



LSVT Global® Public Webinar Series

Title: Interdisciplinary Care of Post COVID-19 Patients with Parkinson's Disease: Considerations and Resources

**Presenters: Heather Hodges, MA, CCC-SLP
Patricia Brown, PT, DPT, NCS
Amy Ramage, PhD, CCC-SLP
Julia Wood, MOT, OTR/L
Jessica Galgano, PhD, CCC-SLP**

**Moderators: Cynthia Fox, PhD, CCC-SLP and
Laura Guse, BSPT, MPT**

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Interdisciplinary Care of Post COVID-19 Patients with Parkinson's Disease: Considerations and Resources

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Webinar Presenters



Heather Hodges, MA, CCC-SLP
LSVT LOUD Faculty, Clinical Expert, & ASHA Coordinator



Julia Wood, MOT, OTR/L
LSVT BIG[®] Training and Certification Faculty



Patricia Brown, PT, DPT, NCS
Clinical Assistant Professor, Physical Therapy Program at Chapman University, LSVT BIG Faculty



Jessica Galgano, PhD, CCC-SLP
Open Lines Speech and Communication PLLC LSVT LOUD Faculty & Expert Clinician



Amy Ramage, PhD, CCC-SLP
Assistant Professor and Research Coordinator, Department of Communication Sciences & Disorders at University of New Hampshire



Moderators:
Cynthia Fox, PhD, CCC-SLP and Laura Guse, BSPT, MPT

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Presenter Biographies

Heather Hodges, MA, CCC-SLP
Ms. Hodges received her master's degree in Speech, Language, and Hearing Sciences from the University of Colorado, and began working on Dr. Lorraine Ramig's research team as a graduate student. She now works at the National Center for Voice and Speech as an ASHA certified speech-language pathologist and research associate. In addition to studying neurogenic voice and speech disorders and being LSVT LOUD certified, Ms. Hodges also works in Denver, CO where she specializes in diagnosing and treating upper airway disorders and swallowing disorders in adult and pediatric populations.

Patricia Brown, PT, DPT, NCS
Dr. Brown has been a board-certified PT Clinical Specialist in Neurology since 1999 and LSVT BIG Certified since 2009. She is a graduate of the Parkinson Foundation's Allied Team Training (ATTP) program. She is a highly experienced physical therapist and is now a Clinical Assistant Professor in the PT Program at Chapman University in California. She is also an instructor and steering committee member at a local non-profit gym for persons with Parkinson disease (PD).

Amy Ramage, PhD, CCC-SLP
Amy Ramage is an Assistant Professor in Communication Sciences and Disorders at the University of New Hampshire. Her research, teaching, and clinical interests center on the neurologic bases of cognition and emotion as they interact with communication competence. Her research group, the Cognition, Brain and Language Team (CoBALT) studies the association between impairments of cognition, emotion & language in neurogenic communication disorders and the brain systems that underlie them. The objective is to identify variables (biomarkers or behaviors) that contribute to the dysfunction of brain systems and to determine their value as predictors of outcomes. The long-term goal of this work is to understand whether these predictors may be targeted and optimized in treatments effecting change in these neural systems.

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Presenter Biographies

Julia Wood, MOT, OTR/L
Ms. Wood was certified in LSVT BIG in 2013, is an ATTP graduate and faculty and is a certified facilitator for PD SELF. She also serves as an ambassador for the Davis Phinney Foundation. Ms. Wood specializes in treating people with movement disorders at the Dan Aaron Parkinson's Rehabilitation Center in Philadelphia. She also serves in interdisciplinary clinics for patients with atypical Parkinsonism, Huntington's disease, ALS and those considering Deep Brain Stimulation.

Jessica Galgano, PhD, CCC-SLP
Dr. Galgano received her doctoral degree in the department of Biobehavioral Sciences from Columbia University in NYC. She is a faculty instructor at NYU Langone School of Medicine and is the Executive Director of Open Lines Speech and Communication in NYC, where she provides LSVT LOUD[®] and other types of therapy to adults and children with a wide variety of speech and language diagnoses. She is also an adjunct professor at San Francisco State University. Dr. Galgano conducted research with Dr. Ramig at Columbia University and is a clinical expert, faculty member and faculty for LSVT Global, Inc.

Laura Guse, BSPT, MPT
Ms. Guse has extensive experience treating people with neurodegenerative disorders in various practice settings. She was LSVT BIG certified in 2009 and now serves as Chief Clinical Officer of LSVT BIG. Ms. Guse oversees the training, curriculum and product development related to LSVT BIG, and has helped to create many of the current LSVT BIG treatment tools, webinars, and courses. She has spoken at many national and international conferences on topics related to LSVT BIG.

Cynthia Fox, PhD, CCC-SLP
Dr. Fox is an expert on rehabilitation and neuroplasticity and the role of exercise in the improvement of function consequent to neural injury and disease. He is a world leader in LSVT LOUD and conducted related efficacy research in Parkinson's and other disorders. Dr. Fox is CEO and Co-Founder of LSVT Global, Inc.

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Disclosures

All presenters have both financial and non-financial relationships with LSVT Global. Non-financial relationships include a preference for LSVT LOUD and LSVT BIG as treatment techniques.

Dr. Fox is an employee of LSVT Global, receives lecture honorarium and has ownership interest. Ms. Hodges and Ms. Guse are employees of LSVT Global and receive lecture honorarium. Drs. Galgano, Brown & Ramage, and Ms. Wood receive lecture honorarium.

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Plan for Webinar

- Purpose
- Logistics
 - ✓ CEU information
 - ✓ References at end of slides, part of handout
- Presentation of Content
- Questions
- Survey

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Information to Self-Report CE Activity

- This LSVT Global webinar is NOT ASHA or state registered for CEUs for speech, physical or occupational therapy professionals, but it may be used for **self-reported CEU credit as a non-registered/non-preapproved CEU activity**. That is, the credit can count towards your CE maintenance progress if you choose to self-report your activity.
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- Attendance for the full webinar is required to earn your certificate.



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- Completion of the webinar **will not be** reported to the ASHA CE registry by us and cannot be added to the ASHA CE registry by you. It will be your responsibility to retain documentation of completion just as you do with any other non-registered CE activity.



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How to Ask Questions

- Type in the question box on your control panel at anytime. We will answer them at the end.
- Email webinars@lsvtglobal.com if you think of questions later!



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Learning Objectives

Upon conclusion of this webinar, participants will be able to:

- Summarize the potential impact of COVID-19 on speech, respiratory, musculoskeletal and central/peripheral nervous systems for people with Parkinson's disease (PD).
- Discuss cognitive changes post-COVID-19 and strategies to evaluate and treat across ST/OT/PT.
- Explain rehabilitation and pre-habilitation considerations for people with PD across severity of post COVID-19 conditions.
- Discuss special considerations for LSVT LOUD or LSVT BIG treatment (initial, continuing, or tune-ups) post COVID-19 recovery.
- Identify resources for more information on post-COVID-19 related care.



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Polling Question: Who is joining us today?

Are you a:

- Speech Therapist
- Physical/Occupational Therapist
- Other healthcare professional
- Person with Parkinson's or family member
- Other



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Setting the Stage for the Presentation

Parkinson's disease and COVID-19

- Complex neurological disorder
- Motor and Non-Motor Symptoms
- Are people with PD inherently more susceptible to COVID-19?
 - Not enough data to know the answer to this question
- As a vulnerable group may be at greater risk for complications
 - Age, underlying co-morbidities, advanced disease severity

Impact of COVID-19 on people with PD not infected

- Psychological stress (anxiety, isolation, uncertainty)
- Reduced access to direct medical care
- Reduction in physical and social activity (speech, physical, occupational therapies, exercise groups, socialization outside of the home)
- These indirect consequences can exacerbate symptoms

Helmich & Bloem, 2020; Papa et al., 2020

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Parkinson's disease and COVID-19

Impact of COVID-19 on those with PD who have been infected


- Very limited data on people with PD post-COVID-19
- First report – 10 clinical cases (Antonini et al., 2020)
 - Patients of older age, with longer disease duration susceptible to COVID-19 with high mortality rate (40%)
 - Those on advanced therapeutics (DBS, levodopa infusion) may be even more vulnerable with 50% mortality rate
- PD already requires rehabilitation services- how does that change post COVID-19 recovery?
 - Risk for worse respiratory complications due to pre-existing weak cough, chest wall rigidity, pre-existing dyspnea
 - Stress, self-isolation, and anxiety
 - Prolonged immobility due to hospitalization, isolation and extreme inactivity

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Novel Situation: Post acute - how best to help people with Parkinson's rehabilitate from COVID –19

- We are learning more, but there are many unknowns:
 - How might recovery differ in a person with PD?
 - For those that survive - how can we help them to safely recover?
 - How do we keep ourselves safe in the process?
- Today's presentation is just the "tip of the iceberg" in this ongoing discussion
- Interdisciplinary care for PD may be more important than ever
 - What is our role in this unique population?
 - How can we work together?
- What are the considerations and opportunities related to PD-specific intensive treatments (e.g., LSVT LOUD and LSVT BIG) in this population?
 - Graduates, those in middle of treatment, new patients

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Heather Hodges, MA, CCC-SLP




Patricia Brown, PT, DPT, NCS

Part 1: Systems Impact of COVID-19

- Speech and Swallowing Systems
- Respiratory System
- Cardiovascular/Pulmonary Systems
- Musculoskeletal System
- Central and Peripheral Nervous System

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Overview of Speech Systems Impact



- **Respiratory**
 - Increased dyspnea post COVID-19 across severity levels
 - More severe manifestations include pneumonia, lung scarring, ARDS, sepsis.
 - Decreased vital capacity, impaired breathing coordination post-ventilator, wearing a mask during your eval/treatment will also impact breath support


"Recovery from lung damage takes time. There's the initial injury to the lungs, followed by scarring. Over time, the tissue heals, but it can take three months to a year or more for a person's lung function to return to pre-COVID-19 levels."

