CONTINUING EDUCATION
for Occupational Therapists

THE ROLE OF OCCUPATIONAL THERAPY IN PULMONARY REHABILITATION

PDH Academy Course #OT-1604 | 3 CE HOURS

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Course Abstract

This course provides an overview of Occupational Therapy's role in pulmonary rehabilitation, with attention to diagnoses, terminology and procedures, and process. It concludes with case studies.

Target audience: Occupational Therapists, Occupational Therapy Assistants (no prerequisites).

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Learning Objectives

By the end of this course, learners will be able to:

- ❏ Differentiate between primary pulmonary diagnoses
- ❏ Identify terminology and procedures pertaining to pulmonary rehabilitation
- ❏ Recognize roles of occupational therapy in pulmonary rehabilitation
- ❏ Recall elements of three pulmonary rehabilitation-focused case studies

Timed Topic Outline

I. Primary Pulmonary Diagnoses (30 minutes)
Chronic Obstructive Pulmonary Disease (COPD), Pneumonia (PNA), Interstitial Lung Disease (ILD), Acute Respiratory Distress Syndrome (ARDS)

II. Common Respiratory Terminology and Procedures (15 minutes)

III. Role of Occupational Therapy in Pulmonary Rehabilitation (45 minutes)
Overview, Settings, Process, Common Questions

IV. Case Studies (75 minutes)

V. Conclusion, Additional Resources, References, and Exam (15 minutes)

Delivery & Instructional Method

Distance Learning – Independent. Correspondence/internet text-based self-study, including a provider-graded multiple choice final exam. *To earn continuing education credit for this course, you must achieve a passing score of 80% on the final exam.*

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Course Author Bio & Disclosure

Midge (Annamaria) Hobbs, OTR/L, originally from the UK, graduated with an MA in Occupational Therapy from Tufts University, Boston MA in 2005. She spent the following ten years working in long-term acute care gaining experience as a clinician, educator, and manager. In 2010, Midge was selected for the inaugural cohort of AOTA's Emerging Leaders Development Program (ELDP). Since then she has continued to amplify AOTA's leadership initiatives by serving the Emerging Leaders Development Committee (ELDC) as Chairperson and as a member of AOTA's Volunteer Leadership Development Committee (VLDC). She is currently the Editor of AOTA's A Mindful Path to Leadership, a new online self-paced leadership development course, and she co-authored Module 3: Mentoring and Leadership with current AOTA president, Amy Lamb.

Midge is currently employed as a consultant for internship development in the adolescent residential psychiatric programs at Sheppard Pratt Hospital in Baltimore MD, an adjunct professor at the MGH Institute of Health Professions in Boston, and a clinician at local rehab and assisted living facilities. Midge is also enrolled at Thomas Jefferson University for her post-professional OTD with a specialty in teaching in the digital age. In her limited spare time she watches English soccer and eats a lot of popcorn.

DISCLOSURES: Financial – Midge (Annamaria) Hobbs received a stipend as the author of this course. Nonfinancial – No relevant nonfinancial relationship exists.

INTRODUCTION

According to the Center for Disease Control (CDC), 15% of adults in the United States live with a diagnosis of chronic lung disease such as asthma or chronic obstructive pulmonary disease (COPD).[1] While approximately 10% of those adults report mild symptoms, more than a third report persistent moderate to severe symptoms that greatly impact quality of life.[2] Each year more than 614,000 inpatient admissions are attributed to chronic and unspecified bronchitis.[1] Additionally, chronic lung disease greatly increases the risk of developing pneumonia with critical episodes accounting for approximately 1.1 million inpatient admissions per year.[3] Critical illness or acute lung injury, such as acute respiratory distress disease (ARDS) commonly associated with sepsis, trauma, and severe pulmonary infections, account for approximately 15-18% of all ventilated patients in inpatient care.[4] Lung disease has now become the third highest cause of mortality in the U.S.A.[1]

Common symptoms associated with chronic lung disease such as COPD include increased shortness of breath, deconditioning with general loss of muscle mass and strength impacting activity tolerance, as well as anxiety and depression. Persistent symptoms can greatly reduce function leading to a gradual loss of independence and a downward spiral in confidence based on the understanding that quality of life has been permanently compromised.[5,6] Interdisciplinary rehabilitation is generally designed to alleviate and/or manage symptoms, increase strength and endurance in order to optimize function, and maximize quality of life.[7]

Occupational Therapy (OT) can be a key member of the interdisciplinary team with its focus on providing client-centered care to maximize individual functional capacity through education, the improvement of activity

tolerance, and psychosocial support. While many occupational therapists may not choose to specialize in pulmonary rehabilitation, many therapists working in physical medicine settings will encounter adults with limitations associated with lung disease, and it is important to understand OT's role and be prepared to provide appropriate services.[8]

PRIMARY PULMONARY DIAGNOSES

Chronic Obstructive Pulmonary Disease (COPD)

Description:

COPD is not a single disease but rather an umbrella term used to describe progressive lung diseases that include emphysema and chronic bronchitis. While COPD is considered preventable, it is also a progressive, life-threatening disorder in which the lungs are irreparably damaged making it difficult to breathe. Multiple factors may contribute to its onset and progression, including smoking, exposure to environmental pollutants, and a history of asthma. Prolonged exposure to toxic agents over time may result in increased mucous production (chronic bronchitis) and tissue breakdown (emphysema).[9] COPD is characterized by irreversible airflow obstruction causing **dyspnea** (shortness of breath) and limited reserve lung capacity with an increased risk of developing **hypoxemia**. [10]

Worldwide, 64 million people live with COPD with an estimated 3 million deaths attributed to the disease each year. According to the World Health Organization (WHO), 80% of deaths are a result of long-term smoking, which explains why COPD typically affects older adults who may have had a longstanding history of tobacco use.[9] Additionally, more women than men are now being diagnosed with the disease as a result of increased tobacco use over the past 30 years.[9],[11] In 2010, the cost of hospital admissions attributed to COPD exacerbations was estimated at $32.1 billion dollars annually and is projected to reach $49 billion by 2020.[12]

Pathophysiology:

Upon inhalation, air is moved down through the trachea which then branches into two bronchi leading into the lungs. The bronchi then branch into smaller bronchioles, which end in clusters of air sacs known as alveoli that are comprised of tiny blood vessels or capillaries. **Gas exchange** occurs when inspired air moves from the lungs to the bloodstream via the walls of the alveoli and carbon dioxide simultaneously moves from the blood into the capillaries of the lungs to be exhaled. A diagnosis of emphysema is indicated when the walls of the alveoli become damaged due to long-term exposure to toxic agents and the capillaries decrease their elasticity impacting gas exchange. Bronchitis is inflammation of the bronchioles indicated by an increase in mucus production and a thickening and narrowing of the airway walls. Chronic bronchitis is diagnosed when increased inflammation persists over time and it is characterized by a chronic productive cough.[13]

Clinical Picture:

An increase in mucus production and narrowing of the airways significantly impacts gas exchange and may exhaust respiratory muscles and lead to an accumulation of **carbon dioxide** as well as an increased risk of **hypoventilation**. Dyspnea with minor exertion is the most common symptom associated with COPD, along with a persistent cough, expiratory wheezing, and fatigue.[8] However, symptoms of COPD typically do not manifest until significant lung damage has already occurred. A diagnosis may be confirmed through a **pulmonary function test (PFT)**, a chest X-ray, CT scan, or an **arterial blood gas** analysis **(ABG)**. Management of the disease focuses on lifestyle changes, including smoking cessation, and prescribed medication such as **bronchodilators** that relax the muscles around the airways and relieve coughing and dyspnea.[14]

For more severe symptoms, inhaled **corticosteroids** may be prescribed to reduce airway inflammation and minimize the risk of worsening symptoms known as an exacerbation. However, even with appropriate lifestyle changes and symptom management, individuals with COPD may experience exacerbations commonly triggered by increased exposure to irritants or a respiratory infection. Immediate medical care is indicated for an acute exacerbation to minimize the risk of lung failure. For persistently moderate symptoms or an acute exacerbation, a short course of oral steroids may be indicated. Typically, long-term use of oral steroids is avoided due to the significant side-effects associated with prolonged use. These include diabetes, weight gain, osteoporosis, and an increased risk of infection. In cases of moderate to severe COPD, doctors may also prescribe supplemental **oxygen**.[15]

Pneumonia (PNA)

Description:

Pneumonia is an acute infection affecting one or both lungs that is classified by origin, location, and type or pathogen. It may be caused by bacteria, a virus, or fungi.[16] Influenza is one of the most common causes of viral pneumonia, while *Streptococcus pneumonia* is the most common cause of bacterial pneumonia. Aspiration pneumonia is the result of inhaling foreign material, such as gastric contents, into the lungs.[17] It can be further classified as hospital-acquired (HAP), community-acquired (CAP), or ventilator-acquired pneumonia (VAP). Symptoms may range from mild to life-threatening depending upon etiology, age, and baseline health concerns. While it can affect all

age groups, PNA tends to be more serious for infants and young children, older adults over the age of 65, and individuals with co-morbidities such as COPD or those with compromised immune systems. According to the CDC, pneumonia is the leading cause of hospitalizations for adults and children in the United States. Worldwide, it is the leading cause of death in children under 5 years of age. In the United States, approximately 53,000 adult deaths are attributed to PNA each year.[18]

Pathophysiology:

The infecting organism can be inhaled, spread directly from another site, or carried via the bloodstream, and impacts the lower respiratory tract. Once colonized, infection may develop. Viral pneumonia creates interstitial inflammation, first affecting the bronchial mucous glands before spreading to the alveoli, which fill with fluid and purulent material (pus). Bacterial pneumonia triggers an inflammation of the alveoli causing low ventilation that congests the capillaries. In turn, alveoli fill with fluid and purulent material. In aspiration pneumonia, particles of inhaled foreign material may obstruct airways and trigger an inflammatory response. Regardless of pathway, gas exchange is restricted making breathing difficult.[16]

Clinical Picture:

While the clinical picture may vary depending upon the type of pneumonia, the most common symptoms include dyspnea, a cough, fever, shaking chills, fatigue, substernal discomfort, and myalgia. While the prognosis is good for those with healthy lungs, immediate medical attention is indicated when there is a persistent fever above 102 F, a lasting cough with excess sputum, or chest pain.[16] It is particularly important for those in high risk groups to seek immediate medical attention. For example, pneumonia can quickly escalate to life-threatening status in those individuals with chronic heart failure, underlying lung disease, or suppressed immune systems, such as those receiving chemotherapy.[3]

Diagnosis is made via a chest X-ray to confirm **infiltrates**, a sputum specimen, blood cultures, and a white blood count to differentiate the type of organism present and whether the infection is viral or bacterial in origin. **Pulse oximetry** may also indicate oxygen saturation levels in the blood.[19] Treatment for pneumonia is primarily focused on managing the infection and preventing complications. In many cases, individuals with community-acquired pneumonia (CAP) may be treated at home, although symptoms may persist for up to a month. Typically, treatment includes antibiotics for bacterial pneumonia or an anti-viral medication for viral pneumonia, antipyretics to reduce fever, rest, and increased fluid intake. In more serious cases, hospitalization may be indicated and the individual may receive supplemental oxygen, intravenous (IV) fluids, and breathing treatments to support recovery. In severe cases, complications include respiratory failure that may lead to acute respiratory distress syndrome (ARDS), or the development of **sepsis** - systemic inflammation of the body that may lead to organ failure. Both are life-threatening scenarios that may require the use of a **mechanical ventilator** to support breathing.[20]

Interstitial Lung Disease (ILD)

Description:

Rather than referring to one specific disease, interstitial lung disease is a group of disorders that share a similar clinical profile. The chief characteristic is scarring of the pulmonary **interstitium**, which includes the walls of the alveoli and the microscopic spaces around the blood vessels. Scarring causes progressive lung stiffness impacting the ability to breathe.[21] Disorders associated with ILD may be of known or unknown etiology.[22] It has not been possible to accurately estimate the prevalence of ILD given the diverse number of associated diseases and variation in etiology.[23]

ILD associated with exposure to toxic agents: The most common toxic agents associated with occupational exposure include asbestos, commonly found among electricians, auto mechanics, and pipe fitters; silica, commonly attributed to mining and foundry work; and coal dust, associated with mining and granite workers. Additionally, prolonged exposure to therapeutic radiation in the management of cancer is also a known contributor to the development of acute inflammation that can cause lung scarring over time. Individuals exposed to birds or molds may also develop inflammation and hypersensitivity pneumonitis. [22,23]

ILD associated with systemic disease: ILD is a common complication of a number of connective tissue diseases, including rheumatoid arthritis, scleroderma, and systemic lupus erythematosus. Sarcoidosis, a multi-system inflammatory disease, is the most common ILD in the United States affecting more women than men and individuals over the age of 20.[22,24]

