

Pulmonary Rehab and Special Considerations in the Post-COVID Population

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Disclosures

- I have no financial relationships or conflicts of interest to disclose

Objectives

Participants will be able to:

- Describe the basic components of a pulmonary rehab program
- Apply the new pulmonary rehab billing codes
- Recognize and describe the differing post-COVID patient presentations
- Identify appropriate rehab alternatives for patients with post-COVID conditions

What Is Pulmonary Rehab?

"Pulmonary rehabilitation (PR) is a comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies that include, but are not limited to, exercise training, education, and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviors."

- American Thoracic Society/European Respiratory Society Statement on PR, 2013

What Is Pulmonary Rehab?

"A pulmonary rehabilitation (PR) program is typically a physician-supervised, multidisciplinary program individually tailored and designed to optimize physical and social performance and autonomy of care for patients with chronic respiratory impairment. The main goal is to empower the individuals' ability to exercise independently. Exercise is combined with other training and support mechanisms to encourage long-term adherence to the treatment plan."

- Medicare Benefit Policy Handbook

Benefits of PR

- Reduces symptoms
- Improves functional outcomes
- Reduces healthcare costs
- Does not improve lung function directly, but can have greater impact on symptoms and functional status than other interventions
- Improves comorbid conditions including
 - Peripheral muscle dysfunction
 - Decreased mobility
 - Body composition and metabolic disorders
 - Anxiety/Depression
 - Poor self-management

Who Should Do PR?

- Many patients will benefit from PR, and providers should consider a referral for anyone who:
 - Has dyspnea at rest or with exertion
 - Is diagnosed with a chronic respiratory condition
 - Has been hospitalized for a respiratory condition
 - Is experiencing reduced exercise capacity or functional capacity
 - Has impaired health status related to a respiratory condition
- Not all patients will "qualify" for PR, but the referral should still be made, and most patients will still be able to participate

Components of a PR Program

Programs must provide a comprehensive, evidence-based multidisciplinary intervention for patients with chronic respiratory impairment, which must include:

- Patient assessment
- Psychosocial assessment and support
- Outcome measurement
- Self-management education
- Physician-supervised exercise training
- Goal setting
- Smoking cessation/relapse prevention as needed



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Medicare Requirements in Pulmonary Rehab

Medicare Requirements Resources

Medicare Coverage Determination:

- <https://www.cms.gov/medicare-coverage-database/view/article.aspx?articleid=52770>

Medicare Benefit Policy Manual

- <https://www.cms.gov/files/document/r10573bp.pdf-0>

Medicare Claims Processing Manual

- <https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/downloads/clm104c32.pdf>

Medicare Program Requirements

- Individualized Treatment Plan (ITP)
 - A comprehensive assessment and plan of care document which must be signed by the program's Medical Director prior to initiating treatment sessions, at least once every 30 days during treatment, and at discharge
 - All patient assessments completed during the patient intake should be documented
 - Must include:
 - Plan of care for exercise training including mode, duration, frequency, and planned progression of exercise training
 - Education to be provided
 - Specific, measurable goals and expected outcomes

Medicare Program Requirements

- Physician Prescribed Exercise
 - The training program may be developed by program staff (physical therapist, respiratory therapist, nurse etc.) but must be written up in the ITP, which must be signed by the physician
 - Patients **must** participate in some sort of aerobic exercise training at every PR session
 - Patients should additionally participate in strength training and breathing retraining
 - It is recommended that patients attend at least twice per week
 - The exercise training program should be tailored to each individual patient

Medicare Program Requirements

- Educational Training
 - Patient should be provided with education that is tailored to their needs and may include:
 - Information on their respiratory condition
 - Self-management of their health as it relates to their lung disease
 - Smoking cessation or relapse prevention counseling
 - All education and training **must** assist the patient to attain their established goals for increased independence with daily living, adaptation to limitations, and improved quality of life

Medicare Program Requirements

- Psychosocial Assessment
 - Written evaluation of an individual's mental and emotional functioning as it relates to the individual's rehabilitation or respiratory condition
 - It should include: (1) an assessment of those aspects of the individual's family and home situation that affects the individual's rehabilitation treatment, and (2) a psychological evaluation of the individual's response to, and rate of progress under, the treatment plan
 - Periodic re-evaluations are necessary to ensure the individual's psychosocial needs are being met