- Dr. Panagis Galiatsatos, M.D., M.H.S., Johns Hopkins Medical Center

****Consult and Collaborate**** with pulmonary, respiratory therapy and physical therapy on appropriateness of IMT, EMT, and inspiration spirometry in treatment plan.

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Overview of Speech Systems Impact




- **Laryngeal** (Across Severity Levels/intubated or not)
 - Chronic cough, throat clearing, PVFM signs and symptoms, upper airway irritation or reactivity
 - Dysphonia related to COVID-19, may be in addition to baseline dysphonia
 - Post intubation with mechanical ventilation
 - 83% of laryngeal injury was found. Many were mild injuries, although moderate to severe injuries occurred in 13-31% of patients across studies.
 - The most frequently occurring clinical symptoms reported post extubation were dysphonia (76%), pain (76%), hoarseness (63%), and dysphagia (49%) across studies.
 - ENT Exams
 - Recent ASHA Statement during COVID-19: for determining the appropriateness and balancing necessity and risk on case-by-case bases.

****Consult and Collaborate**** with ENT department, referring physician, the ASHA [Code of Ethics](#), state laws and regulations, and facilities/clinics should establish their protocols during the COVID-19 pandemic.

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Overview of Swallowing Systems Impact



- **Swallowing**
 - Even mild COVID-19 cases may have difficulty coordinating breathing and swallowing necessary for a safe swallow due to affects of dyspnea and cough
 - Increased breathing rate of 25+ breaths per minute heightens dysphagia risk
 - Iatrogenic dysphagia secondary prolonged intubation or traumatic intubation
 - Delayed swallow
 - Atrophy and sensory deficits post prolonged intubation
 - 25-67.5% dysphagia in those with prolonged intubation (2+ days)
 - Increased silent aspiration risk in those over 65 years old

****Consult and Collaborate Re: COUGH****


Many purposes and reasons (expectoration, secretion movement, air way protection/ aspiration, laryngeal irritation/chronic cough)

- Treat accordingly
- Consult with respiratory therapy as necessary (huff cough, use of acapella valve, etc.)

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Overview of Speech Systems Impact

- **Neurologic**
 - Can occur with or without respiratory symptoms
 - Symptoms seen in people with COVID-19 can overlap with those of PD
 - Loss of smell
 - Inability to taste
 - Muscle weakness
 - Tingling or numbness in the hands and feet
 - Dizziness
 - Confusion
 - Mechanism is not yet known (virus itself, inflammation, or changes in O2 and CO2 levels)
- May also experience delirium, seizures, and stroke.
 - Strokes may be related to blood clots found to occur body wide
 - Strokes occurring in those without traditional risk factors for stroke
 - Not yet known if the coronavirus itself stimulates blood clots to form, or if they are a result of an overactive immune response to the virus.



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Collective Impact on Communication

- **Weak Voice** exacerbated by:
 - Laryngeal trauma
 - Upper Airway Irritation
 - Chronic cough
 - Post intubation injury
 - Reduced respiratory support
 - Wearing masks
- **Fatigue**
 - Apathy, lack of interest in communication
- **Cognitive challenges**
 - Disoriented
 - Difficult to focus
 - Cognitive challenges – discussed later



Difficulty with communication affects ALL aspects of recovery and rehabilitation: physical, mental, social

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Screenings: Speech & Swallowing

- Clinical swallowing exam
 - Chart and labs review, oral mech, CN, clinical assessment, National Dysphagia Diet Levels
- Laryngeal assessment
 - Dysphonia, dysphonia compared to baseline disorder, upper airway and irritable larynx
- Respiratory s/s
 - Breathing rate, breath support for speech, PVFM/ILO, inspiratory and expiratory strength
- Stroke
 - Cognitive, linguistic, strength

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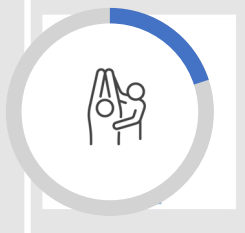
Differentiation of Cause

- How do you tell if the problem is related to PD, COVID-19, or a combination?
 - Interview
 - Range of severity in COVID-19 manifestations
- Does it matter?
 - Extend their treatment course
 - May result in you treating and triaging multiple deficits
- When might it matter?
 - Prioritizing treatment
 - Building endurance

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Therapy Role in Prevention of Decline

- 20% of those recently discharged from Acute Hospital are readmitted within 30 days (Zuckerman, et al., 2016)
- Risk factors for readmission: physical function and impaired ADLs
- Home & equipment assessment
- Activity (Maximal Daily Exercises and Functional Component Tasks can help maintain or increase functional reserve)
- Eyes & Ears for signs and symptoms (screening!)
- Keep in mind: Risk to benefit ratio




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Screening & Systems Review

<p>Review of Systems (ROS) (Subjective)</p> <ul style="list-style-type: none"> • Endocrine • EENT • GI • GU • Hematologic/Lymphatic • Psych/Emotional • Cardiovascular/Pulmonary • Neuromuscular • Integumentary • Musculoskeletal 	<p>Systems Review (SR) (Physical Examination)</p> <ul style="list-style-type: none"> • Cardiovascular/Pulmonary • Neuromuscular • Integumentary • Musculoskeletal 
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Cardiovascular/Pulmonary - ROS




- COVID-19 Cardiovascular signs:
 - Arrhythmia
 - Ask: Irregular heartbeat
 - Heart failure
 - Ask: swelling in feet and weight gain
 - MI, myocarditis
 - Ask: if had a heart attack
 - Enlargement heart
 - Cardiac arrest coagulopathy
 - Hyper or hypotension
 - Elevated D-dimer
 - Prolonged prothrombin time (Wang, et al., 2020)
 - Ask: if taking blood thinners

Yadav, et al., 2020; Wang, et al., 2020


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Cardiovascular/Pulmonary-ROS



In people with Parkinson's disease (PWP):


- Orthostatic hypotension & fatigue worsened
- Ask: lightheadedness & fatigue
 - Modified Fatigue Impact Scale & others



Antonini et al., 2020; Schiehser, et al., 2013

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Cardiovascular/Pulmonary-SR




- Vital Signs-important to monitor
 - Breathing pattern
 - Accessory muscle use
 - O2 sat/O2 requirement
 - Encourage PWP to obtain pulse oximeter
 - Stable COVID-19 patients: Goal is O2saturation > 90%
 - BP HR (tachycardic -> PE)
 - RPE scale, if alert/oriented
 - BORG scale or Modified Borg Scale
- Endurance
 - 2-min Walk Test
- Monitor for signs of VTE
 - See CPG for VTE screening & management

Hillegass et al., 2014, 2016; Klok et al., 2020

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Cardiovascular/Pulmonary-Treatment Considerations




- Techniques to + secretion clearance:
 - assisted or stimulated cough maneuvers
 - exercise and mobilization
- Therapist should position self out of the line of cough
- Incorporate optimal breathing mechanics/coordination
 - with exercise
 - functional tasks
- Monitor!

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Musculoskeletal Considerations- ROS


- Muscle aches can be a symptom of COVID-19 (Wu, 2020)
- Medications:
 - Reduced immune response with corticosteroid administration (oral and injectable (Haynes & Fauci, 1978; Dixon, et al., 2012)
 - Non-steroidal anti-inflammatory medications (NSAIDs) have been linked with a more severe form of COVID19 (Viswanath & Monga, 2020; Day, 2020)
 - Rheumatic Conditions, esp RA and Lupus may not be able to get their medications due to COVID-19-related shortage (Hydroxychloroquine (Paqueniil) and Chloroquine)
- Surgery & treatment deferrals
- Hospital Treatment:
 - Proning



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Musculoskeletal Considerations-SR


- ICU acquired weakness (Zhou, 2014)
 - Critical Illness Myopathy & Polyneuropathy, Guillain-Barre Syndrome
 - Strength/motor control assessments
 - 5x STS
 - Treatment:
 - stretching and strengthening (think LSVT BIG Maximal Daily Exercises)
 - mobility training
 - Decreased exercise capacity
 - Range of motion



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Proning- Potential Sequelae

- Increases intraocular pressure (Saran et al., 2019; Alhazzani et al., 2020)
 - worsening of glaucoma
 - decreased retinal arterial occlusion and optic nerve head perfusion
 - scleral edema and corneal abrasions
- Limits ability to receive oral care (Tanguay & MacDonald, 2007)
- Pressure injuries
- Foot drop
- Shoulder subluxation
- Neck stiffness
- Compartment syndrome
- Peripheral nerve injuries (brachial plexus, peroneal nerve) due to compression or stretch (Goettler, Pryor & Reilly, 2002)

