Long COVID guidance

Introduction

COVID-19 is the disease caused by the SARS-CoV-2 coronavirus, the spread of which sparked a global pandemic in March 2020. COVID-19 infection causes multi-organ symptoms ranging from acute to chronic impairments (**World Health Organisation** (WHO)).

This is the first edition of the RCSLT guidance for speech and language therapists (SLTs) managing post COVID-19 disorders. The guidance has been developed using available evidence and clinical experience of SLTs working in the field. As this is a newly emerged condition, there is limited clinical guidance informing SLT practice.

The guidance provides a framework for understanding, assessing, and treating, individuals living with communication, swallowing, voice, and upper airway sequelae post COVID-19. The information is relevant to UK SLTs encountering a person with this condition. We do not seek to explain the aetiology or transmission of SARS-CoV-2 as it is beyond the remit of this clinical guidance.

The different disorders will be familiar to qualified SLTs, however the COVID-19 presentation is different, requiring specific guidance. Disorders are presented in discrete sections although individuals rarely present with a single concern. Clinicians will develop treatment plans in line with the person's need and in reference to their other symptoms.

The guidance is a culmination of work by the RCSLT COVID-19 working group and clinicians who volunteered their time. We hope the guidance serves as a useful resource and reflects the commitment and experience of these clinicians. This web content will be reviewed as more evidence and information becomes available.

To discuss issues relating to working with individuals post COVID-19, contact **info@rcslt.org**

Background

Context

COVID-19 has had the single biggest impact on worldwide health in living memory. When the pandemic was declared in March 2020, SLTs were instrumental in intensive care units providing support for patients with communication, swallowing and upper airway dysfunction following critical illness (Dawson et al., 2020; McGrath et al., 2020). The importance of SLTs within ICU was recognised (Intensive Care Society GPICS, 2022; NICE, 2009), with early input improving outcomes for swallowing and communication disorders (Rodrigues et al., 2023).

COVID-19 is recognised as a multi-system disease affecting breathing, the heart, nerves, muscles/joints, digestion, ear nose and throat and energy levels plus more (Roberts et al., 2020). At the height of the pandemic, up to 15% of people infected required hospitalisation (Guan et al., 2019; Mathieu et al., 2020), of which 14-26% required intensive care (Richardson et al., 2020; Wang et al., 2019).

Numerous people were ill at home and recovered. Between 31-69% of those infected experience symptoms which continue for more than 12 weeks or develop after a delay (Patil et al., 2022; Su et al., 2022). The National Institute for Health and Care Excellence (NICE) definition of long COVID, consists of both ongoing (4 to 12 weeks) and post-COVID-19 (≥ 12 weeks) symptoms. We will refer to ongoing symptoms as long COVID (NICE, 2021).

How ill an individual was when they were infected, does not indicate if they will develop long COVID (Shah et al., 2021). Some people with a severe infection do not develop long COVID and some people with mild illness do. The breadth of long COVID symptoms and their severity fluctuates between individuals and for the same person at different times. This is important to grasp as it will affect treatment approaches, planning, and goals.

More documented cases of severe COVID-19 infection and long COVID are amongst adults (UK Government, 2023). There is a small incidence of severe COVID-19 in children, with fewer hospitalisations (Royal College of Paediatrics and Child Health, 2023; Lopez-Leon et al., 2022). This guidance is predominantly aimed at adults and young people due to the numbers involved. Input from SLTs working with children and young people was requested. It has been included, where provided. Future updates would benefit from more input from clinicians.

Speech and language therapists are experts in assessing, treating, and managing communication impairments (language, cognitive communication, speech, and voice disorders), swallowing and upper airway difficulties. The presence of ongoing communication, swallowing and upper airway difficulties post COVID-19 is documented (Dawson et al., 2023). SLTs have a vital role, as part of a multi-disciplinary team, in caring for people post COVID-19 (Chadd et al., 2021).

Objectives

- To provide SLTs with research evidence and best practice principles to guide their decision making around diagnosis, assessment and management for people post COVID-19.
- To enable SLTs to feel confident and well-equipped to support someone living with communication, swallowing and upper airway difficulties post COVID-19.
- To provide evidence of the benefits of SLTs input for long COVID that can be used to support bids for funding and service commissioning.

Additional considerations

- As COVID-19 is a newly emerged disease, there is limited specific evidence on speech and language therapy treatments. Therapists have been transferring knowledge and techniques from existing conditions where evidence is available.
- Except for dysphagia/upper airway and instrumental assessment, speech and language therapy interventions are believed to present a low clinical risk to the recipient with few side effects. They frequently involve behaviour change. This is reassuring to clinicians applying existing techniques off-label to COVID-19 rehabilitation.
- There is a need for therapists working with COVID-19 to apply existing techniques pragmatically and publish research about their work.
- Rates of severe COVID-19 illness and primary hospitalisations have significantly dropped (ONS, March 2023). However, several speech and language therapy interventions, particularly those for dysphagia and dysphonia, elicit increased aerosol production (prompted coughing and voice techniques) and use aerosol generating procedures (AGPs) (Chacon et al., 2021; Saccente-Kennedy et al., 2021). Clinicians are advised to consider infection risks to themselves and their clients and seek local infection control advice when assessing the use of AGPs.
- Therapy delivery methods have significantly changed post pandemic with a greater emphasis on telehealth (video and telephone) (Sprianu et al., 2022). Techniques with a higher AGP risk may be effectively delivered online to minimise infection risks (Shahouzaie et al., 2022).
- Restrictions to, and changes in, healthcare delivery due to the pandemic have significantly increased waiting times. Clinicians are advised to consider innovative delivery methods (e.g. telehealth) and practices (e.g. groups, online apps and self-supported management tools) that can increase the speed at which people access SLT services (Cullum et al., 2014).

Key recommendation

Individuals post COVID-19 should have support from, and access to, speech and language therapy for their communication, swallowing and upper airway needs throughout their rehabilitation journey.

Dysphonia

This information provides best practice information for SLTs working with individuals experiencing voice change (dysphonia) post COVID-19. For professional guidance on working with dysphonia, refer to the **RCSLT clinical guidance on dysphonia** available to RCSLT members.

This COVID-19 information is an extension of the voice guidance. It assumes the user has a working knowledge of, and referred to, that guidance.

Prevalence of dysphonia

- Dysphonia is a common symptom of COVID-19 (Saniasiaya et al., 2023).
- Up to 25% of people experience dysphonia during acute infection; this is higher amongst females (Chung-Wei et al., 2023).
- 17% of individuals have persistent dysphonia after recovery (Chung-Wei et al., 2023).
- Dysphonia is reported by 20% of individuals living with long COVID (Chung-Wei et al., 2023).
    - Hospitalised population: 34% of UK adult patients post ICU admission reported voice problems (Dawson et al., 2023).
    - Non-hospitalised population: 25-43% individuals experience mild-moderate new onset voice change >60 days post infection (Cantarella et al., 2021; Lechien et al.,2020).

Aetiology

There is likely to be more than one cause of dysphonia including, but not limited to:

- immune system response leading to erythema (redness) and inflammation of the vocal folds and surrounding laryngeal tissue (Naunheim et al., 2020)
- increased mucus in the throat and larynx due to acute infection (Lechien et al., 2022)
- post viral infection affecting the vagus nerve leading to vocal fold palsy (Rapoport et al., 2022)
- reduced respiratory support and breathlessness affecting voice projection and vocal stamina (Cantarella et al., 2021)
- generalised muscle weakness and fatigue
- laryngeal injury such as vocal fold palsy or paresis due to intubation, ventilation and/or proning (Kelly et al., 2023)
- laryngeal pathology post extubation: glottic or subglottic stenosis (airway narrowing), granuloma (inflammatory lesions), cyst type lesions, laryngeal and airway polyps, dislocation of laryngeal cartilage (Regan 2021, Wallace 2022)
- acid reflux causing laryngeal oedema and hoarseness (Koufman, 1991). Gastrointestinal symptoms, including acid reflux persist in up to 25% of patients 6 months after acute COVID-19 (Freedberg et al., 2022; Silva Andrade et al., 2021).

Features of dysphonia

Changes are reported to vocal function, voice quality and laryngeal sensations. Dysphonia is less frequently reported perhaps because it emerges later and is not life-threatening (Miles et al., 2022). Voice difficulties may not become obvious until vocal demands increase e.g., the person returns to work or education (Chung Wei et al., 2023). It is important to ask about voice change in the acute and chronic phases of illness. Conditions such as stenosis develop gradually over time (Neeval et al., 2021). Clinicians need to be alert to individuals with late presenting voice and airway changes, or those whose voices were stable and deteriorate.

Dysphonia onset:

- Sudden in the acute stage of infection (hospitalised or not).
- Sudden onset dysphonia may occur during intubation or post extubation.
- Gradual onset changes noted in long COVID with or without hospitalisation/intubation.

Dysphonia pattern:

- Often fluctuating in the non-hospitalised population with increased dysphonia related to fatigue levels and prolonged voice use.
- In non-hospitalised patients, it is unlikely to chronically deteriorate.
- Dysphonia may be constant post intubation and may deteriorate if stenosis occurs.

Dysphonia features:

Feature	Stage of infection
Hoarse, croaky voice	Acute and chronic
Loss of voice (aphonia)	Typically acute (1-2 weeks post infection) Chronic aphonia in fewer cases and may occur post intubation
Weak voice quality	Acute and chronic
Straining to talk or more effort to talk	Typically the acute phase, but can become chronic if muscle tension persists
Deeper voice or changes to pitch	Acute and chronic
Reduced vocal stamina and/or vocal fatigue	Often noticed after acute recovery
Inability to talk over background noise (reduced voice power)	
Running out of breath when talking	Chronic stage
Delayed onset dysphonia and stridor	Voice change may occur after some time in people with a history of intubation (months or years later)

The voice changes are frequently accompanied by changes to the throat in terms of irritation and sensitivity either acute or chronic **(see upper airway change/dysfunction)**.

Risk factors and impact

Risks:

The quality of our voice naturally changes throughout the lifespan. Certain populations have known risk factors for dysphonia:

- women, particularly at menopause, due to differences in laryngeal structure and hormonal changes (Cohen et al. 2012; Roy et al., 2005)
- occupational voice users with high voice use, such as teachers, healthcare professionals, retail workers, hospitality workers, actors, tour guides, fitness instructors amongst others (van Houtte et al., 2012)
- individuals with psychological distress (Gomes et al., 2019; Misono et al., 2016)
- people with acid reflux and smokers (Lechien et al., 2017; Roy et al., 2005)
- co-morbid medical conditions such as respiratory conditions, nasal conditions, hearing loss, allergies, immune system conditions, neurological or neuromuscular conditions

- hospitalisation for severe COVID-19 illness with non-invasive or invasive ventilation (Dawson et al., 2023).

Many of these people are at increased risk of contracting COVID-19 due to the nature of their role (e.g. people facing), their proximity to infected individuals (e.g. healthcare workers), their working environments (Lally, 2020), or health conditions (UK Government, 2023).

Impact of COVID-19 dysphonia

Our voices are unique, and the impact of dysphonia is too. The effect size is not correlated with dysphonia severity. It is influenced by our life roles, activities of daily living and self-image. The WHO ICF classification provides a framework for the impact of dysphonia post COVID-19 (WHO, 2001):

- Body functions and structures (impairments of the body)
    - direct injury to the larynx or airway or lesion growth leading to changes in breathing and voice quality
    - inflammation of the larynx and vocal folds leading to altered voice quality
    - alternative airway e.g., tracheostomy requiring augmentative communication such as a speaking valve
    - straining the muscles to talk after laryngeal inflammation or injury
    - breathlessness (**see co-morbidities**) affecting breath support for speaking.
- Activities of the individual (limitations)
    - inability to talk, sing, shout or project the voice
    - vocal fatigue affecting the length of comfortable conversations.
- Participation of the individual (restrictions as a member of society)
    - inability to fully participate in hobbies and social activities such as singing, socialising with friends and family, communicating with work colleagues (Vilkman et al., 2020)
    - restricted duties at work and impact on employment and income
    - impact on education through inability to fully participate in discussions, presentations or subjects such as drama
    - restricted or altered relationships with friends, family and work colleagues
    - socioeconomic impact on the UK workforce of working age individuals unable to return to work.
- Environmental factors
    - reduced self-confidence, and altered self-image (Dassie-Leite et al., 2021)
    - reduction in psychological well-being and distress (Misono et al., 2016)
    - lower quality of life (Wilson et al., 2002).

SLT role and pathways

SLT role

SLTs are fundamental to identifying, managing, and treating disorders of the speaking voice post COVID-19. They are likely to be involved at the following stages:

- **Identifying** individuals with dysphonia:
  - from a person's report, listening to a person's voice, screening tools, multidisciplinary team (MDT) discussions, GP referrals and other sources.
- **Referring** people onto and liaising with other professionals such as:
  - GP, long COVID service (where available), respiratory medicine, gastroenterology, ENT, social care services, allied health profession (physiotherapy, occupational therapy and psychology amongst others) and educational support.
- **Diagnosis**
  - being present during ENT assessment (a joint voice clinic)
  - examining a person's larynx using endoscopy (specialist clinics only) and conferring a diagnosis with ENT
  - meeting a person during unidisciplinary or multidisciplinary appointments (either face to face or via telehealth).
- **Assessment**
  - Face to face or telehealth appointments with people living with the aftereffects of COVID-19
  - Patient questionnaires and screening tools
  - Identifying symptoms of concern and making onward referrals primarily to GP, ENT or other medical professionals as per local protocols.
- **Treatment/therapy**
  - Education and advice about COVID-19 dysphonia
  - Direct therapy – such as voice production exercises
  - Indirect therapy – voice care, behaviour change, environmental changes, getting help from others
  - Information pre and post medical interventions and surgery to maximise effectiveness (if required).
- **Collecting baseline and outcomes measures: refer to the RCSLT guidance on outcome measurement for details**
- **Long-term support**
  - advocacy for patients and referral onto other services
  - signposting to support services such as charities, support groups and patient forums, **ENO Breathe programme**, LivingWith App amongst others
  - access long COVID resources.

Pathways

Referral pathways differ depending on service provision and local commissioning. Specialist Post COVID-19 services (PCS) have been established in some regions (**see NHS England for details**). Referrals in an area without a local PCS are likely to rely on existing SLT service provision for voice therapy.

See example referral flowcharts for dysphonia with or without endoscopy in **RCSLT guidance on voice and upper airway disorders in the context of COVID-19**.

Referrals

The criteria for UK SLTs working with individuals with dysphonia apply (see **dysphonia guidance**):

- Individuals with voice change greater than three weeks should be referred for laryngeal examination prior to referral for voice input by an SLT (Stachler et al., 2018).
- Examination is by an ENT doctor, GP with specialist training or Enhanced Practitioner SLT (local agreement required).
- Examination comprises endoscopic evaluation of the larynx (EEL) preferably with videostroboscopy and recording of images plus case history and observation.
- The assessment should be conducted within 6 months of referring to an SLT.

The referral to SLT should include the patient's details, medical history (including COVID-19 infection), voice presentation, physical examination findings and onward referrals. The person must consent to the SLT referral.

Assessment

Assessment builds a comprehensive picture of the onset, patterns, features, and impacts of dysphonia. Assessment typically involves a standard set of narrative questions plus questionnaires highlighting the impact of dysphonia on the person.

Clinicians typically use a 'toolbox' approach, focusing on factors relevant to the person and the impact of their dysphonia. It can be conducted face to face or via telehealth. Assessment happens continuously throughout the intervention process. Notes of the findings are recorded after each session and therapy adjusted accordingly.

- See **dysphonia guidance** for detailed information on assessment.
- See **RCSLT guidance on voice and upper airway disorders in the context of COVID-19** (pp 30-33) for guidance on audio equipment requirements and telehealth practices.

The first assessment typically involves:

- A thorough case history of factors that predispose the person to voice change, the features of the COVID-19 infection (date, duration, hospitalisation) and factors which maintain the problem (fatigue, sleeping, anxiety, cognitive function, acid reflux, coughing, amongst other health conditions).
- Ask about the onset of dysphonia (sudden or gradual) and patterns (constant or fluctuating)
- Check intubation history (when, for how long, complications, extubation).
- Discuss laryngeal findings and the impact on the person's voice quality.
- Explanation of the impact of COVID-19 on the body and specifically the larynx.
- Collecting outcome measures including patient reported outcome measures (PROMs). There are none specifically for COVID-19 dysphonia. See **clinical guidance on dysphonia** for validated measures.
- Make observations of the voice and breathing: perceptual rating (GRBAS, Hirano, 1981), acoustic analysis, audio recording and observations of breathing for speaking.
- Screen for acid reflux: Reflux Symptom Index and consider onward referral to gastroenterology if there are red flag symptoms (Belafsky et al., 2002).
- Ask about voice features seen post COVID-19 and throat sensations (**see features of upper airway dysfunction**).
- Record the person's perception of changes to their voice quality and throat discomfort.
- Ask about trends and fluctuations plus triggers for symptom change. Note changes due to fatigue, sleep, psychological well-being and menstrual cycle (as appropriate).
- Screen for risk factors:
    - constant dysphonia
    - no fluctuations
    - pre-morbid issues
    - hospital admission with intubation or ventilation
    - deteriorating dysphonia
    - pain when voicing
    - history of smoking.

