Review

Dysphagia Severity and Management in Patients with COVID-19

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ABSTRACT: COVID-19 has resulted in unprecedented numbers of patients treated at intensive care units (ICUs). Dysphagia is a key concern in critical illness survivors. We investigated the severity of dysphagia in COVID-19 and the need to adapt practices to provide efficient care. We reviewed the literature on COVID-19, post-critical-illness dysphagia, and dysphagia and tracheostomy guidelines during the pandemic. Critically ill COVID-19 patients present a high incidence of dysphagia, aggravated by respiratory distress, deconditioning, and neurological complications. Mechanical ventilation (MV), delirium, sedation and weakness are worse in COVID-19 than in other etiologies of critical care. In awake patients, respiratory compromise impairs breathing-swallowing-coughing coordination. Tracheostomy reduces laryngopharyngeal trauma, sedation, delirium, ICU stay and improves swallowing rehabilitation. Tracheostomy weaning and swallowing evaluation is complex in COVID-19 due to respiratory instability and a team discussion will guide adaptations. Patients assessed in the ICU were 67% recommended to be nil by mouth (were aspirating). Two months following hospital discharge, 83% of those who had undergone tracheostomy were managing a normal diet. Severely ill COVID-19 patients are expected to regain swallow function. Dysphagia care is based on adaptation of practices to the patients' multiple impairments.

KEYWORDS: *Dysphagia; COVID-19; Swallowing; Critically ill; Tracheostomy.*

Introduction

Coronavirus disease-2019 (COVID-19) has overwhelmed the health systems worldwide and resulted in unprecedented numbers of patients being admitted to intensive care units (ICUs).

Post-extubation dysphagia is a key concern in survivors of critical illness [1,2] and has been identified as a predictor of overall adverse outcome and mortality [3].

A recent systematic review and meta-analysis reported a combined weighted incidence of post-extubation dysphagia at 41% and silent aspiration at 36% [2].

Among critically ill patients admitted for acute respiratory failure, 33% presented post-extubation aspiration on at least one bolus [4].

About half of the critically ill patients with dysphagia were found to remain dysphagic at hospital discharge [5].

Several neurological complications that have been described in COVID-19 are associated with swallowing impairment [6].

Encephalopathies, inflammatory central nervous system syndromes such as encephalitis, acute disseminated encephalomyelitis, myelitis, stroke, and Guillain-Barré syndrome have been reported in COVID-19 [6,7].

Post-extubation dysphagia incidence was found to be associated with overall disease severity and increased length of mechanical ventilation (MV) [3].

COVID-19 critical illness has several features that are related to dysphagia [8].

A high proportion of the patients need prolonged MV due to Acute Respiratory Distress Syndrome (ARDS) and vasopressor treatment for septic shock [9].

These are risk factors for the development of critical illness polyneuropathy and myopathy.

Due to the prolonged MV time and severe respiratory distress, a significant proportion of ICU-admitted patients with COVID-19 have a tracheostomy [10-12].

Care of the tracheostomy and weaning, which is closely related to swallowing improvement, are also greatly affected by COVID-19 related factors, mainly the respiratory instability, and the patients' general deconditioning [13].

Patients recovering from severe or critical COVID-19 present various other impairments besides dysphagia that complicate the evaluation and management of dysphagia, including

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respiratory sequelae, cognitive changes and nervous system disorders, deconditioning, myopathy, neuropathy, psychiatric problems, stiffness, pain, and movement difficulties [14,15].

Otolaryngologists, gastroenterologists, speech-language pathologists, and rehabilitation specialists are subject to virus exposure due to aerosol-generating procedures (AGPs) in swallow assessments and interventions [14,16-20].

Evidence-based dysphagia clinical practice, while adopting appropriate safety measures, is challenging in all clinical settings during the pandemic.

Organizational issues regarding COVID-19 patients' care and multidisciplinary teamwork protocols affect the strategies implemented in different institutions [21].

This paper aims to discuss issues related to the severity and management of dysphagia in patients with COVID-19 and the need to rely on the best evidence and adapt clinical practices while providing care for dysphagic patients, balancing between safety and efficient health care.

The factors contributing to post-extubation dysphagia in COVID-19 patients

The mechanisms that have been recognized to contribute to ICU-related dysphagia apply to most critically ill patients with COVID-19.