Medicare Program Requirements

- Outcomes Assessment
 - Must be completed at the beginning and end of the program
 - May be completed at other points during the program to measure progress
 - Should be patient centered and measure the clinical effectiveness of the PR program intervention and can include:
 - Aerobic capacity testing (6 minute walk test, shuttle walk test)
 - Questionnaires assessing shortness of breath and quality of life
 - Assessment of functional status
 - Assessment of smoking status and supplemental oxygen use

Medicare Program Requirements

- Setting Requirements
 - PR services must be provided in a physician's office or in a hospital outpatient setting
 - The setting must have the necessary cardiopulmonary, emergency, diagnostic, and therapeutic life-saving equipment accepted by the medical community as medically necessary (for example, oxygen, cardiopulmonary resuscitation equipment, and a defibrillator) to treat chronic respiratory disease
 - There **must** be a supervising physician immediately available
 - This does not have to be the program Medical Director

Medicare Program Requirements

- Physician Requirements

- Medicare Part B pays for PR services supervised by a physician only if the physician meets all of the following requirements:

- (1) expertise in the management of individuals with respiratory pathophysiology
 - (2) licensed to practice medicine in the state in which the PR program is offered
 - (3) responsible and accountable for the PR program, and
 - (4) involved substantially, in consultation with staff, in directing the progress of the individual in the PR program

My Patient Doesn't Have Medicare...

- Many Medicare Advantage Plans (MAPs) and private health insurance plans may cover PR as a benefit
- These plans follow Medicare guidelines
- If the patient's insurance plan covers "Pulmonary Rehabilitation" then you can follow the Medicare requirements and bill for PR using codes 94625 and 94626

Covered Diagnoses for PR

- Medicare pays for PR services under the bundled "all inclusive" codes 94625 and 94626 when the following requirements are met:
 - The patient holds an active Medicare Part B plan
 - They are referred to the program by a physician (MD or DO)
 - Meet one of the two diagnosis requirements:
 - The patient has COPD GOLD stage 2-4 (moderate to very severe COPD)
 - The patient has confirmed or suspected COVID-19 and is experiencing persistent symptoms that include respiratory dysfunction for at least four weeks (effective January 1, 2022)
- 94625 and 94626 can be billed by a qualified clinician, i.e., physician, non-physician practitioner (NPP), respiratory therapist (RT), physical therapist (PT), occupational therapist (OT) or appropriately supervised/qualified therapist assistant (physical therapist assistant (PTA) or occupational therapist assistant (OTA))
- There is no National Coverage Determination for PR, so you need to check with your local MAC for a Local Coverage Determination for additional details

COPD Severity Staging (post bronchodilator)

GOLD Stage 1	Mild	$FEV_1 \geq 80\%$ predicted
GOLD Stage 2	Moderate	FEV_1 50% - 79%
GOLD Stage 3	Severe	FEV_1 30% - 50%
GOLD Stage 4	Very Severe	$FEV_1 < 30\%$

My Patient Doesn't Meet The COPD or COVID-19 Diagnosis Requirements...

- They can still be seen in the same program by the same program staff, but you **cannot** call it “Pulmonary Rehabilitation”
 - They are participating in a group pulmonary therapy program
- Documentation and physician signature requirements follow the documentation/signature requirements of each individual discipline
 - If billing 97000 series CPT codes, document and bill under a therapy plan of care
 - If billing G0237, G0238, G0239 codes, document and bill under a physician plan of care
- Billing to be covered shortly!

Typical Program Staff

- Medical Director
- Supervising Physician
- Patient's Personal Physician
- Program Coordinator or Director (Physical Therapist, Respiratory Therapist, Pulmonary Nurse, Exercise Physiologist)
- Rehabilitation/Exercise Specialist (Physical Therapist, Exercise Physiologist)
- Ancillary Personnel
 - Occupational Therapist
 - Registered Dietitian
 - Psychologist, Social Worker, Chaplain
 - Pharmacist
 - Physician Extender
 - Administrative Assistant

Program Design and Structure

- Program should be at least 2 days per week, but may be up to 5 days per week
- Program length may be anywhere up to 36 weeks long per Medicare regulations
 - Typically will be 6-12 weeks long
- Can be cohort groups or rolling admission
- Must include aerobic training (ambulation, stationary cycling)
- Should include strength, balance, flexibility, and breathing training
- Must include education
- Must include regular reassessment of status and outcome measures