  These symptoms require early ENT review

- Discuss the impact of COVID-19 and dysphonia on psychological well-being.

If you are working with a child or young person, consider adapted PROMs or those conducted by the parent in discussion with the child. Use pictures or simple rating scales and models (see assessment section of **dysphonia guidance**)

Investigations and onward referrals:

- A repeat laryngeal endoscopy may be required either by ENT, in a joint ENT/SLT voice clinic or an Enhanced Practitioner SLT clinic (local agreement required). Indications include: providing biofeedback, lack of progress in therapy, reviewing current laryngeal status to see if pathology has changed.
- If new symptoms emerge or concerns, do not delay asking for repeat ENT examination. Use your clinical expertise. If the sound of the voice, the onset and pattern of voice change do not fit with the diagnosis, discuss with your ENT colleagues. You can ask an RCSLT advisor **info@rcslt.org.**
- Referral to other services if progress is affected by other conditions such as:
    - specialist Respiratory Physiotherapy for breathlessness post COVID-19
    - psychology for anxiety and depression and post-traumatic stress disorder
    - occupational therapy for fatigue, pacing, attention, memory and processing.

Treatment

Treatment varies depending on the diagnosis, individual's goals and agreed treatment plan.

Goal setting:

- Ask about the person's priorities.
- Help them to identify barriers to progress and change such as fatigue, psychological wellbeing, memory, cognitive dysfunction (brain fog) and other health conditions.
- Encourage them to set their own goals using personalised care and coaching approach.
- Discuss the potential for recovery with a holistic approach and realistic milestones: celebrate all milestones, big or small e.g. being able to talk on the telephone for 15 minutes instead of 5 minutes.

A course of therapy may involve:

- Education – how the voice works, how to care for the voicebox.
- Compensation strategies – changing schedules, using amplifiers, environmental modifications in work or education setting or work-based modifications such as reduced time on the telephone.
- Maximising efficiency of posture and breathing for speaking.
- Exercises to improve glottic closure in vocal fold palsy (**see evidence and research for voice** therapy).
- Reducing muscle strain and hyperfunction when present.
- Voice production exercises:
    - resonant voice therapy (Verdolini Abbott, 2008)

- semi-occluded vocal tract therapy (Andrade et al., 2014; Kapsner-Smith et al., 2015; Meerschman et al., 2019; Titze, 2006)
- onset modification (Mathieson, 2013; Mattioli et al., 2011; Niebudek-Bogusz et al., 2008)
- deconstriction work (Steinhauer and Klimek, 2019)
- laryngeal manual therapy (Lieberman, 1998; Mathieson, 2013).

Refer to the RCSLT **guidance for dysphonia management**.

Remember: although COVID-19 is a new condition, the symptoms are common to other voice conditions with evidence-based methods.

Management and discharge

See general principles of management and discharge post COVID-19.

Stammering

This information provides best practice guidance for SLTs working with individuals experiencing speech changes (dysfluency known as stammering/stuttering) post COVID-19. Stammering and stuttering are interchangeable terms. For general professional guidelines on working with dysfluency refer to the **RCSLT clinical guidance on dysfluency** available to RCSLT members.

This COVID-19 information is an extension of this guidance. It assumes the user has a working knowledge of, and referred to, that guidance.

Prevalence of stammering post COVID-19

Stammering has been reported as a rarer consequence of COVID-19. Only two research articles with three adults were identified to inform this guidance (Furlanis et al., 2022; Rosen et al., 2021). True prevalence is unknown. Stammering prevalence has not been reported in large scale epidemiological studies of COVID-19 at the time of publication.

Aetiology

The precise mechanisms of dysfluency onset post COVID-19 are not understood. There is limited research available on the post COVID-19 presentation. All three of the reported cases were in adults who did not stammer pre-morbidly.

Dysfluency post COVID-19 may be a neuropsychological consequence involving the central nervous system (Furlanis et al., 2022; Rosen et al., 2021). It is possible that inflammation effects due to an exaggerated immune system response alters the blood brain barrier (Wang et al., 2021), or causes low blood flow to the brain (Boldrini et al., 2021). This results in post-acute central nervous system dysfunction (Taquet et al., 2021).

Other neurological symptoms, such as headache, anxiety, sleep disorder and sensorimotor changes have been reported in a large number of COVID-19 patients (Boldrini et al., 2021; Helms et al., 2020). The prevalence of neurological symptoms suggests that some form of neurological dysfunction may underlie dysfluency in COVID-19.

Structural and functional differences in the brains of adults who stammer were identified pre COVID-19 (Watkins et al., 2007). Individuals with post COVID-19 dysfluency demonstrate difficulties in other cognitive tasks and nerve testing which suggests slower than expected patterns of brain activity (Furlanis et al., 2022).

Features of dysfluency

The following features were reported in two studies post COVID-19:

- blocks and repetitions at the start of words and sentences
- repeating words, parts of words or sentences
- effortful movements (facial grimaces and orofacial movements) accompanying the dysfluency
- slow or fluctuating rate of speech
- finding it an effort to speak
- of the two cases reported by Furlanis et al. (2022) symptoms improved between 4-5 months post infection with a return to pre-morbid speech baseline
- dysfluency may be present as part of a wider range of cognitive symptoms such as cognitive dysfunction (brain fog) including word finding difficulties, reduced attention, and memory issues. Screening for this cluster of symptoms is advised
- the frequency and severity of difficulties may fluctuate from day to day in relation to situations and other COVID-19 health factors such as sleep quality, fatigue levels, psychological functioning (stress and anxiety levels) and other health conditions (cardiac, neurological, autonomic nervous system changes).

Risk factors and impact

Risks

No specific risk factors have been identified for developing dysfluency post COVID-19, beyond those identified pre COVID-19, which include: brain injury, re-occurrence of a childhood stammer (Rosen et al., 2021) and significant stress or trauma.

Impact

As with dysfluency from other aetiologies, the impact is not correlated with severity. It is influenced by our life roles, activities of daily living and self-image. The WHO ICF classification provides a framework for the impact of dysfluency post COVID-19 (WHO, 2001):

- Body functions and structures (impairments of the body):
    - possible changes to the neurophysiology of the brain
    - tension and discomfort in the muscles of articulation and facial muscles
    - altered body language such as eye contact, altered posture.
- Activities of the individual (limitations):
    - choosing to avoid speaking with stammering rather than openly stammering in front of others
    - more severe fluency breakdown with increased pressure to communicate
    - tiredness and exhaustion when speaking due to the effort required

    - impact on social communication skills: listening skills, turn-taking, volume and social conventions.
- Participation of the individual (restrictions as a member of society):
    - a breakdown in the listener/speaker relationship with friends, family, work colleagues and novel listeners
    - avoidance of situations perceived to cause fear and anxiety and negative evaluation by listeners at school or work, leading to social anxiety
    - avoidance of or reluctance to fully participate in hobbies and social activities such as socialising with friends and family and communicating with colleagues and peers
    - negative impact at work/education and impact on employment and income
- Environmental factors:
    - reduced self-confidence, and altered self-image
    - significant impact on emotional and psychological functioning
    - lower quality of life (Wilson et al., 2002) .

SLT role and pathways

SLT role

- **Identifying** new onset dysfluency
- **Referring** people onto and liaising with other professionals such as:
    - GP, specialist dysfluency services, post COVID-19 services
- **Diagnosis:** characterising the features of motor speech change
- **Assessment**
    - Face to face or telehealth appointments
    - Questionnaires and screening tools
- **Treatment/therapy**
    - Education and advice about COVID-19 dysfluency
    - Direct therapy – reducing the dysfluency through conditioning or control of speech and/or breathing, or improving fluency, emphasising communication competence, self-confidence and acceptance
    - Indirect therapy – changing environmental factors, holistic relaxation such as mindfulness and breathing control strategies, discussing alternative communication strategies, focusing on communicative success
- **Collecting baseline and outcomes measures:** **refer to the RCSLT guidance on outcome measurement for details**
- **Long-term support**
    - Advocacy

- Signposting to support services

Pathways

Referral pathways differ depending on service provision and commissioning. Specialist Post COVID-19 services (PCS) have been established in some regions (**see NHS England for details**). Referrals in an area without a local PCS are likely to rely on existing SLT service provision for dysfluency.

Referrals are likely to be received from the GP, Post COVID-19 Service or self-referral to local SLT services if this is an available pathway.

Referrals

Refer to the **dysfluency guidance** and local service policy for more details on who may be referred. Referrals are likely to be received for individuals with new onset motor speech disturbance post COVID-19. This may include adults and children.

Assessment

The first assessment typically involves:

- A thorough case history of the onset of dysfluency and patterns, the features of the COVID-19 infection (date, duration, features) and factors which maintain the problem (fatigue, sleeping, psychological well-being, cognitive function, and other health conditions).
- Ask about pre-morbid dysfluency in childhood or when under pressure.
- Record the person's perception of changes to their speech.
- Ask about trends and fluctuations plus triggers for symptom change. Note changes related to fatigue, sleep quality, and psychological well-being (anxiety and stress levels) as required .
- Provide an explanation of the impact of COVID-19 on the body and brain functions, including psychological functioning linked to physiological stress and well-being.
- Collecting outcome measures including Patient Reported Outcome Measures (PROMs). There are none specifically for COVID-19 dysfluency. See **clinical guidance on dysfluency** for validated measures existing within the field.
- Make observations of the speech pattern and breathing along with other features of verbal communication including voice perceptual rating if required (GRBAS, Hirano, 1981).
- Screen for cognitive communication difficulties: memory, processing, recall.
- Screen for acid reflux: Reflux Symptom Index (Belafsky et al., 2002) and consider discussion with GP/gastroenterology if there are concerns.
- Discuss the impact of COVID-19 and dysfluency on psychological well-being.

Treatment

Therapy may include:

- fluency shaping strategies which change the timing and tension of speech production
- speech modification strategies which aim to enable acceptable dysfluency
- holistic relaxation techniques
- desensitisation and avoidance reduction
- strategies to reduce communication anxiety – slow down, write down key points and rehearse

- psychological methods such as solution focused brief therapy and cognitive behavioural therapy (Kim, 2008; Pandey et al., 2017).

Due to the small number of adults presenting with this post COVID-19 sequelae, intervention is likely to be delivered one to one.

Management and discharge

See general principles of management and discharge post COVID-19.

Dysphagia and altered swallow function

This information provides best practice guidance for SLTs working with individuals experiencing swallowing difficulties and discomfort post COVID-19. For general professional guidelines on working with dysphagia refer to the **RCSLT clinical guidance on dysphagia** available to RCSLT members.

This COVID-19 information is an extension of the dysphagia guidance. It assumes the user has a working knowledge of, and referred to, that document.

Dysphagia incorporates the following post COVID-19 symptoms:

- oropharyngeal dysphagia: difficulty or discomfort during the process of swallowing saliva, solids, or fluids from the mouth to the opening of the oesophagus (Clave et al., 2014).
- globus (the sensation of a lump in the throat) (Lechien et al., 2023)
- food sticking (muscle tension dysphagia) (Kang et al., 2021)
- new onset or increased acid reflux .

Prevalence of dysphagia

Adults

Dysphagia is a frequently reported symptom post COVID-19 regardless of disease severity (Miles et al., 2022; Miles, 2023).

We have included the dysphagia prevalence from research for people experiencing post hospitalisation dysphagia and those who convalesced at home. There are differences in dysphagia presentation relative to COVID-19 disease severity and the presence of intubation or proning during care. However, individuals who stayed at home may exhibit similar dysphagia features and severity to people who were admitted to hospital.

Hospitalised population:

- ICU
    - High rates of dysphagia following ICU admission 14%-90% (Dawson et al., 2023; Hellgren et al., 2022; Miles et al., 2022; Sassi et al., 2022; Regan et al., 2021).
    - In a UK wide study of 64 NHS trusts, 20% of individuals reported dysphagia post ICU (Dawson et al., 2023).
    - Swallowing changes were linked to disease severity and treatment factors (ventilation, intubation and proning) rather than sociodemographic factors (age, gender, ethnicity or deprivation).

    - 60% of people with post ICU dysphagia received invasive ventilation and were likely to be proned (Dawson et al., 2023).
    - Research indicates dysphagia symptoms have resolved for many by discharge (Clunie et al., 2022; Miles et al., 2022).
    - 30% of people post-tracheostomy reported swallowing difficulties one month after hospital discharge despite being discharged from SLT (Rouhani et al., 2021).
- General hospital admission
    - Dysphagia is reported by 51.7% on admission and 23.3% 6 months post discharge (Martin-Martinez, 2021).
    - Dysphagia may persist longer in people who were admitted to general wards than those with post ICU dysphagia (Miles et al., 2022).

Non-hospitalised population:

- 30% of people living with long COVID reported ongoing difficulty swallowing and/or globus (Davis et al., 2021).

Paediatrics

- Children typically experience milder COVID-19 symptoms than adults, both acute and chronic (UK Government, 2023).
- There is limited data on dysphagia incidence in children.
- Some children may develop dysphagia from COVID-19 complications including: Multisystem Inflammatory Syndrome (MIS-C), Acute Respiratory Distress Syndrome (ARDS) and intubation (Tutor, 2023).
- In an American study of 50 children with MIS-C post COVID-19, 76% developed dysphagia with 3 children requiring ongoing therapy (Cheong et al., 2021).

Aetiology

Dysphagia post COVID-19 has many sources. A combination of these is likely to cause symptoms during the acute stage, and beyond. They include, but are not limited to:

- Immune system response
    - leading to inflammation of the lining of the throat (Naunheim et al., 2020)
    - hypersensitivity in the throat due to viral infiltration leading to increased mucus in the throat, throat clearing and coughing, plus voice change (Leichen et al., 2022)
- Systemic conditions:
    - fatigue, weakness and critical care myopathy affecting swallow efficiency (Printza et al., 2021). Fatigue levels are a factor in long COVID

- Respiratory changes
    - damage to the lung tissue by the virus, post viral complications, intubation or mechanical ventilation
    - alterations to breathing pattern after mechanical ventilation, or autonomic nervous system response, or neurological issues which impact swallow/breathing co-ordination, shortness of breath and neural control for swallowing (Argenziano et al., 2019; Docherty et al., 2020)
- Laryngeal injury or airway changes
    - post viral infection or laryngeal injury after intubation affecting the vagus nerve leading to vocal fold palsy or airway pathology (Rapoport et al., 2022) compromising swallow safety (Kelly et al., 2023; Dawson et al., 2023) **(see dysphonia)**
    - acid reflux causing oedema, erythema and hypersensitivity in the throat which may result in mucus production, coughing, throat clearing and globus (Freedberg et al., 2022; Koufman, 1991; Silva Andrade et al., 2021). (see section on acid reflux).

Features of dysphagia post COVID-19

Changes are reported in mechanical swallowing function and sensations for swallowing. They differ in the acute stages of illness (hospitalised or non-hospitalised), versus long COVID.

We have listed the features post COVID-19. Other symptoms of dysphagia will be present and should be noted (**see clinical guidance on dysphagia**).

It is important to ask about swallowing difficulties at every stage of the person's illness.

- aspiration/coughing and choking when eating and drinking
- oral residue if weakness and fatigue are factors
- respiratory/swallow incoordination
- recurrent chest infections
- excessive mucus in the throat or thick secretions
- swallow fatigue – taking longer to eat or altered eating patterns (smaller portions)
- avoiding certain consistencies such as hard food or taking continuous gulps of drinks
- effortful swallowing or muscle tension around the larynx when swallowing
- reduced interest in eating and/or drinking and avoidance of certain temperatures of food or consistencies
- changes to taste and smell affecting pleasure in eating and appetite (Mohapatra and Mohan, 2023)
- the impact of mouth ulcers if present

- increased awareness of swallowing, distress around eating and drinking or a fear of swallowing or choking
- sensory changes: the sensation of a lump in the throat or food/pills sticking in the throat/just above the level of the collarbones.

