Swallowing and Communication Management of Tracheostomy and Laryngectomy in the Context of COVID-19
A Review

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We are in the midst of a pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19). Management of patients with surgically modified airways, such as tracheostomy and laryngectomy, is challenging for the health care team in this novel context. Although there are few studies detailing infection rates and level of risk in the management, those with tracheostomy and laryngectomy represent a potential transmission and infection risk for health care professionals owing to the high viral load present in the upper aerodigestive tract. Several professional organizations worldwide have published guidelines on the management of these patients for otorhinolaryngologists and head and neck surgeons.

Urgent and essential care provision is still required for these patients during the current pandemic, and many more patients are requiring tracheostomy insertion as part of their recovery from severe COVID-19. Multidisciplinary teams involved in the treatment of patients with tracheostomy or laryngectomy often include allied health professionals, such as speech-language pathologists (SLPs), who are responsible for the therapeutic restoration of swallowing and communication. Speech-language pathologists are routinely involved with stoma and voice prosthesis care procedures and may perform suctioning of the lower airways. The objective of this study is to review available publications and practice guidelines on management of tracheostomy and laryngectomy in the context of COVID-19. This study performed a review and synthesis of information available in the PubMed database and from national SLP organizations across 6 countries.

Methods
Using elements from a rapid review approach, a comprehensive search of a single database and guidance documents published by relevant professional societies/organizations was completed. Guidelines unrelated to those of the current pandemic were also considered for synthesis. Two searches were conducted simultaneously using the PubMed database on May 15, 2020, using descriptors relevant to our objective—specifically, (1) tracheostomy, COVID-19, and SARS-CoV-2 using the Boolean operator and; and (2) laryngectomy, COVID-19, and SARS-CoV-2, also using the Boolean operator and. Using the selection criteria, a single reviewer...
(J.V.) screened all titles and abstracts for possible inclusion. Those meeting the criteria were selected for a full-text review by the same reviewer (J.V.), following which the final selection was completed. Relevant online guidance documents produced by SLP professional societies and associations were searched from several countries,13-18 including (1) the Americas (Brazilian Society of Speech and Hearing Therapy, Speech-Language and Audiology Canada, and American Speech-Language-Hearing Association), (2) Oceania (Speech Pathology Australia), (3) Africa (South African Speech-Language and Hearing Association), and (4) Europe (Royal College of Speech and Language Therapist). These sources were accessed on May 15, 2020, using their websites.

Included were English publications that described tracheostomy and/or laryngectomy management (in the postsurgical stage) of patients during the COVID-19 pandemic and included procedures involving SLPs. We excluded those studies that were limited to describing only aspects of surgical procedures, personal protective equipment (PPE), and/or drug management. Once the relevant publications and documents were determined from included sources, a descriptive narrative synthesis was conducted that stratified information germane to our objective according to themes/practice area.

Results and Observations

In the database search, a total of 24 unique, relevant citations were captured. Following full-text review, 7 met inclusion criteria for tracheostomy and laryngectomy (4 and 3 publications, respectively) with one3 duplicated in both searches, resulting in 6 included publications (Figure). Study characteristics are summarized in Table 1.3,19-22 When searching the websites of professional organizations, we found that 3 had produced relevant guidance documents.13-15 Following data extraction and synthesis, the results were categorized according to practice domains for tracheostomy and laryngectomy. The main recommendations according to each practice area are shown in Table 2.3,13,14,19-25

Discussion

Clinical Presentation

Given their surgically altered airways, patients with tracheostomy and laryngectomy present unique challenges for clinicians because the virus manifests in the respiratory tract and is transmitted through droplets. Furthermore, many of these patients normally require SLP assessment and management of their airway,26 swallowing,27-30 and communication.31,32 This may result in reflexive coughing and secretion expulsion with risk for aerosol generation.13-15,33 Understandably, the primary focus of the evidence base was the delineation of which procedures were considered “at risk” for aerosol generation. Given this risk, the evidence supported modifications for the evaluation and management of this population’s surgically modified airway, including delaying certain practices until viral testing is negative.19-21 These modifications need to be considered according to local regulations regarding practice as well as the use of PPE.