Pulmonary Rehab Billing - Medicare

- Billing code for PR initially developed in conjunction with new PR guidelines in 2010, updated in 2022 to be more comparable to Cardiac Rehab codes and differentiate medical complexity based on oxygen monitoring needs
- Codes **94625** and **94626**
 - 94625 - Physician or other qualified health care professional services for outpatient pulmonary rehabilitation; without continuous oximetry monitoring (per session), or
 - 94626 - Physician or other qualified health care professional services for outpatient pulmonary rehabilitation; with continuous oximetry monitoring (per session)
 - Can bill a maximum of 2 units per day
 - Can bill a maximum of 36 units per episode of care
 - Additional 36 units available if medically necessary for second episode of care
 - Must use KX modifier for all units beyond the initial 36
 - This benefit does not renew, so patients have a *lifetime* limit of 72 units

Pulmonary Rehab Billing - Medicare

- Requirements for billing 94625 or 94626
 - Units are reported in 1-hour increments
 - The patient must be receiving treatment for **at least** 31 minutes to bill 1 unit, and at least 91 minutes to bill 2 units
 - First 60 minutes would be 1 unit, the next 31 minutes would meet the requirement for a second unit
 - The patient must perform some amount of physician-prescribed exercise during each hour of the session to bill 94625 or 94626
 - There must be a physician who is “immediately available” throughout the duration of the treatment session
 - Only **licensed health care providers** may bill 94625 and 94626; these codes are not billed incident-to
- 94625 and 94626 fall under the 80/20 coinsurance for Medicare Part B
 - Patients will be responsible for 20% of the cost unless they have a secondary insurance that picks it up

Pulmonary Rehab Billing non-Medicare Part B

- Medicare Advantage Plans and Private Insurers
 - Most cover 94625 and 94626, but a benefits check should be conducted to determine coverage and allowable units/sessions
 - Follow Medicare guidelines for requirements to bill 94625 and 94626
 - Many have benefits that are session based rather than unit based
 - Many have a benefit that resets yearly
 - There is typically a co-pay or coinsurance for PR benefit
 - Amount varies by state and insurance plan
- Medicaid
 - Medicaid coverage is different in each state, but in my experience, Medicaid does not cover 94625 and 94626 in NC

Decision-Making and the New PR Billing Codes

- **94625** - Physician or other qualified health care professional services for outpatient pulmonary rehabilitation; *without continuous oximetry monitoring*
- **94626** - Physician or other qualified health care professional services for outpatient pulmonary rehabilitation; *with continuous oximetry monitoring*
- Patient status must determine need to choose which code you use. Leaving the pulse-ox on the patient for convenience purposes does not qualify as a reason to bill 94626
- It is okay to switch which code you bill within an episode of care if patient status changes, but if you bill 2 units for 1 session then they should be the same code

Decision-Making and the New PR Billing Codes

- Things to consider to demonstrate necessity of continuous monitoring
 - Is the patient on supplemental O2?
 - Did they desaturate <88% during 6MWT?
 - Are we actively titrating O2?
 - Do they have large or rapid changes in SpO2 with activities?
 - Do they have a medical condition (e.g. PAH, untreated CAD) that means a low SpO2 would be particularly dangerous?
 - Do they have a history of cardiac arrhythmias?
 - What is the stage of their disease?
 - Mild, moderate, severe, very severe, advanced, end-stage
 - More advanced disease more likely to need continuous monitoring

Billing Codes Decision-Making Resource

- 2022 Pulmonary Rehab Update from American Association for Respiratory Care
 - <https://www.aarc.org/wp-content/uploads/2022/06/aarc-medicare-pulmonary-rehabilitation-update-2022.pdf>

Red and Yellow Flags for Participation

Contraindications

- **Unstable cardiac arrhythmia**
- **Severe untreated pulmonary hypertension**
- Severe cognitive deficits
- Untreated psychiatric disease

Precautions

- Advanced liver disease
- Unaddressed severe orthopedic problems
- Stroke with little to no mobility or ability to exercise
- Heart failure that is not well managed

Special Considerations in the Post- COVID-19 Population

Patient Presentation Post-COVID-19

- Varied presentations depending on severity of illness and multi-system involvement
- In most cases we see:
 - Impaired skeletal muscle strength and endurance
 - Decreased ability to complete daily activities
 - Ongoing symptoms which can include: shortness of breath, cough, tachycardia, fatigue, brain fog, and oxygen desaturation with activity even once acute infection is resolved
- Two general broad categories:
 - Those presenting similar to other patients post-ARDS/critical illness – “PICS” Presentation
 - Those presenting with an autoimmune response similar to patients with myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) – “Neuroimmune” Presentation