ILD of unknown etiology: Despite evaluation efforts to determine origin, underlying systemic disease association, or genetic predisposition, many individuals with ILD belong in the idiopathic interstitial pneumonia (IIP) category. The most common IIP is idiopathic pulmonary fibrosis, a crippling disorder with minimal treatment options most commonly affecting individuals over the age of 60. It has a poor prognosis due to rapid progressive scarring.[22,25]

Pathophysiology:

The pulmonary interstitium is a collection of tissue within the lungs that includes the space between

the alveoli and adjacent blood vessels, and is directly involved in supporting the process of gas exchange. Typically, the body is able to repair tissue that is damaged, but if inflammation persists over time, the interstitial tissue develops scarring (fibrosis) that eventually replaces normal lung tissue. As the tissue and walls of the alveoli thicken, gas exchange is impaired. While medications may slow down the disease process, scarring is typically irreversible.[22]

Clinical Picture:

Regardless of etiology and type, the primary clinical signs and symptoms of ILD are similar. These include dyspnea and a non-productive cough. Additional symptoms, such as increased sputum production, hemoptysis associated with microscopic hemorrhages, and wheezing, as well as non respiratory related symptoms, such as myalgia and joint pain may help to further classify the disease.[22] A thorough physical examination and history is imperative to determining an accurate diagnosis.[26] Upon auscultation, many individuals with ILD will have bilateral respiratory crackles with inhalation indicating excess fluid in the lungs. Imaging, pulmonary function tests (PFT), and a lung tissue analysis are commonly ordered by doctors in order to make a definitive diagnosis. For example, a computerized tomography (CT) scan may reveal the extent of the fibrosis, while an **incentive spirometry** test will indicate lung capacity. Given that lung scarring is irreversible, treatment is typically associated with disease management.[27] For example, minimizing exposure to any known toxic agents, providing supplemental oxygen to assist breathing, and prescribing anti-inflammatory or immunosuppressing medications. In some cases, a lung transplant may be considered, although mortality risk is high.[22]

Acute Respiratory Distress Syndrome (ARDS)

Description:

Acute respiratory distress syndrome (ARDS) is defined as an acute life-threatening inflammatory reaction to illness or trauma affecting approximately 200,000 people each year in the United States.[28] In many cases, ARDS is a complication of severe pneumonia, sepsis, or major trauma with severity greatly influenced by age, comorbidities, and alcohol consumption. Onset typically occurs within 24 hours to three days of the initial illness or trauma. The inflammatory response causes injury to the lungs and fluid to build up in the alveoli compromising gas exchange, making breathing difficult, and increasing the risk of respiratory failure.[29] Up to 40% of ARDS cases are fatal with research suggesting more men than women are affected, although the cause is commonly a predictor of survival rates. For example, typically healthy young patients with trauma-related ARDS have a better survival rate than older individuals who develop ARDS as a result of sepsis.[30]

Pathophysiology:

Lung injury associated with ARDS is commonly described as having three distinct but overlapping phases. The initial inflammatory phase may last for a week after onset followed by a proliferation phase characterized by tissue damage and narrowing of air space with a subsequent fibrotic phase. The degree of fibrotic changes in the lungs is commonly a predictor of outcomes.[31] The consequences of lung injury typically include significantly impaired gas exchange resulting in hypoxemia, decreased compliance whereby the fluid filled lungs become stiff and unable to stretch and expand, and increased arterial pressure that may lead to right ventricular failure. Most deaths associated with ARDS are attributed to sepsis and multi-organ failure versus primary respiratory dysfunction.[32]

Clinical Picture:

Signs and symptoms vary in severity depending on the cause and the presence of underlying heart or lung disease; however, the most common early symptoms include significant dyspnea, increased respiration rate, low blood pressure, extreme fatigue, and confusion.[33] Diagnosis is usually determined via a complete physical exam and diagnostic testing. These include an arterial blood gas test (ABG), a chest X-ray to assess fluid levels in the lungs, a chest CT scan to look for signs of pneumonia or tumors, a complete blood count (CBC) and sputum culture to help clarify the cause of the infection.[34]

ARDS is a life-threatening condition and treatment is most commonly conducted in an intensive care unit (ICU) with the primary aim of improving oxygen levels and treating the underlying cause. Supplemental oxygen may be initially provided via a **nasal cannula** or face mask but if breathing is significantly difficult, **non-invasive positive pressure ventilation (NIPPV)** may be trialed. For example, **continuous positive airway pressure (CPAP)** may improve oxygenation thereby minimizing the need for more invasive mechanical ventilation procedures. However, the need for intubation or the placement of a **tracheostomy** are common considerations if the airway needs protection in an unconscious patient or where there is facial or neck trauma, if there is significant hypoxemia or an increase in secretions, or if there is a need to control **hypercapnia**.[35] The ventilator is designed to provide adequate oxygen, remove carbon dioxide, and support the process of breathing when respiration is compromised, and it is adjusted to the needs of the individual patient. For example, providing low tidal ventilation may minimize airway pressure and avoid over distention of the alveoli, while the use of **positive end expiratory pressure (PEEP)** may maximize alveoli involvement. Additional treatment focuses on fluid management and minimizing further complications such as malnutrition, blood clots, **pneumothorax**, and pneumonia. Medications may include vasodilators in order to improve gas exchange, as well as anti-inflammatories.[31,36]

Once medically stable, a systematic ventilator weaning process may begin with short regular breathing trials to assess the individual's spontaneous efforts.[37] If successful, the patient will trial pressure support ventilation (PSV) whereby the individual initiates every breath with ventilator support. The ultimate goal of weaning is for the patient to tolerate unassisted breathing.[38] Due to the severity of ARDS, recovery from the condition may be protracted and it is commonly associated with residual physical and cognitive challenges requiring additional pulmonary rehab or support for depression.[39]

COMMON RESPIRATORY TERMINOLOGY AND PROCEDURES

Arterial blood gas (ABG): A test to provide valuable information about the acidity (pH) and the partial pressures of specific gases such as oxygen (PaO_2) and carbon dioxide ($PaCO_2$) in the blood. It is used to determine how well a patient's lungs are able to move oxygen into the blood and remove carbon dioxide from the blood, and is typically performed via a puncture in the radial artery at the wrist or in the femoral artery at the groin. It is commonly used in critically ill patients who are in respiratory failure or who have deteriorated quickly due to sepsis or multi-organ failure.

The normal range for pH is 7.35-7.45. A decrease in pH suggests respiratory acidosis, which is a medical emergency caused by hypoventilation that increases the CO_2 in the blood. An increase in pH suggests respiratory alkalosis due to an abnormally low level of CO_2, often caused by rapid deep breathing that can be a result of pneumonia, lung disease, or asthma. Partial pressure of PaO_2 measures the pressure of the O_2 dissolved in the blood and how well it moves from the airspace of the lungs into the blood. Partial pressure of $PaCO_2$ measures the pressure of CO_2 dissolved in the blood and how well it is excreted from the body.[40]

Bilevel Positive Airway Pressure (BiPAP): Please see **Non-invasive positive pressure ventilation** (NIPPV).

Bronchodilator: A medication used to relax the bronchial muscles causing the airways to dilate and improve ventilation. It is commonly used in cases of asthma where narrowing of the bronchial tubes causes wheezing and difficulty breathing. Bronchodilators are categorized depending on need and come in many forms. For example, the medication may be breathed in via spray or mist, taken orally, or given intravenously. The most common form of bronchodilator is the beta-adrenergic agonist, which stimulates the bronchial muscles to relax. It is most commonly inhaled so that it can work rapidly. Theophylline bronchodilators are typically taken orally or given intravenously, and their effect can last 12-24 hours. Theophylline bronchodilators are not considered as strong as the beta-adrenergic agonists and have been noted for unpleasant side effects including stomach issues and insomnia. Additionally, anticholinergic bronchodilators are used to treat patients with emphysema and chronic bronchitis. They are typically inhaled and not recommended in asthma.[41]

Bronchoscopy: An endoscopic procedure to visually examine the airway in order to assess abnormalities that may be affecting ventilation. Abnormalities may include foreign bodies, bleeding, or inflammation. The bronchoscope may be inserted into the airway via nose or mouth, or in some cases, a tracheostomy, and there are two types of procedures. A flexible bronchoscopy uses a long, thin tube, is performed without general anesthesia, and allows for minor biopsies. A rigid bronchoscopy uses a hollow metal tube and is performed under general anesthesic, most commonly when the risk for bleeding is higher or larger biopsies are required.[42]

Carbon dioxide (CO_2): A colorless and odorless naturally occurring waste gas that is produced by all aerobic organisms in the process of respiration. If gas exchange is impaired and the body cannot appropriately remove CO_2, respiratory acidosis may occur, which is considered a medical emergency. Signs and symptoms of respiratory acidosis include increased fatigue or drowsiness, shortness of breath, headache, and confusion. In cases of respiratory alkalosis where there is too little CO_2 in the bloodstream, symptoms may include prolonged muscle spasms or twitching, numbness, and nausea. If untreated, symptoms may escalate rapidly and include dizziness and difficulty breathing leading to shock or coma.[45]

Continuous Positive Airway Pressure (CPAP): The most common non-surgical intervention for obstructive sleep apnea (OSA). A CPAP machine is a small bedside device that delivers a continuous flow of air via a nasal or facial mask that is worn over the nose and mouth. OSA is a disorder that causes the airway to collapse or become blocked while the individual is sleeping leading to episodes of shallow breathing or interruptions in breathing. Consequently, oxygen reaching the lungs is limited and gas exchange is impaired. Continuous pressure from a CPAP machine maintains an open airway and prevents it from collapsing or becoming blocked, thereby improving gas exchange. To assess appropriateness for CPAP, a sleep study is typically required in order to measure oxygen levels during the night. CPAP may also be indicated in individuals who have both OSA and COPD as an additional means of maintaining healthy oxygen levels in the bloodstream.[45,46]

Corticosteroids: Synthetic drugs that closely resemble cortisol, a hormone that is produced naturally in the adrenal glands. Corticosteroids are often referred to by the shortened term "steroids" and are used to reduce the production of chemicals that cause inflammation particularly when inflammation threatens to damage critical body organs.[43]

Decannulation: The removal of a tracheostomy tube when an individual no longer requires mechanical ventilation to support breathing or the airway is deemed safe. The opening in the neck is covered with a sterile dressing and taped to inhibit air leakage. The hole typically heals over a period of days to a week.[44]

Dyspnea: Shortness of breath or difficulty breathing, commonly an indicator of airway, lung, or heart dysfunction. The most common respiratory diseases associated with dyspnea include asthma, pneumonia, and COPD. Red flags of particular concern include dyspnea at rest, chest pain, wheezing, palpitations, and crackles (suggestive of left sided heart failure or interstitial lung disease). An appropriate history and physical is required to determine severity, cause, and treatment.[45]

Foley catheter: A flexible tube that is inserted into the urethra and into the bladder to drain urine. It has a small balloon at the bladder end, which can be inflated and retained as an indwelling catheter. Urine is typically collected via a bag outside of the body that will require regular emptying. A Foley catheter is recommended by doctors when an individual cannot control his or her bladder, including those experiencing critical illness. [46]

Gas exchange: The primary role of respiration or gas exchange is to deliver oxygen from the lungs to the bloodstream. The process occurs via simple diffusion and takes place in the alveoli in the lungs and the surrounding capillaries. As oxygen moves from the alveoli to the blood, carbon dioxide is transferred from the blood in the capillaries to the alveoli and is breathed out via the lungs.[47]

Hypercapnia: Abnormal increase of carbon dioxide (CO_2) in the blood.[45]

Hypoventilation: Abnormally slow rate of breathing that results in an increased amount of carbon dioxide (CO_2) in the blood.[45]

Hypoxemia: Abnormally low levels of oxygen (O_2) in the blood indicative of breathing or circulatory disorders. A normal range is considered 95-100% and in many cases, below 90% is considered low. Without sufficient O_2, the brain, liver, and other organs may be damaged. Symptoms of inadequate O_2 include shortness of breath, headache, fatigue, and confusion, and may be the result of asthma, COPD, interstitial lung disease, pneumonia, pulmonary fibrosis, sleep apnea, pneumothorax, or ARDS.[48]

Hypoxia: Hypoxemia (low O_2 in the blood) may cause hypoxia, which is an abnormally low level of O_2 in the body's tissues and cells. Most common symptoms include changes in skin color (most often a blue hue), confusion, shortness of breath, sweating, and wheezing. Like hypoxemia, it is a medical emergency requiring immediate assistance, most commonly provided via supplemental O_2.[46]

Incentive spirometry (IS): Spirometry is method of measuring an individual's volume of inhalation and exhalation. The technique is commonly used to diagnose conditions such as asthma or COPD, and may also be used to monitor the effectiveness of treatment for chronic respiratory conditions. Additionally, it is often used to improve respiratory health following surgery or an acute illness such as pneumonia when breathing may be difficult. Individuals blow into the mouthpiece of the device and are encouraged to exhale normally before inhaling slowly. An indicator within the chamber of the device will rise upon inhalation providing an observable measure of volume that may be recorded to assess progress. The goal is to take long, deep breaths to expand the lungs that may help increase O_2 levels as well as improve an individual's ability to clear mucus.[22]

Interstitium: A lace-like network of supportive tissue that extends throughout both lungs. Chronic inflammation of the interstitium changes the lungs' ability to function well impacting gas exchange.[22]

Infiltrates: Fluid filled air space or presence of inflammation in the lungs, commonly indicating infection, including PNA.[20]

Mechanical ventilation: A life support system used to assist or control respiration. A mechanical ventilator is also commonly called a respirator or breathing machine, and is used in cases of severe illness or injury when an individual is unable to breathe independently or there is significantly impaired gas exchange seriously impacting the levels of O_2 or CO_2 in the blood. In many cases, a ventilator is used as a short-term measure to medically stabilize a patient who is critically ill and is commonly used in an intensive care unit (ICU). However, it is also found in long-term care facilities if the patient is considered medically stable or if being cared for at home. While a ventilator can be life-saving it also comes with risks, and healthcare providers typically attempt to wean individuals from the machine as soon as possible.