These mechanisms include neuromuscular weakness, oropharyngeal and laryngeal trauma, reduced laryngeal sensitivity, impaired synchronization of breathing and swallowing, delirium, and cognitive impairment [3].

COVID-19 critical illness has several characteristics that are recognized as contributing factors for post-extubation dysphagia [8]. (Table 1)

Table 1. COVID-19 severe/critical illness reported characteristics that are recognized as contributing factors for post-extubation dysphagia.

Significant respiratory compromise causing difficulty in coordinating breathing, swallowing and coughing
Prolonged mechanical ventilation
High incidence of severe and long-lasting delirium
Prolonged continuous sedation requirements
General deconditioning
Neurological complications

A high proportion of the COVID-19 patients need prolonged MV, which is associated to dysphagia [5].

The median length of critical care was reported by the Intensive Care National Audit and Research Centre (ICNARC) to be 12 days (IQR 5, 28) for patients treated in the UK until the end of August 2020 [22].

The ICNARC reported longer ICU stay for patients with COVID-19 compared with patients with viral (non-COVID-19) pneumonia in the years 2017-19, both overall and for the survivors [9,22].

Greater percentages of and lengthier advanced respiratory and cardiovascular support were reported for COVID-19 patients compared with other viral causes of pneumonia [9,22].

A study of patients on MV (mean duration of intubation: 9.4 days) examined with Fiberoptic Endoscopic Evaluation of Swallowing (FEES) within 72 hours after extubation found that 22% presented aspiration and 35.6% penetration into the laryngeal inlet [23].

Among critically ill patients admitted for acute respiratory failure (median MV duration: 5.25 days), penetration was detected in 63% and aspiration in 33% on at least one bolus [4].

The most common consistency to penetrate and/or aspirate was thin liquids, and the most common time to aspirate was during the swallow [4].

A recent study reported that silent aspiration was seen on at least one trial in 56% of the patients who completed FEES post-extubation, and age was a significant factor in whether the aspiration was silent [24].

A study of the swallowing in critically ill elderly patients after prolonged intubation found that 52% of the patients older than 65years and 36% of the younger patients aspirated at FEES, 48 hours after extubation [25].

After two weeks, 13% of the elderly participants showed persistent impairment of deglutition.

ARDS and septic shock, common occurrences in COVID-19 critically ill patients, are risk factors for developing critical illness polyneuropathy and myopathy.

Muscular weakness and muscular atrophy may affect the swallowing apparatus and the swallowing process.

Safe swallowing requires adequate strength and coordination of orofacial, lingual, and pharyngo-laryngeal muscles.

Specific swallow-related muscular weakness was recently reported in patients intubated for

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ARDS (median intubation duration: 14 days) [26].

A Video-fluoroscopic Swallowing Study (VFSS), completed a median of 5 days post-extubation, indicated slowed pharyngeal and laryngeal swallowing timing, suggesting muscle weakness [26].

FEES testing within 72 hours of extubation (after mean intubation of 9.4 days), also showed a pharyngeal swallow response delay [23].

Another study found that patients with post-extubation dysphagia exhibited longer oral transit time and lower tongue strength and endurance and lip strength than the non-dysphagia groups [27].

Patients intubated for more than seven days exhibited lower maximal tongue strength and tongue endurance than those intubated for less than a week [27].

Recent studies have shown that the feeding status and the FEES findings strongly correlated with the tongue strength in patients at risk of unsafe swallowing [28].

ICU-acquired weakness has been associated with "disuse" of swallowing structures due to long-term intubation, long-term use of analgesics, sedation, and neuromuscular blocking agents [3].

Additionally, dysfunction of the respiratory muscles in critically ill patients has been reported to compromise glottic clearance due to diminished cough strength [29].

Reduced local sensation in the pharynx, associated with direct mechanical damage, local inflammation and edema, and critical illness polyneuropathy can impair the afferent pathways of swallowing in COVID-19 patients [3,30].

Secretions and other debris dried onto pharyngeal and laryngeal mucosa are common occurrence.

Direct oropharyngeal and laryngeal trauma seems an obvious mechanism in ICU-acquired swallowing dysfunction.

Pharyngeal, laryngeal, and tracheal pathologies have been described by Postma et al. in intubated patients studied with FEES [31].

