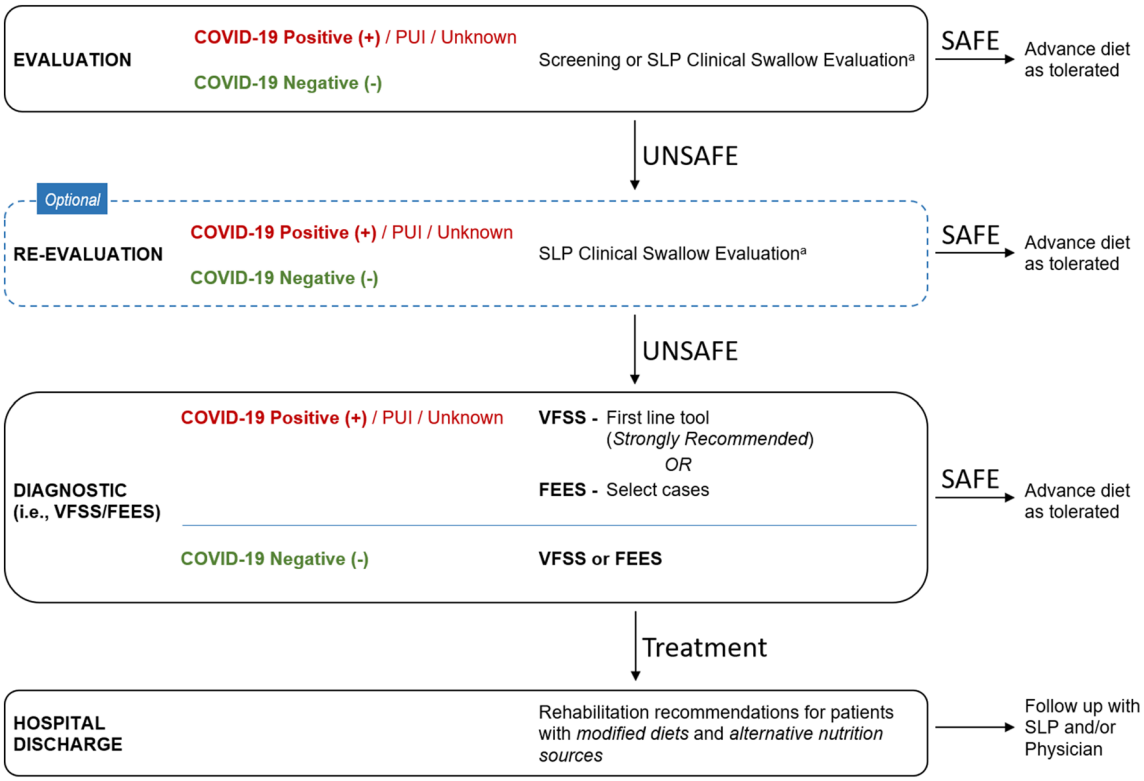

Fig. 2 Schematic of Dysphagia Evaluation and Treatment. Swallowing therapy strongly recommended. *FEES* flexible endoscopic evaluation of swallowing, *PUI* patient under investigation, *SLP* speech-language pathologist *VFSS*, videofluoroscopic swallow study

- Limiting Aerosolization
  - If possible and based on the clinical or bedside exam, the patient is instructed/encouraged to hold bolus in the oral cavity until the mask is replaced and then have patient initiate the swallow. Standardized protocols and commercially prepared barium consistencies and volumes should be used to improve the efficiency and safety of the exam.
  - If patient is able to self-administer each bolus, the SLP can limit contact with patient during the exam, simply instructing the patient as they proceed.
  - When performing FEES, avoid topical aerosolized anesthetic or vasoconstrictor sprays, and instead consider avoidance altogether or topical application via pledget, swab, or gel.

- Disinfection of Procedure Suite/Room
  - Consult with facility infection control, considering CDC recommendations, regarding time interval between each study based on air changes per hour in fluoroscopy suite [25].
  - Room sanitization should include thorough cleaning of exposed surfaces
  - Use disinfectant registered with the environmental protection agency (EPA) such as 75% alcohol, 2–3% hydrogen peroxide, 2–5 g/L chlorine, or equivalent method effective against COVID-19 [22].