Assessment and Treatment of Tracheostomy

Patients with tracheostomy are at high risk for dysphagia.27 To the best of our knowledge, the frequency of dysphagia in patients with tracheostomy with SARS-CoV-2 is undetermined. Available evidence regarding tracheostomy and COVID-19 SLP practice focused on cuff manipulation, swallowing assessments, tracheal suction, communication, and decannulation.3,13-15,19

Cuff Manipulation, Swallowing, and Tracheal Suction

According to the literature, where possible, maintenance of cuff inflation is recommended for patients with known or suspected COVID-19 along with avoidance of cuff manipulation/deflation4,19 and cannula manipulation.3,13,14,21 As a result, nonoral feeding is recommended until cuff deflation is tolerated21 and swallowing may be assessed. Among other adverse outcomes, prolonged cuff inflation may hinder secretion management and negatively affect swallowing physiology24; therefore, where cuff deflation is medically necessary, the multidisciplinary team should agree on the best ap-
approach. Should tracheal suctioning be required, it is recommended that it be performed using closed suction systems with viral filters,20,21,22 and enhanced PPE, such as an N95 or FFP2/3 respirator and face shield.3

Communication
Communication is often enhanced for those with tracheostomy through the use of speaking valves, digital occlusion, and/or above-cuff vocalization (ACV). In the current context, clinical care requires modifications owing to the risk of aerosol generation. First, to decrease viral transmission risk, speaking valve assessments should be delayed until viral testing is negative.13 Similarly, we suggest that digital occlusion also be avoided; however, if digital occlusion is necessary, diligent hand hygiene should be performed before and after. Another method, ACV, allows for vocalization with the cuff inflated by introducing airflow through the subglottic port of the tracheostomy tube.20 Because of the high risk of secretion aerosolization as well as the likelihood that ACV may be contraindicated in patients with severe cases of COVID-19 or intubation trauma causing airway edema, consensus expert opinion advises against the use of ACV in these patients.23,24 Furthermore, we see value in the use of telehabilitation (eg, online, telephone) wherever possible to reserve in-person visits for urgent cases. While these recommendations may not be ideal, we believe that SLPs can adapt alternative communication devices remotely and/or in advance, to maximize communication effectiveness in patients with a surgically modified airway (be it tracheostomy or laryngectomy) while reducing transmission risk. These may include low-tech options, such as disposable communication boards and writing utensils, and/or the use of high-tech options, such as text-to-speech applications on portable devices.

Decannulation
A systematic multidisciplinary approach to decannulation is typically undertaken to wean patients from tracheostomy, which often includes increasing periods of cuff deflation, use of speaking valves and caps, and/or tracheostomy cannula downsizing.20,21 Because of the variable access to resources as well as operational mandates, approaches to decannulation in the current environment have been largely determined at the institution level, with recommendations including delaying the decannulation process until after 2 consecutive days of negative test results.21

Assessment and Treatment of Laryngectomy
Adequate management of swallowing and communication difficulties in patients with laryngectomy is important to increase the quality of life of this highly vulnerable population in the current context of the pandemic. In this review, the relevant domains of practice throughout the literature were related to the management of breathing, pulmonary aspiration, and laryngeal voice, and tracheoesophageal prosthesis.

Respiration
After laryngectomy, patients have a surgically modified airway with a permanent stoma that limits respiration to the front of the neck, without the possibility of air passage through the upper airway.36 Current guidelines suggest that patients wear a mask to cover the nose and mouth along with humidification filters over the stoma.3,22,25 Where masks are not available, some regions have suggested the use of a T-shirt, scarf, or cloth bandana to cover the mouth, nose, and stoma, while ensuring that air exchange is sufficient for adequate respiration. The most frequently cited heat and moisture exchanger (HME) devices were Provox Micron (Atos Medical), as-

Table 1. Characteristics of the Included Publications

<table>
<thead>
<tr>
<th>Source</th>
<th>Title</th>
<th>Topics</th>
<th>Purpose</th>
<th>Study design</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skoog et al, 19 2020</td>
<td>Tracheostomy in the SARS-CoV-2 Pandemic</td>
<td>Tracheostomy</td>
<td>Review of evidence to make recommendations</td>
<td>Review</td>
<td>Use suction with closed system and inflated cuff; avoid changing tube.</td>
</tr>
<tr>
<td>Piccin et al, 21 2020</td>
<td>Early Experience in Tracheostomy and Tracheostomy Tube Management in COVID-19 Patients</td>
<td>Tracheostomy</td>
<td>Report experience and recommendations</td>
<td>Experience report</td>
<td>Use a nasogastric tube and insufflated cuff. Start to desufflate cuff and decannulation process when patient has reached a satisfactory swallowing function.</td>
</tr>
<tr>
<td>Kligerman et al, 22 2020</td>
<td>Managing Head and Neck Cancer Patients With Tracheostomy or Laryngectomy During the COVID-19 Pandemic</td>
<td>Tracheostomy and laryngectomy</td>
<td>Review of evidence and to make recommendations for the head and neck cancer population</td>
<td>Review</td>
<td>Use inflated cuff and suction with closed system; avoid changing tube; use filters to stoma and mask in mouth (for patients); and disinfect the electrolarynx; guidelines were offered for adverse events of the tracheoesophageal prosthesis.</td>
</tr>
<tr>
<td>Laryngectomy</td>
<td>NA</td>
<td>Editorial</td>
<td>Patients should use filters and masks and be provided guidelines to change the tracheoesophageal prosthesis.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hennessy et al, 23 2020</td>
<td>Commentary on the Management of Total Laryngectomy Patients During the COVID-19 Pandemic</td>
<td>Laryngectomy</td>
<td>Recommendations</td>
<td>Commentary</td>
<td>Patients should use filters and masks and be provided guidelines for adverse events of the tracheoesophageal prosthesis.</td>
</tr>
</tbody>
</table>