The ventilator is connected to the patient either via a means of intubation, whereby an endotracheal tube is placed into the mouth or nose, or a tube is inserted via a tracheostomy, where a surgical incision is made directly into the trachea. The tracheostomy or "trach tube" is considered more secure than the endotracheal tube. The ventilator conducts oxygen into the lungs with the rate and flow set according to the needs of the patient. For example, it may provide full respiratory support or partial assistance. Patients may require temporary sedation while on the ventilator, particularly during the early stages of critical care, in order to minimize resistance against the machine's flow or to avoid pulling at the ventilator lines or the trach tube.

The potential for infection, including the development of pneumonia, increases with ventilator use due to the

risk of bacteria accessing the lungs via the endotracheal or tracheostomy tube. Additional risks associated with ventilator use include pneumothorax (lung collapse), which may occur if the lung is weak. The pressure of the ventilator may also cause damage to the lungs over time and it is important to find the appropriate level of oxygen required per individual. The ventilator weaning process involves safely decreasing the amount of support that the patient receives so that the individual begins to take on greater responsibility for respiratory effort.

Whether intubated via an endotracheal tube or attached to the ventilator via a tracheostomy, patients cannot speak or eat and typically receive nutrition via a nasogastric tube (NGT) or a percutaneous endoscopic gastrostromy (PEG) tube. During the weaning process, patients may be provided with a **Passy-Muir® valve** or trach cap, both of which enable the individual to speak despite retaining the trach tube. The most common type of Passy-Muir valve® is a small plastic device that is placed over the hub of the trach tube to redirect air flow through the vocal folds enabling communication, improving swallowing and secretion management.[51]

Nasal cannula (NC): Lightweight tube that splits into prongs and is used to deliver supplemental O_2 via the nostrils. A standard nasal cannula delivers an inspiratory O_2 fraction (FiO_2) of 24-40% and supply rates ranging between 1-5L. [50]

Nebulizer: A device used to convert a medication in liquid form into a mist or fine spray which can then be inhaled. It is most commonly provided via an inhaler, but can also come in the form of a portable compressor unit. They are particularly effective in delivering asthma medications.[51]

Non-invasive positive pressure ventilation (NIPPV): A process of delivering ventilation without the need for invasive procedures like intubation or a tracheosotomy. **Bilevel Positive Airway Pressure (BiPAP)** and **Continuous Positive Airway Pressure (CPAP)** are the most common non-invasive ventilation therapies and were originally intended to treat people with obstructive sleep apnea (OSA) but are now considered important options in treating other respiratory disorders. Both deliver pressurized air from a small bedside device via a tube to a nasal or facial mask that is worn over the nose and mouth. Both forms of NIPPV can improve ventilation and can be particularly beneficial for those suffering from chronic lung disease. The difference between the two NIPPV therapies is that CPAP delivers a single pre-set air pressure to maintain open airways, while BiPAP delivers two levels of pressure: one that corresponds with the inhale and one with the exhale. BiPAP is the more common method used for people with a diagnosis of COPD because it targets the dysfunctional ventilation patterns associated with the disease. The custom settings can alleviate the work of breathing at night and improve ventilation leading to more efficient gas exchange and elimination of CO_2. In the case of an acute COPD exacerbation, the option to use NIPPV may minimize the risk of more invasive procedures.[52, 53]

Oxygen (O_2): A vital, life-sustaining odorless gas that represents 21% of air. It plays a vital role in gas exchange. The exchange takes place in the alveoli in the lungs and the surrounding capillaries. A normal peripheral capillary oxygen saturation (SpO_2) range is between 95-100%. While 90-95% is considered low it is not necessarily indicative of a health issue. Without adequate O_2, the brain, liver, and other vital organs can be damaged. The brain is extremely sensitive to lack of O_2 and cells can begin dying within minutes with significant implications including brain damage or death.[45]

Passy-Muir® valve: Please see **Mechanical ventilation**.

Pleural effusion: An increase in fluid accumulation in the space between the pleura, the thin membrane that lines the surface of the lungs. A pleural effusion may be indicative of a number of conditions, including congestive heart failure and cancer. It is also a common indication of pneumonia as a result of inflammation. Symptoms may include shortness of breath, chest pain, and/or a cough. A pleural effusion is typically detected via imaging, such a chest X-ray. [54]

Pneumothorax: An accumulation of air, gas, or blood in the pleural space may cause the lung to collapse or partially collapse causing chest pain and difficulty breathing. It is most commonly a result of underlying lung disease, trauma, or a medical procedure, such as a bronchoscopy, where air is introduced into the pleural space. Pressure from mechanical ventilators can also damage the lungs leading to a pneumothorax. Diagnosis is via chest x-ray and treatment involves using a catheter inserted into the area to facilitate drainage.[55]

Positive end expiratory pressure (PEEP): A common technique used in ventilator support to assist the process of breathing by increasing the air pressure in the lungs and air passages near the end of expiration so that an increased amount of air remains in the lungs following expiration.[51]

Pulmonary function test (PFT): A means of measuring breathing to assess how well the lungs are functioning; includes an assessment of lung volume and how well gas exchange is being performed. It is typically used to determine the cause of shortness of breath, diagnose diseases such as asthma or bronchitis, check lung function prior to surgery, or measure the progress of treatment. Measurements are made via a spirometer, which is a mouthpiece connected to a tube and recording device. The volume of air inhaled and exhaled, as well as the duration of the breath cycle, are recorded and analyzed. Lung volume measurements indicate the elasticity of the lungs and strength of the respiratory muscles. Flow rates indicate the degree of

airway narrowing or obstruction.[56]

Pulse oximetry: A non-invasive means of measuring oxygen saturation levels in the blood. A pulse oximeter is a small device that is usually attached to a fingertip, but can also be used on a toe or an ear. Light passes from the device through the blood in the finger and the device calculates the information to provide a percentage reading.[57]

Pursed-lip breathing: A simple technique used to slow the rate of breathing by prolonging exhalation in order to manage shortness of breath. It improves breathing patterns, keeps the airway open for longer, and facilitates relaxation. Clients are encouraged to breathe in slowly and normally through the nose for a count of two before exhaling through pursed-lips while counting to four. A common phrase associated with the technique is, "Smell the coffee, blow out the candles." [58]

Sepsis: A potentially life-threatening condition associated with the body over-responding to infection causing damage to multiple organ systems. It is most common in older adults or those with compromised immune systems, and requires immediate and emergency medical care. Treatment typically includes antibiotics and IV fluids.[59]

Tracheostomy: An emergency procedure whereby a small incision in the trachea is made to access the airway when It isratuory hoscopy, where air eumothorax. ung disease, trauma, or during a medical procedure, such as bronchoscopy, where air ventilator support is critical to a patient's survival or long-term ventilator support is indicated. Tube selection is important and considerations for size include minimizing airflow resistance to reduce the work of breathing and the ability to facilitate suctioning bronchoscope use, as well as ventilator weaning.[60]

ROLE OF OCCUPATIONAL THERAPY IN PULMONARY REHABILITATION

Overview of Occupational Therapy Philosophy

Occupational Therapy practice, education, research, and advocacy is founded on the premise that individuals, communities, and populations of all age groups have the right to engage in meaningful occupations throughout the lifespan. It is understood that participation in occupation can be a conduit to change and a means to foster health and well-being. "Health enables people to pursue the tasks of everyday living that provide them with life meaning that is necessary for their well-being." [61]

Occupation is defined as any purposeful and meaningful activity that enables participation in society and supports the ability to live life to its fullest. Occupational Therapists (OT) and Occupational Therapy Assistants (OTA) consider both intrinsic and extrinsic factors in determining interventions, including psychosocial, cultural, physical, and environmental issues, and use occupation as a means to promote health and wellness.[62]

OT/OTAs are trained in the areas of prevention, life-style modification, and physical and psychosocial rehabilitation.[63] Therapists work from the understanding that many factors influence participation and performance, and that clients have values, life experience, and skills that are invaluable in developing meaningful short and long-term goals. OT/OTAs understand that including the client and caregivers in the decision-making process care is empowering and that client-centered practice fosters greater collaboration and participation in the therapeutic process.[64]

Additionally, interprofessional collaborative practice is integral to providing safe, quality, accessible, and client-centered care. Successful interprofessional practice includes four competencies: understanding one's role and those of other professions to assess and address the needs of clients and populations served; maintaining a climate of mutual respect based on shared values and ethical principles; providing responsible and timely communication with clients, caregivers, communities, and other healthcare providers; and applying relationship-building values to maintain healthy team roles in order to plan and deliver effective client-centered health care.[65]

Occupational Therapy plays a distinct role in interprofessional practice and in the provision of client-centered care while addressing respiratory disease across the continuum of care from acute care to inpatient rehab to home care.

Typical Settings Associated with Occupational Therapy and Pulmonary Rehabilitation

Acute Care Hospitals: Individuals are typically admitted to acute care hospitals with significant or life-threatening health concerns requiring immediate medical diagnosis and/or intervention, as well as 24-hour physician and nursing care. An intensive care unit (ICU) is indicated for those individuals who require advanced medical support, which may include acute respiratory distress syndrome (ARDS), respiratory arrest, threatened airway, and significantly low oxygen saturations causing hypoxemia and risk of brain injury. Respiratory support may be provided via non-invasive positive pressure ventilation (NIPPV), mechanical ventilation, or supplemental oxygen.

OT/OTAs are increasingly assuming a more active role in acute care settings with an emphasis on early mobilization, monitoring of vitals with activity, client and caregiver education, restoring function,

and performing evaluations to assist with the coordination of care and to determine appropriate discharge recommendations. OT/OTAs work within an interprofessional team that may include members from medicine, nursing, respiratory therapy, case management, physical therapy, speech and language pathology, social work, and spiritual care.

Long-term Acute Care (LTAC): In some cases, individuals require ongoing medical care while beginning rehabilitation. In these instances, individuals may have experienced a prolonged and/or complex hospital course or may remain significantly impaired requiring 24-hour care. In these cases, a long-term acute care facility may be indicated as a bridge between acute care and rehabilitation or home.

As successful critical care intervention increases and mortality rates decline, the number of individuals surviving but experiencing long-lasting complications is on the rise. These include chronically impaired pulmonary function, neuromuscular weakness, and cognitive impairments, as well as anxiety and depression. It is important for all members of the interprofessional team to understand these additional complications while addressing the more common impairments associated with respiratory disorders.[66]

Common pulmonary conditions encountered in long-term acute care include COPD exacerbations, pneumonia (PNA), interstitial lung disease (ILD), and acute respiratory distress syndrome (ARDS). Occupational therapy provides evaluations and develops client-centered short- and long-term goals that may address ADL and IADL re-training, as well as education that includes safety, energy-conservation strategies, and cognitive impairments. Therapists are also involved in caregiver training and discharge planning. OT/OTAs work within an interprofessional team that may include members from medicine, nursing, respiratory and/or pulmonary therapy, case management, physical therapy, speech and language pathology, social work, and spiritual care.

Inpatient Rehab and Skilled Nursing Facilities (SNF): Given the number of admissions to acute care facilities that are associated with chronic pulmonary conditions, such as COPD exacerbations, as well as health crises that are acute in nature, such as pneumonia, individuals are often referred to inpatient rehabilitation facilities. The primary focus of OT in short-term rehab is to promote strength, endurance, and mobility within the context of ADL and IADL re-training, and provide client/caregiver education, including energy conservation strategies, in order to manage conditions at home and in the community upon discharge.

OT/OTAs work within an interprofessional team that may include members from medicine, nursing, case management, physical therapy, speech and language pathology, social work, and spiritual care.

Home Care, Including Independent and Assisted Living Facilities (ILF and ALF): Upon discharge from either acute care, inpatient rehab, or long-term acute care settings, clients may benefit from continued OT services to maximize functional independence within the context of their own homes. Therapists often continue to provide ADL and IADL re-training, as well as safety and energy-conservation education while supporting caregivers during this transitional period.