Terminology

- All of the below refer more or less to the same thing:
 - Long COVID
 - A term developed early on by the patient community
 - PASC - Post-Acute Sequelae of COVID-19
 - Long-Haul COVID
 - Post-COVID Condition
 - Long term effects of COVID
 - Chronic COVID



WHO Definition of "Long COVID"

- *"Post COVID-19 condition occurs in individuals with a history of probable or confirmed SARS CoV-2 infection, usually 3 months from the onset of COVID-19 with symptoms and that last for at least 2 months and cannot be explained by an alternative diagnosis. Common symptoms include fatigue, shortness of breath, cognitive dysfunction but also others and generally have an impact on everyday functioning. Symptoms may be new onset following initial recovery from an acute COVID-19 episode or persist from the initial illness. Symptoms may also fluctuate or relapse over time."*
- **Essentially: new or ongoing symptoms related to COVID infection that persist or have onset/recurrence at least 3 months after initial infection**

Long COVID Statistics

- Increasing numbers of COVID-19 infections mean increasing numbers of patients who may be at risk for post-COVID Conditions
- Recurrent infections increase the risk of experiencing long COVID
- It is estimated that anywhere between 10%–30% of patients who become infected with COVID-19 will go on to develop a post-COVID condition. This means that there may be from 9–30 million individuals in the US living with Long COVID.
 - There are people who may have long COVID and not realize it
 - These numbers are likely low due to many unreported cases



Risk Factors for Development of Long COVID

- It is impossible to predict exactly who may develop post-COVID conditions, but there are some things that may increase an individual's risk:
 - Severity of acute illness, specifically viral load
 - Underlying health conditions including type 2 diabetes and asthma
 - Older age
 - Female gender
 - Reactivation of Epstein-Barr Virus (causes mono)
 - Presence of specific autoantibodies (similar to what is seen in other autoimmune conditions)

Patient Presentation Post-COVID-19

Patients who were critically ill often have more impairments

...but not always!

Identification of post-viral fatigue and other impairments that may seem less obvious can have a huge impact on rehab participation and success, and ensuring the appropriate rehab setting

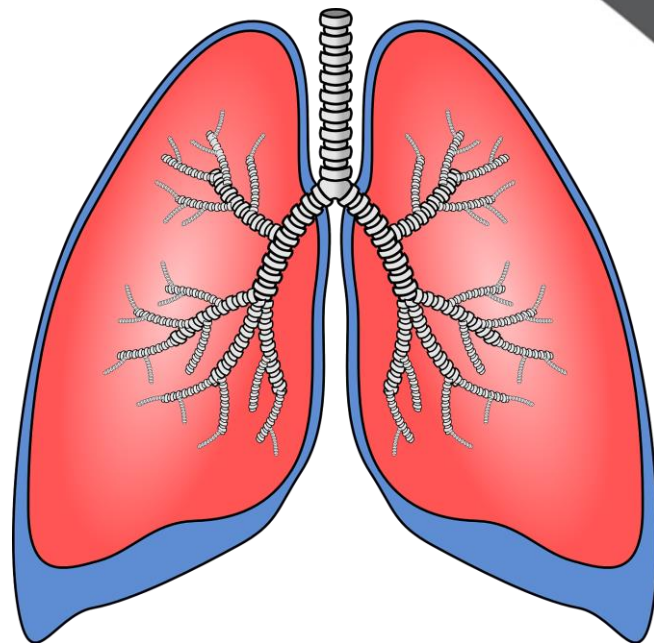
Patient Presentation Post-COVID-19

Post-Critical Illness/PICS

- Presentation most closely matched to Acute Respiratory Distress Syndrome (ARDS) with additional aspects of Post Intensive Care Syndrome (PICS)
 - Severely impaired endurance with or without decreased oxygen saturations
 - Profound strength deficits and loss of muscle mass
 - Cognitive and neurological deficits
 - Restricted breathing pattern similar to pulmonary fibrosis
 - Mental health involvement including anxiety, depression, and PTSD
 - Impaired safety due to all of the above which increases risk for falls