Abbreviations: COVID-19, coronavirus disease 2019; NA, not applicable; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.
Table 2. Synthesized Recommendations Across Included Literature

<table>
<thead>
<tr>
<th>Practice areas</th>
<th>Recommendations*</th>
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<tbody>
<tr>
<td><strong>Tracheostomy</strong></td>
<td></td>
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</tbody>
</table>
| Cuff manipulation, swallowing, and tracheal suction | • Avoid tracheostomy tube changes,1,19
• Avoid manipulation or removal of the internal cannula,5,13,14,19,21
• Maintain cuff inflation and avoid its manipulation,5,19
• Use filters/mask on the stoma and facial masks,3,20
• Reduce hand-to-stoma contact and practice frequent handwashing,3
• Avoid assessment of cough reflex, gag, and intraoral examinations during swallowing assessments,1,14
• Consider the use of nonoral feeding options,21
• Perform suction procedures using closed suction systems with viral filters,2,13,14,19,20 |
| Communication | • Delay speaking valve assessments, digital occlusion, and/or above-cuff vocalization.13,23,24 |
| Decannulation | • Initiate decannulation process (eg, cuff deflation, speaking valve use, cannula downsizing) once negative viral test results achieved.20,21 |
| **Laryngectomy** |                     |
| Respiration | • Use filters/mask on the stoma and facial masks,2,22,25
• Use heat and moisture exchanger devices.22,25 |
| Pulmonary aspiration | • Conduct urgent TEP changes in appropriate clinical setting and with adequate personal protective equipment.13
• Attempt TEP leakage amelioration through prosthesis plugs and/or diet modifications where appropriate.5,13,14,22 |
| Alaryngeal voice | • Use a hands-free communication device.13,14
• In the event of TEP failure, attempt alternative means of communication as appropriate (eg, electrolarynx).13,14
• Engage in frequent hand and device hygiene.3 |

Abbreviation: TEP, tracheoesophageal prosthesis.
* Most recommendations have considerations for special/urgent circumstances where their application could be considered with modifications. Many recommendations are applicable until viral testing results are negative, and all should be considered where appropriate/applicable, considering local regulations.

Advancing Research and Practice

The current state of the literature is largely based on expert opinion and consensus while lacking in empirical studies, particularly for patients with modified airways. While the current guidelines are a useful starting point, to move our practice forward, their focus should be broadened. This should include diverse setting and service care delivery considerations as well as advanced knowledge across 3 main areas: aerosol-generation risk, viral effect on sensory and motor aspects of the upper aerodigestive tract, and the epidemiology/risk factors associated with severe SARS-CoV-2 infection. Specifically, determining practice areas that are aerosol generating and their corresponding transmission risk level will help to inform assessment and treatment modifications required for this population across set-
tings. Current opinion supports the use of cuff inflation and filters to reduce aerosols; however, understanding whether these activities have a measurable impact on aerosol reduction is required, as these modifications may have deleterious effects on swallowing function and communication as well as social/emotional ramifications for the patient. Future research should also seek to determine methods of instrumental swallowing assessment that minimize aerosol generation, as well as determining viral effects on the mucosa and upper aerodigestive tract structures. This would afford patients continued access to diagnostic services while informing our understanding of swallowing function, airway complications, and communication impairments over the short, medium, and long term in the context of SARS-CoV-2. Finally, understanding the epidemiologic characteristics among those affected by severe SARS-CoV-2 will support the development of risk profiles to expedite the identification of those at risk for swallowing and communication impairments. Doing so would support the delineation of multidisciplinary team membership to preserve the quality of care while mitigating adverse outcomes.

Conclusions

Current literature regarding the assessment and treatment of patients with surgically modified airways in the context of the COVID-19 pandemic is largely based on expert opinion and guidelines from relevant organizations. The primary recommendations center on minimizing transmission risk during swallowing and communication management (eg, cuff inflation maintenance, closed-circuit suction system utilization) for those procedures with high risk for aerosol generation. This often leads to recommended delays for nonurgent procedures until virus testing is negative as well as harnesses remote support without face-to-face contact (eg, telerehabilitation). Empirical studies are required in this area to better inform our practice for those with surgically modified airways, and it behooves our clinical community to continue advocacy for patients while keeping current with the emerging information and guidelines.