The most common pulmonary conditions addressed in home care or independent/assisted living facilities are asthma, COPD, and pneumonia related. However, OT/OTAs may also assist clients with more significant pulmonary impairments, including individuals with a diagnosis of interstitial lung disease or those recovering from acute respiratory distress syndrome (ARDS) and prolonged hospitalization.

Occupational therapy works within an interprofessional team that may include members from medicine, nursing, physical therapy, speech and language pathology, as well as independent/assisted living staff.

Outpatient Pulmonary Rehab: Typically, OTs have a limited role in outpatient pulmonary rehab programs but clinicians may work within an interdisciplinary team to address the needs of clients with chronic pulmonary conditions. OT/OTAs typically assess an individual's ability to perform meaningful ADLs and IADLs in a satisfactory manner, develop individualized treatment plans, and collaborate with the client and caregivers to establish goals and provide education to manage conditions at home and in the community.

OT Process – From Evaluation to Discharge

Evaluation Process:

An OT evaluation is indicated when there are concerns regarding an individual's functional ability to perform the activities that are meaningful and necessary to live life to its fullest. In order to understand an individual's performance strengths and limitations, an OT will use his/her clinical reasoning skills to perform an evaluation that may include a synthesis of formal standardized assessment tools, medical data, informal observation and interview techniques, as well as interprofessional communication. In addition to performance skills impacting motor, cognitive processing, and/or social interaction, client factors and performance patterns, such as values and beliefs and roles and routines, as well as environmental and contextual factors are also considered in OT's holistic approach to care.

By synthesizing all pertinent data, the OT is able to develop an occupational profile that will guide the plan of care. This includes collaborating with the client and/or caregiver to determine his or her priorities regarding outcomes in order to develop objective

and measurable goals that are meaningful and client-centered. Once the goals have been established, interventions may be determined to execute the plan of care.[59,60]

OT Evaluations and Screening Tools that May be used in Pulmonary Rehabilitation

ADLs

Functional Independence Measure (FIM®): A system of measuring dysfunction appropriate for varied settings including sub-acute and rehabilitation facilities, long-term care hospitals, and skilled nursing facilities. It determines the degree of assistance required for an individual to perform his or her ADLs and is typically completed upon admission and discharge. The tool assesses 18 areas of ADLs, including 13 motor and 5 cognitive items. Performance areas are rated on a 7-point scale ranging from total assistance to independence. Every facility has its own processes in place for administering the FIM®; however, OTs will most commonly address the performance areas of eating, grooming, bathing, upper body dressing, lower body dressing, toileting, toilet transfer, shower transfer, problem-solving and memory.[67]

FIM® levels:

7 = Independence (timely, safely)

6 = Modified independence (device, increased time)

5 = Supervision (cuing, prompting)

4 = Minimal assistance (performs 75% or more of task)

3 = Moderate assistance (performs approximately 50-74% of task)

2 = Maximal assistance (performs approximately 25-49% of task)

1 = Total assistance (performs less than 25% of task)

0 = Activity does not occur (only used upon admission)[62]

Barthel Index (BI): A 10 item ordinal scale used to measure ADL performance that is most commonly used in inpatient rehabilitation, skilled nursing facilities, and home care. Each of the 10 items describes performance in feeding, bathing, grooming, dressing, bowel control, bladder control, toileting, chair transfer, ambulation, and stair climbing. Each performance item has a designated score. A higher total score is associated with the increased likelihood of an individual successfully and safely living at home independently.[68]

BI sample performance items and rating scale:

Grooming

0 = needs help with personal care

5 = independent face/hair/teeth/shaving (implements provided)

Dressing

0 = dependent

5 = needs help but can do about half unaided

10 = independent (including buttons, zips, laces, etc.)

Transfers (bed to/from chair)

0 = unable, no sitting balance

5 = major help (one of two people, physical)

10 = minor help (verbal or physical)

15 = independent [63]

ADLs/IADLs

Canadian Occupational Performance Measure (COPM): An evidence-based, client-centered outcome tool designed to reflect an individual's satisfaction with ADL and/or IADL performance. It is primarily administered by OTs and can be used across the lifespan with all clients, regardless of diagnosis or setting. The COPM enables individuals to self-assess performance, prioritize areas to address, and collaborate with their therapist to identify goals. Administration is conducted via a semi-structured interview format and is recommended at the beginning of services and periodically thereafter to monitor progress towards outcomes. The tool has five key steps: The client is asked to identify performance areas that are challenging, rate the importance of each identified area using a 10-point scale, and then select up to 5 of the most important problems to address through therapy. The client is then asked to self-assess their own level of performance and satisfaction with each of the identified problem areas. The therapist then calculates an average score, typically between 1-10. A low score indicates poor performance and lower satisfaction with a higher score indicative of good performance and a higher level of satisfaction.[69]

Safety/Fall Risk:

Missouri Alliance for Home Care (MAHC-10): A standardized multi-factor screening tool used to determine fall risk that may be used with all home care clients, including those who are bed-bound and those with significant mobility impairments. Scoring is based on clinical judgment with one point designated for each core element scoring a "yes." Screening components include age (above 65), three or more co-existing documented diagnoses, prior history of falls, presence of incontinence, visual impairment, decreased functional mobility, environmental hazards, poly-pharmacy, pain affecting function, and cognitive impairment.[70]

Work Activities:

Functional Capacity Evaluation (FCE): A combination of interview, tests, and observations typically completed over the course of 4-6 hours and designed to assess an individual's functional ability to perform specific tasks associated with employment. It is typically conducted as a means to determine an individual's ability to return to work or participate in voluntary activities after illness or injury, assess an individual's appropriateness for vocational rehabilitation services, or when an individual is applying for Social Security Disability benefits. The process allows OTs to analyze the activity components required to perform the specific tasks associated with a typical work day. Therapists will review the individual's medical history and current health status, and compare performance factors and skills to the demands of the task. The components of the FCE will depend upon the individual's needs, but may include an interview and musculoskeletal screen. Areas of function tested may include material-handling such as lifting, positional-tolerance such as sitting or reaching, and object-handling such as in-hand manipulation or fine motor control. Pain and cognitive demands are also commonly assessed in order to fully assess performance and identify recommendations. An FCE is typically paid for by workers' compensation insurance plans, individual insurance plans, federal, state, and/or local agencies, employers, or managed care plans.[71, 72]

Exercise/Activity Intensity:

Borg Rating of Perceived Exertion Scale (RPE): A self-assessment tool used by individuals to measure his or her perceived intensity of an exercise or activity. Individuals are asked to estimate the degree of exertion required during an activity using a 0-10 scale where 0 equals no perceived exertion and 10 indicates maximal exertion.

Modified Borg Scale for Perceived Dyspnea (RPD): A modified scale designed to assess an individual's shortness of breath associated with exercise or activity. An RPD score can be compared over time to assess activity tolerance and pacing needs.[73]

RPD examples:

0 = Nothing at all

2 = Mild shortness of breath

3 = Moderate shortness of breath or breathing difficulty

4 = Somewhat severe

7 = Severe shortness of breath or very hard breathing

9 = Extremely severe

10 = Shortness of breath so severe you need to stop[67]

Cognition:

The Montreal Cognitive Assessment (MoCA): A brief screening tool designed to detect mild cognitive impairment (MCI). The 30-point test has been validated for 55-85 year olds and takes approximately 10 minutes to administer. The tool assesses multiple cognitive areas including attention, concentration, working memory, language, visuospatial and executive function.[74]

MoCA sample test items:

- Visuospatial: Draw clock (ten past eleven)
- Memory: Read list of words, subject must repeat them. Do two trials, even if first trial is unsuccessful. Do a recall after 5 minutes.
- Attention: Read list of letters. The subject must tap with his hand at each letter A. No points if > 2 errors
- Abstraction: Similarity between e.g. banana – orange = fruit[68]

The Mini Mental State Examination (MMSE): A 30-point questionnaire designed to measure cognitive impairment, most commonly used as a screen for dementia but can be used to estimate cognitive impairment associated with illness or injury. The tool typically takes approximately 5-10 minutes to administer and assesses cognitive areas such as attention, recall, language, repetition, orientation, calculation, and ability to follow directions. One point is given to each correct response with a score equaling or greater than 24 points out of 30 indicating normal cognition. A score of 19-23 indicates mild cognitive impairment, a score of 10-18 suggests moderate impairment, with a score equal or below 9 points indicative of severe cognitive deficits.[75]

MMSE sample questions:

- What is the year? Season? Date? Day? Month? (Maximum score = 5)
- The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until the patient learns all of them, if possible. (Maximum score = 3)
- "I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65…) Alternative: "Spell WORLD backwards." (D-L-R-O-W). (Maximum score = 5)
- "Repeat the the phrase: "No ifs, ands, or buts." (Maximum score = 1)

- "Make up and write a sentence about anything." (This sentence must contain a noun and a verb.) (Maximum score = 1)[69]

Short Portable Mental Status Questionnaire test (SPMSQ): A short 10-item standardized assessment tool designed to detect intellectual impairment, particularly in the elderly. Incorrect responses are tallied to provide an indication of cognitive impairment. For example, 0-2 errors indicate normal mental functioning, 3-4 errors indicate mild cognitive impairment, 5-7 errors suggest moderate impairment, and 8 or more errors are associated with severe deficits.[76]

SPMSQ sample questions:

- What is the date, month, and year?
- What is the name of this place?
- How old are you?
- What year were you born?
- Who is the current president?
- Who was the president before that?[69]

Intervention Process:

Once the initial evaluation process is complete and objective, measurable goals have been determined, OTs develop an individualized treatment plan tailored to meet individual needs that also incorporate anticipated outcomes and methods. Discharge and long-term needs are also considered, along with recommendations to other professionals if needed. The plan of care typically includes meaningful occupation-based interventions such as skill training and education, but may also include preparatory methods to facilitate performance. The client's response to therapy is monitored throughout the process and modified as needed.[60]

OT Interventions and Education that May be used in Pulmonary Rehabilitation

Early mobilization: A process of passive, active, and progressive movement during critical illness to counter the effects of sedation and immobility that may lead to neurocognitive deficits and physical debilitation. It may be performed by any member of the interdisciplinary team, including OTs. Early mobilization typically occurs in acute care settings, particularly in the ICU with critically ill patients, but may also be relevant in long-term acute care or sub-acute settings when the client has experienced a prolonged or complex hospital course after critical illness and remains significantly debilitated. Evidence indicates that limited mobility is a significant contributor to long-term health issues including muscle weakness, delirium and cognitive impairments, and joint shortening. Research suggests that safe and appropriate early mobility can significantly improve functional outcomes.[77]

Activities of daily living (ADL) re-training: Clients experiencing respiratory disorders commonly find their ability to perform basic ADLs compromised by dyspnea and decreased activity tolerance. OT/OTAs provide interventions to address tasks that are typically performed on a daily basis and are considered essential to an individual's ability to live life to its fullest. ADLs include bathing/showering, grooming, dressing/undressing, toileting including hygiene, eating, sexual activity, and the ability to perform functional mobility.[61] In caring for clients with respiratory disorders, energy conservation techniques are commonly embedded into ADL re-training. For example, the OT/OTA may provide recommendations to modify tasks, such as adjusting body mechanics to minimize the work of breathing, or may suggest altering the environment to reduce extraneous effort and decrease activity demand. Therapists will also educate the client or caregiver regarding the use of adaptive equipment (AE) to maximize functional independence, such a long-handled shoe or sock aide, or the use of durable medical equipment (DME), such as a tub seat for seated showers. The ability to complete ADL tasks safely is also a consideration and appropriate education is provided to both client and caregiver.

Instrumental activities of daily living (IADL) re-training: IADLs include activities that support daily life and enable an individual to successfully live life to its fullest and interact with his/her environment and community. Examples of IADLs include home management, shopping, meal preparation, driving and community mobility, pet care, financial management, medication management, care of others, leisure tasks, employment, education, rest/sleep, and social participation.[61] The OT/OTA may provide recommendations to modify tasks or alter the environment to reduce extraneous effort and decrease activity demand. Energy conservation techniques are commonly embedded into IADL re-training. Examples of recommendations include making larger meals to freeze, letting dishes air dry, grouping task items together to minimize unnecessary searches, sliding rather than carrying items, shopping with someone who can carry grocery bags, or using grocery home delivery services.

Activity tolerance and energy conservation techniques: Fatigue, shortness of breath, and limited endurance are common factors that may limit performance and participation. OT/OTAs address strategies to modify tasks, and make recommendations regarding the use of assisted devices (AD), and/or adaptive equipment (AE) to reduce effort associated with the performance of daily routines in order to minimize fatigue, shortness of breath, and work of breathing. Energy conservation education emphasizes

prioritizing, planning, and organizing tasks. This may include simple strategies such as eliminating unnecessary steps, sitting versus standing if possible, setting up task equipment in advance to minimize extraneous effort, and using lightweight tools or utensils. Additionally, clients are encouraged to self-assess dyspnea, pace themselves through activities, and take rest breaks prior to experiencing fatigue.