Symptom Presentation

- Common symptoms in the “critical illness/PICS” presentation:
 - Fatigue
 - Brain fog
 - Breathlessness with/without low oxygen saturations
 - Breathing pattern disorders
 - Chest tightness
 - Cough
 - Generalized tachycardia
 - Global weakness
 - Joint/muscle pain
 - Nausea and other GI problems
 - Anxiety/Depression/PTSD



Patient Presentation Post-COVID-19

Neuroimmune

- Presentation most closely matched to patients with myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS), and/or postural orthostatic tachycardia syndrome (POTS)
 - ***Many of these patients never required hospitalization***
 - ME/CFS: A chronic illness affecting many body systems which can manifest on a wide spectrum of severity. Primary symptoms include severe fatigue, pain, orthostatic intolerance, and brain fog. "Overdoing it" often leads to post-exertional symptom exacerbation (PESE)
 - Postural Orthostatic Tachycardia Syndrome (POTS): a chronic illness affecting many body systems characterized by orthostatic intolerance with an abnormal elevation of heart rate in standing. Can occur on a spectrum of severity and may or may not include syncope

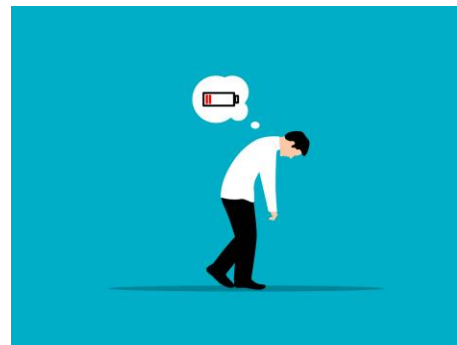
Patient Presentation Post-COVID-19 Neuroimmune

Post-Exertional Symptom Exacerbation (PESE):

- A worsening of symptoms following even minor physical or mental exertion, with symptoms typically worsening 12 to 48 hours after activity and lasting for days or even weeks.
- Also called Post-Exertional Malaise (PEM)

Symptom Presentation

- Common symptoms in the “neuroimmune” presentation:
 - Extreme and out of proportion fatigue/exhaustion
 - Brain fog
 - Orthostatic intolerance
 - Exercise intolerance
 - Out of proportion tachycardia with activity and position change
 - Post-Exertional Symptom Exacerbation
 - PESE
 - Dizziness and Lightheadedness
 - Presyncope
 - Insomnia
 - Impaired body temperature regulation
 - Nausea and other GI problems
 - Altered peripheral sensation
 - Joint/muscle pain
 - Vision changes including light sensitivity



Screening Post-COVID-19 for Pulmonary Rehab

Is the patient appropriate?

Cardiac Rehab Take Note

- This presentation is in the context of pulmonary rehab, but all of the following information can be applied to patients referred to cardiac rehab who have a history of COVID-19 infection

Screening Patients Post-COVID

- Standard patient history and intake you normally do
- Date and severity of acute COVID-19 infection
 - Hospitalized? Required Oxygen? Required ventilation? Medications? Complications such as CVA/DVT/PE
 - If there has been more than one infection, will want all the information related to each infection
- Symptoms experienced during acute infection
- Duration of acute symptoms
 - “acute COVID” is up to 4 weeks
 - “persistent COVID” is 4-12 weeks
 - “long COVID” is >12 weeks
- Ongoing symptoms and symptoms triggers
- Changes in functional level from pre to post infection
 - Including exercise, recreation, ADLs, occupation
 - Even if patient is doing everything they used to do, are they taking longer? More rest breaks? Still symptomatic?
- Post-Exertional Symptom Exacerbation (PESE) or Exercise intolerance*
- Orthostatic intolerance (OI)*

Screening Questionnaires

- Depression screenings
 - Whatever you are already using for other patients might be fine, PHQ-9 is a quick, easy, and free measure
- Quality of life measures
 - There are many out there, whatever your program already uses will likely be fine
- Symptom-based questionnaires
 - Shortness of breath questionnaires , Fatigue Severity Scale, DePaul Symptom Questionnaire
- Cognitive assessments
 - Short Blessed Test (free), Mini-Mental State Examination (not free), MoCA (not free, requires training), Symbol-Digit Modalities Test (free)
- Functional capacity
 - Duke Activity Status Index (DASI - free)