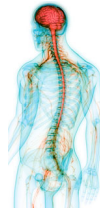


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COVID-19 Neurologic Signs

36-40% develop neuro signs

- HA
- Nausea
- Dizziness
- Loss of smell and taste
- Lethargy
- Unstable gait
- Malaise
- Peripheral nerve injury
- Change in emotional state
- Cerebral hemorrhage
- Cerebral infarct
- Convulsions
- Change in mental status
- Encephalitis
- Loss of brainstem control of respiration

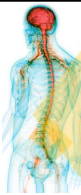


(Baig 2020; Chung 2020; Wang et al., 2020; Asadi-Pooya, 2020; Zhou et al., 2020; Moshayedi et al., 2020; Pereira, 2020)

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Neurologic Sequelae


- Can occur with or without respiratory symptoms
- Symptoms seen in people with COVID-19 can overlap with those of PD
 - Loss of smell
 - Inability to taste
 - Muscle weakness
 - Tingling or numbness in the hands and feet
 - Dizziness
 - Confusion
- Mechanism in COVID-19 is not yet known (virus itself, inflammation, or changes in O2 and CO2 levels)
- May also experience delirium, seizures, and stroke.
 - Strokes may be related to blood clots found to occur body wide
 - Strokes occurring in those without traditional risk factors for stroke
 - Not yet known if the coronavirus itself stimulates blood clots to form, or if they are a result of an overactive immune response to the virus.



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COVID-19 Neurologic Considerations in People with Parkinson's

- In PWP: worsening of motor symptoms (Antonini et al., 2020)
- Study of 100 PWP in India: worsening or new symptoms reported or perceived by PWP (11%) and caregivers (10%) (Prasad et al., 2020)
- Suspension of Botox treatment may lead to worsening of dystonia - higher risk in PWP (Stoessel, Bhatia & Merello, 2020)
- In-hospital complications (delirium, adverse drug reactions, syncope, aspiration pneumonia, falls & fractures) (Papa et al., 2020)
- Medication supply chains may be impacted for PWP (Papa et al., 2020)



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COVID-19 Neurologic Considerations in People with Parkinson's: Non-Motor


- Depression prevalence: 48.3%
- Anxiety prevalence: 22.6%
- Combination of both: 19.4%
- N= 4872
- In those exposed to social media – can exacerbate symptoms already seen in PD

(Gao et al., 2020)

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Neuromuscular- ROS

- Changes in gait, balance, rigidity, functional mobility and ADLs
- Ask:
 - Dizziness?
 - Seizures?
 - Changes in thinking, speaking or memory?
- Caregiver health
- Medication hx
 - Ask: access to meds?
- Depression/Anxiety screens
 - Hospital Anxiety and Depression Screen (HADS) (Zigmond & Snaith, 1983; Rodriguez-Blazquez, et al., 2009)



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Neuromuscular - SR

- Motor control/strength
 - Symmetrical vs asymmetrical
 - UE vs. LE
 - Proximal vs distal or diffuse
 - Hypokinesia or bradykinesia?
 - Coordination and quality of movement
- Peripheral nerve injuries due to pressure or stretch (Goettler, Pryor & Reilly, 2002)
 - Brachial plexus (C5-T1)
 - Peroneal nerve (foot drop, sensory changes)
- Cranial Nerve screen
- Range of Motion Assessment
- Gait & Balance Assessment: TUG; Berg; Mini-BESTest; FGA, etc.
- ADL/IADL Assessments: PASS, Barthel Index, COPM; Goal Attainment Scale

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Part 2: Cognitive Impact of COVID-19

Considerations for Speech, Physical and Occupational Therapy



Amy Ramage, PhD, CCC-SLP

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Cognitive Impairment as a Symptom of COVID-19

- While most reports of COVID-19 infections reported in the media focus on the respiratory system, there are emerging findings of effects of the virus on the central nervous system.
- For example, of the 799 moderately-severely ill or critically ill patients admitted to Tongji Hospital in Wuhan, Hubei Province, China between 13 January and 12 February 2020, the following were present at admit (Chen et al., 2020):
 - Fever
 - Cough
 - Fatigue
 - Chest tightness
 - Anorexia/diarrhea
 - Myalgia
 - Most had O₂ saturation levels < 93%
 - Abnormal bilateral chest radiographs
 - Significantly more deceased (82%) than recovered (16%) patients received mechanical ventilation
 - A small number had disorders of consciousness (22% deceased, 1% recovered)
 - Delirium, seizures, altered consciousness

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Effects of COVID-19 on the Central Nervous System

There appear to be a few avenues by which the CNS may be effected:

- Intermittent or chronic hypoxia as a result of respiratory distress
- Direct effects of virus on the CNS –
 - Hyper-Inflammatory System Activity
 - Via mucosal membranes in the nasal cavity effecting the olfactory bulb (anosmia)
- Virus-related hypercoagulation

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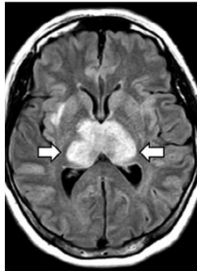
Hypoxia in COVID-19

- Acute Respiratory Distress Syndrome (ARDS) was reported in 100% of deceased patients in Wuhan, but in only 16% of recovered patients
- Cognitive impairment is present in
 - 70-100% of critically ill patients with prolonged durations of hypoxia or mechanical ventilation and
 - persists in approximately 20% of those 5 years later (Herridge et al., 2016; Wilcox et al., 2013).
- Hypoxic Encephalopathy seen in 20% of deceased patients in Wuhan, China

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Inflammatory System Activity in COVID-19

- The virus causes hyperinflammatory states – “cytokine storms” – that damage lungs, CNS, and other organs.
- A recent paper in press reports on a female, late 50s, with severe presumptive COVID-19 presenting with cough, fever, and altered mental state.
- Following several radiologic assessments, she was found to have acute necrotizing encephalopathy (ANE), a rare complication of influenza and viral infections.
- ANE is associated with intracranial ‘cytokine storms’ (hyperinflammatory process, (Mehta et al., 2020)) that cause breakdown of the blood-brain barrier and can result in symmetrical, multifocal lesions of medial temporal and thalamic cortex.



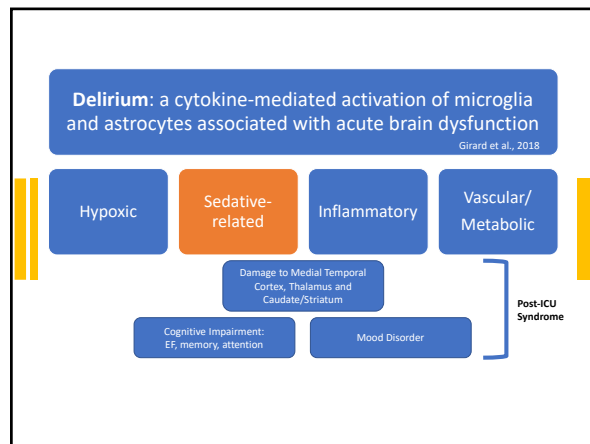
(Poyiadji et al., 2020)

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Hypercoagulation in COVID-19

- Following the surge of infections in Italy, there have been reports centering on co-occurring increases in coagulation factors (blood clotting factors) (Panigada et al., 2020; Ranucci et al., 2020; Spiezia et al., 2020; Tang et al., 2020).
- This increase in blood clotting appears to be infection-related, likely as a result of chronic inflammatory states and excess of fibrin (a protein activated when there is vessel wall injury to produce clotting to prevent blood loss (Weisel & Litvinov, 2017)
- This occurs in the lungs but spills over into the circulatory system resulting in arterial and venous thrombi, myocardial infarctions, and cerebrovascular accidents (Weuve et al., 2011).

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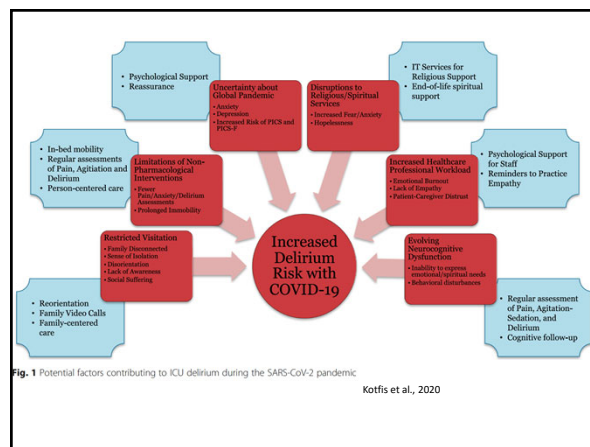


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Cognitive Impairment and Delirium

- Delirium in critical illness is predictive of cognitive impairment 12 months after discharge.
- A multi-center study of a large cohort of critically ill patients identified that delirium was associated with poorer performance on the global cognitive scores of the *Repeatable Battery for the Assessment of Neuropsychological Status* (RBANS) at 3-months and one-year post discharge (Girard et al., 2018).
- Importantly, participants in the study did not tend to have one sub-type of delirium in the absence of another.
- That is, a critically ill patient who is on mechanical ventilation is also typically sedated and, in the presence of an infection like COVID-19, there is also systemic inflammatory activity with the potential for sepsis.