- FEES-specific Considerations
  - Used scopes should be transported out of the exam room in closed containers to minimize the risk of direct or fomite transmission.
  - Reprocessing staff must exercise hand hygiene before and after cleaning laryngoscopes and wear proper PPE during cleaning procedures.
  - Disposable laryngoscopes could be considered.

Surgical Intervention

During the COVID-19 pandemic, conservation of resources and limiting virus spread must be balanced with the benefits of surgical intervention. The American College of Surgeons (ACS) has provided guidance on triaging surgical patients in each phase of the pandemic [26]. For regions in the early and late recovery phases, where resources are more available, restrictions on elective surgeries are lifted and the ACS has suggested that only selected "non-urgent" cases

be performed (e.g. endoscopy, gastrostomy tube placement). Select patients with non-obstructive or minimally obstructive pathology (e.g. cricopharyngeal webs, early Zenker's diverticulum) without evidence of significant weight loss or aspiration risk may be delayed if hospital resources are limited. The timing of surgery requires considering many factors including dysphagia etiology, clinician, patient, and the procedure itself (Fig. 1). As testing increases in both the hospital and ambulatory setting, the provider may also consider bedside or in-office procedures where appropriate.

Environment

Hospital Setting

Particularly relevant to the COVID-19 era is the prevention and management of malnutrition and dysphagia in patients post-extubation from mechanical ventilation in ICUs. The prevalence of post-extubation dysphagia (PED) is variable between 3 and 63% with increased rates of pneumonia, reintubation, ICU readmission, and increased hospital mortality [27]. Patients with PED also have a delayed return to oral intake. Causes of PED are likely multifactorial and are largely associated with critical care and include laryngeal injury, neuromuscular weakness that is either iatrogenic (medication-induced) or as a result of disuse, dyssynchronous breathing and swallowing, and potentially gastroesophageal reflux [28]. Age has also been shown in some studies to be an independent predictor of PED [29]. Somatosensory disturbances and impaired cognition are further challenges in the post-extubation patient with increased risks of aspiration [19, 28]. Until recently, clinicians may have waited for prolonged periods of time post-extubation to screen/assess patients for dysphagia [30]. Several studies and reviews have debunked this perceived need to wait 24 h, concentrating on patient readiness versus an arbitrary time point [19, 29, 31–34]. Timing of initial assessment post-extubation does not predict success, however intubation greater than four days is associated with nonfunctional swallow [29, 33, 34]. Intubated and ventilated ICU patients should have enteral nutrition started through nasogastric tube after patients are stabilized. PED symptoms can last for weeks-to-months beyond hospital discharge, even up to 5 years [35–37]. Given the propensity of silent aspiration post-extubation, dysphagia evaluation remains mission critical to the fragile pulmonary status in the recovering COVID-19 patient [34, 35]. While it is common practice to remove the orogastric feeding tube (OGT) with the endotracheal tube (because the two tubes are generally taped together in situ or the OGT becomes dislodged upon extubation), one alternative is to place a nasogastric feeding source prior to extubation as a preventative measure. With the increased access to SARS-CoV-2 testing, the dysphagia algorithm can be implemented according to risk of transmissible disease (Fig. 1 and Fig. 2).

Many patients recovering from COVID-19 will require ongoing rehabilitation, and many will be discharged to long-term care settings, such as long-term acute care hospitals (LTACH), skilled nursing facilities (SNF), and home health. Patients discharged from acute care facilities to long-term care settings may not have been ready or had instrumental assessments deferred due to COVID-19 concerns prior to discharge due to lingering effects of illness, and many may be discharged from acute care with alternative means of nutrition. Long-term care facilities have a unique set of challenges, including access to instrumental testing, an older patient population, and patients with multiple medical comorbidities which will be addressed separately.