Identifying Post-COVID Patients for PR

- Many patients post COVID will be referred to outpatient pulmonary rehab programs, but not all of them will qualify for pulmonary rehab, and not all will be appropriate
- Medicare criteria:
 - "Confirmed or suspected COVID-19 and experience persistent symptoms that include respiratory dysfunction for at least four weeks"
 - Patients who have resolution of symptoms within 4 weeks from acute infection may not qualify
 - Patients who do not have respiratory symptoms may not qualify

Identifying Post-COVID Patients for PR



- Many patients will qualify for, and benefit from, traditional outpatient pulmonary rehabilitation programs and graded exercise training
 - Will be primarily the PICS/post critical illness presentation
- Patients with the neuroimmune presentation are more likely to require individual PT, OT, and SLP interventions and would **not** do well in a pulmonary rehab group or with traditional graded exercise
 - Graded exercise training is often contraindicated in individuals experiencing PESE
- Being able to screen and differentiate patient presentation will be key to success with rehab
 - You may have to tell patients referred to your program that PR is not appropriate for them, and help them find a more appropriate option

Screening and Differentiation of Patients



- With increasing cases of COVID-19, we will continue to see increasing cases of Long COVID
- Patients referred to PR for other respiratory diagnoses may have a history of COVID, even if it is not their reason for referral
- Screening for Long COVID in any patient with a history of suspected or confirmed COVID-19 infection, regardless of the reason for referral, will ensure that you:
 - Can be more effective and targeted with your interventions
 - Do not cause harm or exacerbate Long COVID symptoms
 - Can be more prepared, and prepare the patient, for anticipated responses to interventions
 - Be aware of/sensitive to the psychosocial implications of the individual's experience with Long COVID
 - Refer out to a different program/therapist if they are not appropriate for PR

Examination, Monitoring, and Interventions

PICS Presentation

If the patient screens **OUT** for PESE/OI, you can pretty much follow your typical process for pulmonary rehab:

- Assess and monitor vital signs at rest and with activity
- Be aware of changes in glycemic control
- Assess symptoms with activities and interventions
 - Use RPE and DOE scales
- Complete aerobic capacity testing with close monitoring
- Graded exercise training is generally well tolerated, but may have some ongoing symptoms or slower progression
- Many of these patients may be able to wean off supplemental oxygen!
- Consider referral to a PT, OT, or SLP if there are strength, balance, functional, or cognitive impairments your program is not in a position to address

Examination, Monitoring and Interventions

Neuroimmune Presentation

- Assess patient's experiences of PESE, through detailed report or using questionnaire(s)
 - DePaul Symptom Questionnaire
 - Post-Exertional Malaise (PEM) and COVID subscales
- If your program design allows:
 - Educate on activity pacing and daily activity tracking
 - Establish symptom patterns and response to therapy interventions
 - Utilize weekly tracking sheets to improve individual symptoms and set goals
 - Sleep hygiene
 - Appropriate restful activities
 - Safe cognitive/physical exertion

Screening for PESE



Simple screening questions:

Evidence-based Question	Patient/Client Response Indicating PESE
Does it take more than one day to recover to your usual baseline from activity?	"Yes."
Do you feel unwell, weak, don't sleep well, or have pain when recovering from activity?	"Yes" to at least one; diagnostic accuracy optimized for three or more.
Are you feeling limited in your ability to do your normal daily tasks after activity? Does exercise/activity positively affect you?	"Yes" to functional decrement and "No" to positive effect/mood.

Screening for PESE

- It is important to note that “activity” can be:
 - Physical exertion
 - Including exercise, ADLs (bathing, dressing, grooming), IADLs (cooking, cleaning, grocery shopping, childcare)
 - Cognitive exertion
 - Including work, driving, reading, television
 - Social exertion
 - Including spending time with family, friends, coworkers, healthcare providers, church, community events
 - Anything else that causes stress, anxiety, excitement



Screening for Orthostatic Intolerance

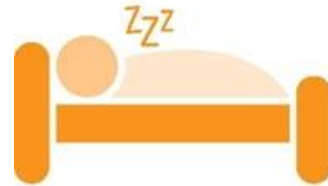
- Are symptoms worse when patient is in a more upright position?
 - Especially during more static standing types of activities
 - May include tachycardia, palpitations, hypotension, shortness of breath, lightheadedness, brain fog, chest pain, blood pooling, changes in skin color and temperature, nausea, presyncope
- Orthostatic vitals – standard 3 minutes standing may not be a long enough assessment
- NASA 10-minute lean test
 - <https://batemanhornecenter.org/assess-orthostatic-intolerance/>

How You Can Help Patients with PESE and OI

- Ideally you will want to help facilitate a referral to a knowledgeable clinician for 1:1 rehab as soon as possible
- While they are in your session
 - Educate on Stop, Rest, Pace
 - Educate on adequate hydration and slow position changes



STOP trying to push your limits. Overexertion may be detrimental to your recovery.