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What are the long-term outcomes?

- A few studies have documented that Post-ICU Syndrome is seen in approximately 64% of post ICU patients at 3 months and in 56% at 1-year post ICU stay. (Bruck et al., 2019; Marra et al., 2018).
- Patients who were medically fragile prior to ICU stay were more likely to develop PICS.
- Of these, 37% complain of cognitive impairment which persisted in most cases one year later
- Many also had depression and disability (in ADLs).
- Interestingly, subjective measures of cognitive impairment (self-report) relate more to psychological measures (depression, PTSD) than to objective measures of cognitive performance (Bruck et al., 2019).

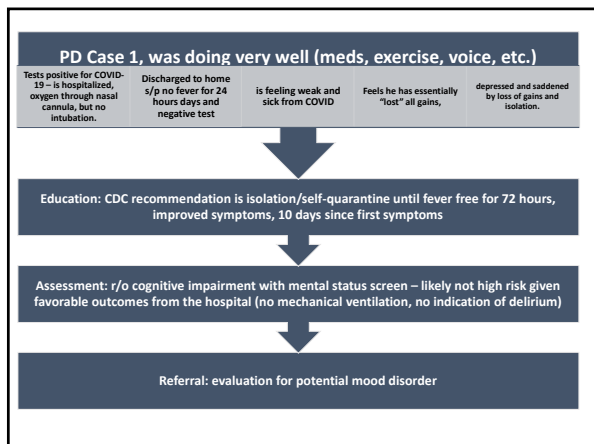
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Intervention s/p Delirium in the Critically Ill

- Improving Recovery and Outcomes Every Day after the ICU (IMPROVE)** study at Indiana University investigating the combined physical exercise and cognitive training on cognitive function
- Physical Exercise Intervention:** 45 minutes of multi-modal physical exercise focused on seated aerobic and progressive resistance training designed to improve aerobic capacity, muscular strength and endurance consistent with current exercise recommendations. 3 sessions per week for 3 months.
- Cognitive Intervention:** a suite of 24 programs called Brain HQ developed by Posit Science Inc., organized into six categories: attention, speed, memory, people skills, intelligence, and navigation. 45-minute sessions of Brain HQ exercises. The modules are designed to improve time-order judgment, visual discrimination, spatial-match, forward-span, instruction-following, and memory. 2 sessions per week for 3 months.

Wang et al., 2018

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Recommendations

- Interdisciplinary rehabilitation, beginning early and continued throughout the acute hospital stay
- Education for the patient and family through the continuum of care
- Continued rehabilitation in outpatient, at home, either in person or by telepractice (Lew et al., 2020)
- Consider subjective and objective measures of cognitive function (Brück et al., 2019)
- Anticipate not only effects on voice and dysphagia post-extubation (Brodsky et al., 2020), but also cognitive impairment and need for modifications of recommendations
- Prehabilitation: wide adoption of physical and psychological assessments prior to surgery (Silver, 2020)
- Considerations: physical, financial, logistic, ... (McIntyre et al., 2020)

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Part 3: Rehab Considerations for People with PD Recovering from COVID-19

Jessica Galgano, PhD, CCC-SLP

- Addressing Non-Motor Symptoms and Physical Sequelae
- Treatment Precautions
- Treatment Considerations
- Treatment Tips for LSVT patients

Julia Wood, MOT, OTR/L

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Rehabilitation is Essential!

"It's one thing to survive the infection, but what's next? Some COVID-19 patients need rehab to walk, talk and problem solve"

<https://www.chicagotribune.com/coronavirus/ct-coronavirus-covid-patients-rehabilitation-recovery-illinois-20200508-ummrndvlf47ivjzcyv5nfau-storv.html>

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No One Size Fits All...

People with PD are *incredibly diverse* in symptoms, presentation, stage of disease

Impact of COVID-19 is *incredibly diverse* in both acute symptoms and sequelae, and much is still unknown

Therefore, recovery and rehabilitation will vary highly depending on the complexities and interactions of these diagnoses

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PD Non-motor Symptoms

- Depression
 - 25% major/17% minor
 - precedes motor symptoms
 - may contribute to dementia
- Loss of higher cognitive functions
 - shifting cognitive set
 - slow thinking
 - retrieval
 - self-cueing
 - sustaining attention
- Dementia
 - 30%
 - occurs 6.6X as frequently than in elderly non-PD
 - shortens survival
- Autonomic abnormalities
 - hypotension, bowel/bladder, sexual, blurry vision, short of breath
- Sensory changes
 - pain, tingling, burning
 - generalized decreased kinesthetic awareness
 - Self-perception/monitoring
- Sleep Disorders
 - fatigue
- Emotional Changes
 - Anxiety
 - Apathy

Any can worsen post COVID-19

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Stress & Parkinson's Disease (PD)

Emotional stress can increase motor symptoms

Studies indicate that stress can impinge on dopaminergic control of motor movements

The timing and intensity of stressors may affect the efficiency of exercise being neuroprotective.

PD patients with depression and/or chronic stress may experience a chronic neuroinflammatory environment perhaps linked to exacerbated PD pathology

(Hemmerle, Herman & Seroogy 2012)

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Depression, Apathy, and Anxiety


- Reductions in physical activity and a loss of aerobic exercise during the COVID crisis increases risk of:
 - Chronic stress → Increased psychological stress → worsening of motor symptoms while reducing the efficacy of dopaminergic medication
 - Dopamine depletion → cognitive and motor inflexibility → impaired ability to successfully cope with new circumstances, causing a sense of loss of control → increased stress, and so on and so on...
- GOOD NEWS!! Online exercise education, classes and therapy are helping!
- Incorporate self-management strategies that reduce stress, increase coping, and increase physical exercise (e.g., LSVT LOUD and LSVT BIG)
- Consider referrals to psychology and psychiatry

Helmich & Bloem, 2020


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Depression and Apathy-Salient and Engaging Tasks


- Incorporate tasks that are meaningful and salient to person – enhances motivation
- Link program to functional goals
- Hobbies and passions should be incorporated and used to achieve self-realization, improved function and participation in occupational roles
- Utilize task oriented, client centered treatment



Family



Work



Hobby

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Mood & Depression Screening Measures

☑

Beck Depression Inventory (BDI)

21 item questionnaire, provides severity rating

🧠

Hospital Anxiety & Depression Scale (HADS)

self report inventory

👤

Geriatric Depression Scale (GDS)

Long form (30 questions)
Short form (15 questions)
Publicly accessible, takes <10 mins to administer

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Improved function and geriatric depression scale profile in outpatients with Parkinson's disease through the participation in Lee Silverman Voice Therapy BIG® program

- 23 subjects with PD participated in the 4-week intensive LSVT BIG program in an outpatient physical therapy practice
- LSVT BIG program resulted in statistically significant improvements (p < .01) in Geriatric Depression Scale scores, Timed Up and Go times, Functional Gait Assessment scores, Berg Balance Scale scores.
- LSVT BIG can improve both motor function and Geriatric Depression Scale values associated with the disease.
- The effect of LSVT BIG on Geriatric Depression Scale values may indicate an impact on quality of life.

Walter et al., 2018

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Fatigue “It makes everything harder.”

Affects motivation

Reduced engagement in therapy and social engagement

Physical & Cognitive

Interferes with carryover of treatment strategies

Also impacts freezing of gait and vision

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Fatigue Screening Measures

MDS review of fatigue rating scales (Friedman et al., 2010)

Functional Assessment of Chronic Illness Therapy-Fatigue Scale (FACIT-F)

Patient reported rating scale consisting of 13 items

Parkinson's Fatigue Scale (PFS-16), (Brown et al., 2005)

Self report to questions regarding last 2 weeks

Fatigue Severity Scale

9 item questionnaire with Likert scale 1-7

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Fatigue Factors

- Fatigue has been and continues to be a significant concern for PWP - prior to and during the COVID-19 crisis
- Exercise can boost energy in PWP
- In general, it's important to push PWP, but we may need to be more cautious and always consult with the medical team in post COVID patients

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Fatigue Treatment Tips

- ✓ Add additional breaks for rest and hydration
- ✓ Safely progress across exercises
- ✓ Monitor SpO2 levels during exercises
- ✓ Include strategies to help your patient manage and reduce frustration, anxiety and stress levels, which will increase verbal fluency and improve motor symptoms
- ✓ Help patients and families identify and use compensatory attention and memory strategies and AAC when necessary to reduce the impact of cognitive-linguistic difficulties and anxiety associated with communication difficulties

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Energy Conservation and Sleep Hygiene Strategies

- Alternate high energy and low energy activities to promote recovery.
- Rest before difficult activities. Encourage rest breaks if short of breath or fatigued during tasks.
- Delegate more strenuous tasks or ask for help. Assist with finding community resources (Meals on Wheels, etc.) if needed.
- Create consistent sleep and wake times.
- Set a bedtime that allows at least 7 hours of sleep.
- Exercise!