Risk factors and impact

Risks

- There is an increased risk of dysphagia in individuals with a history of intubation. Be aware of co-morbidities and Post Intensive Care Syndrome (PICS) (Stam et al., 2020).
- The UK wide Post-hospitalisation COVID-19 study (PHOSP) showed younger people and females are more likely to experience dysphagia symptoms post COVID-19 (Dawson et al., 2023).
- Co-morbidities which may predispose someone to dysphagia include asthma 26%, acid reflux 15%, and previous mental health problems (Dawson et al., 2023).
- The PHOSP data did not find any differences in ethnicity, education, deprivation, healthcare worker or shielding status prior to admission.
- Early intervention and MDT involvement in dysphagia management for patients in ICU leads to better outcomes (Wallace and McGrath, 2021; Wallace, 2022).
- If SLT intervention is missed in ICU then dysphagia as an ongoing symptom of PICS needs to be identified. The PICUPS tool can be helpful in doing so and signposting to SLT (Clunie et al., 2022, Turner-Stokes et al., 2022).
- Dysphagia is a known risk for ICU admission due to muscle weakness (critical care myopathy), delirium and Acute Respiratory Distress Syndrome (ARDS) (Clunie et al., 2022).
- Individuals with dysphagia spend longer in hospital than those without (Dawson et al., 2023).

SLT role and pathways

SLT role

- **Identifying** new onset dysphagia and pre-existing dysphagia
- **Referring** people onto other professionals such as dietitians, gastroenterologists and ENT specialists amongst others. Where changes to taste and smell may impact on appetite, nutrition and weight, a referral to the dietitians is indicated.
- **Diagnosis:** characterising the signs of oropharyngeal dysphagia and recognising features of oesophageal dysphagia and the impact on deglutition
- **Assessment**
    - discussion with the person, their family and care givers
    - bedside screening

    - instrumental assessment of swallowing dysfunction (See information on Fibreoptic Endoscopic Evaluation of Swallowing below)
- **Treatment/therapy**
    - education and advice about dysphagia post COVID-19
    - direct therapy – safer swallowing strategies or manoeuvres, providing devices such as cups, or equipment to improve swallowing function
    - indirect therapy – changing environmental factors such as taste/temperature, positioning, distractions, promoting self-feeding or safe strategies for carer feeding, modifying consistencies (food and fluids – **see IDDSI framework**), education on safer swallowing including breathing/swallow cycle and the impact of oxygen therapy and oxygen demands on the safety and efficiency of swallowing
- **Collecting baseline and outcomes measures: refer to the RCSLT guidance on outcome measurement for details**.

Pathways

Referral pathways will differ depending on service provision and commissioning. Hospital based patients are likely to be seen by an acute speech and language therapy service with support from specialist SLTs trained in Videofluoroscopy and FEES.

Community based care will differ. Specialist post COVID-19 services (PCS) have been established in some regions (**see NHS England for details**). Referrals in an area without a local PCS are likely to rely on existing SLT service provision for dysphagia.

Referrals

Refer to the **dysphagia guidance** for further information and local guidelines. Referrals will be received for any person suspected of having new onset, or worsening dysphagia symptoms post COVID-19.

Assessment

For full details of dysphagia assessment refer to the RCSLT **clinical guidance on dysphagia**. This information relates to COVID-19.

The first assessment typically involves:

- A thorough case history of factors predisposing a person to dysphagia
    - medical history and medical treatments including intubation/extubation, systemic disease (diabetes), sedation, the presence and size of tracheostomy (if appropriate)

- co-morbidities for dysphagia including cardiovascular, metabolic/endocrine and respiratory diseases (Dawson et al., 2021; Eyigor and Umay, 2021)
- a person's neurological status
- pre-existing dysphagia (Adkins et al., 2020)
- features of the COVID-19 infection (date, duration, hospitalisation) and factors which maintain the problem (fatigue, sleeping, anxiety, cognitive function, acid reflux, coughing, amongst other health conditions)
- the person's perception of their difficulties
- a focused bedside swallowing assessment.

Fibreoptic Endoscopic Evaluation of Swallowing (FEES)

For comprehensive information on this tool, see the **RCSLT FEES position paper**.

This instrumental assessment tool has significant benefits in the ICU setting (Boggiano et al., 2022; Clunie et al., 2022). It can be used with patients requiring continuous positive airway pressure (CPAP) and high flow nasal oxygen (Flores et al., 2019), and when Videofluoroscopy is not logistically possible.

Benefits include:

- observing secretions and secretion management
- identifying laryngeal complications such as injury or pathology
- assessing airway protection functions: glottic closure, laryngeal excursion
- informing and supporting early tracheostomy weaning
- identifying if silent aspiration is present
- determining the presence of laryngopharyngeal acid reflux and if it is exacerbating sensory swallowing impairments
- FEES can be used as a biofeedback tool to demonstrate patterns of muscle tension (related to stress, acid reflux, post extubation) that may underlie globus, the sensation of food sticking, the 'COVID strangle' and voice change. It can also be used to demonstrate the impact of strategies to release laryngeal muscle tension (Clunie et al., 2022).

Videofluoroscopy (VFS)

For general guidance, see the **RCSLT position paper on videofluoroscopy**. This information is an extension of this paper, specific to COVID-19.

Benefits:

- to discriminate between oropharyngeal dysphagia versus oesophageal stage difficulties and acid reflux as referred laryngeal sensations are present in this population (Krasnodębska et al., 2023)
- to be used as a biofeedback tool for identifying the presence, or absence, of oropharyngeal dysphagia
- to reassure people experiencing swallowing difficulties or discomfort if oropharyngeal dysphagia is not seen
- to guide onward referral such as ENT or gastroenterology in discussion with the medical team.

Acid Reflux

The SARS-CoV2 virus reproduces within the gut and acute COVID-19 alters the gut microbiome (Freedberg et al., 2022). There is evidence that COVID-19 increases the risk and incidence of acid reflux (gastroesophageal and laryngopharyngeal types) in the acute stages and long COVID. Nearly half (46%) of patients in a post COVID-19 survey reported new onset acid reflux symptoms (Barrett-Englert et al., 2022).

Acute stages

- People who are hospitalised either with or without intubation or are in ICU are at an increased risk of acid reflux.
- Acid reflux is reported in >50% of patients (Freedberg et al., 2022).

Post COVID syndrome and long COVID:

- Gastrointestinal (GI) symptoms (such as heartburn, constipation, nausea, abdominal pain, diarrhoea and acid reflux) lasting longer than 6 months post COVID-19 in 10-25% of patients (Barrett-Englert et al., 2022; Freedberg et al., 2022).

Treatment

Treatment for dysphagia post COVID-19 will vary depending on the origin of the symptoms. It is likely to include a combination of direct impairment-based therapy and indirect modification strategies to maximise swallowing safety and efficiency. Consult the RCSLT **clinical guidance on dysphagia** and consider:

- traditional compensatory strategies – diet and/or fluid modifications, safe swallowing manoeuvres and swallowing postures
- rehabilitation strategies – swallow strengthening exercises (e.g. Masako, Shaker)

- pharyngeal electrical stimulation has been shown to benefit individuals with severe post-viral neurogenic dysphagia with sensory impairment (Blakemore et al., 2021)
- individuals with globus, sensations of food sticking, tightness in the throat and acid reflux may benefit from voice therapy exercises to reduce laryngeal muscle tension (Kang et al., 2021). These exercises are NOT practised when eating and drinking
- acid reflux treatment may indirectly reduce globus and throat tightness because of laryngeal guarding if acid reflux is present (Hamilton et al., 2020). Follow advice for acid reflux management and consider a referral to gastroenterology.

Management and discharge

There is no definitive point at which to consider discharge. It is likely to be when maximum function has been achieved in the case of rehabilitation or when alternative feeding has been established. Refer to the **dysphagia guidance**, alongside those for **eating and drinking with acknowledged risks**.

See also general principles of management and discharge post COVID-19.

Upper airway change/dysfunction

This information provides best practice guidance for SLTs working with individuals experiencing upper airway changes post COVID-19. For professional guidelines on working with this field refer to the **RCSLT clinical guidance on upper airway disorders** available to RCSLT members.

This COVID-19 information is an extension of the upper airway disorders guidance. It assumes the user has a working knowledge of, and referred to, that document.

Respiratory infections and respiratory conditions, including sinus conditions, have established links with upper airway dysfunction. Upper airway dysfunction is an umbrella term used to describe abnormal laryngeal function (Hull et al., 2016). Upper airway dysfunction incorporates the following symptoms post COVID-19:

- chronic cough
- laryngeal hypersensitivity
- globus pharyngeus (the sensation of a lump in the throat) (Lechien et al., 2023)
- Inducible Laryngeal Obstruction (ILO) (also known as Vocal Cord Dysfunction (VCD) and previously termed Paradoxical Vocal Fold Movement)
- laryngospasm

Structural laryngeal and airway changes

We acknowledge the prevalence of structural changes to the larynx and upper airway such as vocal fold injury (palsy/paresis), arytenoid dislocation/ankylosis, posterior/subglottis stenosis, tracheomalacia, granulation tissue/granuloma and polyp formation amongst others. These conditions typically develop in individuals with a history of intubation during care. (AllisanArrighi et al., 2022; Neevel et al., 2021).

SLTs need to be aware of these conditions and indicative symptoms (increasing breathlessness, declining exercise tolerance, gradual voice change, stridor) to make an onwards referral to ENT. These conditions require medical examination and input. We will not be exploring these conditions in depth. This guidance is aimed at conditions that benefit from primary SLT input.

Prevalence of upper airway dysfunction

Upper airway symptoms are frequently reported post COVID-19 regardless of disease severity and where the individual was treated (hospital or home).

- In a 2022 RCSLT study of the role of SLTs in post COVID-19 care, some of the most common identified needs included laryngeal hypersensitivity (12%) and upper airways difficulties (Chadd et al., 2022).

- In a dataset of 21 patients there was a high proportion of breathing pattern disorder (81%), globus (76%) and chronic cough (52%) (Miles et al., 2022).
- Dry cough is the second most common feature of acute infection in symptomatic patients with prevalence between 57-70% (Zhou et al., 2020; Huang et al., 2020; Grant et al., 2020).
- Ongoing chronic cough is a common symptom after COVID-19 (Carfi et al., 2020, Neevel et al., 2021).
- Persistent cough was estimated to have a prevalence of 18% up to 4 months later in a pooled analysis of 14 studies of post hospitalised patients, with COVID-19 infection (Song et al., 2021).
- Coughing can become chronic leading to cough hypersensitivity (Song et al., 2021).
- There was an incidence of laryngeal hypersensitivity of 21.8% to 29% in patients in a UK based service evaluation (Chalmers et al., 2023).
- In a Spanish multicentre study one year post hospital discharge, 2.5% had ongoing cough, and 23.3% experienced ongoing dyspnoea (sensation of breathlessness) (Fernández-de-las-Peñas et al., 2021).
- Five adults presented with vocal cord dysfunction/inducible laryngeal obstruction (VCD/ILO) post SARS-CoV-2 vaccination (Leong et al., 2022). All patients were female and had features of dyspnoea, sensation of throat closure, increased respiratory effort, hoarse voice, stridor and sometimes wheeze. It began within 30 minutes of vaccination.
- There is limited or no research on the increased risk of ILO post COVID-19 infection although this has been reported informally on UK SLT forums.

Aetiology

Upper airway dysfunction post COVID-19 is likely to have many sources. A combination may cause symptoms during the acute and chronic stages of illness. They include, but are not limited to:

- Immune system response
    - Sudden onset response to COVID-19 vaccination which can lead to angioedema and ILO type symptoms (Leong et al., 2022).
    - Hypersensitivity in the throat due to viral infiltration leading to inflammation of the lining of the throat (Naunheim et al., 2020), increased mucus in the throat, throat clearing and coughing (Xiong et al., 2021).
- Respiratory changes
    - Damage to the throat and lung tissue by the virus, post viral complications, intubation or mechanical ventilation.
    - Alterations to breathing pattern after mechanical ventilation, or autonomic nervous system response, or neurological issues which impact breathing co-ordination and feeling short of breath (dyspnoea) (Argenziano et al., 2019; Docherty et al., 2020).

- Laryngeal injury or airway changes
    - Evidence of persistent sensory changes in the larynx post COVID-19 as the virus infiltrates the tissues (Lagier et al., 2021).
    - Laryngeal injury after intubation affecting the vagus nerve leading to laryngeal hypersensitivity **(see dysphonia).**
    - Structural changes due to larynx and upper airway secondary to intubation, proning and/or tracheostomy insertion (Wallace and McGrath 2021; Wallace 2022).
    - Acid reflux causing oedema, erythema and hypersensitivity in the throat which may result in mucus production, coughing, throat clearing and globus (Freedberg et al., 2022; Silva Andrade et al., 2021) **(see section on acid reflux)**.

Features of upper airway dysfunction post COVID-19

Some features are obvious (stridor, increasing breathlessness) whereas others are subtle and only apparent on explicit questioning by an SLT (Chalmers et al., 2023). Subtle signs may only be apparent sometime after the initial infection.

We have listed the commonly reported features (Miles et al., 2022). Other symptoms may be present. It is important to ask about upper airway dysfunction at every stage of the person's illness.:

- dry coughing. If this persists >8 weeks in the absence of a lung condition it is termed a chronic cough (Irwin et al., 2006)
- a scratchy or irritated throat
- tickling in the throat or upper chest behind the collarbones
- burning in the mouth or throat, or a sore throat
- tightness in the throat muscles, sometimes referred to as 'COVID strangle'
- mouth ulcers have been reported in long COVID
- persistent or relapsing/remitting sore throat
- feelings of too much mucus in the throat or thick secretions
- the feeling of a lump in the throat, even in the absence of eating and drinking
- feeling breathless or short of breath, even at rest
- increased sensitivity to environmental factors including aerosols, air temperature, smells and sprays amongst others
- difficulties swallowing dry, textured or particulate foods (e.g. biscuits, bread and meat) in the absence of choking **(see dysphagia section)**.
- stridor – inspiratory or expiratory.

Risk factors and impact

Limited research has been published about the risk factors for developing upper airway dysfunction post COVID-19.

Risks

- Co-morbidities which may pre-dispose someone to upper airway changes including asthma 26% and acid reflux 15% (Dawson et al., 2023).
- Being female is a risk factor for developing upper airway dysfunction, particularly chronic cough, even in the absence of COVID-19 (Hull et al., 2016).
- Hospitalisation with intubation with or without tracheostomy care and proning (Bhatta et al., 2021; Elarabi et al., 2020; McGrath et al., 2020; Piazza et al., 2021).

SLT role and pathways

SLT role

SLTs understand the complex interactions between airway protection (breathing), swallowing and voice production in the larynx. They are likely to be involved at the following stages:

- **Identifying** new onset upper airway dysfunction amongst hospitalised and non-hospitalised individuals (adults and children).
- **Referring** people onto other professionals such as respiratory medicine and ENT for thorough investigation of lung function and/or laryngeal examination prior to SLT input. SLTs may be the first clinician to question whether upper airway dysfunction is present.
- **Diagnosis**
    - characterising the features of upper airway dysfunction and the impact on voicing, swallowing and airway protection (breathing).
    - SLTs may be present at joint clinics with either respiratory doctors or ENT during diagnosis or helping to run provocation challenge assessments (specialist clinics).
    - meeting a person during unidisciplinary or multidisciplinary appointments (either face to face or via telehealth).
- **Assessment**
    - Full case history including COVID-19 onset and care setting (hospital or home recovery).
    - Taking Patient Related Outcome Measures (PROMS) of symptom impact.
    - Instrumental assessment of laryngeal dysfunction which may include a swallowing assessment **(see information of FEES**) or being present at laryngeal examination.
- **Treatment/therapy**
    - Education and advice about caring for the larynx and desensitisation to reduce upper airway dysfunction.

    - Direct therapy – cough and throat clearing control strategies, acute alleviation strategies for ILO attacks, breathing retraining such as returning to nasal breathing or breathing control exercises and voice therapy exercises to reduce tension to laryngeal muscles.
    - Indirect therapy – advice on nasal care, psychoeducation counselling, stress management.
- **Collecting baseline and outcomes measures***:* refer to the **RCSLT guidance on outcome measurement** for details.

Pathways

Referral pathways will differ depending on service provision and commissioning. Referrals are likely to come from a GP, hospital doctor, other healthcare professional or post COVID-19 service (where available).

Referrals are likely to be sent to an existing outpatient service working with voice disorders and/or upper airway conditions. Specialist Post COVID-19 Services (PCS) have been established in some regions (**see NHS England for details**). There are a small number of tertiary airway services in the UK. Contact the RCSLT **info@rcslt.org** for details.

Referrals

Refer to the **upper airway disorders guidance** for further information and local guidelines.

Referrals are likely to be received for a person suspected of having new onset upper airway dysfunction (chronic cough, laryngeal hypersensitivity, globus, ILO). As per **dysphonia guidance** we advise that all patients with suspected upper airway dysfunction are examined by an ENT consultant or during joint ENT/SLT assessment prior to SLT intervention. This is for clinical governance and to exclude other conditions with overlapping features such as asthma. Where patients present with overlapping respiratory symptoms, a referral to respiratory medicine prior to SLT intervention is strongly recommended.