REST is your most important management strategy. Do not wait until you feel symptoms to rest.



PACE your daily physical and cognitive activities. This is a safe approach to navigate triggers of symptoms.

How You Can Help Patients with PESE and OI

- Educate on "control symptoms first, then progress activity"
 - "Progressing activity" does not necessarily mean exercise training, it might just be adding back in more movement to their day, resumption of ADLs or activities such as shopping, working, or school, without crashes consistently
- Graded exercise training is not appropriate for patients with PESE
 - May be able to do very slow progression of exercise once symptoms are controlled, or may never be able to do exercise training
- Graded exercise training may or may not be appropriate with OI
 - If tolerated, will need to start all exercise (aerobic and strength) in recumbent positions, allow plenty of recovery time, and progress slowly to more upright positions

Take Home on PESE and OI

- **Patients with PESE and OI are not good candidates for group pulmonary rehab**
- The best thing you can do for the patient is help facilitate a referral to a clinician with knowledge and expertise working with individuals with these conditions
- Attempting graded exercise training with these patients can be detrimental to their recovery, can prolong or exacerbate symptoms, and can cause them to lose trust in the healthcare system leading to worse outcomes and lack of follow up

Case Studies and Discussion

Case 1 – PICS Presentation

- Patient is a 56-year-old female with PMH significant for obesity, OSA, CAD, partial thyroidectomy, and HLD who presents to outpatient therapy s/p diagnosis of COVID-19.
- Tested positive for COVID-19 on 8/17, admitted with worsening symptoms on 8/21. She was treated with Remdesivir and Decadron, but ultimately required transfer to ICU on 8/23 and intubation on 8/29.
- She underwent tracheostomy on 9/1 and required deep sedation, multiple prone nights, and paralytics. Her ICU stay was also complicated by pneumothorax requiring emergent chest tube placement.
- She was transferred to post-acute medical LTACH on 10/7 for further care, trach maturation, vent weaning and goal of decannulation. She had a PEG placed on 11/1, and was able to have her trach capped on 11/12 and decannulated 11/16.
- Transferred to Acute Inpatient Rehab Hospital on 11/19. Patient was discharged from Rehab to home on 1/7. At time of discharge patient required supervision for bed mobility, min-modA for sup<>sit with use of hospital bed functions, min-modA for slide board transfers, and x6 steps with body-weight support harness in parallel bars.
- Participated in home health therapy for 2 months, and presented to outpatient COVID rehab PT and OT evaluations on 3/22.

Case 1 – PICS Presentation

- At time of PT evaluation:
 - Reporting symptoms of ongoing weakness, cough, right leg numbness and intermittent buckling
 - Ongoing significant weight loss with hypotension due to poor oral intake
 - Arrives to evaluation in a wheelchair, reports walking household distances with a walker, transfers without a walker, unable to do stairs, still requiring assistance with self care and daily activities

Case 1 – PICS Presentation

Functional Outcome Measures at Evaluation (and first treatment):

- 6 Minute Walk Test:
 - Ambulated 421 feet (128.3 meters) with a rollator walker, which was 25% of the predicted
- Short Physical Performance Battery:
 - Total score 6/12
 - Able to hold full tandem 10 seconds, gait speed 0.49 m/sec, 5x chair stands 20.66 seconds WITH arms, unable to stand without arms

Case 1 – PICS Presentation

- Attended 1:1 PT sessions 2-3 times per week initially, then decreased to 1 time per week after ~3 months
- She did not experience any symptoms indicative of PESE or OI
- Interventions:
 - Progressive ambulation training on a walking track with walker
 - Progressive recumbent cycling
 - Breathing retraining and thoracic expansion exercises
 - Progressive upper and lower body strength training
 - Balance training
 - Progression to outdoor ambulation on variable surfaces and with inclines
 - Progression to ambulation with cane and then with no device

Case 1 – PICS Presentation

Current status after 7 months of rehab (with a few "breaks" due to scheduling conflicts)