Trauma can be caused directly by any artificial tube, including endotracheal and tracheostomy tubes, echocardiography probes, or feeding tubes.

This may be more severe in emergency interventions.

The most common complications are laryngotracheal granulomas, webs, stenosis, and malacia [32].

Acute laryngeal injuries were reported in 57% of ICU patients who underwent nasolaryngoscopy within 36 hours of extubation (median intubation length: three days).

The most common findings were granulation tissue, posterior glottic ulceration, and subglottic mucosal ulceration [33].

All available data refer to patients treated in the supine position.

No data on patients ventilated for a prolonged time in the prone position has been so far produced regarding laryngopharyngeal injuries.

Swallowing, breathing, and coughing are mutually coordinated to prevent aspiration. Significant and prolonged respiratory compromise causes difficulty in coordinating breathing and swallowing.

This would be an issue in COVID-19 even if a person did not require intubation and MV.

If a person has a high respiratory rate of over 25-30 breaths per minute, it is difficult to protect the airway while swallowing.

The apnoeic period during swallowing is shortened in patients with respiratory distress, and the larynx can potentially open prematurely.

ICU delirium is common in COVID-19 patients [34].

Delirium is a severe neurologic syndrome associated with longer MV, and ICU stay, and institutionalization post-discharge.

Increasing levels of delirium severity and duration are associated with worsening cognitive and functional outcomes after discharge.

A recent study on COVID-19 critical illness reported greater percentages and a longer duration of neurological support in patients with COVID-19 compared with patients with viral (non-COVID-19) pneumonia in the years 2017-19 [9].

Before COVID-19, the prevalence of delirium in mechanically ventilated patients has been decreasing over the years to a range of 16.5-33%.

A recent study reported delirium in 215 out of 268 (80.22%) consecutive patients with COVID-19 treated in ICU, in contrast to previously reported rates from the same center (22.7%) [34].

The median delirium duration was five days and it was mostly severe.

The patients who developed delirium were treated with significantly more benzodiazepines, opioids, propofol and other medications [34] known to exacerbate post-ICU muscle weakness.

Neurological complications of COVID-19 are related to multilevel damage to the swallowing network and cause or aggravate ICU-related dysphagia [6,35].

In COVID-19 severe and long-lasting deconditioning has been reported, after ICU discharge.

It may be related to the high incidence and severity of delirium and worsened by organizational issues of health care of COVID-19 patients, mainly the lack of direct contact with family and friends and the time-limited physical contact with health care personnel.

Tracheostomy timing, care, weaning, and swallowing management

A significant proportion of ICU-admitted patients with COVID-19 have a tracheostomy [12,13].

Before the onset of the COVID-19 pandemic, early tracheostomy was considered helpful in shortening MV duration and length of stay in ICUs [36].

Tracheostomy avoids pressure-induced trauma to the trachea and oral cavity, reducing the potential sequelae leading to tracheal stenosis [21,32], decreases sedation requirements, and may reduce the severe physical deconditioning associated with prolonged MV and allow faster swallowing rehabilitation [36,37].

However, for patients requiring critical care for COVID-19, the role and timing of tracheostomy was initially under debate, due to uncertainty of patient benefit and concern for healthcare workers' exposure during AGPs [16,17,21,38,39].

Present guidance recommends full personal protective equipment (PPE) for all AGPs [16,17].

Recent papers reported the outcomes for large numbers of tracheostomies performed in institutions applying protocols that aim at the benefits of weaning patients from MV while avoiding personnel contamination [11,12,38].

The existing evidence supports that large numbers of tracheostomies have been performed safely, under strict protocols, with a timing aiming to improve respiratory wean [12,37,40].

Prolonged continuous sedation requirements have been reported as a common feature in ventilated COVID-19 patients [34,37].

Tracheostomy gives a chance to reduce sedation requirements and potentially reduce delirium and overall length of ICU stay [5,37].

A multidisciplinary COVID-19 airway team reported outcomes of the first 100 COVID-19 patients who underwent tracheostomy with main indications failed extubation (13%), failed sedation hold (52%), and anticipated prolonged respiratory wean (32%) [12].

Sedation was discontinued within 48hours of tracheostomy insertion in 76.5% of the patients.