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Is my patient ready for a PD-specific therapy now? Which are, by definition, intensive.

<p>NO!</p> <ul style="list-style-type: none"> • Too deconditioned and weak from illness • Unable to participate in full session due to unmanageable increased HR, blood pressure, respiratory rate or low SpO2 • Has more urgent medical or therapy needs to address first • Does not respond to stimulability testing 	<p>YES!</p> <ul style="list-style-type: none"> • GOOD NEWS! Many people can begin intensive programs right away, pending medical approval • Can tolerate 1-hour sessions with rest breaks • Vitals stable with exercise • No longer dealing with active infection • Medically cleared for therapy • Responds to stimulability testing
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66

No - Not ready for intensive SLT yet, but here is what you can do.

- Prioritize swallowing concerns (safe swallow)
- Nutritional considerations
- Establish simple communication boards for basic needs may be helpful when
 - Can't be heard due to weak voice, exacerbated with masking
 - Painful to exert effort when trying to speak louder
 - Offers ability to control and communicate with therapists, family, etc. (depending on SNF, home, outpatient clinic, telepractice)
- Consider respiratory therapies
 - Expiratory muscle strength training
 - If LSVT LOUD graduate, use of daily exercises to build endurance

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No - Not ready for intensive SLT yet, but here is what you can do.




- Maintaining safe care for individuals living with a tracheostomy is vital
- Challenges:
 - continued access to care
 - home care personnel issues
 - availability of PMVs, humidifiers for stoma, PPE, etc.
 - potential need for rationing of care
 - Offer suggestions for optimizing health during this time
- Allow laryngeal trauma to heal
 - May need to wait until ENT evaluations are available before proceeding with voice treatment

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No - Not ready for Intensive PT or OT yet, but here is what you can do.

- Continue or initiate pre-hab phase (short or long)
 - Lower frequency and/or shorter sessions
 - Diligent monitoring of HR, sPO2, RPE, Respiratory Rate, BP
 - Rest breaks as needed
 - Exercise:- cardio, progressive resistance, stretching, balance, walking, mobility training
 - Functional Training – ADLs, IADLs
 - Education: energy conservation, sleep hygiene, mindfulness
 - Caregiver training and education
 - Establish habit of daily exercise, and build endurance
- Continue to communicate with other team members on goals and progress toward goals.



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Yes! Ready for intensive treatment for LSVT LOUD and LSVT BIG Graduates



- If previous LSVT LOUD/LSVT BIG client, evaluate level of function compared to last visit (either end of treatment or where you left off during protocol)
- Determine level of motor functioning and sensory calibration
- Determine where in the protocol to resume activity

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Yes! Ready for Intensive PD Specific therapy for naïve clients

- If patient is nearly back to their pre-COVID baseline, or had a milder case, they may be ready for more intensive PD specific therapy
- Consult with medical team for approval
- Many PWP need ongoing rehabilitation, even without COVID-19, and especially after to help restore any lost function
- Intensive exercise programs are helpful
 - Designed to meet the rehabilitation needs of those who have experienced an illness or prolonged hospital stay but are still not able to return to their prior level of function or ADLs
 - Intensive LSVT programs for people with PD are supported by 30+ years research

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Yes! Ready for Intensive PD Specific therapy for naïve clients

- Stimulability Testing
 - ✓ Can they move bigger/talk louder?
 - ✓ Is the bigger movement or louder voice better quality/more efficient?
 - ✓ Can do a week of trial LSVT BIG or LSVT LOUD if needed
- Can they tolerate 1-hour sessions of therapy with rest breaks prn?
- What are the functional goals which are salient to that patient as they recover from COVID-19 and battle their PD?

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Always Monitor

- Vitals
 - HR, BP, SpO2, Respiratory Rate, RPE
- Pain
- General Response- observation and subjective report
- Medication side-effects; on/off times
- Voice and movement quality
- Safety and balance



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Consider if any LSVT BIG or LSVT LOUD adaptations are needed

Adaptations ARE:

- Increasing repetitions for shorter durations (decreased respiratory support)
- OR- decreased reps of LSVT BIG exercises with decreased hold times
- Allowing greater rest breaks (fatigue)
- Persisting at phrase/sentence levels of the hierarchy (slower build of endurance)
- Using seated or supine positions for exercises
- Utilizing family and support system for carryover
- Adding additional sessions and more frequent follow-ups

Adaptations are NOT:

- Altering core protocol
- Delivering fewer or shorter sessions
- Changing treatment tasks
- Eliminating core elements (target, mode, calibration)


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Adaptations: Cognitive Concerns

- Complete treatment in a room separate from others and with as few distractions as possible
- Clinician should model exercises as he/she wants the client to perform them
- Clinician can use environmental cues
- Repetition, repetition, repetition!!!
- Clinician should keep focus simple, even when other communication or motor deficits are present


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Considerations for Treatment Settings




Home environment vs. clinic setting vs. SNF

Where is the patient?
Is in home care possible?



Is in-person treatment necessary or beneficial?

Note: If in-person visits are necessary, ASHA recommends that employers provide SLPs adequate protection from droplet transmission during AGPs consistent with the [CDC recommended guidelines for personal protective equipment \(PPE\)](#). Make sure you and your patients are protected!



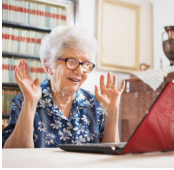
PPE for you and the patient

Can the patient see your face?
Can you see their face?
How is volume affected?
What is the impact of the mask on breathing during exercise?
Is intensive exercise safe with a mask on?

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Telehealth

- **5 C's of telehealth** (Bloem, Dorsey & Okun, 2020)
 - Better access to **CARE**
 - Greater **CONVENIENCE**
 - Enhanced patient **COMFORT**
 - Better **CONFIDENTIALITY**
 - Reduced **CONTAGION**
- Con's: Safety; no ability to physically assist patient (PT/OT); more limited assessment options; may not be reimbursable; technology challenges



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Telehealth Resources

For Everyone: [Telepractice Delivery of LSVT LOUD and LSVT BIG: What you need to know](#)

Find LSVT eLOUD providers:
<https://www.lsvtglobal.com/LSVTFindClinicians>

For LSVT LOUD Clinicians: Telepractice Delivery of LSVT LOUD: Logistics and Guidelines

For LSVT BIG Clinicians: Office Hours: Telepractice Delivery of LSVT BIG: Logistics and Guidelines

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Be the positive, persistent energy they need now, more than ever!

"I do believe that as patients begin to see positive results from therapy and hear positive comments from others their confidence increases which impacts their ability to cope with anxiety, depression, apathy, etc. better."


-LSVT Clinician




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Know when to refer!

We have a lot to learn about COVID-19 and our patient's response to treatment.



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"We are the eyes and ears for nurses and doctors. We spend more direct time with patients and may become more aware of non-motor symptoms. We need to be educated and relay information in a professional manner."

-LSVT Clinician

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Professional Resources

- [Guide to Free COVID-19 Webinars and Facebook Live Recordings From APTA and Others](#)
- [Recommendations From APTA Components](#)
- [OTA Resources related to COVID-19](#)
- [Research Information from the NIH](#)
- [CDC information for Health Care Professionals](#)

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SLP Resources

ASHA Coronavirus/COVID-19 Updates
<https://www.asha.org/About/Coronavirus-Updates/>

Enabling ICU Communication During COVID-19
 An interprofessional group of speech-language pathologists and others have created [free materials to aid bedside communication](#) with intubated patients during COVID-19.

Medicare Expands Telehealth Services to Audiologists and SLPs
 The [recently announced expanded coverage](#) will last the duration of the COVID-19 public health emergency and is retroactive to March 1, 2020.

Get Updated COVID-19 Telepractice Resources
 Find the latest on state telepractice regulation changes as well as [tips and guidance for providing telepractice services](#).

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SLP Resources

Get Guidance on Providing Voice Services in the Absence of Endoscopic Evaluation
 ASHA's guidance can help speech-language pathologists (SLPs) [make informed decisions about providing voice treatment](#) in the absence of laryngeal visualization during the COVID-19 pandemic.

Guidance on voice Endoscope evaluation during COBID-19
<https://www.asha.org/SLP/healthcare/Considerations-When-Providing-Voice-Services-in-the-Absence-of-Endoscopic-Evaluation-During-COVID-19.htm>

ASHA Guidance for those at home with swallowing disorders
<https://finance.yahoo.com/news/asha-offers-guidance-those-sheltering-134000487.html>

DRS COVID-19 Resource Page
https://www.dysphagiaresearch.org/page/COVID-19Resources?fbclid=IwAR38XAEIXqVGhBNDJpHC7PdWoi0J69H5Yvx2G3EguC9YK2bu_k8YYAf9nZc


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Resources for People with PD

- [Michael J. Fox Foundation COVID-19 Resource Hub](#)
- [APDA COVID-19 Questions and Answers](#)
- [APDA COVID-19 Information and Resources](#)
- [Parkinson Foundation Coronavirus Information](#)
- [Parkinson and Movement Disorder Alliance Online Resources related to COVID-19](#)
- [Centers for Disease Control and Prevention](#)

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Did you know?