Assessment

For full details of assessment refer to the **RCSLT upper airway guidance**.

The first assessment typically involves:

- A thorough case history
    - medical history and medical treatments including intubation/extubations, systemic disease (asthma, allergies, nasal disease)

  - pre-existing airway sensitivity on exposure to triggers, such as coughing or sensitivity to airborne particles, temperature changes, talking on the telephone or laughter
  - clinical features such as episodic difficulty breathing in, throat tightness, feeling unable to take a deep breath, in association with coughing and voice change, stridor or sudden onset choking sensations
  - features of the COVID-19 infection (date, duration, hospitalisation) and factors which maintain the problem (fatigue, lack of sleep/insomnia, mood/anxiety and stress levels, cognitive function, acid reflux, coughing, amongst other health conditions)
  - the person's perception of their difficulties (such as cough frequency and severity on a 1-10 scale) or other visual analogue scales
- Observation of the main features
  - breathing patterns – Brompton Breathing Pattern Assessment Tool (BPAT), (Todd et al., 2015)
  - breathing for speaking – does the person breathe through the mouth between sentences, do they have difficulties breathing through their nose?
- Patient reported outcome measures
  - Newcastle Hypersensitivity Questionnaire (Vertigan et al., 2014)
  - Leicester Cough Questionnaire (Birring et al., 2003)
  - Modified BORG scale (Borg, 1998)
  - Dyspnoea 12 (Yorke et al., 2010)
  - Voice measures **(see assessment of dysphonia).**

Endoscopic Evaluation of the Larynx (EEL)

Endoscopic Evaluation of the Larynx is the gold standard for diagnosing ILO when symptomatic (Halvorsen et al., 2017) and excluding other upper airway conditions. The airway will appear functionally normal outside of an ILO episode. Provocation challenge testing (exposing the person to a known trigger) is recommended in specialist clinics (Leong et al., 2023).

EEL provides diagnostic information about the presence, or absence of vocal fold and supraglottic hyperfunction in response to a trigger (Lee et al., 2018). It can also be used therapeutically for biofeedback to help the person learn to control the airway response to a trigger. See **guidance on upper airway** conditions.

As a biofeedback tool, EEL demonstrates patterns of muscle tension (related to stress, acid reflux, post extubation) that may underlie ILO, globus, the sensation of food sticking, the 'COVID strangle' and voice change. It can also be used to demonstrate the impact of strategies to release laryngeal muscle tension (Clunie et al., 2022).

Treatment

Treatment for upper airway dysfunction post COVID-19 will vary depending on the combination of symptoms. There may be cough and hypersensitivity in the presence or absence or other conditions such as ILO. Consult the **RCSLT guidance on upper airway conditions**.

It is likely that treatment will include one or more of the following elements:

- education on the anatomy and physiology of upper airway and larynx for breathing, swallowing and voice production
- explanation of how upper airway hypersensitivity develops in response to an initial inflammation or irritation, is triggered by certain external factors and perpetuated by the act of coughing/throat clearing/acid reflux and ILO (Ayres and Gabbott, 2002)
- advice on how to care for the upper airway and throat including hydration, steaming, avoiding irritants, managing acid reflux and nose breathing
- impairment based strategies to manage episodes of coughing, throat clearing, ILO and laryngospasm
- exercises to decrease laryngeal constriction if present e.g. pretend yawning, chewing with exaggerated lower jaw movement up and down (from Estill Voice Model: Benson, 2017)
- acid reflux treatment may indirectly reduce up upper airway dysfunction (Hamilton et al., 2020) **(see section on acid reflux)**.

Management and discharge

Discharge is likely to occur when one or more of the following conditions has been reached:

- the person can independently self-manage with strategies
- the symptoms have resolved or significantly improved
- the person has reached their target level of symptom control.

See general principles of management and discharge post COVID-19.

Communication changes

This information provides guidance for SLTs working with individuals experiencing communication changes, including motor speech and cognitive communication changes, post COVID-19. For general professional guidelines refer to the **RCSLT clinical guidance** available to RCSLT members.

Most published research into cognitive communication changes post COVID-19 has been with adults. We acknowledge that the absence of research does not indicate a lack of prevalence amongst children, rather an absence of research. This information is designed to be applicable to adults and young people.

Prevalence of communication changes post COVID-19

Cognitive impairments are a significant consequence of COVID-19 which develop independently of other mental health conditions such as depression and anxiety (Cysique et al., 2022). Cognitive impairments can develop regardless of illness severity or whether the person was treated in hospital (Mohapatra and Mohan, 2023; Woo et al., 2020; Daroische et al., 2021).

Communication changes may be subtle or not perceived until a change in the person's circumstances such as discharge from hospital or return to work (Mohapatra and Mohan 2023) or education. With cognitive communication changes, there is a risk that individuals, particularly children, may not be aware of their changes and deficits may go undetected and untreated (Snow et al, 1995). Individuals may present for therapy following a delay after their illness (Cummings, 2023a). Parents should be encouraged to observe their child's cognitive communication skills for changes following a COVID-19 infection.

It is vital for SLTs to be aware of and educate others about potential changes post COVID-19. This includes liaison with individuals living with long COVID, their families and carers, medical staff and allied health professionals, schools and workplaces.

There is some evidence that adults with significant respiratory symptoms and who were treated in hospital have worsened cognitive function than people who recovered at home (Hampshire et al., 2021). There is an increased risk of stroke in acutely unwell adults (Misra et al., 2021) leading to aphasia and cognitive communication changes (Varatharaj et al., 2020).

Adult hospitalised population:

- In the UK wide PHOSP data, 23% of people who were hospitalised with the effects of COVID-19 reported communication difficulties (Dawson et al., 2023).
- Cognitive deficits (brain fog) were reported by up to 70% of adults more than 3 months post hospitalisation.

- Estimates of cognitive communication difficulties following COVID-19 range from 43-66.8% (Alnefeesi et al., 2021).
- Communication difficulties have been reported by 22.5% of adults post discharge (Dawson et al., 2023).

Adult non-hospitalised population:

- In a study of 92 non-hospitalised individuals with COVID-19 (Cummings, 2023a), who were studied an average of 11.7 months after the onset of their COVID-19 infection, a wide range of cognitive and communication problems were reported:
- Speech and language problems were reported by 25%
- Cognitive issues were reported by 54.4%
- Tinnitus and hearing loss were reported in 13% and 3.3%, respectively
- Participants also reported voice problems (5.4%) and swallowing difficulties (2.2%)

Aetiology

The exact origin of communication deficits is not understood. Theories include:

- a consequence of damage to the structure of the brain cortex which could include but is not limited to stroke, hypoxia and viral encephalitis (Mohapatra and Mohan, 2023)
- non-central nervous system (CNS) impairment (Kumar et al., 2021)
- disruption of the CNS
- an immune system response leading to a psychological reaction of the CNS (Ritchie et al., 2020)
- hypoxic brain injury in individuals with severe COVID-19 symptoms, intubation and mechanical ventilation (Mart and Ware, 2020).

Features of communication changes

Communication changes have been reported in adults and children. Individuals with COVID-19 may present with global cognitive and linguistic impairments.

The term brain fog has been widely used to describe a range of symptoms as listed below. Brain fog is not a medical term. It is associated with a feeling of fuzzy thinking, forgetfulness, feeling confused or lost for words.

Communication changes following COVID-19 may be present in people who can produce well formed, meaningful language and do not meet criteria for aphasia (Cummings, 2023a). The changes listed below are present in people who may otherwise have intact grammar and be able to produce well-formed sentences.

- **Motor speech changes**
  - dysarthria
  - foreign accent syndrome (Cotelli et al., 2020)
- **Neurolinguistic changes**
  - word finding difficulties and changes to verbal fluency (Cummings, 2023a; Priftis, 2023)
  - changes to understanding written language (dyslexia) and spoken input (aphasia) (Almeria et al., 2020)
  - deficits in writing (agraphia)
  - dysfluency known as stammering/stuttering **(see stammering)**
  - verbal recall deficits (Cummings, 2023a)
  - reduced discourse informativeness (Cummings, 2023a)
- **Cognitive dysfunction (brain fog)**
  - confusion is prevalent in adults post ICU discharge (Rogers et al., 2020)
  - memory problems can be short- or long-term (Crunfli et al., 2021; Woo et al., 2020) and include working memory deficits (Jaywant et al., 2021)
  - reduced processing speed (Jaywant et al., 2021)
  - disruption in new learning ability
  - divided and selective attention: short term and long-term consequences (Crunfli et al., 2021; Hampshire et al., 2021)
  - Reduction in sustained attention (Zhou et al., 2020)
  - poor ability to divide attention (Jaywant et al., 2021)
  - executive dysfunction including problems with planning and problem solving.

Risk factors and impact

Risks

- Hospitalisation, particularly in ICU with intubation and mechanical ventilation.
- Prolonged reduction in oxygen during the acute phase of illness and possible hypoxia.
- The UK wide PHOSP data showed a higher incidence of communication difficulties in younger adults, women, people living in social deprivation and healthcare workers (Dawson et al., 2023).
- Baseline co-morbid conditions such as dementia, diabetes and obesity were also identified as a factor for adult cognitive deficits post hospitalisation (Dawson et al., 2023).
- Pre-morbid education levels. Lower performance on some linguistic assessments was associated with years of education (Cummings, 2023a).

Impact

- Prolonged cognitive impairments have a significant impact on quality of life (Denke et al., 2018).
- Adults with communication and cognitive deficits may be unable to return to pre-morbid functioning in their personal, work and family life (Callan et al., 2022; Cummings 2023a).
- The economic impact is significant with many working age adults unable to return to full-time employment (Davis et al., 2021).
- Changes to mood, self-esteem and anxiety linked with changes in speech and communication difficulties (Chasco et al., 2022).
- Possible changes to roles, responsibilities or independence impacting on work/school or social life (Callan et al., 2022).

SLT role and pathways

SLT role

SLTs are fundamental to identifying, managing, and treating communication and cognitive communication changes post COVID-19. They are likely to be involved at the following stages:

- **Identifying** adults and children with communication/cognition deficits
    - from a person's report, reports from family/carers or educational settings, informal conversation, screening tools, formal assessment batteries multidisciplinary team (MDT) discussions, GP referrals and other sources
- **Referring** people onto and liaising with other professionals such as:
    - GP, long COVID service (where available), respiratory medicine, gastroenterology, neurology, ENT, social care services and allied health professions (physiotherapy, occupational therapy and psychology amongst others), SENCOs or children's support services
- **Diagnosis**
    - diagnosing communication and cognitive communication disorders following assessment
    - meeting an adult or child during unidisciplinary or multidisciplinary appointments (either face to face or via telehealth)
- **Assessment**
    - face to face or telehealth appointments with people living with the aftereffects of COVID-19 and their families/carers
    - questionnaires and screening tools
    - identifying symptoms of concern such as confusion and worsening memory, and making onward referrals to GP or other medical services such a neurology or memory clinics as indicated

- **Treatment/therapy**
    - education and advice about COVID-19 changes
    - direct therapy – impairment based therapy
    - indirect therapy – education, behaviour change, environmental changes, getting help from others
- **Collecting baseline and outcomes measures:** refer to the **RCSLT guidance on outcome measurement** for details.
- **Long-term support**
    - advocacy for individuals and referral onto other services such support groups, charities, social care services and community services e.g. LivingWith App, **YourCOVID Recovery website**
    - liaising with community services, schools, education, SENCOs, occupational health psychological support services and social care services as required.

Pathways

Referrals may be accepted from a Post COVID Service (where available), GP, other healthcare professional or self-referral, depending on commissioning and local guidelines. Any person suspected of having new onset, or worsening communications symptoms post COVID-19 should be offered a referral to a local speech and language therapy service. Working alongside Occupational Therapy is likely to achieve the most holistic plan for individuals with cognitive dysfunction post COVID-19.

SLTs may be working in one of the following services:

- post COVID Service (typically as part of an MDT)
- community Speech and Language Therapy Service
- cognitive Rehabilitation Service
- outpatient SLT service.

Referrals

Local policies will apply. SLT services are likely to accept referrals from patients who present with any combination of communication and cognitive deficits. Individuals may present with multiple deficits in language and cognition rather than a single issue and clinicians are advised to screen for a range of conditions.

Assessment

Assessment builds a comprehensive picture of the onset, patterns, features, and impact of communication changes post COVID-19. Assessment typically involves formal and informal tools and should highlight the impact of communication changes. There are no standardised assessments for communication changes post COVID-19 at the time of publication. However, a range of cognitive-communication assessments were in use before COVID-19 with other clinical populations (e.g., traumatic brain injury) (Steel et al., 2023). These assessments can be transferred with acknowledgement that they were not designed for this population.

Discourse-based assessments are most sensitive to cognitive dysfunction in long COVID as they can reveal communication impairments even when structural language skills are relatively intact (Cummings, 2023a). Assessment should include a combination of conversation and discourse analyses. Discourse production tasks can be conducted in contexts with varying levels of cognitive challenge (e.g. picture description, narration based on pictures).

Clinicians should use a toolbox approach, focusing on factors relevant to the person and the impact of their communication deficits. Sessions can be conducted face to face or via telehealth. Repeat assessment should happen continuously throughout the intervention process. Notes of the findings should be recorded after each session and therapy adjusted accordingly.

See **RCSLT guidance on voice and upper airway disorders in the context of COVID-19** (pp 30-33) for guidance on audio equipment requirements and telehealth practices.

Assessment typically involves:

- a thorough case history of factors with any predisposing or pre-existing communication difficulties identified
- medical history and medical treatments during COVID-19 (including intubation/extubation, systemic disease (diabetes), sedation)
- co-morbidities for cognitive changes including neurological status
- features of the COVID-19 infection (date, duration, hospital/home treatment) and factors which maintain the problem (fatigue, sleeping, mood/stress/anxiety, cognitive function, acid reflux, coughing, amongst other health conditions)
- the person's perception of their difficulties
- discourse-based assessments reveal cognitive-communication disorders in people living with long COVID (Cummings, 2023b).
- cognitive screening such as the Mini Mental State Examination (Folstein et al., 1975) can be used alongside working with occupational therapists on memory, problem solving, planning and attention
- existing language batteries such as the Boston Naming Test (Goodglass, Kaplan and Weintraub, 1983), British Picture Vocabulary Assessment (Dunn, Dunn and Whetton, 1982),

Comprehensive Aphasia Test (Swinburn et al., 2004) can be used to highlight areas of difficulty

- standardised motor speech assessments including The Frenchay Motor Speech Assessment (Enderby, 1980), and Robertson Dysarthria Profile (Robertson, 1982) may be used to assess speech changes
- standardised tests of language, attention, learning, memory, executive functions, information processing speed, motor speech can be transferred to this population with acknowledgement that they are not standardised for the post COVID-19 population.

Treatment

Evidence on cognitive rehabilitation therapy in adults post COVID-19 is limited. A multidisciplinary approach to treatment is advised to help the individual adapt to new levels of functioning and restore lost abilities, where possible. Working with occupational therapists, psychologists and other professionals is vital to achieving change.

SLTs are experts in working with cognitive communication difficulties from a range of other conditions such as brain injury. COVID-19 deficits share common features. Intervention techniques can be transferred to working with post COVID-19 communication changes, with acknowledgement that they are not standardised for this population.

No one single treatment is applicable. Treatment will vary depending on the diagnosis, individual's goals and treatment plan. Treatment plans are likely to include a combination of impairment-based therapy, functional changes and environmental/behavioural modifications alongside support from the person's family/friends/work/education settings.

Goal setting:

- Ask about the person's priorities or those of the family/carers for children.
- Help them to identify barriers to progress and change such as fatigue, mood/stress/anxiety levels, memory problems, brain fog and other health conditions.
- Encourage them to set their own goals (personalised care).
- Discuss the potential for recovery with a holistic approach and realistic milestones: celebrate all milestones, big or small e.g. being able to read a page of a book instead of aiming for a chapter.
- Telehealth may be suitable as a medium for assessment and therapy sessions as it reduces the travelling time. However, prolonged screen time may be difficult for individuals with brain fog, attention and processing deficits due to diminished selective attention (Delgado-Alonso et al., 2022).

A course of therapy may involve:

- compensation strategies – memory aids, visual timetables, prompts, diaries and journals.
- environmental modifications – communication partner training, reducing distractions and background noise, use of hearing aids and glasses to facilitate communication.
- employment – working with occupational therapists, human resource professionals and employers to arrive at tailored phase returns to work, appropriate redeployments, and patterns of working that will ensure individuals can remain in the workplace
- education – (the individual and caregivers/family/school or college) of the impact of COVID-19 and possible cognitive, mood and behavioural changes
- managing factors that affect cognition – the importance of sleep, holistic relaxation, stress reduction, nutrition, pacing and fatigue effects.