The authors found that for those expected to have a slow respiratory wean, a tracheostomy offered the advantage of safely weaning sedation, reduced airway trauma, improved patient comfort, and proactive rehabilitation [12].

A recent study reported an association between the placement of tracheostomy and decreased opioid use, increased days with attempted spontaneous breathing trials, improvement in mental status, and increased participation in physical therapy [37].

Cessation of sedation allows improved communication, earlier identification of neurological dysfunction, patient participation in rehabilitation, and earlier return to oral alimentation.

Tracheostomy care involves several procedures associated with aerosol generation [21] (Table 2).

Table 2. Tracheostomy related procedures common in the dysphagic critically ill COVID-19 patients associated with aerosol generation.

Tracheostomy tube insertion
Wound care
Suction of the respiratory tract
Changing heat and moisture exchange (HME) filters
Tracheostomy tube change
Induction of sputum
Bronchoscopy
Alternating between supportive mechanical ventilation and ventilator-free status
Weaning
One-way valve handling
Fiberoptic examination of the nasal cavity and upper respiratory tract
Decannulation

Patients with COVID-19 with a tracheostomy may be infectious for longer.

Prolonged viral shedding was shown to be associated with invasive MV.

The viral shedding in the lower respiratory tract was reported to last 29 days (median) in critically ill COVID-19 patients [41].

As the patient's recovery begins, rehabilitation involves communication, swallowing assessment and treatment, weaning, and eventual decannulation.

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Certain tracheostomy care adjustments decisive for safe swallowing rehabilitation have been proposed regarding stoma care, cuff management, humidification, secretion management, and oral hygiene [13,42].

A heat and moisture exchange viral filter or a ventilator filter are fitted once the tracheostomy tube is disconnected from MV, taking care that excessive secretions do not place the patient at risk of tube occlusion [13].

Tracheotomized patients also require effective oropharyngeal secretion clearance [21].

Patients able to do so should be encouraged for self-clearance of secretions and oral hygiene.

Tracheostomy tubes with subglottic aspiration ports, that allow removal of the secretions that accumulate around and above the cuff, can generate aerosol during suction if cough is produced [13].

Initiation and advancement of weaning is a complex procedure for the COVID-19 tracheotomized patients, mainly due to the respiratory instability and general deconditioning of the patients and the need to minimize AGPs.

Organizational issues regarding COVID-19 patients' care and multidisciplinary teamwork protocols affect the strategies implemented in different institutions [44].

Factors such as MV duration, long-term use of sedation and neuromuscular blocking, and previously failed extubations will guide an individualized approach to weaning [13,43,44].

Cuff deflation trials should progress using clinical criteria to guide trial duration.

The care team should decide to deflate the cuff and progress to respiratory weaning, which includes speaking valve trial, carefully weighing the benefits against the risks [44].

One-way valves are a useful tool in tracheostomy weaning, promoting airway protection and training the patient to regain full control of the upper respiratory tract.

They may facilitate phonation and communication, improving psychological wellbeing, sense of recovery and swallowing rehabilitation.

The swallow outcomes for a large cohort of critically ill Covid-19 patients, including a subgroup of patients who underwent a tracheostomy, were recently published [45].

The mean time to starting oral intake from extubation for the endotracheal tube patients was 5.3 days.

For patients with a tracheostomy, the mean time was 14.8 days from tracheostomy date and 13 days from sedation cessation [45].

For both groups (endotracheal tube and tracheostomy group) a significant positive correlation was found between the number of days a patient was intubated and days from intubation to commencing oral intake [45].

Swallowing evaluating in critically ill COVID-19 patients encompasses the assessment of alertness, sensation, secretion management, effective cough, and capacity for physical function and aims to evaluate swallowing safety and to reinstate oral intake.

Dysphagia cases management during the COVID-19 pandemic

A paradigm of case management modifications was applied to the management of post-ICU COVID-19-related dysphagia in the Departments where the authors work.

Open surgical tracheostomy was performed by the otolaryngologists on full PPE or percutaneous dilatational tracheotomy was performed by the ICU physicians.

All hospital units that could support invasive ventilation were used for COVID-19 patients' treatment.

Therefore, although the indications for surgical tracheostomy were based on patients' characteristics some patients were also submitted to surgical tracheostomy because the ICU physicians were overwhelmed by the mechanically ventilated patients numbers.