- 3 out of 4 people with Parkinson's do not receive medications on time when staying in the hospital
- When medications are not on time in the hospital, 2 out of 3 will experience unnecessary complications.
- With more frequent hospital visits and a high sensitivity to the timing and dosing of PD medications, people with PD face great risks in the hospital.
- A person with PD should never be given Halperidol/Haldol
- **What can you do?**
 - Advocate for your patient and educate colleagues on the importance of PWPs getting their medications **on time, every time!**

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Parkinson's Foundation Aware in Care Kit

- Learn about the risks associated with hospital or nursing home stays.
- Receive tools that empower patients and family to play an active role in their care.
- Prepare PWP for a hospital visit, whether planned or unplanned.
- Have a plan to get the best possible care in the hospital.
- Order a free kit online:
<https://www.parkinson.org/Living-with-Parkinsons/Resources-and-Support/Patient-Safety-Kit>



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Summary

- COVID-19 could have a wide range of impact on the speech, respiratory, musculoskeletal and nervous systems in PWP.
- There are many possible cognitive sequelae in PWP who have had COVID-19.
- Understanding these sequelae may help therapists to provide safer rehabilitation to those who are recovering.
- Intensive therapies like LSVT LOUD and LSVT BIG may be an option for post-COVID patients with PD.
- We have much more to learn as time goes on!

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How to Ask Questions

- Type in the question box on your control panel
- Raise your hand!
 - Click on the hand icon
 - Your name will be called out
 - Your mic will be unmuted,
 - Then you can ask your question out loud
- Email info@lsvtglobal.com if you think of questions later!



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THANK YOU!

Please complete short survey

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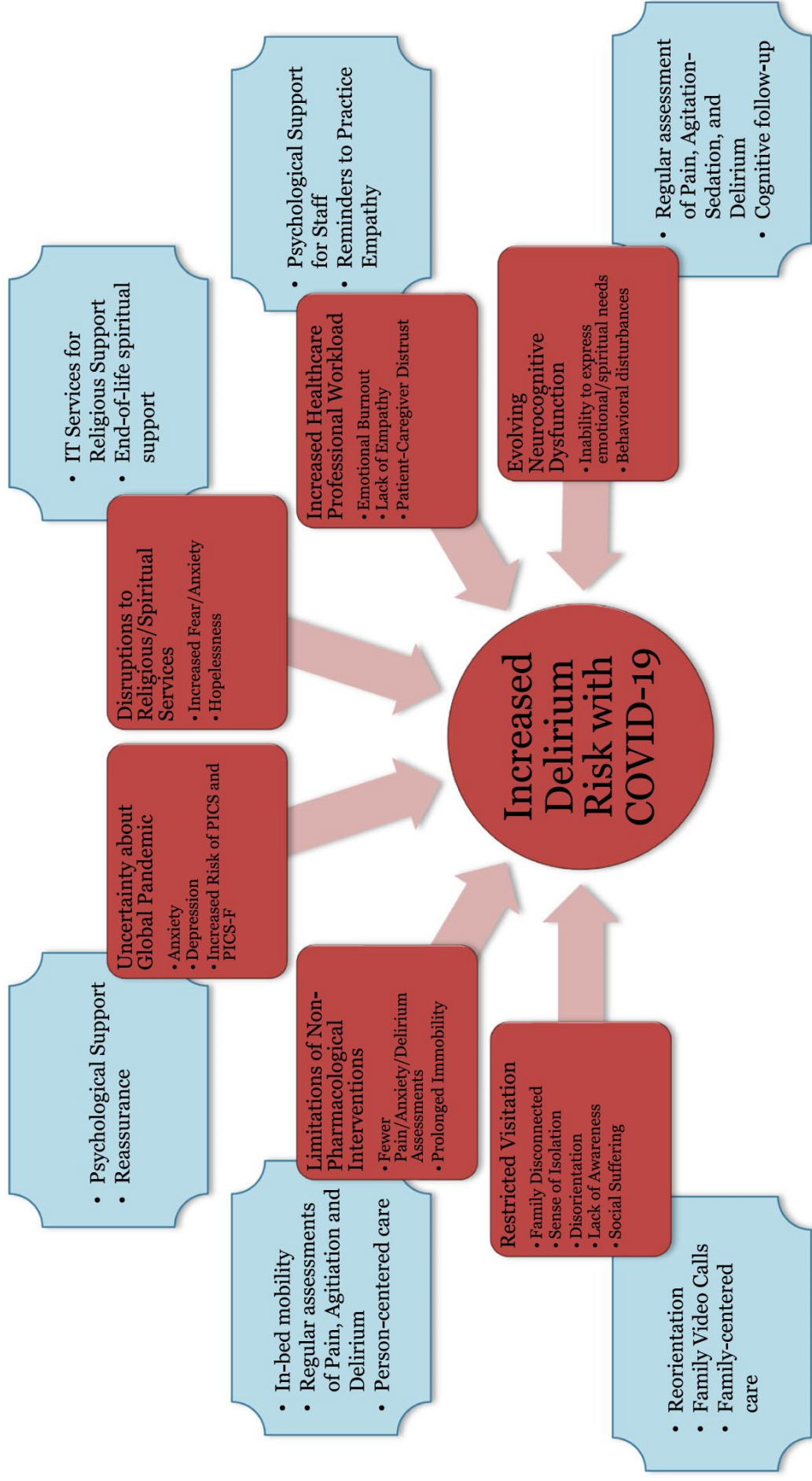


Fig. 1 Potential factors contributing to ICU delirium during the SARS-CoV-2 pandemic

Kotfis et al., 2020

References from:

Interdisciplinary Care of Post COVID-19 Patients with Parkinson's Disease: Considerations and Resources Webinar

1. Alhazzani, W., Moller, M. H., Arabi, Y. M., Loeb, M., Gong, M. N., Fan, E., Oczkowski, S., Levy, M. M., Derde, L., Dzierba, A., Du, B., Aboodi, M., Wunsch, H., Cecconi, M., Koh, Y., Chertow, D. S., Maitland, K., Alshamsi, F., Belley-Cote, E., ... Rhodes, A. (2020). Surviving sepsis campaign: Guidelines of the management of critically ill adults with coronavirus disease 2019 (COVID-19). *Intensive Care Medicine*, 46(5), 854-857. <https://doi.org/10.1007/s00134-020-06022-5>
2. American Speech-Language Hearing Association. (2020). *Considerations when providing voice services in the absence of endoscopic evaluation during COVID-19*. <https://www.asha.org/SLP/healthcare/Considerations-When-Providing-Voice-Services-in-the-Absence-of-Endoscopic-Evaluation-During-COVID-19.htm>
3. Antonini, A., Leta, V., Teo, J., & Chaudhuri, K. R. (2020). Outcome of Parkinson's disease patients affected by COVID-19. *Movement Disorders*. <https://doi.org/10.1002/mds.28104>
4. Asadi-Pooya, A. A., Simani, L. (2020). Central nervous system manifestations of COVID-19: A systematic review. *Journal of the Neurological Sciences*, 413. <https://doi.org/10.1016/j.jns.2020.116832>
5. Baig, A. M. Neurological manifestations in COVID-19 caused by SARS-CoV-2. *Central Nervous System Neuroscience & Therapeutics*, 26(5), 499-501. <https://doi.org/10.1111/cns.13372>
6. Barker, J., Martino, R., Reichardt, B., Hickey, E. J., & Ralph-Edwards, A. (2009). Incidence and impact of dysphagia in patients receiving prolonged endotracheal intubation after cardiac surgery. *Canadian journal of surgery. Journal Canadien de Chirurgie*, 52(2), 119-124.
7. Brodsky, M. B., Gellar, J. E., Dinglas, V. D., Colantuoni, E., Mendez-Tellez, P. A., Shanholtz, C., . . . Needham, D. M. (2014a). Duration of oral endotracheal intubation is associated with dysphagia symptoms in acute lung injury patients. *Journal of Critical Care*, 29(4), 574-579. <https://doi.org/10.1016/j.jcrc.2014.02.015>
8. Brodsky, M. B., González-Fernández, M., Mendez-Tellez, P. A., Shanholtz, C., Palmer, J. B., & Needham, D. M. (2014b). Factors associated with swallowing assessment after oral endotracheal intubation and mechanical ventilation for acute lung injury. *Annals of the American Thoracic Society*, 11(10), 1545-1552. <https://doi.org/10.1513/AnnalsATS.201406-274OC>
9. Brodsky, M. B., Levy, M. J., Jedlanek, E., Pandian, V., Blackford, B., Price, C., Cole, G., Hillel, A. T., Best, S. R., & Akst, L. M. (2018). Laryngeal injury and upper airway symptoms after oral endotracheal intubation with mechanical ventilation during critical care: A systematic review. *Critical Care Medicine*, 46(12), 2010-2017. <https://doi.org/10.1097/CCM.0000000000003368>
10. Brodsky, M. B., Nollet, J. L., Spronk, P. E. & González-Fernández, M. (2020). Prevalence, pathophysiology, diagnostic modalities and treatment options for dysphagia in critically ill patients. *American Journal of Physical Medicine Rehabilitation*. <https://doi.org/10.1097/PHM.0000000000001440>
11. Brodsky, M. B., Pandian, V. & Needham, D. M. (2020). Post-extubation dysphagia: A problem needing multidisciplinary efforts. *Intensive Care Medicine*, 46(1), 93-96. <https://doi.org/10.1007/s00134-019-05865-x>
12. Brück, E., Larsson, J. W., Lasselín, J., Bottai, M., Hirvikoski, T., Sundman, E., Eberhardson, M., Sackey, P., & Olofsson, P. S. (2019). Lack of clinically relevant correlation between subjective and objective cognitive function in ICU survivors: A prospective 12-month follow-up study. *Critical Care*, 23(1), 253. <https://doi.org/10.1186/s13054-019-2527-1>
13. Chung HY, Wickel J, Brunkhorst FM, Geis C. (2020) Sepsis-Associated Encephalopathy: From Delirium to Dementia?. *J Clin Med*. 9(3):703. Published 2020 Mar 5. doi:10.3390/jcm9030703