Ventilation strategies / breathing techniques: OT/OTAs provide education that includes strategies to regulate breathing with activity, self-assess dyspnea with exertion, and independently apply appropriate techniques to minimize work of breathing as well as perform recovery breathing, if applicable. The most common technique employed to minimize shortness of breath is **pursed-lip breathing**. Strategies are commonly embedded into ADL/IADL tasks and mobility.[78]

Stress management / relaxation strategies: Stress and anxiety are common by-products of respiratory disorders. Providing education to help individuals manage their shortness of breath is an important step in lessening anxiety and promoting participation in the treatment program. Interventions include strategies to help clients prioritize activities and create a balanced lifestyle, increase awareness of body and mind interaction to manage breathing, increase confidence to manage stressors and perform daily activities with more confidence, and provide education on a variety of relaxation methods. These include guided imagery, progressive muscle relaxation, pursed-lip breathing technique, and diaphragmatic breathing.[79, 80]

Therapeutic exercise programs / upper extremity function: Prolonged hospitalization and chronic respiratory conditions frequently impact muscle strength, and in turn, may limit participation and/or performance in functional activities. Clients with a diagnosis of COPD, for example, often experience pain in the neck and/or shoulder region associated with overuse of accessory muscles, while individuals who have experienced critical illness may present with significant muscle weakness. Providing education for body mechanics, stretching, and an appropriate exercise program can be invaluable to the process of improving aerobic capacity, reducing O_2 requirements, minimizing pain, and increasing performance in functional tasks.[75]

Discharge Planning:

While each discipline involved in an individual's care will contribute specific information according to their professional expertise, discharge planning is typically an interdisciplinary effort ensure safe transitions. OT provides a distinct perspective on the client's functional status, including the individual's ability to safely perform ADLs, IADLs, and mobility, with recommendations for the continuum of care including the potential need for equipment, home modifications, or further services.[61]

Additional OT Considerations for Safe Discharge Planning

Safety / home O_2 management: OT/OTAs address home safety training that may include recommendations for environmental modifications, such as grab bar installation, the removal of scatter rugs, and the improvement of lighting. Education also focuses on fall prevention training and emergency responses, safe O_2 tank use and O_2 cord management training, as well as caregiver education to support a safe transition.

Health / wellness at home and in the community: Education includes medication management training, exploration of healthy leisure pursuits for the home and/or the community to promote lifestyle balance, information regarding community resources, such as fitness groups, diet and nutritional education, and smoking cessation, as well as caregiver education to support a safe transition.

Common Pulmonary-Related Questions that Clients may Ask in the Course of OT Services:

I have COPD, can I still use my fireplace at home?

You should minimize pollutants in your home and this includes smoke from open fires, vapors from cooking, aerosol spray products, strong perfumes, and tobacco smoke. It is advisable not to burn wood or kerosene in your home unless this is the only means of heating your environment.

I use O_2, can I still cook?

You can continue to cook but use common sense. Don't cook on an open flame and be careful that your O_2 tubing does not come into contact with hot burners or hot pans/pots – essentially, anything that could cause your tubing to melt. Additionally, electrical appliances that get hot or may spark should be kept away from the O_2 tank. Oxygen does not burn but anything flammable will do so more readily in an O_2-rich environment.

Why should I quit smoking?

Research has shown that people who quit smoking reduce the risk of developing or exacerbating lung disease, and increase their chances of living longer.

Can I use O_2 when I shower to relieve my shortness of breath?

Yes, if your medical provider has prescribed O_2 for home use it is advisable to keep your O_2 on while taking a shower as this can be a demanding activity for some.

How do I get around my home while using O_2?

Your home O_2 supplier will assist you in setting up the

container and establishing how much cord you will need to be able to freely and safely move around your home, as well as do the activities you need to do.

How heavy are portable O_2 tanks?

Tanks vary in size and weight, but most commonly weigh between 6-15 pounds, and can be carried on the shoulder via a strap or transported by other means, such as a rollator basket.

I use O_2, what should I do if I want to leave my home?

Small, portable tanks should be available from your supplier. Make sure you are aware of the tank's capacity in relation to your O_2 needs, so that you can calculate the number of hours available to you.

Can I still drive or travel while using O_2?

Yes, but use common sense. Make sure you have enough O_2 with you to last your trip and make sure the tank is stable while driving so that it will not tip or fall. You may also travel via public transportation using a portable tank.

Can I fly using O_2?

Airlines are not required by the Americans with Disabilities Act (ADA) to provide O_2 service on flights, so policies and procedures vary between carriers and some may not permit the use of supplemental O_2. Therefore, it is important to communicate directly with your carrier before you fly and notify them of your O_2 needs. Federal regulations do not permit the transportation of personal O_2 canisters aboard but passengers can often purchase canisters from the airlines for use during the flight. You will need to provide a doctor's letter to verify your needs. Additionally, it is important to arrange O_2 supplies for layovers and for your arrival at your final destination. Anticipate providing the local carrier with flight information, as well as local contact information.

What should I do if I run out of O_2?

Much depends on how much O_2 you are using, which is typically prescribed by your medical provider. It's important to contact your O_2 supplier immediately if you do run out so that they can refill the container. Your breathing may become uncomfortable, so minimize your activities to reduce the demand on your lungs while you wait. If you are concerned, go to the emergency room.

CASE STUDY #1

COPD Exacerbation (Short-term Rehab Setting)

History of Presenting Information (HPI):

Mrs. M. is a 63-year-old woman with a past medical history significant for moderate COPD on 2L O_2 at baseline who presented to the emergency room as a result of an exacerbation of symptoms x 1 week, including increased shortness of breath, fatigue, an elevated temperature, persistent headache, and a productive cough. Upon admission, the patient had a temp of 100.5 F, significant dyspnea, and an O_2 sat of 84% on 2L. Her lungs were noted for diminished bases and an expiratory wheeze throughout, and her labs indicated increased CO_2. Her husband reported a significant increase in his wife's work of breathing and that she had been unable to participate in her normal routine, including ADLs. Her past medical history includes a 40-year tobacco history (she quit 3 years ago), hypertension, anxiety, and depression after the death of her adult son 3 years ago in a motor vehicle accident. She was diagnosed with community acquired PNA (CAP) and admitted to acute care for the third time in twelve months. Her hospital course was unremarkable and she was treated with **Bilevel Positive Airway Pressure (BiPAP)**, antibiotics, prednisone, and **nebulizers**. She continued to require increased supplemental O_2 between 4-5L to maintain an O_2 saturation above 92%. Once stable, the patient was transferred to a short-term rehabilitation facility for continued medical management and rehab efforts.

Reason for OT Referral:

Mrs. M. has decreased endurance and is functioning below her baseline. She continues to have shortness of breath with minimal activity and is requiring an increase in O_2 from her baseline. The initial plan is for her to return home and resume her normal routine. She is being referred to OT for an evaluation in order to assess her current status, develop a plan of care, and provide appropriate interventions and education to support a safe discharge home and minimize future hospitalizations.

OT Initial Assessment:

The evaluation to ascertain Mrs. M.'s background and current functional status is conducted in her room via informal interview, observation, and the Functional Independence Measure (FIM). Mrs. M. is greeted resting on her bed in a hospital gown. The head of the bed is in an elevated position and she is watching TV. She is on 4L O_2 via nasal cannula and appears comfortable. She reports being anxious about the evaluation as she gets tired very quickly but she agrees to participate as tolerated.

She is married and lives with her husband in a 2 level home with 3 stairs to enter and a rail on the right side. She is on disability and her husband works part-time, mostly afternoon/evening shifts. Prior to admission, the patient was independent (I) with mobility without an assistive device, and functioning at a moderate independent (Mod I) level for bathing and dressing, although she reports that her husband has needed to help more recently, particularly her lower body bathing (LBB) and dressing (LBD). She typically removes her O_2 for showers and reports feeling very short of breath and tired afterwards. The patient's bedroom and

bathroom are on the second floor. She typically uses a tub/shower combination with a tub seat, hand-held shower hose, and a grab rail, but she also uses the half-bath downstairs during the day to minimize the use of stairs. She has no other medical devices and uses a regular bed.

Her husband does the grocery shopping and heavier household chores, and the patient tries to do all the meal prep and laundry although has required more assistance from her husband in recent weeks. The patient states that she likes to keep a nice home and do housework, especially vacuuming, but this is getting harder due to her respiratory status. She does not like to be idle because it gives her too much time to think and she gets sad about her son's death. She has a strong faith but is not part of a specific church community. She has persistently deferred seeing a psychiatrist for her depression despite her primary care physician's recommendation. She enjoys playing games on her iPad, watching TV, and going to Foxwoods casino, although this hasn't been possible this past year due to her medical status and frequent hospitalizations. Her husband is very supportive but continues to smoke in the house.

During the initial OT interview, Mrs. M. appeared to be comfortable at rest and only mildly short of breath while talking with a respiration rate (RR) of 18 and an O_2 sat of 93% on 4L. She appeared weak getting to the edge of the bed and when attempting to stand, but was able to slowly transfer to a bedside chair with close supervision (CLS) and a rolling walker. However, Mrs. M. became increasingly short of breath while ambulating 15 feet to the bathroom and her O_2 decreased to 87%. She became anxious and was instructed to perform seated pursed-lip breathing. She benefitted from a visual demonstration and verbal cues for 2 minutes in order to maintain consistency with the technique and her O_2 level increased to 93%. Her supplemental O_2 was increased to 5L with activity and Mrs. M. was able to participate in toileting and seated sponge-bathing and dressing tasks, but only stood as needed. She required increased time with all ADL tasks and benefitted from moderate assistance (Mod A) for both LBB and LBD due to shortness of breath with increased activity demand. Her O_2 saturations were monitored throughout the evaluation process using a pulse oximeter, and ranged between 88-91%. She needed frequent cueing to apply pursed-lip breathing technique and minimize her shortness of breath due to impaired gas exchange. A basic cognitive screen using the Mini Mental State Examination (MMSE) indicated that Mrs. M. was alert and oriented x 3, able to follow multi-step directions, and both short- and long-term memory was intact. She verbalized anxiety about her increased shortness of breath and current need for more oxygen. She also expressed concern and feelings of depression about her frequent hospitalizations this year and how much her health is affecting her husband's life.

OT Problem List:

- Limited activity tolerance impacting mobility and participation in ADLs/IADLs
- Limited knowledge of O_2 use, energy-conservation education, and effective pacing strategies
- Increased anxiety with shortness of breath impacting ability to manage breathing and apply appropriate pursed-lip breathing techniques
- Increased signs of depression associated with a decline in function and potential caregiver burden
- Limited knowledge of available adaptive equipment (AE) to assist with ADLs
- Limited knowledge of community-based resources
- Exposure to second hand smoke due to her husband's ongoing tobacco use in the home

OT Plan of Care (POC):

Anticipated length of stay: 2 weeks

Duration and frequency of OT sessions: Approximately 60 minutes per day, 5-6 x per week.

OT Goals (Anticipated timeframe – 2 weeks):

- Patient will complete all steps of toileting routine with modified independence (Mod I) and appropriate application of pursed-lip breathing technique
- Patient will complete shower routine with Mod I sitting/standing as tolerated with appropriate use of adaptive equipment (AE) and application of pursed-lip breathing technique
- Patient will complete dressing routine sitting/standing as tolerated with Mod I, appropriate use of AE, and application of pursed-lip breathing technique
- Patient will complete safe tub transfer with Mod I and appropriate use of durable medical equipment
- Patient will complete simple meal prep or laundry folding task with Mod I, appropriate energy conservation strategies, and application of pursed-lip breathing technique
- Patient will purchase adaptive equipment to maximize functional independence with ADLs upon discharge home
- Patient will explore relaxation strategies and independently use an appropriate technique to minimize anxiety with increased shortness of breath
- Patient will participate in disease management and lifestyle balance strategies
- Patient and husband will be provided with community resources regarding smoking cessation

- Patient will tolerate 15 minutes daily upper extremity (UE) exercise in order to increase general activity tolerance and performance in ADLs/IADLs

Interprofessional Communication:

Physical Therapy (PT): Discussed Mrs. M.'s OT plan of care and goals in order to develop a coordinated, collaborative effort with PT to build strength, activity tolerance, and functional mobility. Participated in daily communication to provide updates, reinforce consistent educational material, and coordinate efforts to minimize schedule conflicts.

Nursing: Discussed Mrs. M.'s ADL goals and provided rationale for allowing her to practice her newly acquired energy conservation skills during all tasks so that she could improve her functional status and perform her bathing, dressing, and toileting tasks at a Mod I level by discharge. Both nursing and nursing assistants were encouraged to cue Mrs. M. to self-pace, apply pursed-lip breathing, and use adaptive equipment (AE) as needed.