Ambulatory Setting

The issue that many outpatient clinicians will likely face is that the disease status of the individual may be unknown. Currently, as no definitive recommendations otherwise exist, the appropriate PPE for AGPs in COVID-19 unknown patients should default to the highest level (i.e., those for COVID-19 suspected/positive patients). Even if pre-visit testing is available, there is controversy as to the frequency of false negative for various tests within differing populations with varied disease prevalence [38, 39]. To adequately protect staff members, a strong argument can be made that higher-level PPE for AGPs is warranted, even when individuals have negative pre-clinic SARS-CoV-2 testing. The goal of pre-clinical testing is to identify positive patients so that direct contact may be deferred if possible and alternatives considered. It is not to limit the PPE recommendations that should be utilized during AGP. Lastly, it is imperative to work closely with infection prevention staff to be sure appropriate guidelines are followed.

The United States Environmental Protection Agency, in accordance with the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) sets standard commercial building codes for minimum ventilation rates and indoor air quality [40]. Using the ASHRAE 62.1–2010 coding standards, most ambulatory settings (i.e., commercial buildings) have a range of 6–15 air exchanges per hour, using the minimum airflow exchanges once per 10 min. The CDC has guidelines related to what the efficiency of clearance is of airborne particles in relation to the amount of air turnover per hour [25]. There are 69 min needed to filter 99.9% of airborne contaminants with 6 air turnovers in 1 h; 46 min reaches an efficiency of 99%. Another consideration, with or without the proper air exchange is the half-life of the virus. In aerosol, median estimates are 1.1 – 1.2 (95%CI: 0.64, 2.64) hours [41].

Working with your hospital's building management should help to identify what your rate of air changes are per hour for the specific space you are considering. Other additives to consider: consider air-exchange handlers, smoke evacuators, High Efficiency Particulate Air (HEPA) or Ultra Low Particle Air (ULPA) filters, and in-line viral filters for suction canister.

Telemedicine

A silver lining of the current pandemic is the increased use of technology to provide remote or virtual healthcare. Although telemedicine was available prior to this time [42], the need to find alternatives to in-person clinic visits has led to greater acceptance by practitioners, patients, and payers. As of the date of this publication, however, there remains no coverage for 64 million Medicare patients in the United States seeking either a clinical swallowing evaluation or swallowing treatment [43–45]. Telemedicine allows the clinician to minimize exposure risks by determining which patients require in-person services versus those that can be managed remotely. Even if in-person services are needed, because assessment can begin with telemedicine, the face-to-face time with the clinician in the clinic can be reduced, further decreasing exposure risk (see Fig. 3) [46–49]. Following the telemedicine visit, clinicians may suggest further, in-person clinical assessment, need for treatment/intervention or other consultations.

Long Term Care

Dysphagia continues to be a significant symptom in SNFs, affecting 15–54% of residents regardless of the presence of COVID-19 [50–53]. Patients in long-term care facilities are at significantly higher risk for contracting bacterial and viral-based illnesses [54]. Thus, dysphagia assessment for patients residing in these facilities requires special considerations.

Often, long-term care facilities, in particular SNFs, do not have on-site access to VFSS. Mobile VFSS companies do exist, but there are relatively few companies providing these services, and there are concerns regarding having outside providers enter a SNF. Thus, many patients would require transfer to a medical facility for testing. Additionally, SNFs do not want to chance residents leaving the facility and returning with SARS-CoV-2 exposure, possibly leading to facility infection. Maintaining safe nutrition and reducing aspiration risk in these facilities is of utmost importance to avoid patients having to be re-hospitalized. The option to go to the hospital for a VFSS or placement of feeding tubes remains a challenge.

FEES has been suggested as an alternative for VFSS for patients in long-term care settings. While some have advised endoscopy should be discontinued due to concerns