14. Cvejic, L., Harding, R., Churchward, T., Turton, A., Finlay, P., Massey, D., Bardin, P. G., & Guy, P. (2011). Laryngeal penetration and aspiration in individuals with stable COPD. *Respirology*, *16*(2), 269-275. <https://doi.org/10.1111/j.1440-1843.2010.01875.x>
15. Day, M. (2020). COVID-19: Ibuprofen should not be used for managing symptoms, say doctors and scientists. *British Medical Journal*, *368*. <https://doi.org/10.1136/bmj.m1086>
16. de Larminat, V., Montravers, P., Dureuil, B. & Desmots, J. M. (1995). Alteration in swallowing reflex after extubation in intensive care unit patients. *Critical Care Medicine*, *23*(3), 486-490. <https://doi.org/10.1097/00003246-199503000-00012>
17. Dixon, W. G., Abrahamowicz, M., Beauchamp, M. E., Ray, D. W., Bernatsky, S. Suissa, S., & Sylvestre, M. P. (2012). Immediate and delayed impact of oral glucocorticoid therapy on risk of serious infection in older patients with rheumatoid arthritis: A nested case-control analysis. *Annals of the Rheumatic Diseases*, *71*(7), 1128-1133. <https://doi.org/10.1136/annrheumdis-2011-200702>
18. Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Wang, Y., Fu, H., & Dai, J. (2020). Mental health problems and social media exposure during COVID-19 outbreak. *PLoS One*, *15*(4), <https://doi.org/10.1371/journal.pone.0231924>
19. Girard, T. D., Thompson, J. L., Pandharipande, P. P., Brummel, N. E., Jackson, J. C., Patel, M. B., Hughes, C. G., Chandrasekhar, R., Pun, B. T., Boehm, L. M., Elstad, M. R., Goodman, R. B., Bernard, G. R., Dittus, R. S., & Ely, E. W. (2018). Clinical phenotypes of delirium during critical illness and severity of subsequent long-term cognitive impairment: A prospective cohort study. *Lancet Respiratory Medicine*, *6*(3), 213-222. [https://doi.org/10.1016/S2213-2600\(18\)30062-6](https://doi.org/10.1016/S2213-2600(18)30062-6)
20. Goettler, C. E., Pryor, J. P., & Reilly, P. M. (2002). Brachial plexopathy after prone positioning. *Critical Care*, *6*(6), 540-542. <https://doi.org/10.1186/cc1823>
21. Goetz, C. G., Stebbins, G. T., & Luo, S. (2020). MDS-UPDRS use in the COVID era. *Movement Disorders*. <https://doi.org/10.1002/mds.28094>
22. Haynes, B. F., & Fauci, A. S. (1978). The differential effect of in vivo hydrocortisone on the kinetics of subpopulations of human peripheral blood thymus-derived lymphocytes. *Journal of Clinical Investigation*, *61*(3), 703-707. <https://doi.org/10.1172/JCI108982>
23. Helmich, R. C., & Bloem, B. R. The impact of the COVID-19 pandemic on Parkinson's disease: Hidden sorrows and emerging opportunities. *Journal of Parkinson's Disease*, *10*(2), 351-354. <https://doi.org/10.3233/JPD-202038>
24. Hemmerle, A. M., Herman, J. P., & Seroogy, K. B. (2012). Stress, depression and Parkinson's disease. *Experimental Neurology*, *233*(1), 79-86. <https://doi.org/10.1016/j.expneurol.2011.09.035>
25. Herridge, M. S., Moss, M., Hough, C. L., Hopkins, R. O., Rice, T. W., Bienvenu, O. J., & Azoulay, E. (2016). Recovery and outcomes after the acute respiratory distress syndrome (ARDS) in patients and their family caregivers. *Intensive Care Medicine*, *42*(5), 725-738. <https://doi.org/10.1007/s00134-016-4321-8>
26. Hillegass E., Fick, A., Pawlik, A., Crouch, R., Perme, C., Chandrashekar, R., Butler McNamara, S., & Cahalin, L. P. (2014). Supplemental oxygen utilization during physical therapy interventions. *Cardiopulmonary Physical Therapy Journal*, *25*(2), 38-49. <https://doi.org/10.1097/01234-201406000-00002>
27. Hillegass, E., Puthoff, M., Frese, E. M., Thigpen, M., Sobush, D. C., & Auten, B. (2016). Role of physical therapists in the management of individuals at risk for or diagnosed with venous thromboembolism: Evidence-based clinical practice guideline. *Physical Therapy*, *96*(2), 143-166. <https://doi.org/10.2522/ptj.20150264>
28. Johns Hopkins Medicine. (2020, April 13). *What coronavirus does to the lungs*. <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/what-coronavirus-does-to-the-lungs>
29. Klok, F.A., Kruij, M., van der Meer N.J.M., Arbous, M.S., Gommers, D.A.M.P.J., Kant, K.M., Kaptein, F.H.J., Paassen, J.van, Stals, M.A.M., Huisman, M.V., Endeman, H. (2020) Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thrombosis Research*. <https://doi.org/10.1016/j.thromres.2020.04.013>

30. Kotfis, K., Williams Roberson, S., Wilson, J. E., Dabrowski, W., Pun, B. T., & Ely, E. W. (2020). COVID-19: ICU delirium management during SARS-CoV-2 pandemic. *Critical Care*, 24(1), 176. <https://doi.org/10.1186/s13054-020-02882-x>
31. Leder, S. B., Cohn, S. M., & Moller, B. A. (1998). Fiberoptic endoscopic documentation of the high incidence of aspiration following extubation in critically ill trauma patients. *Dysphagia*, 13(4), 208-212. <https://doi.org/10.1007/PL00009573>
32. Lew, H. L., Oh-Park, M. & Cifu, D. X. (2020). The war on COVID-19 pandemic: Role of rehabilitation professionals and hospitals. *American Journal of Physical Medicine & Rehabilitation*. <https://doi.org/10.1097/PHM.0000000000001460>
33. Macht, M., Wimbish, T., Clark, B. J., Benson, A. B., Burnham, E. L., Williams, A., & Moss, M. (2012). Diagnosis and treatment of post-extubation dysphagia: results from a national survey. *Journal of Critical Care*, 27(6), 578-586. <https://doi.org/10.1016/j.jcrc.2012.07.016>
34. Marra, A., Pandharipande, P. P., Girard, T. D., Patel, M. B., Hughes, C. G., Jackson, J. C., Thompson, J. L., Chandrasekhar, R., Ely, E. W., & Brummel, N. E. (2018). Co-occurrence of post-intensive care syndrome problems among 406 survivors of critical illness. *Critical Care Medicine*, 46(9), 1393-1401. <https://doi.org/10.1097/CCM.00000000000003218>
35. Marvin, S. (2015, April 16). *Managing post-extubation dysphagia*. Dysphagia Café. <https://dysphagiacafe.com/2015/04/16/post-extubation-dysphagia-aspiration-pneumonia-fees/>
36. McIntyre, M., Robinson, L. R. & Mayo, A. (2020). Practical considerations for implementing virtual care in physical medicine and rehabilitation: For the pandemic and beyond. *American Journal of Physical Medicine & Rehabilitation*. <https://doi.org/10.1097/PHM.0000000000001453>
37. Moshayedi, P., Ryan, T. E., Mejia, L. L. P., Nour, M., & Liebeskind, D. S. (2020). Triage of acute ischemic stroke in confirmed COVID-19: Large vessel occlusion associated with coronavirus infection. *Frontiers in Neurology*. <https://doi.org/10.3389/fneur.2020.00353>
38. Panigada, M., Bottino, N., Tagliabue, P., Grasselli, G., Novembrino, C., Chantarangkul, V., Pesenti, A., Peyvandi, F., & Tripodi, A. (2020). Hypercoagulability of COVID-19 patients in intensive care unit. A report of thromboelastography findings and other parameters of hemostasis. *Journal of Thrombosis and Haemostasis*. <https://doi.org/10.1111/jth.14850>
39. Papa, S. M., Brundin, P., Fung, V. S. C., Kang, U. J., Burn, D. J., Colosimo, C., Chiang, H. L., Alcalay, R. N., & Trenkwalder, C. (2020). Impact of the COVID-19 pandemic on Parkinson's disease and movement disorders. *Movement Disorders Clinical Practice*, 7(4), 357-360. <https://doi.org/10.1002/mdc3.12953>
40. Parkinson's Foundation. (2020). *Hospitalization during COVID-19 letter*. [https://www.parkinson.org/sites/default/files/Hospitalization%20During%20COVID-19%20Letter%20\(1\).pdf](https://www.parkinson.org/sites/default/files/Hospitalization%20During%20COVID-19%20Letter%20(1).pdf)
41. Pereira, A. (2020). Long-term neurological threats of COVID-19: A call to update the thinking about the outcomes of the coronavirus pandemic. *Frontiers in Neurology*, 11. <https://doi.org/10.3389/fneur.2020.00308>
42. Postma, G. N., McGuirt, W. F., Sr., Butler, S. G., Rees, C. J., Crandall, H. L. & Tansavatdi, K. (2007). Laryngopharyngeal abnormalities in hospitalized patients with dysphagia. *The Laryngoscope*, 117(10), 1720-1722. <https://doi.org/10.1097/MLG.0b013e31811ff906>
43. Poyiadji, N., Shahin, G., Noujaim, D., Stone, M., Patel, S., & Griffith, B. (2020). COVID-19-associated acute hemorrhagic necrotizing encephalopathy: CT and MRI features. *Radiology*. <https://doi.org/10.1148/radiol.2020201187>
44. Prasad, S., Holla, V. V., Neeraja, K., Suriseti, B. K., Kamble, N., Yadav, R., & Pal, P. K. (2020). Parkinson's disease and COVID-19: Perceptions and implications in patients and caregivers. *Movement Disorders*. <https://doi.org/10.1002/mds.28088>
45. PulmCCM. (2013, October 24). *Dysphagia and swallowing disorders in the ICU (Review)*. <https://pulmccm.org/review-articles/dysphagia-swallowing-disorders-icu-review/>