Pulmonary Rehab: Discussed Mrs. M.'s OT plan of care and determined pulmonary rehab's schedule for nebulizer treatments in order to coordinate efforts and minimize schedule conflicts.

Social Work: With Mrs. M.'s permission, a referral was made to Social Work services. Discussed the need for smoking cessation material, community resources, and support due to her husband's ongoing tobacco use.

MD: Discussed evaluation results and requested O_2 parameters prior to initiating services. Provided ongoing updates throughout Mrs. M.'s stay regarding her functional status, O_2 needs with activity, shortness of breath and response to breathing strategies, as well as her progress towards long-term goals. Also discussed Mrs. M.'s report of depression following the death of her son and potential need to see psychiatry.

Spiritual Care: With permission from Mrs. M. a referral was made to Spiritual Care services with particular concern regarding her continued grieving over the loss of her son three years ago.

Case Manager: Ongoing communication throughout Mrs. M.'s stay regarding her OT plan of care, goals, and recommendations for a safe discharge home with continued OT services.

Interventions:

Mrs. M.'s treatment plan consisted of increasing her functional mobility and activity tolerance through both ADLs and IADLs in order to maximize her functional independence and minimize the potential for caregiver burden. It was of primary importance to include education for disease management, energy conservation skills, ventilation strategies, and adaptive equipment use via all tasks so that she could better manage her condition and prepare for a safe discharge home.

Mrs. M. was encouraged to plan her activities in advance in order to decrease the need for extraneous mobility. She was also encouraged to pace herself throughout the task rather than rush, sit for tasks if possible, and apply appropriate breathing techniques to minimize shortness of breath. She was instructed on how to include pursed-lip breathing technique throughout her daily activities, and given energy conservation strategies to perform her tasks more efficiently and with less fatigue. Discussion about the benefits of adaptive equipment (AE) was embedded into her ADL routine and she was encouraged to trial recommendations for a reacher, a long-handled shoe-horn, a sock aide, and a long-handled sponge. After practicing, Mrs. M. decided to purchase all recommended items as she noticed less shortness of breath when she minimized the need to bend frequently to reach her feet during her ADLs. Mrs. M. was also instructed on the importance of using her O_2 for all activities, including showering, as this was a particularly demanding physical activity for her. While initially hesitant, she understood the rationale, and after several trials realized she was significantly less short of breath and fatigued. Once she had mastered her daily ADL routine more efficiently and independently, she more confidently participated in meaningful IADL activities. Energy conservation and work simplification strategies were included in beverage and meal prep activities, as well as light housekeeping allowing Mrs. M. to perform tasks more efficiently and confidently without significant shortness of breath.

Providing both Mrs. M. and her husband with education to help manage COPD was important to ensure less frequent hospitalizations. The impact of second hand smoke on compromised lungs from Mr. M.'s continued tobacco use was explained. He was unable to commit to stopping but he agreed to review the smoking cessation literature provided and stop smoking inside the house. The early signs and symptoms of a COPD exacerbation or the development of PNA were also discussed and Mrs. M. was encouraged to seek medical assistance as soon as possible rather than wait for symptoms to worsen. Both Mrs. M. and her husband verbalized understanding of the rationale for early action.

Mrs. M. was also provided with an UE exercise program to improve her general endurance. She was provided with a handout and after several sessions with visual and verbal cues, she was able to manage the routine independently and apply appropriate breathing strategies. Mrs. M. verbalized her understanding of the importance of maintaining general endurance and agreed to continue the exercise routine after discharge. She also agreed to trying a local outpatient pulmonary rehab program once she had successfully transitioned home and was able to manage community outings.

Mrs. M. also expressed an interest in exploring relaxation strategies to address some of her anxiety associated with her breathing limitations. She was introduced to diaphragmatic breathing and progressive muscle relaxation strategies but stated a preference for guided imagery/meditation via pre-recorded CDs that she was able to trial during her stay in rehab. She agreed to purchase and download several on her smartphone to use at home.

Discharge:

Mrs. M. met all her long-term goals by the anticipated date and was discharged home at a Mod I level of function for all her ADLs and simple IADLs. She agreed to OT services upon discharge to ensure a safe transition home, apply her new strategies in her own environment, and continue to build activity tolerance via higher level IADLs so that she could perform these meaningful tasks to a satisfactory level.

CASE STUDY #2

PNA (Home Care Setting)

History of presenting information (HPI):

Mr. E. is an 81-year-old male with a past medical history significant for hypertension, Parkinson's disease (well managed), and chronic back pain who is hard of hearing and lives in an independent living facility with his wife who has mild dementia. Three weeks ago he was transferred to the hospital due to the sudden onset of a fever with chills and malaise, as well as a harsh, productive cough. Upon admission, his sputum was noted to be yellow, he had difficulty breathing with a respiration rate of 28, a pulse of 120, a temperature of 101.2, and his O_2 saturation was 86% on room air. His white blood count (WBC) was elevated and a chest X-ray revealed a right middle lobe **pleural effusion** consistent with PNA. Due to his advanced age and weakened condition, Mr. E. was admitted and treated with antibiotics and supplemental oxygen. Once stable he was transferred to a skilled nursing facility for continued medical management and rehab efforts where he received OT services 5 x per week for 10 days until ready for discharge home.

Reason for OT Referral:

While Mr. E. made good progress in therapy and was considered medically stable for a safe discharge home, his OT at the rehab facility recognized that he was not at his baseline and recommended home care services in order to continue addressing his strength, endurance, and mobility in an effort to return him to a satisfactory level of function.

OT Initial Assessment:

The initial evaluation to ascertain Mr. E.'s background and current functional status is conducted via informal interview, observation, mobility assessment, the Barthel Index (BI) to assess ADL status, the Short Portable Mental Status Questionnaire (SPMSQ) to assess cognition, and the Missouri Alliance for Home Care test (MAHC-10) to assess fall risk. It was conducted in Mr. and Mrs. E.'s home at the independently living facility; a single level studio apartment with a kitchenette/diner and separate bedroom and bathroom with a shower stall. Mrs. E. was present throughout the evaluation but only contributed when addressed directly. Mr. E. was greeted in his pajamas and dressing gown sitting in a recliner on room air with his legs elevated. He was pale and reported fatigue despite just waking up but did not exhibit any signs of respiratory distress. He was agreeable to the evaluation.

This is a second marriage for Mr. and Mrs. E. who both lost spouses to cancer. They have been married for 20 years but have only lived at the independent living facility for 7 months and still feel like they are acclimating to the change. Prior to his recent hospitalization, Mr. E. was modified independent (Mod I) with mobility using a 4-wheeled rollator both in the apartment and the community. He was able to complete his toileting and grooming independently but had assistance from his wife for shower transfers and dressing. He uses a shower stall with a seat and a grab rail and although he reports that he was capable of bathing unassisted he states that he prefers to have someone present for showers, particularly when doing the transfer. He also reports that he is capable of dressing unassisted but it is easier to let his wife help don his socks and shoes. He uses a regular bed and has a grab rail next to the toilet, but otherwise uses no other adaptive equipment. Mr. E. takes all his meals in the dining room on the first floor, which is accessed via an elevator approximately 150 feet from the apartment. He shared that being able to socialize with other residents during meals and participating in other social events are very important to him. He particularly enjoys movie nights and the monthly themed happy hour. He is concerned that he may be too weak to continue this aspect of community living. His wife likes to stay busy and performs all beverage or snack preparation as needed. Neither husband or wife drive any more but they like to participate in the facility's van trips to the grocery store or other outings to local restaurants. The couple's adult sons help with transportation to medical appointments. They have housekeeping services 1 x per week and a member of staff monitors medications. Mr. E. likes watching the Red Sox and reading the newspaper.

During the initial OT interview, Mr. E. appeared to be comfortable at rest with no significant shortness of breath while speaking. He was able to stand to his rollator without need of assistance, but reported that his legs still felt weak. He completed the MAHC test with a score suggesting that he is at risk for falls, although he has no prior history. Mr. E. was able to ambulate approximately 25 feet to the bathroom and complete his toileting routine unassisted before

washing his hands and face standing at the sink, although he required increased time to complete each step. He subsequently requested a further 5 minute seated rest break due to fatigue before performing a shower stall transfer where he benefitted from contact guard assistance (CGA) to maintain adequate balance while stepping over the lip of the stall and reaching for the grab rail. He required an additional 2 minutes to sit on the shower seat and rest prior to transferring out of the stall and ambulating back to his recliner. He reported moderate fatigue and mild increase in shortness of breath with exertion, which he stated was very frustrating. In completing a dressing routine, he was able to independently don an undershirt and button down shirt but required increased time for buttoning, reporting that his hands felt weak and clumsy since being hospitalized. He required moderate assistance (Mod A) to complete his LBD tasks sitting/standing as tolerated. He was able to feed his feet through both pant legs before standing to hike, button, and buckle his belt, but he did exhibit increased shortness of breath bending forward and reported that it felt like a lot of effort. He requested assistance to don his socks and shoes. Using the Barthel Index in addition to observation, it was evident that Mr. E.'s main deficits were in the areas of bathing and dressing and that endurance was a limiting factor. In recording vitals pre and post activity, Mr. E's RR remained in the 18-20 range, his HR approximately 90-96, and his O_2 sat was between 90-94% on room air. Mr. E. also participated in the SPMSQ test with 4 errors that scored him in the mild intellectual impairment range with short-term memory deficits suggesting potential for new learning but that he may require increased time and repetition. Throughout the evaluation process, he was able to sustain attention to task and follow 1-2 step directions. Mr. E. expressed that his limitations were depressing him and that he was concerned about his wife feeling burdened in caring for him. His medical record stated chronic back pain, but Mr. E. stated that this was not a limiting factor. He requested that he continue using Tylenol and a heating pad as needed. He deferred alternative pain management options.

OT Problem List:

- Limited activity tolerance impacting mobility and participation in ADLs/IADLs
- Limited knowledge of energy-conservation education, effective pacing strategies, and ventilation techniques impacting performance in ADLs and participation in IADLs
- Limited knowledge of available adaptive equipment to assist with ADLs
- Increased signs of depression associated with a decline in function and potential caregiver burden
- Limited strength, including hand strength and fine motor control, impacting ADL performance
- Limited knowledge of fall prevention techniques
- Limited knowledge of PNA, including relevant signs and symptoms

OT Plan of Care (POC):

Anticipated length of OT services: 6 weeks

Duration and frequency of OT sessions: Approximately 45-60 minutes, 2 x per week.

OT Short-term Goals (Anticipated timeframe – 3 weeks):

- Patient will complete safe shower stall transfer with Supervision (S) and verbal cues to appropriately use durable medical equipment (DME)
- Patient will complete shower routine with Supervision (S) sitting/standing as tolerated with appropriate use of adaptive equipment (AE) and verbal cues for energy conservation strategies including ventilation techniques as needed
- Patient will complete dressing routine sitting/standing as tolerated with Supervision (S) and verbal cues for appropriate energy conservation strategies, ventilation techniques, and use of AE as needed
- Patient will tolerate 15 minutes continuous standing to complete shaving routine sink-side with Supervision (S) and verbal cues for appropriate energy conservation strategies, including ventilation techniques as needed
- Patient will complete a simple beverage/snack prep with Supervision (S) and verbal cues for appropriate energy conservation strategies including ventilation techniques as needed
- Patient will participate in disease management education in order to monitor signs and symptoms of acute respiratory distress requiring immediate medical attention
- Patient will participate in fall prevention education in order to maximize safety
- Patient will tolerate 10 minutes daily upper extremity (UE) exercise in order to increase general activity tolerance and performance in ADLs/IADLs
- Patient will tolerate 10 minutes daily fine motor exercises in order to increase dexterity and performance in ADLs/IADLs

OT Long-term Goals (Anticipated timeframe – 6 weeks):

- Patient will complete safe shower stall transfer with Supervision (S) and appropriate use of durable medical equipment (DME)
- Patient will independently (I) complete shower routine sitting/standing as tolerated with

appropriate use of adaptive equipment (AE) and energy conservation strategies including ventilation techniques as needed

- Patient will independently (I) complete dressing routine sitting/standing as tolerated with appropriate application of energy conservation strategies, ventilation techniques, and use of AE as needed
- Patient will tolerate 15 minutes continuous standing to independently (I) complete shaving routine sink-side with appropriate application of energy conservation strategies, including ventilation techniques as needed
- Patient will independently (I) complete a simple beverage/snack prep with appropriate energy conservation strategies including ventilation techniques as needed
- Patient will participate in disease management education and be able to verbalize strategies to monitor signs and symptoms of acute respiratory distress requiring immediate medical attention
- Patient will participate in fall prevention education in order to maximize safety
- Patient will tolerate 15-20 minutes daily upper extremity (UE) exercise in order to increase general activity tolerance and performance in ADLs/IADLs
- Patient will tolerate 15-20 minutes daily fine motor exercises in order to increase dexterity and performance in ADLs/IADLs

Interprofessional Communication:

Primary Care Physician (PCP): Discussed evaluation results and rationale with request for continued OT services 2 x pw for 6 weeks. PCP agreed with plan of care and provided verbal order.