- 6 Minute Walk Test:
 - Ambulated 1233 feet (375.8 meters) on the 6 minute walk test with no device, which is 70% of the predicted
- Short Physical Performance Battery:
 - Total score 11/12
 - Able to hold single leg stance for 10 seconds, gait speed 1.1 m/sec, 5x chair stands 13.47 seconds with no arms
- Reports walking 1.5 miles (slowly) as part of her home program

Case 2 – Neuroimmune Presentation

- 44y/o F who tested positive for COVID-19 on 1/25. Has been having ongoing COVID symptoms, most notably shortness of breath and headaches. Presents to PT and OT evaluations on 2/9
- Prior to COVID lived a "pretty much normal life." Worked as a middle school teacher, teaching six 45-minute classes and was able to get up and move around and do anything she needed to do
- Feels like she is at "rock bottom" and has been in bed for the past two weeks. Has felt exhausted with headaches and also feels shortness of breath with talking
- Reports feeling barely able to walk into the clinic from the parking lot
- Being managed by her PCP, has not seen pulmonology or cardiology
- Provided with extensive education of hydration, electrolytes, compression garments, and activity pacing during the eval

Case 2 – Neuroimmune Presentation

- 10-Minute Stand Test for Orthostatic Tolerance

Body Position	Heart Rate (beats per minute)	Blood Pressure (mmHg)	Symptoms
Supine	72	130/88	Fatigue, headache
Sitting	90	118/82	When she first sat up, had a "whoa" moment, heart racing
Standing 1 minute	104	132/70	"exhausted"
Standing 3 minutes	106	116/84	Worsening fatigue
Standing 5 minutes	104	118/72	Exhausted, really Has to concentrate on not swaying
Standing 10 minutes	116	110/80	Shortness of breath, increased effort/focus to stand

Patient returned to sitting and required 2 minutes for symptoms to resolve.

Vitals reassessed: HR 99 BP 130/74

Remaining symptoms: fatigue/exhaustion

**Patient's HR noted to go up to 119 bpm during static standing

Case 2 – Neuroimmune Presentation

- Aerobic Capacity Test on Recumbent Bike

Exercise Test – Recumbent Bike

Time	Level	Goal Watts	Actual Watts	HR	BP	RPE	Symptoms
Rest				91	138/90	6	fatigue
Warm-up (3 min)	L2	24	25	99	120/80	13	Increased shortness of breath
0-1 min	L4	49	49				
2 min	L6	74	74	115	120/82	15	
3 min	L8	98	100	142		18	
4 min	L10	123	121	151	144/80	20	Exhausted, headache, shortness of breath

Case 2 – Neuroimmune Presentation

Response to initial eval:

- Returned to first PT session and reported that from her evaluation she was completely exhausted, had a very bad headache.
- Continues to struggle with position changes despite increasing fluid, salt, and using compression garments

Overall presenting with significant orthostatic intolerance and moderate PESE

After several weeks saw cardiology and initiated metoprolol for heart rate control

Case 2 – Neuroimmune Presentation

Interventions

- Breathing retraining in supine
- Activity modification, pacing, symptom tracking
- Recumbent cycling starting with very short duration intervals at a very low resistance in a dark, quiet room
- Work modifications – delayed return to work by 1 additional month, then returned at $<1/2$ time with significant accommodations
- Many exacerbations and setbacks as activities gradually reintroduced

Case 2 – Neuroimmune Presentation

Interventions

- Initiation of unweighted range of motion "strength" training for core and legs after 6-8 weeks
- After 5 months of therapy able to tolerate 35 minutes of continuous light intensity aerobic exercise
- At 5 months initiated ambulation for "exercise" starting with just 3 minutes
- Gradual addition of light resistance to strength training exercises
- Able to start the school year working $\sim\frac{3}{4}$ of her full-time schedule with ongoing accommodations

Case 2 – Neuroimmune Presentation

Current status after 8.5 months of therapy

- Is able to work almost full time, but still requires accommodations
- Still unable to complete all previous activities and has symptom "crashes" on the weekends and during the week if she does too much
- Able to complete 40 minutes of light aerobic exercise, of which 10 minutes is walking (speed around 2.2mph)
- Continues to require education on pacing, activity modification, not pushing too hard
- Continues to experience delayed onset and orthostatic symptoms, though less severe
- Sometimes able to stand for up to 4 minutes without symptoms, sometimes unable to stand for any amount of time without symptoms

What Questions Do You Have?

Please feel free to contact me via e-mail



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