Management and discharge

See general principles of management and discharge post COVID-19.

Co-morbidities

This section includes concomitant conditions that frequently occur post COVID-19 (Michelen et al., 2021) including: fatigue, breathlessness, changes to psychological well-being and neurological symptoms. They can fluctuate in severity from day to day and affect all aspects of a person's life. They have a long-term impact on the person's ability to engage with health/family/social/educational and work commitments (Davis et al., 2023).

Whilst SLTs are not diagnosing these conditions or providing direct therapy, these conditions have a significant influence on the person's ability to engage with SLT care. SLTs must be aware of the role and impact of these factors to provide effective input.

Fatigue

SLTs need to recognise fatigue, which is characterised by excessive tiredness that persists despite resting or sleeping well. This is separate from feeling tired which improves after rest (Van Herck et al., 2023). Fatigue has a significant knock-on effect to swallowing, voice, communication, and cognitive communication skills. Fatigue can be so severe that individuals are unable to perform everyday tasks such as having a shower, without needing to rest for prolonged periods (O'Mahoney et al., 2023).

It is beneficial for SLTs to have a general understanding of types of exertion that contribute to fatigue including:

- Physical exertion
- Cognitive exertion
- Emotional exertion
- Sensory exertion

All four types of exertion will impact fatigue levels and consequently communication.

Refer to NHS England and Royal College of General Practitioners (RCGP) **long COVID advice and resources for healthcare professionals in primary care** for further information.

Fatigue triggers are unique and will differ for individuals. SLTs can signpost to information about pacing, activity diaries, resting and how energy levels fluctuate impacting on activities of daily living (sometimes called the 'boom and bust' cycle). Royal College of Occupational Therapists (RCOT) have produced advise for patients on **how to manage post-viral fatigue after COVID-19**.

SLTs need to be aware of Post Exertional Malaise (PEM), Post Exertional Symptom Exacerbation (PESE) and how they impact the individual (see information from **Long COVID Physio**).

Liaise with Occupational Therapy regarding fatigue management. The **NICE guidance for ME/Chronic Fatigue Syndrome**, which shares features with long COVID is available. In the absence of long COVID specific guidance, this provides practical advice on physical, cognitive, and sensory adaptations that an SLT can make to maximise the person's ability to engage with therapy.

Telehealth appointments should be considered, where available to support fatigue associated with travelling to appointments. See **Your COVID recovery patient information on fatigue**.

SLTs should also consider the timing and length of sessions accounting for the person's fatigue levels. Ask at the start of therapy and the start of each session. Individuals may benefit from sessions divided into chunks of time accounting for fatigue and processing.

Breathlessness

Breathlessness is a commonly reported symptom post COVID-19 (Michelen et al., 2021). The aetiology may be from lung disease, disordered breathing pattern or a combination of both (Kessler et al., 2022). The origin must be a fully examined by the GP/Respiratory Medicine or Cardiology.

SLTs should be able to explain the role that breathing changes have on speaking, voice production and swallowing. Specialist SLTs with experience of working with **voice** and/or **upper airway disorders** may be able to explain the role of breathing pattern retraining and breathing exercises as part of rehabilitation.

- SLTs should be able to recognise when an altered breathing pattern is present by basic observation. The Brompton Breathing Pattern Assessment Tool (Todd et al., 2018) is a 1-minute observation tool that can indicate the presence and features of a breathing pattern disorder
- SLTs can make an onwards referral to respiratory physiotherapy or specialist SLTs working in respiratory care to teach breathing control and retraining exercises
- High levels of stress and anxiety (physical and emotional) have a significant impact on breathing patterns and affect breathlessness (Gilbert et al., 2014). A referral to psychology for support, where available is likely to be beneficial. Consult local IAPT services or discuss with the person's GP
- SLTs can signpost adults to NHS breathing control exercises online:
    - **Introduction to breathing control**
    - **Breathing control in sitting**

Changes to mood and psychological well-being

- Changes to mood and psychological well-being, including as anxiety and depression, are recognised as primary neuropsychiatric symptoms post COVID (Sobrino-Relaño et al., 2023), as well as being associated with contracting a severe illness with long-term consequences (DePierro et al., 2020; Pitman et al., 2018; Speth et al., 2020)
- Raised levels of anxiety and depression have been reported in people living with long COVID (Mazza et al., 2020)
- Discussing changes to mood and psychological well-being are part of validating the impact of having a long-term condition
- Interventions to include within a session: active listening, validation of symptoms and the lived experience, signposting to holistic relaxation resources and basic cognitive behavioural therapy techniques
- SLTs can make an onwards referral, or signpost people to local psychological services e.g. IAPT or charities such as **MIND** or the **Mental Health Foundation**.

Nervous systems changes

- Research has shown that COVID-19 infection can lead to long-term autonomic nervous system changes associated with increased sympathetic nerve activity (Dani et al., 2021)
- SLTs can discuss the increased response of the nervous system following a COVID-19 infection including characteristics of dysautonomia (Astin et al., 2023; Papadopoulou et al., 2022) and **Postural Tachycardia Syndrome (PoTS)**
- Individuals experience features of dysautonomiaincluding but not limited to: dizziness, irregular and variable cardiac activity, palpitations, sweating, fevers and the onset of PoTS (see **PoTS UK**). These features must be discussed and considered as they will impact on rehabilitation activities delivered by SLTs
- Practical adaptations for sessions could include reducing sensory input, having a stool available for the individual to put their feet on or a plinth to lay down.

Tinnitus and hearing loss

Hearing loss, new onset tinnitus and auditory processing difficulties have been documented following COVID-19 infection (DiSogra, 2022). Changes may be temporary or persistent.

Some people experience new-onset tinnitus or a worsening of existing tinnitus. Hearing changes/loss can contribute to difficulty processing auditory information and undermine verbal communication and interaction. SLTs must be aware of these deficits and maximise communication potential by minimising background noise and providing communication support where necessary.

Even without hearing loss and tinnitus, some people have problems with hearing information or processing what they hear. This is part of cognitive dysfunction (brain fog) and shares features with

auditory processing disorder (DiSogra, 2022).

Ask about changes to hearing and confer with the GP or audiology service when difficulties are reported.

Managing post COVID-19 care

Clinical presentations will vary greatly between people living with long COVID. An accessible **article with resources for primary care providers and patients** is available (Greenhalgh et al., 2022).

There is a free **online e-learning programme** (3 sessions) for healthcare workers supporting people living with long COVID.

General principles for SLTs supporting an individual living with long COVID:

- Recognise the interaction between post COVID-19 symptoms and how to manage inter-dependent symptoms. This is likely to involve a holistic approach and collaboration with other services to provide a comprehensive care package
- Adopt an approach that is person centred and led by the goals and needs of the individual. This will be based on their priorities according to their symptom burden
- Explain the communication challenges of people with long COVID to employers, educators, other health professionals, and family members
- Make recommendations for workplace/education adaptations such as they relate to language and communication (e.g. use of technology to read aloud emails and documents)
- Discuss the physical and psychological health changes resulting from COVID-19 and how they interact. SLTs should be able to offer basic support for physical and psychological features and how/when to signpost to specialist services
- Understand that small milestones are important wins in recovering from long COVID and must be acknowledged as part of rehabilitation
- Clearly define rehabilitation goals and set expectations for what services are available at the start of therapy input
- Understand that recovery and rehabilitation will continue beyond discharge and that therapy must equip individuals for supported self-management
- Support the person living with long COVID to recognise and manage the fluctuations in symptoms on the road to recovery
- Educate the person to know that progress will be fluctuating and not linear
- Support the individual to develop an action plan of what to do during a relapse
- Have knowledge of the local post COVID-19 pathway and how/when to access other services
- Access CPD support either locally or through the RCSLT long COVID forum or via RCSLT appointed advisors.

Your role as an SLT:

- Listen to the person. Answer questions and discuss uncertainty about COVID-19
- Explore beliefs about COVID-19 and long COVID

- Emphasise the need for holistic management including relaxation and self-care with strategies for fatigue, anxiety, sleep and nutrition management
- Slow down, take more time to explain information. Reduce jargon. Repeat and write down information
- Provide information in bite-sized chunks
- Be aware of, and adjust sessions, to meet the needs of people with brain fog and memory issues, fatigue, sensory impairment, learning disability, or factors of neurodiversity. Ask the person, or their carer, what they need. If needed, split the assessment over two sessions to reduce processing overload and fatigue
- Signpost individuals to self-supported care resources
- SLTs may be asked to contribute to applications for funding, additional support at work or in education and benefits applications.

Management and discharge – general principles

Discharge timing will depend on the individual, the diagnosis, their symptoms, and other health priorities. People typically report gradual symptom changes rather than rapid resolution. In COVID-19 care, we need to consider the whole presentation. It is a fluctuating condition exacerbated by other factors.

- Fatigue and cycles of boom and bust (O'Brien et al., 2023)
- Cognitive symptoms
- Headaches and dizziness
- Sleep quality
- Nutrition and gut health
- Psychological well-being including mood, anxiety levels, stress and depression
- Breathlessness, chest pain and palpitations

Discharge planning should be discussed with the person and/or their family/parent or caregiver in advance. Discharge should be geared towards self-supported management with symptom control (see **NHS England information on long COVID**). Helping the person and/or their family/caregiver to identify and manage triggers with advice for pacing and rest is vital. Discharge may occur when the person reaches optimum functioning for their current health status.

The person is likely to have ongoing symptoms after discharge. Clear information and advice should be given on support networks and self-management given that relapses are common post COVID-19. Without clear boundaries, therapy could continue indefinitely.

SLTs are encouraged to agree clear goals, discuss expectations before therapy commences and aim for maximal rehabilitation and minimising discomfort. Goals will need to be aligned with the person's

priorities, whether functional or impairment based. This approach is commonplace for practising SLTs. Therapy outcomes need to be shared with relevant parties, with agreement, including families, schools/colleges and the workplace.

Individuals can be directed to the NHS website **Your COVID Recovery – Supporting Recovery for Long COVID**.

Further resources are available on the RCSLT website.

References

Abenza-Abildúa, M. J., Ramírez-Prieto, M. T., Moreno-Zabaleta, R., Arenas-Valls, R., Salvador-Maya, R. A., Algarra-Lucas, C., et al. (2020). Neurological complications in critical patients with COVID-19. Neurología, 35(9), 621-627.

Abrams, Z. (2023, April 21). The reality of paediatric long COVID. *Monitor on Psychology*, *54*(3). https://www.apa.org/monitor/2023/04/pediatric-long-covid

Adkins, C., Takakura, W., Spiegel, B.M., Lu, M., Vera-Llonch, M., Williams, J. and Almario, C.V., 2020. Prevalence and characteristics of dysphagia based on a population-based survey. *Clinical Gastroenterology and Hepatology*, *18*(9), pp.1970-1979.

Allisan Arrighi, A.E., Rapoport, S.K., Laitman, B.M., Bahethi, R., Mori, M., Woo, P., Genden, E., Courey, M. and Kirke, D.N., 2022. Long term upper aerodigestive sequelae as a result of infection with COVID 19*Laryngoscope Investigative Otolaryngology*, *7*(2), pp.476-485.

Almeria, M., Cejudo, J.C., Sotoca, J., Deus, J. and Krupinski, J., 2020. Cognitive profile following COVID-19 infection: Clinical predictors leading to neuropsychological impairment. *Brain, behavior, & immunity-health*, *9*, p.100163.

Alnefeesi, Y., Siegel, A., Lui, L.M., Teopiz, K.M., Ho, R., Lee, Y., Nasri, F., Gill, H., Lin, K., Cao, B. and Rosenblat, J.D., 2021. Impact of SARS-CoV-2 infection on cognitive function: a systematic review. *Frontiers in Psychiatry*, *11*, p.1629.

Andrade, P., Wood, G., Ratcliffe, P., Epstein, R., Pijper, A., and Svec, J. G. (2014). Electroglottographic study of seven semi-occluded exercises: LaxVox, straw, lip-trill, tongue-trill, humming, hand-overmouth, and tongue-trill combined with hand-over-mouth. Journal of Voice, 28(5): 589-595.

Aoyagi, Y., Inamoto, Y., Shibata, S., Kagaya, H., et al. (2021). Clinical manifestation, evaluation, and rehabilitative strategy of dysphagia associated with COVID-19. American Journal of Physical Medicine & Rehabilitation, 100(5), 424-431.

Archer, S., Iezzi, C., & Gilpin, L. (2021). Swallowing and voice outcomes in patients hospitalised with Covid-19: an observational cohort study. Archives of Physical Medicine and Rehabilitation, 102(6),1084-1090.

Arienti C, Cordani C, Lazzarini SG, Del Furia MJ, Negrini S, Kiekens C. Fatigue, post-exertional malaise and orthostatic intolerance: a map of Cochrane evidence relevant to rehabilitation for people with post COVID-19 condition. Eur J Phys Rehabil Med. 2022 Dec;58(6):857-863. doi: 10.23736/S1973-9087.22.07802-9. Epub 2022 Dec 6. PMID: 36472558.

Argenziano MG, Bruce SL, Slater CL, *et al*. Characterization and clinical course of 1000 patients with Coronavirus disease 2019 in New York: retrospective case series. BMJ 2020;369:m1996. **doi:10.1136/bmj.m1996**

Astin, R., Banerjee, A., Baker, M.R., Dani, M., Ford, E., Hull, J.H., Lim, P.B., McNarry, M., Morten, K., O'Sullivan, O. and Pretorius, E., 2023. Long COVID: mechanisms, risk factors and recovery. *Experimental physiology*, *108*(1), pp.12-27.

Ayres, J.G. and Gabbott, P.L.A., 2002. Vocal cord dysfunction and laryngeal hyperresponsiveness: a function of altered autonomic balance?. *Thorax*, *57*(4), pp.284-285.

Barrett-Englert, M., Rao, A., Chey, S., Sutton, A., Taylor, E. and Chey, W.D., 2022. Sa1054: COVID-19 exacerbates existing digestive disorders and triggers new digestive symptoms and diagnoses: results from an international patient survey. *Gastroenterology*, *162*(7), pp.S-288.

Baker, J., Barnett, C., Cavalli, L., Dietrich, M., Dixon, L., Duffy, J.R., Elias, A., Fraser, D.E., Freeburn, J.L., Gregory, C. and McKenzie, K., 2021. Management of functional communication, swallowing, cough and related disorders: consensus recommendations for speech and language therapy. *Journal of Neurology, Neurosurgery & Psychiatry*, *92*(10), pp.1112-1125.

Belafsky, P.C., Postma, G.N. and Koufman, J.A., 2002. Validity and reliability of the reflux symptom index (RSI). *Journal of voice*, *16*(2), pp.274-277.

Benson, E.A., 2017. The Estill voice model: theory & translation.

Bhatta S, Gandhi S, Saindani SJ, Ganesuni D, Ghanpur AD. Otorhinolaryngological manifestations of coronavirus disease 2019: a prospective review of 600 patients. J Laryngol Otol. 2021; 135(3): 206-211

Birring, S.S., Prudon, B., Carr, A.J., Singh, S.J., Morgan, M.D.L. and Pavord, I., 2003. Development of a symptom specific health status measure for patients with chronic cough: Leicester Cough Questionnaire (LCQ). *Thorax*, *58*(4), pp.339-343.

Blakemore, C., Hunter, J. and Basu, B., 2021. Rapid swallow improvement following Pharyngeal Electrical Stimulation in a COVID-19 patient with long-term severe neurogenic dysphagia: A case report. *Journal of Rehabilitation Medicine-Clinical Communications*, *4*, pp.1-7.

Boggiano, S., Williams, T., Gill, S.E., Alexander, P.D., Khwaja, S., Wallace, S. and McGrath, B.A., 2022. Multidisciplinary management of laryngeal pathology identified in patients with COVID-19 following trans-laryngeal intubation and tracheostomy. *Journal of the Intensive Care Society*, *23*(4), pp.425-432.

Boldrini, M., Canoll, P.D. and Klein, R.S., 2021. How COVID-19 affects the brain. *JAMA psychiatry*, *78*(6), pp.682-683.

Borg, G., 1998. *Borg's perceived exertion and pain scales*. Human kinetics.

British Society of Rehabilitation Medicine and Intensive Care Society (2020). Responding to COVID-19 and beyond: a framework for assessing early rehabilitation needs following treatment in intensive care. National Post-Intensive Care Rehabilitation Collaborative. Version 1. https://www.bsrm.org.uk/downloads/2020.06.23–icsframework-for-assessing-early-reha-(1).pdf. Accessed 8 December 2021.

Callan, C., Ladds, E., Husain, L., Pattinson, K. and Greenhalgh, T., 2022. 'I can't cope with multiple inputs': a qualitative study of the lived experience of 'brain fog'after COVID-19. *BMJ open*, *12*(2), p.e056366.