Physical Therapy (PT): Discussed Mr. E.'s OT plan of care and goals in order to develop a coordinated, collaborative effort with PT to build strength, activity tolerance, and maximize functional mobility and safety. Participated in frequent communication to provide updates, reinforce consistent educational material, and coordinate efforts to minimize schedule conflicts.

Nursing: Discussed Mr. E.'s evaluation results including deficits, goals, and rationale for OT services. Discussed potential risk for falls, depression, and caregiver burden. Participated in frequent communication to provide updates, reinforce consistent educational materials, and monitor for signs and symptoms of depression or caregiver burden.

Independent Living Facility Aides: Discussed evaluation results including Mr. E's goals to return to baseline level of function for ADLs. Discussed OT plan of care and recommendations to maximize functional independence with use of adaptive equipment and energy conservation strategies.

Independent Living Facility Resident Programs Coordinator: Discussed evaluation results and deficits impacting participation in social/community activities, including options to incorporate energy conservation strategies and encourage participation.

Interventions:

Mr. E.'s treatment plan consisted of increasing his activity tolerance and functional mobility through both ADLs and IADLs in order to maximize his functional independence and minimize the potential for depression associated with loss of function or caregiver burden. It was of primary importance to include education for disease management, energy conservation skills, ventilation strategies, and adaptive equipment use via all tasks so that he could better manage his condition and return to a satisfactory baseline level of function.

Mr. E. was encouraged to plan his activities in advance in order to decrease the need for extraneous mobility while he was still building up his activity tolerance. He was encouraged to include both ADLs and community leisure activities into his daily schedule in order to plan for tasks, include adequate rest breaks, and create a balance of necessary and meaningful occupations. He was also encouraged to pace himself through all tasks, sit when possible, and apply appropriate breathing techniques if he experienced shortness of breath. Mr. E. was instructed on how to include pursed-lip breathing technique and given energy conservation strategies to perform tasks more efficiently and with less fatigue. Discussion about the benefits of adaptive equipment was embedded into his ADL routine and he was encouraged to trial recommendations for a reacher, a long-handled shoe-horn, a sock aide, and a long-handled sponge. After practicing, Mr. E. noticed less shortness of breath when minimizing the need to bend frequently to reach his feet during his bathing and dressing tasks. He decided to purchase all recommended items except the shoe-horn because his son purchased easy to don slip-on shoes. Once Mr. E. had mastered his daily ADL routine more efficiently and independently, he was more confidently able to participate in meaningful IADL activities, including retrieving drinks or snacks from the apartment's kitchenette, selecting clothes from the closet or dresser, and warming a heating pad in the microwave when his back was sore. Energy conservation and work simplification strategies were included allowing Mr. E. to perform IADL tasks more efficiently and confidently without significant fatigue or shortness of breath.

Providing Mr. E. with education to self-monitor for signs and symptoms of respiratory distress was important to minimize the risk of PNA and further hospitalizations in the future. Mr. E. was encouraged to seek medical assistance as soon as possible rather than

wait for symptoms to worsen or rely on community staff to notice changes. He was also educated regarding fall prevention strategies and safety recommendations were made, including use of a cable organizer and adequate lighting at night.

Mr. E. was also provided with an UE exercise program to improve his overall endurance. He was issued a handout and a light resistance theraband and after several sessions with visual and verbal cues, he was able to manage the routine independently and apply appropriate breathing strategies as needed. He verbalized his understanding of the importance of exercise in maintaining general endurance and although stated that he disliked exercising he agreed to continue the routine. His wife verbalized that she did enjoy exercise and her inclusion in the training increased Mr. E.'s compliance. Given his general dislike for exercises, he was provided with a list of activities to help him increase his hand strength and fine motor control. These included opening/closing containers, picking up/placing coins, using the TV remote or cell phone, turning newspaper pages, buttoning shirts, playing cards, and writing.

Discharge:

For the first week, Mr. E. used a wheelchair to go down to the dining room for meals or community events, but as his strength and endurance increased he was able to safely ambulate independently with his rollator and initiate seated rest breaks as needed. He met all his long-term goals by the anticipated date and was discharged from OT services at a Supervision level for shower stall transfers, and an Independent level of function for bathing, dressing, and simple IADLs. He agreed to join his wife in the community's exercise group to maintain his strength and endurance, and he was motivated to participate in the monthly health tasks at the facility to learn more about disease management and take more responsibility for his own health and well-being.

CASE STUDY #3

ARDS (Long-term Acute Care Setting)

History of Presenting Information (HPI):

Mr. C. is a 51-year-old male with a past medical history significant for hypertension and hyperlipidemia who presented to the ER with worsening shortness of breath x 2 days, sudden fever, a productive cough with green sputum, and altered mental status (per his wife). Upon admission he was **hypoxic** with an O_2 saturation of 64% on room air, BP 101/54, RR of 24, and HR of 111. BiPAP was attempted unsuccessfully requiring intubation and he was transferred to the intensive care unit (ICU) but failed to respond to conventional treatment. He remained in critical condition and his breathing continued to deteriorate requiring a tracheostomy for continued mechanical ventilation and a nasogastric tube (NGT) placement to support his nutritional needs. His medical work up was indicative of ARDS secondary to **sepsis**. While in the ICU, he experienced prolonged sedation to minimize the work of his respiratory muscles and his hospital course was further complicated by a pneumothorax, edema, an episode of hospital acquired PNA (HAP), and acute renal failure. After 3 weeks he was deemed stabilize enough to slowly wean from the ventilator. However, he remained significantly debilitated and his respiratory function remained compromised. Following a **bronchoscopy**, his pulmonologist decided to maintain the tracheostomy at this time with supplemental O_2 via a nasal cannula in case of complications and the need for re-intubation while he transitioned to a long-term acute care facility.

Reason for OT Referral:

Although considered stable, Mr. C. was transferred to a long-term acute care hospital (LTACH) as he was functioning well below his baseline with significantly decreased strength, endurance, and mobility, and he still required medical management. He continues to have a trach tube in place and uses a **Passy-Muir valve®** to communicate, but experiences shortness of breath with minimal activity and still requires 6L O_2 via a nasal cannula to maintain adequate O_2 saturations. The NGT remains in place but he has begun feeding trials with Speech Language Pathology (SLP). He is currently requiring assistance for all his ADLs and continues to have a **Foley catheter** in place. The plan is for Mr. C. to return home to participate in his normal routine as able with family support as needed. His ultimate long-term goal is to return to full-time work once he has successfully transitioned home. He is being referred to OT for an evaluation in order to assess his current status, develop a plan of care, and provide appropriate interventions and education to support a safe discharge.

OT Initial Assessment:

The evaluation to ascertain Mr. C.'s background and current functional status is conducted in his room via informal interview, observation, and the Functional Independence Measure (FIM). Mr. C. is greeted resting in bed with his eyes closed and the TV off. He is wearing a hospital gown and the head of the bed is in an elevated position. A Passy-Muir valve® is capping his trach tube and he is on 6L O_2 via nasal cannula. He opens his eyes upon greeting and readily agrees to the evaluation stating that he is sick of hospitals and willing to do anything to get home.

He is married and lives with his wife of 22 years in a 2 level home with 2 stairs enter but no rail. He has two children living at home, a boy aged 11 and a girl aged 16. They also have a family dog. Mr. C. works full-time in construction as a supervisor and his wife works part-time as a dental hygienist, although she is willing

to take some leave in order to support his transition home. Prior to admission, the patient was independent (I) for mobility and all ADLs and IADLs. He reports that he works long hours and no longer has time for exercise or leisure activities. His only hobby now is watching sports on TV and occasionally walking the family dog if no else is available. The patient's bedroom and bathroom are on the second floor. He uses a tub/shower combination for standing level bathing and he has no adaptive equipment.

The patient's wife does most of the grocery shopping, meal prep and household tasks, but Mr. C. reports that he tries to help out with the heavier chores as needed and he does all of the yard work, including mowing the lawn. He reports feeling very frustrated about his prolonged hospitalization and somewhat depressed about his loss of function and identified roles, but he refers to the experience as a "wake up call." He states that he still gets nightmares from his time in the ICU and is motivated to live a more balanced life with less stress upon discharge. He also reports that his thinking is still "fuzzy from the ICU" and he has a hard time concentrating for any length of time. He hopes that he will regain both his cognitive skills and function by participating in therapy as his long term goal is to return to work.

During the initial OT interview, Mr. C. appeared to be comfortable at rest and only mildly short of breath while talking with a respiration rate (RR) of 18 and an O_2 sat of 94% on 6L. He appeared weak getting to the edge of the bed and required minimal assistance (Min A) to complete appropriate sitting balance. Once in midline, he was able to support himself with close supervision but visibly fatigued and used his upper extremities to provide additional support. When standing and transferring to a bedside chair he also required Min A and a rolling walker. Mr. C. was notably fatigued with increased shortness of breath with minimal activity demand and stated that he was looking forward to getting back into bed. He was educated about the value of early mobilization and the importance of sitting out of bed more often to build endurance and he agreed with the recommendation. He ambulated approximately 10 feet into the bathroom with Min A and the rolling walker in order to complete a toilet transfer but his O_2 decreased to 88% and he required 3-4 minutes to recover before standing again. He was instructed to perform seated pursed-lip breathing to maximize recovery and decrease his work of breathing, and his O_2 level increased to 92%. With increased time and pacing cues, Mr. C. was able to participate in a sponge-bathing routine sitting/standing as tolerated, and benefitted from moderate assistance (Mod A) for both LBB and LBD due to shortness of breath with increased activity demand and reaching. His O_2 saturations were monitored throughout the evaluation process using an oximeter, and ranged between 87-92%. He needed frequent rest breaks and cueing to apply pursed-lip breathing technique to minimize his shortness of breath. A basic cognitive screen indicated that Mr. C. was alert and oriented x 3 when provided with options for the name of the facility and location. He was able to follow simple 1-2 step directions, but his short-term memory was impaired. His ability to sustain attention declined as he fatigued. Additionally, as his performance declined, he verbalized more feelings of frustration and depression about his slow recovery and ongoing reliance on supplemental oxygen. He also expressed concern about the effect his prolonged hospitalization is having on his family and whether his cognitive status would impact his return to work.

OT Problem List:

- Limited core strength and activity tolerance impacting functional mobility and participation in all ADLs
- Prolonged use of a Foley catheter impacting bladder control and toileting routine
- Limited knowledge of energy-conservation education, effective pacing strategies, and ventilation techniques impacting performance in functional mobility and ADLs
- Limited knowledge of O_2 cord management with mobility impacting safety
- Limited knowledge of available adaptive equipment to assist with ADLs
- Increased signs of acute stress disorder associated with prolonged sedation and time in the ICU
- Increased signs of depression associated with a significant decline in function, loss of role, and potential caregiver burden
- Limited bilateral UE strength, including hand strength and fine motor control, impacting ADL performance
- Decreased attention, ability to concentrate, and problem-solving skills impacting potential for new learning

OT Plan of Care (POC):

Anticipated length of stay: 4 weeks

Duration and frequency of OT sessions: Approximately 30-45 minutes, 5-6 x per week.

OT Short-term Goals (Anticipated timeframe – 2 weeks):

- Patient will complete all steps of toileting routine with close supervision (CLS) and adaptive device (AD) as needed via bedside commode
- Patient will complete sponge-bathing routine sink-side with CLS sitting/standing as tolerated with appropriate use of adaptive equipment (AE) and application of pursed-lip breathing technique as needed

- Patient will complete dressing routine sitting/standing as tolerated with CLS, appropriate use of AE, and application of pursed-lip breathing technique as needed
- Patient will tolerate 10 minutes continuous standing with CLS while performing sink-side grooming tasks in order to increase standing balance/tolerance
- Patient will complete safe tub transfer with contact guard assistance (CGA) and appropriate use of durable medical equipment
- Patient will tolerate standing level beverage prep with CLS, assistive device, and appropriate energy conservation strategies
- Patient will participate in 30-minute leisure activity via Wii sports in order to increase standing balance/tolerance
- Patient will tolerate 15 minutes daily upper extremity (UE) exercise in order to increase general activity tolerance and performance in ADLs/IADLs

OT Long-term Goals (Anticipated timeframe – 4 weeks):

- Patient will complete all steps of toileting routine in bathroom with modified independence (Mod I) and appropriate application of pursed-lip breathing technique as needed
- Patient will complete shower routine with Mod I sitting/standing as tolerated with appropriate use of adaptive equipment and application of pursed-lip breathing technique as needed
- Patient will complete dressing routine sitting/standing as tolerated with Mod I, appropriate use of adaptive equipment, and application of pursed-lip breathing technique as needed
- Patient will complete safe tub transfer with Mod I and appropriate use of durable medical equipment
- Patient will complete simple meal/beverage prep with Mod I and appropriate energy conservation strategies
- Patient will purchase adaptive equipment/durable medical equipment to maximize functional independence with ADLs upon discharge home
- Patient will explore healthy leisure activities and stress management techniques in order to establish lifestyle balance upon discharge
- Patient and family will participate in disease management education
- Patient will tolerate 30 minutes daily upper extremity (UE) exercise in order to increase general activity tolerance and performance in ADLs/IADLs

Interprofessional Communication:

Physical Therapy (PT): Discussed Mr. C.'s OT plan of care and goals in order to develop a coordinated, collaborative effort with PT to build strength, activity tolerance, and functional mobility. Participated in daily communication to provide updates, reinforce consistent educational material, and coordinate efforts to minimize schedule conflicts.