46. Ranucci, M., Ballotta, A., Di Dedda, U., Bayshnikova, E., Dei Poli, M., Resta, M., Falco, M., Albano, G., & Menicanti, L. (2020). The procoagulant pattern of patients with COVID-19 acute respiratory distress syndrome. *Journal of Thrombosis and Haemostasis*. <https://doi.org/10.1111/jth.14854>
47. Rassameehiran, S., Klomjit, S., Mankongpaisarnrung, C., & Rakvit, A. (2015). Postextubation Dysphagia. *Proceedings (Baylor University. Medical Center)*, 28(1), 18-20. <https://doi.org/10.1080/08998280.2015.11929174>
48. Rodriguez-Blazquez, C., Frades-Payo, B., Forjaz, M. J., de Pedro-Cuesta, J., Martinez-Martin, P. (2009). Psychometric attributes of the Hospital Anxiety and Depression Scale in Parkinson's disease. *Movement Disorders*, 24(4), 519-525. <https://doi.org/10.1002/mds.22321>
49. Saran, S., Gurjar, M., Kanaujia, V., Ghosh, P. S., Gupta, A., Mishra, P., Azim, A., Poddar, B., Baronia, A., & Singh, R. (2019). Effect of prone positioning on intraocular pressure in patients with acute respiratory distress syndrome. *Critical Care Medicine*, 47(9), e761-e766. <https://doi.org/10.1097/CCM.0000000000003893>
50. Scheel, R., Pisegna, J. M., McNally, E., Noordzij, J. P., & Langmore, S. E. (2016). Endoscopic assessment of swallowing after prolonged intubation in the ICU setting. *Annals of Otolaryngology & Laryngology*, 125(1), 43-52. <https://doi.org/10.1177/0003489415596755>
51. Schiehser, D. M., Ayers, C. R., Liu, L., Lessig, S., Song, D. S., & Filoteo, J. V. (2013). Validation of the Modified Fatigue Impact Scale in Parkinson's disease. *Parkinsonism & Related Disorders*, 19(3), 335-338. <https://doi.org/10.1016/j.parkreldis.2012.11.013>
52. Silver, J. K. (2020). Prehabilitation may help mitigate an increase in COVID-19 peri-pandemic surgical morbidity and mortality. *American Journal of Physical Medicine & Rehabilitation*. <https://doi.org/10.1097/PHM.0000000000001452>
53. Skoretz, S. A., Flowers, H. L., & Martino, R. (2010). The incidence of dysphagia following endotracheal intubation: A systematic review. *Chest*, 137, 665-673. <https://doi.org/10.1378/chest.09-1823>
54. Spiezia, L., Boscolo, A., Poletto, F., Cerruti, L., Tiberio, I., Campello, E., Navalesi, P., & Simioni, P. (2020). COVID-19-related severe hypercoagulability in patients admitted to intensive care unit for acute respiratory failure. *Thrombosis and Haemostasis*. <https://doi.org/10.1055/s-0040-1710018>
55. Stoessel, A. J., Bhatia, K. P., & Merello, M. (2020). Movement disorders in the world of COVID-19. *Movement Disorders Clinical Practice*, 7(4), 355-356. <https://doi.org/10.1002/mdc3.12952>
56. Tanguay, T., & MacDonald, G. (2007). Improving care for the prone ICU patient. *Dynamics*. 2007;(2):34.
57. Tang, N., Li, D., Wang, X. & Sun, Z. (2020). Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia. *Journal of Thrombosis and Haemostasis*, 18(4), 844-847. <https://doi.org/10.1111/jth.14768>
58. Thomas, P., Baldwin, C., Bissett, B., et al. (2020). *Physiotherapy management for COVID-19 in the acute hospital setting. Recommendations to guide clinical practice*. *Journal of Physiotherapy*. https://www.apta.org/uploadedFiles/APTAorg/News_and_Publications/Latest_News/News_Items/2020/Physiotherapy_Guideline_COVID-19.pdf
59. Viswanath, A., & Monga, P. (2020). Working through the COVID-19 outbreak: Rapid review and recommendations for MSK and allied health personnel. *Journal of Clinical Orthopaedics and Trauma*. <https://doi.org/10.1016/j.jcot.2020.03.014>
60. Walter, K., Pizzichetta, K., Metz, J., DiCarlo, D., Sieban, A., Toscano, M., Atkins, D., Benitez, J., & Babyar, S. (2017). Improved function and geriatric depression scale profile in outpatients with Parkinson's disease through the participation in Lee Silverman Voice Therapy BIG® program. *Physical Medicine and Rehabilitation Research*, 2, 1-6. <https://doi.org/10.15761/PMRR.1000152>
61. Wang, H. Y., Li, X. L., Yan, Z. R., Sun, X. P., Han, J., & Zhang, B. W. (2020). Potential neurological symptoms of COVID-19. *Therapeutic Advances in Neurological Disorders*, 13. <https://doi.org/10.1177/1756286420917830>
62. Wang, S., Hammes, J., Khan, S., et al. (2018). Improving recovery and outcomes every day after the ICU (IMPROVE): Study protocol for a randomized controlled trial. *Trials*, 19(1), 196. <https://doi.org/10.1186/s13063-018-2569-8>

63. Weisel, J. W. & Litvinov, R. I. (2017). Fibrin Formation, Structure and Properties. *Sub-cellular Biochemistry*, 82, 405-456. https://doi.org/10.1007/978-3-319-49674-0_13
64. Weuve, J., Glymour, M. M., & Hu, H. (2011). Forced expiratory volume in 1 second and cognitive aging in men. *Journal of American Geriatrics Society*, 59(7), 1283-1292. <https://doi.org/10.1111/j.1532-5415.2011.03487.x>
65. Wilcox, M. E., Brummel, N. E., Archer, K., et al. (2013). Cognitive dysfunction in ICU patients: Risk factors, predictors, and rehabilitation interventions. *Critical Care Medicine*, 41(9), S81-98. <https://doi.org/10.1097/CCM.0b013e3182a16946>
66. Wu, Y. C., Chen, C. S., & Chan, Y. J. (2020). The outbreak of COVID-19: An overview. *Journal of the Chinese Medical Association*, 83(3), 217-220 <https://doi.org/10.1097/JCMA.0000000000000270>
67. Yadav, S., Vashista, S., & Bhardwaj, P. (2020). Corona virus disease and the heart. *Journal of the Practice of Cardiovascular Sciences*, 6(1), 2-3. https://doi.org/10.4103/jpcs.jpcs_20_20
68. Zhou, B., She, J., Want, Y., & Ma, X. (2020). A case of coronavirus disease 2019 with concomitant acute cerebral infarction and deep vein thrombosis. *Frontiers in Neurology*, 11. <https://doi.org/10.3389/fneur.2020.00296>
69. Zhou, C., Wu, L., Ni, F., et al. (2014). Critical illness polyneuropathy and myopathy: A systematic review. *Neural Regeneration Research*, 9(1), 101-110. <https://doi.org/10.4103/1673-5374.125337>
70. Zuckerman, R. B., Sheingold, S. H., Orav, E. J., Rhuter, J., & Epstein, A. M. (2016). Readmissions, observation and the hospital readmissions reduction program. *New England Journal of Medicine*, 374(16), 1543-1551. <https://doi.org/10.1056/NEJMsa1513024>