Early dysphagia screening post-extubation was not applied systematically due to the presence of respiratory instability, and deconditioning in patients on lengthy MV.

Evaluation of dysphagia was mostly ordered by the medical wards treating the patients after ICU discharge.

FEES was performed (on full PPE) only on PCR-negative patients.

Tongue pressures were measured with Iowa Oral Performance Instrument (IOPI) in the patients examined with FEES.

A chart presentation of the case management during the period that most hospital wards were used for COVID-19 treatment is presented at Figure 1.

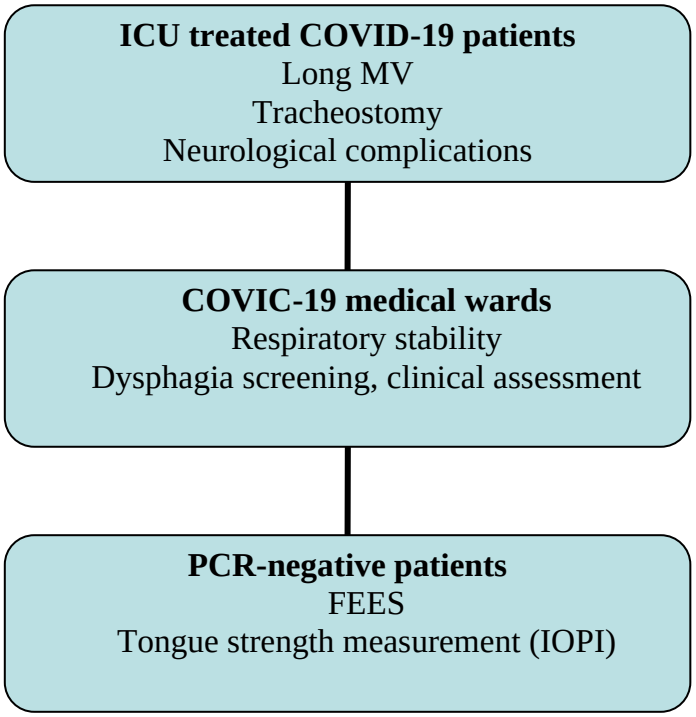

Figure 1. Dysphagia cases management during the period that most hospital wards were used for COVID-19 treatment.

Dysphagia management: screening, clinical assessment, instrumental swallowing evaluation

Dysphagia screening, clinical assessment, and instrumental evaluation involve AGPs, due to the increased likelihood of coughing during food and liquid trials and the use of appropriate PPE is considered mandatory [14,18,19,21,46].

Although dysphagia screening benefits have been well documented in the literature, no evidence-based guidelines exist delineating when and how to evaluate people who have been extubated after ventilation for 48 hours or more [47].

There is significant variability in the way swallow screenings are conducted, and in reported sensitivities. Several dysphagia screening tools demonstrate excellent validity [14].

Dedicated COVID-19 ICU wards have adjusted practices depending on the pandemic dynamic in different health settings.

There are no studies, at present, addressing the diagnostic accuracy of swallowing screening in patients with COVID-19.

Due to the reported severe deconditioning, respiratory instability, and high risk of silent aspiration in COVID-19 critically ill patients, a simple screening tool, encompassing assessment of alertness, with high sensitivity to identify patients at aspiration risk and appropriate for implementation by various members of the treating healthcare team (nurse, physician) seems most appropriate [8,13,14].

It is a common clinical practice to delay swallowing evaluation for at least 24 hours post-extubation [47].

Although recent research has indicated that early screening post-extubation was reliable [47], this practice may not be optimal for COVID-19 patients on lengthy MV due to the presence of respiratory instability, and deconditioning [13].

In the case of screening abnormalities, a clinical dysphagia assessment is necessary to guide the implementation of the first therapeutic interventions, like dietary modifications and compensatory maneuvers.

Only conscious patients with stable respiratory status should be evaluated [14].

The swallow outcomes for a large cohort of patients treated for COVID-19 in a single center in the UK were recently published [45].

The mean time to referral for swallowing evaluation was seven days after admission for patients managed solely on the ward.

For ICU-treated patients on endotracheal tube, the mean time to referral was three days following extubation, and for patients with a tracheostomy 11 days from the date of tracheostomy (10 days from the sedation being discontinued) [45].