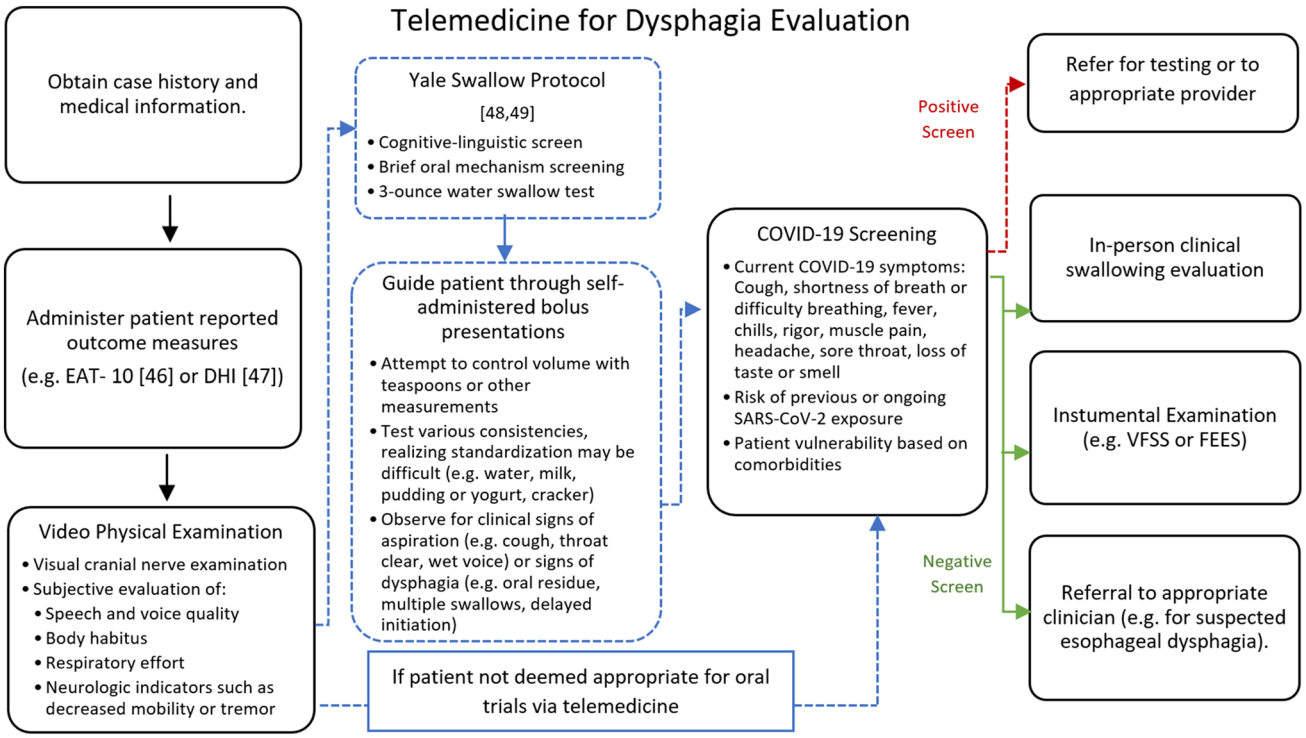

Fig. 3 Telemedicine for Dysphagia Evaluation

for increased risk of spread of SARS-CoV-2, the suggestion that VFSS is the only option for instrumental assessment of swallowing for patients puts strain on nursing home/home health administrators when they cannot get their residents access at this time. The result is many patients needing testing are waiting in limbo, lengths of stay are prolonged, and healthcare costs increase.

To reduce risk to patients and clinicians (see Fig. 2), clinicians performing FEES are advised to don full PPE, including N95 masks, face shields, gowns, and gloves, even in facilities without any positive cases, as there is still a risk for community spread, especially in this setting. As a general rule, nursing care facilities do not stock large quantities of PPE. Pre-COVID-19, most residents who develop transmissible disease were sent to the hospital for care. Access to PPE should be considered prior to intervention.

Environmental considerations for SNFs have been implemented slowly, but more recently some have created isolation wards or single occupancy rooms. For patients in double occupancy rooms, FEES should be completed with the patient and clinician as far away as feasible from the roommate and using barriers (e.g. curtains) if possible. If patients are allowed out of the room, FEES can be completed in his or her room with the roommate absent or by transporting the patient to a separate room altogether. In these cases, a sign is usually put on the door with the time the AGP was performed and what time it is possible to return. All possible surfaces are then wiped down with Sani-Cloths and/or a bleach solution made to the CDC standards.

Conclusion

Dysphagia evaluation and management will continue to be essential for the appropriate care of patients in a multitude of settings. Every practitioner and system will likely have different constraints or preferences leading to the utilization of one technique over another. Our knowledge about this pandemic increases every day, but the algorithms provided here should help in considering the best options for proceeding with safe and effective dysphagia care in this new era.

Compliance with Ethical Standards

Disclosures The authors have no disclosures.

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