Cantarella, G., Aldè, M., Consonni, D., Zuccotti, G., Di Berardino, F., Barozzi, S., Bertoli, S., Battezzati, A., Zanetti, D. and Pignataro, L., 2021. Prevalence of Dysphonia in Non hospitalized Patients with COVID-19 in Lombardy, the Italian Epicenter of the Pandemic. *Journal of Voice*.

Carfì A., Bernabei, R. and Landi, F., 2020. Persistent symptoms in patients after acute COVID-19. *Jama* , *324*(6), pp.603-605.

Chacon, A.M., Nguyen, D.D., McCabe, P. and Madill, C., 2021. Aerosol-generating behaviours in speech pathology clinical practice: A systematic literature review. *Plos one*, *164*), p.e0250308.

Chadd, K., Moyse, K., & Enderby, P. (2021). Impact of COVID-19 on the speech and language therapy profession and their patients. *Frontiers in neurology*, *12*, 629190.

Chadd, K., Chalmers, S., Harrall, K., Moyse, K. and Clunie, G., 2022. An evaluation of speech and language therapy services for people with long COVID in the UK: a call for integrated care. *Journal of Integrated Care*.

Chalmers, S., Harrall, K., Wong, S.Y., Kablan, W. and Clunie, G., 2023. A retrospective study of patients presenting with speech and language therapy needs within multidisciplinary Long COVID services: A service evaluation describing and comparing two cohorts across two NHS Trusts. *International Journal of Language & Communication Disorders*.

Chasco, E.E., Dukes, K., Jones, D., Comellas, A.P., Hoffman, R.M. and Garg, A., 2022. Brain fog and fatigue following COVID-19 infection: an exploratory study of patient experiences of long COVID. *International journal of environmental research and public health*, *19*(23), p.15499.

Cheong R, Jephson C, Frauenfelder C, Cavalli L, Moshal K, Butler C, Wyatt M. Otolaryngologic manifestations in pediatric multisystem syndrome temporally associated with COVID-19. Res lett. 2021. **https://doi.org/10.1001/jamaoto.2020.5698**.

Chung-Wei Lin, Yu-Han Wang, Yu-En Li, Ting-Yi Chiang, Li-Wen Chiu, Hsin-Ching Lin, Chun-Tuan Chang,

Clave, P., Terré, R., De Kraa, M. and Serra, M., 2004. Approaching oropharyngeal dysphagia. *Revista Espanola de Enfermedades Digestivas*, *96*(2), pp.119-131.

Cohen, S., Kim, J., Roy, N. Asche, C. and Courey, M. (2012) Prevalence and causes of dysphonia in a large treatment seeking population. Laryngoscope, 122 (2), 343-348.

Cordani C, Lazzarini SG, Del Furia MJ, Kiekens C, Arienti C, Negrini S. Arthralgia: a map of Cochrane evidence relevant to rehabilitation for people with post COVID-19 condition. Eur J Phys Rehabil Med. 2022 Dec;58(6):870-874. doi: 10.23736/S1973-9087.22.07803-0. Epub 2022 Dec 6. PMID: 36472559.

Cordani C, Lazzarini SG, Zampogna E, Del Furia MJ, Arienti C, Negrini S, Kiekens C. Dyspnea: a map of Cochrane evidence relevant to rehabilitation for people with post COVID-19 condition. Eur J Phys Rehabil Med. 2022 Dec;58(6):864-869. doi: 10.23736/S1973-9087.22.07805-4. Epub 2022 Dec 13. PMID: 36511169.

Cordani C, Battel I, Del Furia MJ, Lazzarini SG, Negrini S, Arienti C. Dysphagia, dysphonia and olfactory disease: a map of Cochrane evidence relevant to rehabilitation for people with post COVID-19 condition. Eur J Phys Rehabil Med. 2022 Dec;58(6):875-879. doi: 10.23736/S1973-9087.22.07811-X. Epub 2022 Dec 19. PMID: 36534007.

Cordani C, Young VM, Arienti C, Lazzarini SG, Del Furia MJ, Negrini S, Kiekens C. Cognitive impairment, anxiety and depression: a map of Cochrane evidence relevant to rehabilitation for people with post COVID-19 condition. Eur J Phys Rehabil Med. 2022 Dec;58(6):880-887. doi: 10.23736/S1973-9087.22.07813-3. Epub 2022 Dec 19. PMID: 36534008.

Cotelli, M.S., Cotelli, M., Manelli, F., Bonetti, G., Rao, R., Padovani, A. and Borroni, B., 2020. Effortful speech with distortion of prosody following SARS-CoV-2 infection. *Neurological Sciences*, *41*, pp.3767-3768.

Clunie G., Wallace S., and Dawson C., (2002) Dysphagia and COVID-19 in adults: What do we know. *Bulletin*, Royal College of Speech and Language Therapist, Winter edition 2022-2023, pp25-29

Clunie, G. M., Bolton, L., Lovell, L., Bradley, E., Bond, C., Bennington, S., & Roe, J. (2022). Considerations for speech and language therapy management of dysphagia in patients who are critically ill with COVID-19: a single centre case series. International Journal of Therapy and Rehabilitation, 1-12. doi:10.12968/ijtr.2021.0078

COVID-related dysphonia and persistent long-COVID voice sequelae: A systematic review and meta-analysis,American Journal of Otolaryngology,Volume 44, Issue 5, 2023, 103950,

Crunfli, F., Carregari, V.C., Veras, F.P., Vendramini, P.H., Valença, A.G.F., Antunes, A.S.L.M., Brandão-Teles, C., da Silva Zuccoli, G., Reis-de-Oliveira, G., Silva-Costa, L.C. and Saia-Cereda, V.M., 2021. SARS-CoV-2 infects brain astrocytes of COVID-19 patients and impairs neuronal viability. *MedRxiv*, pp.2020-10.

Cullum, C.M., Hynan, L.S., Grosch, M., Parikh, M. and Weiner, M.F., 2014. Teleneuropsychology: Evidence for video teleconference-based neuropsychological assessment. *Journal of the International Neuropsychological Society*, *20*(10), pp.1028-

Cummings, L. 2021. Covid-19 and language: A case study. International Journal of Language Studies Volume 15, Number 3, July 2021, pp. 1-24

Cummings, L. 2022 **Long COVID: The impact on language and communication | Fifteen Eighty Four | Cambridge University Press (cambridgeblog.org)** Accessed 29/11/2023

Cummings., L. 2022 **EALTHY – Long COVID: Understanding the Legacy of the COVID-19 Pandemic** Accessed 29/11/2023

Cummings, L., 2022. Pragmatic impairment and COVID-19. *Intercultural Pragmatics*, *19*(3), pp.271-297.

Cummings, L. (2023(a)) 'Cognitive-linguistic difficulties in adults with Long COVID', in L. Cummings (ed.), *COVID-19 and Speech-Language Pathology*, New York: Routledge, 72-95.

Cummings, L. (2023b) 'Communication-related quality of life in adults with Long COVID', in L. Cummings (ed.), *COVID-19 and Speech-Language Pathology*, New York: Routledge, 96-129.

Cummings, L., 2023. Long COVID: The impact on language and cognition. *Language and Health*.

Cysique, L. A. et al. Post-acute COVID-19 cognitive impairment and decline uniquely associate with kynurenine pathway activation: a longitudinal observational study. Preprint at medRxiv **https://doi.org/10.1101/2022.06.07.22276020** (2022).

Dani, M. *et al.* Autonomic dysfunction in "long COVID": Rationale, physiology and management strategies. *Clin. Med.* **21**, e63–e67. (2021).

Daroische, R., Hemminghyth, M.S., Eilertsen, T.H., Breitve, M.H. and Chwiszczuk, L.J., 2021. Cognitive impairment after COVID-19—a review on objective test data. *Frontiers in neurology*, *12*, p.699582.

Dassie-Leite, A.P., Gueths, T.P., Ribeiro, V.V., Pereira, E.C., do Nascimento Martins, P. and Daniel, C.R., 2021. Vocal signs and symptoms related to COVID-19 and risk factors for their persistence. *Journal of Voice*.

Dawson, C., Capewell, R., Ellis, S., Matthews, S., Adamson, S., Wood, M., … & Sharma, N. (2020). Dysphagia presentation and management following coronavirus disease 2019: an acute care tertiary centre experience. *The Journal of Laryngology & Otology*, *134*(11), 981-986.

Dawson, C., Riopelle, S.J. and Skoretz, S.A., 2021. Translating Dysphagia Evidence into Practice While Avoiding Pitfalls: Assessing Bias Risk in Tracheostomy Literature. *Dysphagia*, *36*, pp.409-418.

Dawson C, Clunie G, Evison F, *et al* Prevalence of swallow, communication, voice and cognitive compromise following hospitalisation for COVID-19: the PHOSP-COVID analysis

BMJ Open Respiratory Research 2023;**10:**e001647. doi: 10.1136/bmjresp-2023-001647

Davis, H.E., Assaf, G.S., McCorkell, L., Wei, H., Low, R.J., Re'em, Y., Redfield, S., Austin, J.P. and Akrami, A., 2021. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. *EClinicalMedicine*, *38*.

Davis, H.E., McCorkell, L., Vogel, J.M. and Topol, E.J., 2023. Long COVID: major findings, mechanisms and recommendations. *Nature Reviews Microbiology*, *21*(3), pp.133-146.

Delgado-Alonso, C., Valles-Salgado, M., Delgado-Álvarez, A., Yus, M., Gómez-Ruiz, N., Jorquera, M., Polidura, C., Gil, M.J., Marcos, A., Matías-Guiu, J. and Matías-Guiu, J.A., 2022. Cognitive dysfunction associated with COVID-19: A comprehensive neuropsychological study. *Journal of psychiatric research* , *150*, pp.40-46.

Denke, C., Balzer, F., Menk, M., Szur, S., Brosinsky, G., Tafelski, S., Wernecke, K.D. and Deja, M., 2018. Long-term sequelae of acute respiratory distress syndrome caused by severe community-acquired pneumonia: Delirium-associated cognitive impairment and post-traumatic stress disorder. *Journal of International Medical Research*, *46*(6), pp.2265-2283.

DePierro J, Lowe S, Katz C. Lessons learned from 9/11: mental health perspectives on the COVID-19 pandemic. Psychiatry Res 2020; 288: 113024

DiSogra, R.M. (2022) 'Are COVID-19 "brain fog" symptoms and an auditory processing disorder related?', The Hearing Review.

Docherty AB, Harrison EM, Green CA, *et al*. Features of 20 133 UK patients in hospital with COVID-19 using the ISARIC WHO clinical characterisation protocol: prospective observational cohort study. BMJ 2020;369:m1985. **doi:10.1136/bmj.m1985**

Dunn, L.M., Dunn, L.M. and Whetton, C., 1982. *The British Picture Vocabulary Scale: Manual for the short and long forms*. NFER-Nelson.

Edouard Mathieu, Hannah Ritchie, Lucas Rodés-Guirao, Cameron Appel, Charlie Giattino, Joe Hasell, Bobbie Macdonald, Saloni Dattani, Diana Beltekian, Esteban Ortiz-Ospina and Max Roser (2020) – "Coronavirus Pandemic (COVID-19)". Published online at OurWorldInData.org. Retrieved from: 'https://ourworldindata.org/coronavirus' [Online Resource]

Elarabi AM, Albakri MM, Babiker M, et al. A series of unfortunate events: mind the windpipe. Clin Case Rep. 2020; 9(1): 582-583.

El-Anwar, M. W., Elzayat, S., & Fouad, Y. A. (2020). ENT manifestation in COVID-19 patients. Auris, Nasus, Larynx, 47(4), 559-564.

Enderby, P., 1980. Frenchay dysarthria assessment. *British Journal of Disorders of Communication*, *15* (3), pp.165-173.

ENO Breathe, English National Opera. Accessed 04/08/2023

Eyigör S, Umay E. Dysphagia management during COVID-19 pandemic: A review of the literature and international guidelines. Turk J Phys Med Rehabil. 2021 Sep 1;67(3):267-274.

Félix, L., Tavares, T. L., Almeida, V. P. B., & Tiago, R. S. L. (2021). Incidence of laryngotracheal lesions after orotracheal intubation in coronavirus disease patients. Laryngoscope. doi: 10.1002/lary.29862.

Fernández-de-Las-Peñas, C., Palacios-Ceña, D., Gómez-Mayordomo, V., Florencio, L.L., Cuadrado, M.L., Plaza-Manzano, G. and Navarro-Santana, M., 2021. Prevalence of post-COVID-19 symptoms in hospitalized and non-hospitalized COVID-19 survivors: A systematic review and meta-analysis. *European journal of internal medicine*, *92*, pp.55-70.

Folstein, M.F., Robins, L.N. and Helzer, J.E., 1983. The mini-mental state examination. *Archives of general psychiatry*, *40*(7), pp.812-812.

Flores, M. J., Eng, K., Gerrity, E., & Sinha, N. (2019). Initiation of oral intake in patients using high-flow nasal cannula: A retrospective analysis. Perspectives of the ASHA Special Interest Groups, 4(3), 522–531.

Folstein, M.F., Folstein, S.E. and McHugh, P.R., 1975. "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. *Journal of psychiatric research*, *12*(3), pp.189-198.

Frajkova, Z., Tedla, M., Tedlova, E., Suchankova, M., & Geneid, A. (2020). Postintubation dysphagia during COVID-19 outbreak – contemporary review. Dysphagia, 35(4), 549-557.

Freedberg, D.E. and Chang, L., 2022. Gastrointestinal symptoms in COVID-19: the long and the short of it. *Current Opinion in Gastroenterology*, *38*(6), pp.555-561.

Furlanis, G., Busan, P., Formaggio, E., Menichelli, A., Lunardelli, A., Ajcevic, M., Pesavento, V. and Manganotti, P., 2023. Stuttering-Like Dysfluencies as a Consequence of Long COVID-19. *Journal of Speech, Language, and Hearing Research*, *66*(2), pp.415-430.

Gilbert, C., Chaitow, L. and Bradley, D., 2014. *Recognizing and treating breathing disorders*. Elsevier Health Sciences.

Gomes, V., Batista, D., Lopes, L., Aquino, R. and Almeida, A. (2019) Symptoms and Vocal Risk Factors in Individuals with High and Low Anxiety. Folia Phoniatrica et Logopaedica, 71 (1), 7-15

Goodglass, H., Kaplan, E. and Weintraub, S., 1983. *Boston naming test*. Philadelphia, PA: Lea & Febiger.

Grant, M.C., Geoghegan, L., Arbyn, M., Mohammed, Z., McGuinness, L., Clarke, E.L. and Wade, R.G., 2020. The prevalence of symptoms in 24,410 adults infected by the novel coronavirus (SARS-CoV-2; COVID-19): A systematic review and meta-analysis of 148 studies from 9 countries. *PloS one*, *15*(6), p.e0234765.

Greenhalgh, T., Sivan, M., Delaney, B., Evans, R. and Milne, R., 2022. Long covid—an update for primary care. *bmj*, *378*.

GPICS, Guidelines for the provision of intensive care services, version 2.1, June 2022, Masterson G., and Batchelor A., Intensive Care Society **GPICS V2.1 (2).pdf (ficm.ac.uk)**

Guan, W.J., Ni, Z.Y., Hu, Y., Liang, W.H., Ou, C.Q., He, J.X., Liu, L., Shan, H., Lei, C.L., Hui, D.S. and Du, B., 2020. Clinical characteristics of coronavirus disease 2019 in China. *New England journal of medicine*, *382*(18), pp.1708-1720.

Gov.uk 2023, Coronavirus (COVID-19) in the UK: summary, **https://coronavirus.data.gov.uk/**, Accessed 03/08/2023

Halvorsen, T., Walsted, E.S., Bucca, C., Bush, A., Cantarella, G., Friedrich, G., Herth, F.J., Hull, J.H., Jung, H., Maat, R. and Nordang, L., 2017. Inducible laryngeal obstruction: an official joint European Respiratory Society and European Laryngological Society statement. *European Respiratory Journal*, *50* (3).

Hamilton, N.J., Wilcock, J. and Hannan, S.A., 2020. A lump in the throat: laryngopharyngeal reflux. *bmj* , *371*.

Hampshire, A., Trender, W., Chamberlain, S.R., Jolly, A.E., Grant, J.E., Patrick, F., Mazibuko, N., Williams, S.C., Barnby, J.M., Hellyer, P. and Mehta, M.A., 2021. Cognitive deficits in people who have recovered from COVID-19. *EClinicalMedicine*, *39*.

Hellgren, L., Richard, L.E.V.I., Divanoglou, A., Birberg-Thornberg, U. and Samuelsson, K., 2022. Seven domains of persisting problems after hospital-treated Covid-19 indicate a need for a multiprofessional rehabilitation approach. *Journal of Rehabilitation Medicine*, *54*.