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A thorough clinical history and a team discussion before the assessment will guide potential limitations and adaptations required during the evaluation.

A tendency to undergo quick respiratory status changes characterizes patients with COVID-19.

For patients receiving respiratory support, intermittent monitored short periods of unmasked time should be tried to assure that oxygen therapy can be safely adjusted or removed to allow for oral examination and eating trials during the swallowing assessment [13,14].

Fluctuating levels of alertness and fatigue can also be present.

They can have adverse implications for safety during dysphagia assessments and at mealtime and may consequently place the patient at risk.

The patients should be encouraged to eat on their own if able to do so.

All current guidance advises against assessing cough strength, gag reflex, and exhaustive oral cavity exams [19,46].

It is recommended that the assessment should be completed quickly to reduce the exposure time during the evaluation, involving the fewest number of swallowing trials while still providing the necessary diagnostic information [48].

Telemedicine including teleguidance, telemonitoring, and teleconsultation can enhance the patient's assessment and guidance, reducing the time of physical contact and providing complete and humane care for isolated patients [21].

The dysphagia team members and the patients' treating physicians should keep into consideration the limitations of clinical swallowing assessment performed with these restrictions for critically ill COVID-19 patients.

A recent study reporting on the first swallowing assessment in COVID-19 patients, 24 hours after extubation, found that an alternative feeding method was required for 19.8% of the patients, and 53.5% were put on diet restrictions [48].

The published swallow outcomes for another cohort of COVID-19 critically ill patients are closer to anecdotal clinical reports.

At initial assessment, 67% of the patients assessed in the ICU were recommended to be nil by mouth, and 33% were started on an augmented diet or fluid [45].

For ward patients, 22% were recommended to be nil by mouth at initial assessment, and 29% were able to be immediately placed on a regular or easy to chew diet [45].

Recommendations after a clinical assessment should reflect the known instability in patients' condition while in acute care.

Furthermore, patients who require ongoing respiratory support and are put on modified diets may struggle to eat and drink safely and meet nutritional requirements orally [26].

Therefore, they should be routinely monitored by the primary medical team regarding fatigue while eating, fluctuations in levels of alertness, respiratory status, and sufficient intake [45].

Instrumental procedures including FEES, transnasal endoscopy, pharyngeal-esophageal manometry, and pH-monitoring procedures are all considered high-risk for airborne transmission, and many associations are classifying them as potential AGPs and have released comprehensive recommendations on the use of these procedures during the COVID-19 pandemic [14,18,19,21].

Recommendations have also been launched for videofluoroscopy with specific guidelines for transporting the patient, staff PPE, room use, and room disinfection post-procedure [14].

Instrumental assessment for non-PCR-negative patients is only advised if a potential life-threatening underlying disease is suspected, the airway needs to be examined, clinical assessment has not provided the basis for effective treatment, and the clinical decision cannot be postponed [19,46].

FEES testing in survivors of non-COVID-19 related acute respiratory failure patients identified two significant factors associated with aspiration: reduced pharyngeal squeeze/ medialization and upper airway edema [4].

Pharyngeal weakness was also associated with the presence of residue after swallowing [4].

Swallow outcomes on 40 patients with COVID-19 who had undergone tracheostomy were evaluated approximately two months following hospital discharge [49].

The majority were managing a normal diet (82.9% had a FOIS score of 7), 7.3% were on a total oral diet with multiple consistencies without special preparation but with specific food limitations, 4.9% were on a total oral diet requiring special preparation, and 4.9% were tube-dependent with consistent oral intake of food or liquid [49].

Conclusion

Health professionals involved in dysphagia care are facing a significant challenge in balancing safety with efficient dysphagia management.

Severely affected COVID-19 patients treated either in wards or ICUs present a high prevalence of dysphagia, aggravated by the respiratory distress and general deconditioning.

Maintaining adequate evidence-based dysphagia management shall be based on teamwork, the adaptation of professional practices to match the reality of COVID-19 hospital care, and serious consideration of the multiple impairments and needs that patients with severe COVID-19 have.

Provided with the appropriate care, severely ill patients are expected to regain normal swallowing, and most critically ill COVID-19 patients can regain normal or near-normal swallow function following intubation and tracheostomy.

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Conflicting Interests

The authors declare that there is no conflict of interest related to this paper.

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