Helms, J., Kremer, S., Merdji, H., Clere-Jehl, R., Schenck, M., Kummerlen, C., Collange, O., Boulay, C., Fafi-Kremer, S., Ohana, M. and Anheim, M., 2020. Neurologic features in severe SARS-CoV-2 infection. *New England Journal of Medicine*, *382*(23), pp.2268-2270.

Herridge, M.S., Moss, M., Hough, C.L., Hopkins, R.O., Rice, T.W., Bienvenu, O.J. and Azoulay, E., 2016. Recovery and outcomes after the acute respiratory distress syndrome (ARDS) in patients and their family caregivers. *Intensive care medicine*, *42*, pp.725-738.

Hirano M. Psycho-acoustic evaluation of voice. In: Arnold, Winckel, Wyke, eds. Disorders of Human Communication, 5, Clinical Examination of Voice. New York and Wien: Springer-Verlag; 1981:81–84.

House of Commons Women and Equalities Committee (2020). Unequal impact? Coronavirus and BAME people. https://committees.parliament.uk/publications/3965/documents/39887/default/. Accessed 9 December 2021.

Huang, R., Xia, J., Chen, Y., Shan, C. and Wu, C., 2020. A family cluster of SARS-CoV-2 infection involving 11 patients in Nanjing, China. *The Lancet Infectious Diseases*, *20*(5), pp.534-535.

Intensive Care Society (2020). Speech and language therapy for Covid-19 patients in ICU and beyond. https://www.ics.ac.uk/Society/COVID-19/PDFs/Speech_and_language_therapy_for_COVID-19_patients. Accessed 28 January 2022.

Irwin, R.S., Baumann, M.H., Bolser, D.C., Boulet, L.P., Braman, S.S., Brightling, C.E., Brown, K.K., Canning, B.J., Chang, A.B., Dicpinigaitis, P.V. and Eccles, R., 2006. Diagnosis and management of cough executive summary: ACCP evidence-based clinical practice guidelines. *Chest*, *129*(1), pp.1S-23S.

Jaywant, A., Vanderlind, W.M., Alexopoulos, G.S., Fridman, C.B., Perlis, R.H. and Gunning, F.M., 2021. Frequency and profile of objective cognitive deficits in hospitalized patients recovering from COVID-19. *Neuropsychopharmacology*, *46*(13), pp.2235-2240.

Kapsner-Smith, M., Hunter, E., Kirkham, K., Cox, K. and Titze, I. (2015) A randomized controlled trial of two semi-occluded vocal tract voice therapy protocols. Journal of Speech, Language and Hearing Research, 58(3): 535-549.

Kang, C.H., Zhang, N. and Lott, D.G., 2021. Muscle tension dysphagia: contributing factors and treatment efficacy. *Annals of Otology, Rhinology & Laryngology*, *130*(7), pp.674-681.

Koufman, J.A., 1991. The otolaryngologic manifestations of gastroesophageal reflux disease (GERD): a clinical investigation of 225 patients using ambulatory 24 hour pH monitoring and an experimental investigation of the role of acid and pepsin in the development of laryngeal injury. *The Laryngoscope*, *101*, pp.1-78.

Kelly, E., Hirschwald, J., Clemens, J. and Regan, J., 2023. Persistent Features of Laryngeal Injury Following Endotracheal Intubation: A Systematic Review. *Dysphagia*, pp.1-9.

Kelly, E., Wallace, S., & Puthucheary, Z. (2020). Prolonged intubation and tracheostomy in Covid-19 survivors: consequences and recovery of laryngeal function. ICU Management and Practice, 20(4), 243-249.

Kessler, A., Heightman, M. and Brennan, E., 2022. Post-COVID-19 respiratory problems: Burden and management. *Current Opinion in Supportive and Palliative Care*, *16*(4), pp.203-209.

Kim, J.S., 2008. Examining the effectiveness of solution-focused brief therapy: A meta-analysis. *Research on Social Work Practice*, *18*(2), pp.107-116.

Krasnodębska, P., Szkiełkowska, A. and Miaśkiewicz, B., 2023. Laryngeal sensory neuropathy caused by COVID-19: findings using laryngeal electromyography. European Archives of Oto-Rhino-Laryngology, 280(7), pp.3295-3302.

Kumar, S., Veldhuis, A. and Malhotra, T., 2021. Neuropsychiatric and cognitive sequelae of COVID-19. *Frontiers in psychology*, *12*, p.577529.

Kuper, H. and Scherer, N., 2023. Why are people with intellectual disabilities clinically vulnerable to COVID-19?. *The Lancet Public Health*, *8*(5), pp.e325-e326.

Kwak, P. E., Connors, J. R., Benedict, P. A., et al. (2021). Early outcomes from early tracheostomy for patients with COVID-19. JAMA Otolaryngology – Head & Neck Surgery, 147(3), 239-244.

Lagier, A., Melotte, E., Poncelet, M., Remacle, S. and Meunier, P., 2021. Swallowing function after severe COVID-19: early videofluoroscopic findings. *European Archives of Oto-Rhino-Laryngology*, *278*, pp.3119-3123.

Lally, C., 2020, UK Parliament Post, COVID-19 and occupational risk., **COVID-19 and occupational risk – POST (parliament.uk)** Accessed 04/08/2023

Nicholas W. Larsen, Lauren E. Stiles, Ruba Shaik, Logan Schneider., Srikanth Muppidi., Cheuk To Tsui, Mitchell G. Miglis. Characterization of Autonomic Symptom Burden in Long COVID: A Global Survey of 2,314 Adults. medRxiv 2022.04.25.22274300; doi: **https://doi.org/10.1101/2022.04.25.22274300**

Negrini S, Kiekens C, Cordani C, Arienti C, DE Groote W. Cochrane “evidence relevant to” rehabilitation of people with post COVID-19 condition. What it is and how it has been mapped to inform the development of the World Health Organization recommendations. Eur J Phys Rehabil Med. 2022 Dec 5. doi: 10.23736/S1973-9087.22.07793-0. Epub ahead of print. PMID: 36468825.

Lechien, J.R., Saussez, S., Harmegnies, B., Finck, C. and Burns, J.A., 2017. Laryngopharyngeal reflux and voice disorders: a multifactorial model of etiology and pathophysiology. *Journal of voice*, *31*(6), pp.733-752.

Lechien, Jerome R., Carlos M. Chiesa Estomba, Sammy Place, Yves Van Laethem, Pierre Cabaraux, Quentin Mat, Kathy Huet et al. “Clinical and epidemiological characteristics of 1420 European patients with mild to moderate coronavirus disease 2019.” Journal of internal medicine 288, no. 3 (2020): 335-344.

Lechien, J.R., Chiesa-Estomba, C.M., Cabaraux, P., Mat, Q., Huet, K., Harmegnies, B., Horoi, M., Le Bon, S.D., Rodriguez, A., Dequanter, D. and Hans, S., 2022. Features of mild-to-moderate COVID-19 patients with dysphonia. Journal of Voice, 36(2), pp.249-255.

Lechien, J.R., Baudouin, R., Hans, S. and Akst, L.M., 2023. History of Otolaryngology: Globus Pharyngeus as “Globus Hystericus”. *Otolaryngology–Head and Neck Surgery*, *168*(4), pp.889-892.

Lee, J.W., Tay, T.R., Paddle, P., Richards, A.L., Pointon, L., Voortman, M., Abramson, M.J., Hoy, R. and Hew, M., 2018. Diagnosis of concomitant inducible laryngeal obstruction and asthma. *Clinical & Experimental Allergy*, *48*(12), pp.1622-1630.

Leong, P., Vertigan, A.E., Hew, M., Baxter, M., Phyland, D., Hull, J.H., Carroll, T.L., Gibson, P.G., McDonald, V.M., Halvorsen, T. and Clemm, H.H., 2023. Diagnosis of vocal cord dysfunction/inducible laryngeal obstruction: an International Delphi Consensus Study. *Journal of Allergy and Clinical Immunology*, *152*(4), pp.899-906.

Lieberman, J. (1998) Principles and techniques of manual therapy: applications in the management of dysphonia. In: The Voice Clinic Handbook, Harris, T., Harris, S., Rubin, J., Howard, D. (eds). London: Whurr

Lopez-Leon, S., Wegman-Ostrosky, T., Ayuzo del Valle, N.C. *et al.* Long-COVID in children and adolescents: a systematic review and meta-analyses. *Sci Rep* 12, 9950 (2022). **https://doi.org/10.1038/s41598-022-13495-5** ***Scientific Reports*** volume 12, Article number: 9950 (2022)

Mart, M.F. and Ware, L.B., 2020. The long-lasting effects of the acute respiratory distress syndrome. *Expert review of respiratory medicine*, *14*(6), pp.577-586.

Mathieson, L., 2013. *Greene and Mathieson's the Voice and its Disorders*. John Wiley & Sons.

Martin–Martinez, A., Ortega, O., Viñas, P., Arreola, V., Nascimento, W., Costa, A., Riera, S.A., Alarcón, C. and Clavé, P., 2022. COVID-19 is associated with oropharyngeal dysphagia and malnutrition in hospitalized patients during the spring 2020 wave of the pandemic. *Clinical Nutrition*, *41*(12), pp.2996-3006.

Mattioli, F., Bergamini, G., Alicandri-Cuifelli, M., Molteni, G., Luppi, M., Nizzoli, F., Grammatica, A. and Presutti, L. (2011) The role of early voice therapy in the incidence of motility recovery in unilateral vocal fold paralysis. Logopedics Phoniatrics Vocology, 36(1): 40-47

Mazza, M.G., De Lorenzo, R., Conte, C., Poletti, S., Vai, B., Bollettini, I., Melloni, E.M.T., Furlan, R., Ciceri, F., Rovere-Querini, P. and Benedetti, F., 2020. Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors. *Brain, behavior, and immunity*, *89*, pp.594-600.

McGlashan, J.A., 2018. Evaluation of the voice. In *Scott-Brown's Otorhinolaryngology and Head and Neck Surgery* (pp. 925-941). CRC Press.

McGrath, B. A., Ashby, N., Birchall, M., Dean, P., Doherty, C., Ferguson, K., ... & Higgs, A. (2020). Multidisciplinary guidance for safe tracheostomy care during the COVID 19 pandemic: the NHS National Patient Safety Improvement Programme (NatPatSIP). *Anaesthesia*, *75*(12), 1659-1670.

McGrath, B., Wallace, S., & Goswamy, J. (2020). Laryngeal oedema associated with COVID-19 complicating airway management. Anaesthesia, 75(7), 972. https://doi.org/10.1111/anae.1509

McGrath, B. A., Brenner, M. J., Warrillow, S. J., Pandian, V., et al. (2020). Tracheostomy in the COVID-19 era: global and multidisciplinary guidance. The Lancet. Respiratory Medicine, 8(7), 717-725.

Meerschman, I., Van Lierde, K., Ketels, J., Coppieters, C., Claeys, S. and D'haeseleer, E. (2019) Effect of three semi occluded vocal tract therapy programmes on the phonation of patients with dysphonia: lip trill, water resistance therapy and straw phonation. International Journal of Language and Communication Disorders, 54(1): 50-61

Michelen, M., Manoharan, L., Elkheir, N., Cheng, V., Dagens, A., Hastie, C., O'Hara, M., Suett, J., Dahmash, D., Bugaeva, P. and Rigby, I., 2021. Characterising long COVID: a living systematic review. *BMJ global health*, *6*(9), p.e005427.

Miles, A.,2023 Swallowing difficulties in adults after Covid-19. In Cummings, L. (Editor) Covid-19 and Speech-Language Pathology. Routledge: Taylor Francis Group. 167-181

Miles, A., McRae, J., Clunie, G., Gillivan-Murphy, P., Inamoto, Y., Kalf, H., Pillay, M., Pownall, S., Ratcliffe, P., Richard, T. and Robinson, U., 2022. An international commentary on dysphagia and dysphonia

during the COVID-19 pandemic. Dysphagia, 37(6), pp.1349-1374.

Mills, C.S., Jones, G. and Wallace, S., 2023. The COVID-19 silver lining for speech and language therapists working in intensive care units. *Advances in Communication and Swallowing*, *26*(1), pp.49-52.

Misha, S., 2022 **Why does COVID-19 cause brain fog? Scientists may finally have an answer. | National Geographic** Accessed 29/11/2023

Misono, S., Meredith, L., Peterson, C. and Frazier, P. (2016) New perspective on psychsocial distress in patients with dysphonia: the moderating role of perceived control. Journal of Voice, 30(2): 172-176

Misra, S., Kolappa, K., Prasad, M., Radhakrishnan, D., Thakur, K.T., Solomon, T., Michael, B.D., Winkler, A.S., Beghi, E., Guekht, A. and Pardo, C.A., 2021. Frequency of neurologic manifestations in COVID-19: a systematic review and meta-analysis. *Neurology*, *97*(23), pp.e2269-e2281.

Miu, K., Miller, B., Tornari, C., Slack, A., Murphy, P., Ahmed, I., Burnay, V., & Karagama, Y. (2021). Airway, voice and swallow outcomes following endotracheal intubation and mechanical ventilation for COVID-19 pneumonitis: preliminary results of a prospective cohort study. British Journal of Surgery, 108(Suppl 2). https://doi.org/10.1093/bjs/znab134.049

Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations. World Health Organization. https://www.who.int/newsroom/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19- implications-for-ipc-precaution-recommendations. Published 2020. Accessed 03/08/2023.

Mohapatra B., Ranjini M., 2023. A new challenge in speech-language pathology. In Cummings, L. (Editor) Covid-19 and Speech-Language Pathology. New York, Routledge: Taylor Francis Group. 167-181

Moraes, D. P., Sassi, F. C., Mangilli, L. D., et al. (2013). Clinical prognostic indicators of dysphagia following prolonged orotracheal intubation in ICU patients. Critical Care, 17(5), R243. Doi: 10.1186/cc13069.

Naunheim, M.R., Zhou, A.S., Puka, E., Franco Jr, R.A., Carroll, T.L., Teng, S.E., Mallur, P.S. and Song, P.C., 2020. Laryngeal complications of COVID 19*Laryngoscope investigative otolaryngology*, *5*(6), pp.1117-1124.

Neevel, A.J., Smith, J.D., Morrison, R.J., Hogikyan, N.D., Kupfer, R.A. and Stein, A.P., 2021. Postacute COVID-19 laryngeal injury and dysfunction. *OTO open*, *5*(3), p.2473974X211041040.

NHS Scotland: **https://www.nhsinform.scot/illnesses-and-conditions/infections-and-poisoning/coronavirus-COVID-19**

NICE Clinical guidelines (CG83). Rehabilitation after critical illness in adults, first published 25 March 2009., **Overview | Rehabilitation after critical illness in adults | Guidance | NICE**

NICE COVID-19 rapid guideline, managing COVID-19 (NG191). First publishes 23 March 2021, updated 22 June 2023. **https://www.nice.org.uk/guidance/ng191 Accessed 03/08/23**

Niebudek-Bogusz, E., Sznurowska-Przygocka, B., Fiszer, M., Kotyło P., Sinkiewicz, A., Modrzewska, M. and Sliwinska-Kowalska, M. (2008) The Effectiveness of Voice Therapy for Teachers with Dysphonia. Folia Phoniatr Logop, 60: 134–141

ONS March 2023, Office for National Statistics, Coronavirus (COVID-19) latest insights: **https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/arti** accessed 03/08/23

O'Brien KK, Brown DA, McDuff K, et al., Conceptualising the episodic nature of disability among adults living with Long COVID: a qualitative study, BMJ Global Health 2023;8:e011276.

O'Mahoney, L.L., Routen, A., Gillies, C., Ekezie, W., Welford, A., Zhang, A., Karamchandani, U., Simms-Williams, N., Cassambai, S., Ardavani, A. and Wilkinson, T.J., 2023. The prevalence and long-term health effects of Long Covid among hospitalised and non-hospitalised populations: A systematic review and meta-analysis. *EClinicalMedicine*, *55*.

Osbeck Sandblom, H., Dotevall, H., Svennerholm, K., Tuomi, L., & Finizia, C. (2021). Characterization of dysphagia and laryngeal findings in COVID-19 patients treated in the ICU – an observational clinical study. PLoS One, 16(6), e0252347. doi:10.1371/journal.pone.0252347

Özçelik Korkmaz, M., Eğilmez, O. K., Özçelik, M. A., & Güven, M. (2020). Otolaryngological manifestations of hospitalised patients with confirmed COVID-19 infection. European Archives of Oto-rhino-laryngology, 278(5), 1675-1685.

Papadopoulou M, Bakola E, Papapostolou A, Stefanou MI, Gaga M, Zouvelou V, Michopoulos I, Tsivgoulis G. Autonomic dysfunction in long-COVID syndrome: a neurophysiological and neurosonology study. J Neurol. 2022 Sep;269(9):4611-4612.

Pandey, M.K., Mishra, P. and Shukla, A., 2017. Efficacy of Cognitive Behaviour Therapy in an Adult with Stammering. *Indian Journal of Clinical Psychology*, *45*(1), pp.79-82.

Patil S, Patil R, Gondhali G. Long COVID In Post-COVID-19 Care Setting: Prospective, Observational, And Interventional Study Of 6,000 Cases In Tertiary Care Setting In India. Chest. 2022 Jun, 161(6):

A538

Piazza C, Filauro M, Dikkers FG, et al. Long-term intubation and high rate of tracheostomy in COVID-19 patients might determine an unprecedented increase of airway stenoses: a call to action from the European Laryngological Society. Eur Arch Otorhinolaryngol. 2021; 278(1): 1-7.

Pitman A, Suleman S, Hyde N, Hodgkiss A. Depression and anxiety in patients with cancer. BMJ 2018; 361: k1415

Priftis, K 2023, Neurolinguistic deficits and other cognitive disorders in adults with severe COVID-19 infection in L. Cummings (ed.), *COVID-19 and Speech-Language Pathology*, New York: Routledge, 72-95.

Printza, A., Tedla, M., Frajkova, Z., Sapalidis, K. and Triaridis, S., 2021. Dysphagia severity and management in patients with COVID-19. *Current Health Sciences Journal*, *47*(2), p.147.

Puthucheary, Z., Brown, C., Corner, E., Wallace, S., Highfield, J., Bear, D., et al. (2021). The Post-ICU presentation screen (PICUPS) and rehabilitation prescription (RP) for intensive care survivors. Part II: clinical engagement and future directions for the national post-intensive care rehabilitation collaborative. Journal of the Intensive Care Society. doi:10.1177/1751143720988715

Rapoport, S.K., Alnouri, G., Sataloff, R.T. and Woo, P., 2022. Acute vocal fold paresis and paralysis after COVID-19 infection: a case series. *Annals of Otology, Rhinology & Laryngology*, *131*(9), pp.1032-1035.

Regan J, Walshe M, Lavan S, Horan E, Gillivan Murphy P, Healy A, Langan C, Malherbe K, Flynn Murphy B, Cremin M, Hilton D, Cavaliere J, Whyte A. Post-extubation dysphagia and dysphonia amongst adults with COVID-19 in the Republic of Ireland: A prospective multi-site observational cohort study. Clin Otolaryngol. 2021 Nov;46(6):1290-1299.

Regan, J., Walshe, M., Lavan, S., Horan, E., et al. (2022). Dysphagia, dysphonia and dysarthria outcomes among adults hospitalised with Covid-19 across Ireland. The Laryngoscope, https://doi.org/10.1002/lary.29900

Richardson, S., Hirsch, J. S., Narasimhan, M., et al. (2020). Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. JAMA , 323(20), 2052–2059

Ritchie, K., Chan, D. and Watermeyer, T., 2020. The cognitive consequences of the COVID-19 epidemic: collateral damage?. *Brain communications*, *2*(2), p.fcaa069.

Roberts, C.M., Levi, M., McKee, M., Schilling, R., Lim, W.S. and Grocott, M.P., 2020. COVID-19: a complex multisystem disorder. *British journal of anaesthesia*, *125*(3), pp.238-242.

Robertson, S.J., 1982. Dysarthria Profile: background and development. *College of Speech Therapists Bulletin*, *370*, pp.10-12.

Rodrigues, M., Costa, A. J., Santos, R., Diogo, P., Gonçalves, E., Barroso, D., ... & Lima, A. (2023). Inpatient rehabilitation can improve functional outcomes of post-intensive care unit COVID-19 patients—a prospective study. *Disability and Rehabilitation*, *45*(2), 266-276.

Rogers, J.P., Chesney, E., Oliver, D., Pollak, T.A., McGuire, P., Fusar-Poli, P., Zandi, M.S., Lewis, G. and David, A.S., 2020. Psychiatric and neuropsychiatric presentations associated with severe coronavirus infections: a systematic review and meta-analysis with comparison to the COVID-19 pandemic. *The Lancet Psychiatry*, *7*(7), pp.611-627.

Rosen, A.C., Lavacot, J.A., Porter, I.M., Chao, S.Z., Bikson, M., Kumar, A.A. and Cardenas, V.A., 2022. TDCS in a patient with dreadlocks: Improvements in COVID-19 related verbal fluency dysfunction. *Brain Stimulation: Basic, Translational, and Clinical Research in Neuromodulation*, *15*(1), pp.254-256.

Rouhani MJ, Clunie G, Thong G, Lovell L, Roe J, Ashcroft M, Holroyd A, Sandhu G, Al Yaghchi C. A Prospective Study of Voice, Swallow, and Airway Outcomes Following Tracheostomy for COVID-19. Laryngoscope. 2021 Jun;131(6):E1918-E1925. doi: 10.1002/lary.29346. Epub 2020 Dec 28. PMID: 33341953.

Roy, N. et al. (2005) Voice Disorders in the General Population: Prevalence, Risk Factors, and Occupational Impact. Laryngoscope, 115 (11), P 1988-1995

Royal College of Paediatrics and Child Health., 2023 **https://www.rcpch.ac.uk/key-topics/covid-19. Accessed 03/08/2023**

RCSLT Guidance, 10 August 2020, Guidance on voice and upper airway disorders in the context of COVID-19 in adult and paediatric services. **RCSLT guidance on voice and upper airway disorders in the context of COVID-19**. Accessed 03/08/2023

RCSLT Guidance, Voice. **Clinical guidance | RCSLT** Accessed 03/08/2023

Saccente-Kennedy, B., Archer, J., Symons, H.E., Watson, N.A., Orton, C.M., Browne, W.J., Harrison, J., Calder, J.D., Shah, P.L., Costello, D. and Reid, J.P., 2022. Quantification of respirable aerosol particles from speech and language therapy exercises. Journal of Voice.

Saniasiaya, J., Kulasegarah, J. and Narayanan, P., 2023. New-onset dysphonia: a silent manifestation of COVID-19. *Ear, Nose & Throat Journal*, *102*(4), pp.NP201-NP202.

Sassi FC, Ritto AP, de Lima MS, Valente Junior CN, Cardoso PFG, Zilberstein B, Saldiva PHN, de Andrade CRF. Characteristics of postintubation dysphagia in ICU patients in the context of the COVID-19 outbreak: A report of 920 cases from a Brazilian reference center. PLoS One. 2022 Jun 16;17(6):e0270107. doi: 10.1371/journal.pone.0270107. PMID: 35709233; PMCID: PMC9202872.

Shah, W., Hillman, T., Playford, E. D., & Hishmeh, L. (2021). Managing the long term effects of covid-19: summary of NICE, SIGN, and RCGP rapid guideline. *bmj*, *372*.

Shahouzaie, N. and Gholamiyan Arefi, M., 2022. Telehealth in speech and language therapy during the COVID-19 pandemic: a systematic review. *Disability and Rehabilitation: Assistive Technology*, pp.1-8.

Silva Andrade, B., Siqueira, S., de Assis Soares, W.R., de Souza Rangel, F., Santos, N.O., dos Santos Freitas, A., Ribeiro da Silveira, P., Tiwari, S., Alzahrani, K.J., Góes-Neto, A. and Azevedo, V., 2021. Long-COVID and post-COVID health complications: an up-to-date review on clinical conditions and their possible molecular mechanisms. *Viruses*, *13*(4), p.700.

Song, W.J., Hui, C.K., Hull, J.H., Birring, S.S., McGarvey, L., Mazzone, S.B. and Chung, K.F., 2021. Confronting COVID-19-associated cough and the post-COVID syndrome: role of viral neurotropism, neuroinflammation, and neuroimmune responses. *The Lancet Respiratory Medicine*, *9*(5), pp.533-544.

Snow, P., Douglas, J. and Ponsford, J., 1998. Conversational discourse abilities following severe traumatic brain injury: A follow up study. *Brain injury*, *12*(11), pp.911-935.

Sobrino-Relaño, S., Balboa-Bandeira, Y., Peña, J. *et al.* Neuropsychological deficits in patients with persistent COVID-19 symptoms: a systematic review and meta-analysis. *Sci Rep* **13**, 10309 (2023)

Speth, M.M., Singer Cornelius, T., Oberle, M., Gengler, I., Brockmeier, S.J. and Sedaghat, A.R., 2020. Mood, anxiety and olfactory dysfunction in COVID 19: evidence of central nervous system involvement?. *The Laryngoscope*, *130*(11), pp.2520-2525.

Sprianu, C., Krpalek, D., Kugel, J.D., Bains, G. and Gharibvand, L., 2022. COVID-19 and telehealth use among occupational therapy, physical therapy, and speech-language pathology practitioners in the United States. *Internet Journal of Allied Health Sciences and Practice*, *20*(2), p.20.

Stachler, R., Francis, D., Schwartz, S., Damask, C., Digoy, G., Krouse, H., McCoy, S., Ouellette, D., Patel, R., Reavis, C., Smith, L., Smith, M., Strode, S., Woo, P. and Nnacheta, L. (2018). Clinical Practice Guideline: Hoarseness (Dysphonia) (Update). Otolaryngology–Head and Neck Surgery, 158(1_suppl), S1–S42.

Stam, H.J., Stucki, G. and Bickenbach, J., 2020. Covid-19 and post intensive care syndrome: a call for action. *Journal of rehabilitation medicine*, *52*(4).

Steel, J., Coluccio, I., Elbourn, E. and Spencer, E. (2023) 'How do speech-language pathologists assess and treat spoken discourse after TBI? A survey of clinical practice', International Journal of Language & Communication Disorders. doi: 10.1111/1460-6984.12784.

Steinhauer, K. and McDonald Klimek (2019) Vocal Traditions: Estill Voice Training, Voice and Speech Review

Su Y, Yuan D, Chen DG, Ng RH, Wang K, Choi J. et al. Multiple early factors anticipate post-acute COVID-19 sequelae. Cell. 2022, 185:881–95.e20.

Sutherland, Stephanie, March 2023, Long Covid now looks like a neurological disease. Helping doctors to focus treatments: **Long COVID Now Looks like a Neurological Disease, Helping Doctors to Focus Treatments | Scientific American** Accessed 22/11/2023

Swinburn, K., Porter, G. and Howard, D., 2004. Comprehensive aphasia test.

Taquet, M., Dercon, Q., Luciano, S., Geddes, J.R., Husain, M. and Harrison, P.J., 2021. Incidence, co-occurrence, and evolution of long-COVID features: A 6-month retrospective cohort study of 273,618 survivors of COVID-19. *PLoS medicine*, *18*(9), p.e1003773.

Taquet, M., Skorniewska, Z., Hampshire, A. *et al.* Acute blood biomarker profiles predict cognitive deficits 6 and 12 months after COVID-19 hospitalization. *Nat Med* **29**, 2498–2508 (2023). https://doi.org/10.1038/s41591-023-02525-y

Todd, S., Walsted, E.S., Grillo, L., Livingston, R., Menzies Gow, A. and Hull, J.H., 2018. Novel assessment tool to detect breathing pattern disorder in patients with refractory asthma. *Respirology*, *23*(3), pp.284-290.

Titze, I., (2006) Voice training and therapy with a semi-occluded vocal tract: rationale and scientific underpinnings. Journal of Speech, Language and Hearing Research, 49(2): 448-59.

Turner-Stokes, L., Corner, E.J., Siegert, R.J., Brown, C., Wallace, S., Highfield, J., Bear, D., Aitken, L.M., Montgomery, H. and Puthucheary, Z., 2022. The post-ICU presentation screen (PICUPS) and rehabilitation prescription (RP) for intensive care survivors part I: Development and preliminary clinimetric evaluation. *Journal of the Intensive Care Society*, *23*(3), pp.253-263.

Tutor, J.D. COVID-19 and Dysphagia in Children: A Review. *Dysphagia* 38, 122–126 (2023). https://doi.org/10.1007/s00455-022-10475-9

Van Houtte, E., Claeys, S., Wuyts, F. and van Lierde, K. (2012) Voice disorders in teachers: Occupational risk factors and psycho-emotional factors. Phoniatrics Vocology, 37 (3), 107-16.

Van Herck, M., Goërtz, Y.M. and Lareau, S., 2023. What is fatigue?. *American Journal of Respiratory and Critical Care Medicine*, *207*(5), pp.P1-P2.

Varatharaj, A., Thomas, N., Ellul, M.A., Davies, N.W., Pollak, T.A., Tenorio, E.L., Sultan, M., Easton, A., Breen, G., Zandi, M. and Coles, J.P., 2020. Neurological and neuropsychiatric complications of COVID-19 in 153 patients: a UK-wide surveillance study. *The Lancet Psychiatry*, *7*(10), pp.875-882.

Verdolini Abbott, k. (2008) Lessac-Madsen Resonant Voice Therapy: Clinician Manual. Plural Publishing

Vertigan AE, Bone SL, Gibson PG. Development and validation of the Newcastle laryngeal hypersensitivity questionnaire. Cough. 2014 Feb 19;10(1):1. doi: 10.1186/1745-9974-10-1. PMID: 24552215; PMCID: PMC3931290.

Vilkman E. Voice problems at work: a challenge for occupational safety and health arrangement. Folia Phoniatr Logop 2000;52:120–5. **doi:10.1159/000021519**

Wallace, S., & McGrath, B. A. (2021). Laryngeal complications after tracheal intubation and tracheostomy. BJA Education , 21(7), 250–257.

Wallace, S. (2023) Clinical presentation of patients with Covid-19 in critical care following intubation and tracheostomy. in L. Cummings (ed.), *COVID-19 and Speech-Language Pathology,* New York: Routledge, 72-95. p146-166.

Wang, D., Hu, B., Hu, C., Zhu, F., et al. (2019). Clinical characteristics of 138 hospitalized patients with novel coronavirus-infected pneumonia in Wuhan, China. JAMA ,323(11), 1061–1069.

Wang, L., Sievert, D., Clark, A.E., Lee, S., Federman, H., Gastfriend, B.D., Shusta, E.V., Palecek, S.P., Carlin, A.F. and Gleeson, J.G., 2021. A human three-dimensional neural-perivascular 'assembloid'promotes astrocytic development and enables modeling of SARS-CoV-2 neuropathology. *Nature Medicine*, *27*(9), pp.1600-1606.

Watkins K. E. et al, (2007). Structural and functional abnormalities of the motor system in developmental stuttering. Brain 131(1), 50–59

Wilcox, M.E., Brummel, N.E., Archer, K., Ely, E.W., Jackson, J.C. and Hopkins, R.O., 2013. Cognitive dysfunction in ICU patients: risk factors, predictors, and rehabilitation interventions. *Critical care medicine*, *41*(9), pp.S81-S98.

Woo, M.S., Malsy, J., Pöttgen, J., Seddiq Zai, S., Ufer, F., Hadjilaou, A., Schmiedel, S., Addo, M.M., Gerloff, C., Heesen, C. and Schulze Zur Wiesch, J., 2020. Frequent neurocognitive deficits after recovery from mild COVID-19. *Brain communications*, *2*(2), p.fcaa205.

World Health Organization 2001. ICF browser: **http://apps.who.int/classifications/icfbrowser/**

World Health Organization 2001. The International Classification of Functioning, Disability and Health (ICF). Geneva: WHO. **http://www.who.int/classifications/icf/en/**

WHO World Health Organisation, 5th May 2023: **https://news.un.org/en/story/2023/05/1136367** accessed 03/08/2023

(WHO) World Health Organisation 2020 – **https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-COVID-19—11-march-2020**

Wilson, J.A., Deary, I.J., Millar, A. and Mackenzie, K., 2002. The quality of life impact of dysphonia. *Clinical Otolaryngology & Allied Sciences*, *27*(3), pp.179-182.

Xiong, Q., Xu, M., Li, J., Liu, Y., Zhang, J., Xu, Y. and Dong, W., 2021. Clinical sequelae of COVID-19 survivors in Wuhan, China: a single-centre longitudinal study. *Clinical microbiology and infection*, *27*(1), pp.89-95.

Yorke, J., Moosavi, S.H., Shuldham, C. and Jones, P.W., 2010. Quantification of dyspnoea using descriptors: development and initial testing of the Dyspnoea-12. *Thorax*, *65*(1), pp.21-26.

Zaga, C., Pandian, V., Brodsky, M., Wallace, S., et al. (2020). Speech-language pathology guidance for tracheostomy during the COVID-19 pandemic: an international multidisciplinary perspective. American Journal of Speech-Language Pathology, 29(3), 1320-1334.

Zhou, H., Lu, S., Chen, J., Wei, N., Wang, D., Lyu, H., Shi, C. and Hu, S., 2020. The landscape of cognitive function in recovered COVID-19 patients. *Journal of psychiatric research*, *129*, pp.98-1

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