Speech-Language Pathology: Discussed evaluation and plan of care in terms of limitations impacting self-feeding with recommendations and goals to improve function. Discussed SLP's plan of care in order to develop a coordinated and collaborative effort.

MD: Discussed evaluation results and requested O_2 parameters prior to initiating services. Discussed timeline for removal of NGT and Foley catheter, as well as O_2 weaning process and **decannulation** of the trach tube. Provided ongoing updates throughout Mr. C.'s stay regarding his functional status, O_2 needs with activity and response to breathing strategies, as well as his progress towards long-term goals. Also discussed referral to psychiatry due to Mr. C's report of ongoing nightmares and feelings of depression associated with prolonged sedation and extended hospitalization.

Nursing: Discussed Mr. C.'s ADL goals and provided rationale for allowing him to participate in all steps of routine sink-side when able. Encouraged inclusion of energy conservation skills and use of adaptive equipment/durable medical equipment during all tasks so that he could improve his functional status and perform his bathing, dressing, and toileting tasks at a Mod I level by discharge.

Respiratory Therapy: Discussed respiratory plan of care to continue weaning process in anticipation of eventual decannulation. Provided ongoing updates throughout Mr. C.'s stay regarding his shortness of breath and O_2 needs with functional activity, and his response to breathing strategies.

Pulmonary Therapy: Discussed Mr. C.'s OT plan of care and determined pulmonary rehab's schedule for medication and/or therapy in order to coordinate efforts and minimize schedule conflicts.

Case Manager: Ongoing communication throughout Mr. C.'s stay regarding his OT plan of care, goals, and recommendations for a safe discharge home with continued OT services.

Psychiatry: Discussed Mr. C's report of ongoing nightmares and feelings of depression associated with prolonged sedation and hospitalization, including the impact on cognition and function. Discussed adjunctive strategies to minimize anxiety and depression.

Interventions:

Mr. C.'s treatment plan consisted of increasing his functional mobility and activity tolerance through both ADLs and IADLs in order to maximize his functional independence and minimize the potential for caregiver burden upon discharge. It was of primary importance to also address his cognitive status, including his attention to task, ability to follow multi-step directions, and problem-solving skills through both familiar routine tasks and more challenging scenarios. His education also included energy conservation skills, ventilation strategies, adaptive equipment use, and O_2 cord safety via all tasks so that he could begin to see progress towards independence, minimize his need for assistance, and prepare for a safe discharge home.

With the removal of the Foley catheter on day 2, Mr. C. experienced frequent episodes of urinary urgency and two episodes of incontinence. He found these experiences very embarrassing and he verbalized frustration with his ongoing need to have assistance to get to the bathroom. It was recommended that he use a urinal and a bedside commode as a short-term measure in order to promote bladder control and help him to feel more independent. As his endurance improved and O_2 cord management was implemented, he was able to safely ambulate with supervision and a rolling walker to the bathroom. He slowly progressed to performing all toileting tasks at a Mod I level.

With the removal of the NGT and an upgraded diet by SLP, Mr. C. was encouraged to take all meals sitting out of bed to increase his sitting tolerance and ventilation capacity. He initially struggled to maintain a consistent out of bed routine due to fatigue and tired easily while self-feeding but was able to slowly increase his endurance for out of bed activities.

He was initially encouraged to participate in all aspects of sponge-bathing tasks sitting at the edge of the bed or in his chair with a short-term goal of completing all his bathing routine sink-side until he was able to tolerate a shower. A routine was established and the plan of care discussed with nursing staff, including nursing aides, to minimize bed level ADLs. He was encouraged to pace himself throughout his ADL routine, sit for tasks if possible, and apply appropriate breathing techniques to minimize shortness of breath. He was instructed on how to include pursed-lip breathing technique throughout his daily routine, and given energy conservation strategies to perform his tasks more efficiently and with less fatigue. Discussion about the benefits of adaptive and durable medical equipment was embedded into his ADL routine and he was encouraged to trial recommendations for a reacher, a long-handled shoe-horn, a sock aide, and a long-handled sponge, along with a tub seat and grab rails for showers. After practicing, Mr. C. decided to defer purchase until closer to discharge in the hope that he would not need them. He agreed to use the equipment as needed in the interim. After two weeks of therapy, he was able to demonstrate increased activity tolerance but still only stood as tolerated. He also improved his functional reach but still benefitted from using the adaptive equipment to complete his LBB and LBD tasks as bending continued to increase his work of breathing, which he found uncomfortable. While undergoing the O_2 weaning process, Mr. C. was also instructed on the importance of using O_2 for all demanding activities while he continued to build up his strength and endurance. This included using O_2 while showering as this was a particularly demanding physical activity for him. By discharge, he was still performing his ADL routine sitting/standing as tolerated but no longer required the adaptive equipment to reach his lower extremities. He initially required assistance to complete a safe tub transfer but progressed to a Mod I level, still using a grab rail and tub seat to maximize safety and functional independence. He decided to purchase a tub seat and have a grab rail installed for discharge but decided against purchasing any further adaptive equipment.

Once Mr. C. had mastered his daily ADL routine more efficiently with CLS to monitor his respiratory status and provide cues as needed, he more confidently participated in meaningful IADL activities. Energy conservation and work simplification strategies were included in both simple beverage and meal prep activities allowing Mr. C. to perform tasks more efficiently and confidently without significant shortness of breath. Additionally, all IADL tasks were graded as needed to increase Mr. C.'s ability to follow multi-step directions and facilitate problem-solving skills.

Mr. C. was agreeable to stress management education and the exploration of strategies to create a more balanced lifestyle upon discharge. He agreed to trial leisure options, and regularly participated in Wii golf and bowling during his hospitalization, which helped him to increase his standing balance and tolerance while also engaging in a fun leisure activity that he could continue with his family upon discharge. Mr. C. also agreed that he could also walk the dog on a daily basis and explore options to get involved in his children's extracurricular sports activities.

Mr. C. was also provided with an UE exercise program to improve his general strength and endurance. He was initially frustrated by his debilitation and reluctant to perform exercises with "easy" weights but he was encouraged to use them until he was able to tolerate more advanced options. He was provided with a handout and was able to manage the routine independently with good application of breathing strategies. By discharge, Mr. C. had progressed to using "heavy" resistance bands and 8lb hand weights. Mr. C. verbalized his understanding of the importance of maintaining general endurance and agreed to continue the exercise routine after discharge, using heavier

weights as tolerated. He also agreed to explore local gyms once he had successfully transitioned home and was able to manage community outings.

Discharge:

Mr. C. was decannulated after 2 weeks, weaned from supplemental O_2 after 3 weeks, and met his long-term therapy goals by the anticipated date. He was discharged home at a Mod I level of function for all his ADLs and simple IADLs. He agreed to OT services upon discharge to ensure a safe transition home and to continue building activity tolerance via higher level IADLs so that he could eventually return to his prior functional status and complete his recovery by returning to work full-time.

CONCLUSION

In response to the growing number of individuals living with chronic pulmonary conditions as well as those recovering from acute respiratory illness or injury, OT/OTAs are becoming increasingly involved in care across the continuum. In addition to physical and psychosocial rehabilitation, OT/OTAs are educated in the areas of disease prevention and/or management and lifestyle modification that give the profession a distinct role within the interprofessional team. Using a collaborative and client-centered approach, therapists are able to rely on their clinical reasoning training to holistically address the needs of clients experiencing pulmonary dysfunction in order to develop individual treatment plans and promote health and wellbeing at home and in the community.

RESOURCES

Functional Independence Measure (FIM®)
http://www.udsmr.org/WebModules/FIM/Fim_About.aspx

Barthel Index (BI)
http://www.strokecenter.org/wp-content/uploads/2011/08/barthel.pdf

Canadian Occupational Performance Measure (COPM)
http://www.thecopm.ca

Montreal Cognitive Assessment (MoCA):
http://www.mocatest.org

The Short Portable Mental Status Questionnaire (SPMSQ):
http://www.npcrc.org/files/news/short_portable_mental_health_questionnaire.pdf

The Mini Mental State Examination (MMSE):
http://www.dementiatoday.com/wp-content/uploads/2012/06/MiniMentalStateExamination.pdf

The Missouri Alliance for Home Care Fall Risk Assessment Test (MAHC-10):
http://www.homecaremissouri.org/projects/falls/documents/Oct2012FINALValidatedFallriskassessmenttool.pdf

Stress management and relaxation techniques:
http://www.caot.ca/default.asp?pageid=1327

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The Role of Occupational Therapy in Pulmonary Rehabilitation
(3 CE Hours)

1. **Lung injury associated with Acute Respiratory Distress Syndrome (ARDS) is commonly described as having three distinct but overlapping phases. The proliferation phase, characterized by tissue damage and narrowing of air space, is the _____ phase.**
   a. Final
   b. First
   c. Second
   d. Third

2. **_____ can be further classified as hospital-acquired, community-acquired, or ventilator-acquired.**
   a. Acute Respiratory Distress Syndrome (ARDS)
   b. Chronic Obstructive Pulmonary Disease (COPD)
   c. Interstitial Lung Disease (ILD)
   d. Pneumonia (PNA)

3. **_____ is not a single disease but rather an umbrella term used to describe progressive lung diseases that include emphysema and chronic bronchitis. It is considered preventable, but it is also a progressive, life-threatening disorder in which the lungs are irreparably damaged making it difficult to breathe.**
   a. Acute Respiratory Distress Syndrome (ARDS)
   b. Chronic Obstructive Pulmonary Disease (COPD)
   c. Interstitial Lung Disease (ILD)
   d. Pneumonia (PNA)

4. **Regardless of etiology and type, the primary clinical signs and symptoms of _____ are similar, and include dyspnea and a non-productive cough. Additional symptoms, such as increased sputum production, hemoptysis associated with microscopic hemorrhages, and wheezing, as well as non respiratory related symptoms, such as myalgia and joint pain may help to further classify the disease.**
   a. Acute Respiratory Distress Syndrome (ARDS)
   b. Chronic Obstructive Pulmonary Disease (COPD)
   c. Interstitial Lung Disease (ILD)
   d. Pneumonia (PNA)

5. **A non-invasive means of measuring oxygen saturation levels in the blood with a small device that is usually attached to a fingertip, but can also be used on a toe or an ear: _____.**
   a. Positive end expiratory pressure (PEEP
   b. Pulmonary function test (PFT)
   c. Pulse oximetry
   d. Tracheostomy

6. **Individuals blow into the mouthpiece of the device and are encouraged to exhale normally before inhaling slowly. An indicator within the chamber of the device will rise upon inhalation providing an observable measure of volume that may be recorded to assess progress.**
   a. Incentive spirometry (IS)
   b. Non-invasive positive pressure ventilation (NIPPV)
   c. Pulse oximetry
   d. Pursed-lip breathing

7. **The most common form of _____ is the beta-adrenergic agonist. It is most commonly inhaled so that it can work rapidly.**
   a. Bronchodilator
   b. Incentive spirometry
   c. Mechanical ventilation
   d. Oxidizer

8. **The primary focus of OT in this setting is to promote strength, endurance, and mobility within the context of ADL and IADL re-training, and provide client/caregiver education, including energy conservation strategies, in order to manage conditions at home and in the community upon discharge: _____.**
   a. Acute Care Hospitals
   b. Home Care, including Independent and Assisted Living Facilities
   c. Inpatient Rehab and Skilled Nursing Facilities
   d. Long-term Acute Care

9. **A 30-point questionnaire designed to measure cognitive impairment, most commonly used as a screen for dementia but can be used to estimate cognitive impairment associated with illness or injury: _____.**
   a. Borg Rating of Perceived Exertion Scale (RPE)
   b. Functional Capacity Evaluation (FCE)
   c. Short Portable Mental Status Questionnaire test (SPMSQ)
   d. The Mini Mental State Examination (MMSE)

10. **A combination of interview, tests, and observations typically completed over the course of 4-6 hours and designed to assess an individual's functional ability to perform specific tasks associated with employment: _____.**
    a. Canadian Occupational Performance Measure (COPM)
    b. Functional Capacity Evaluation (FCE)
    c. Missouri Alliance for Home Care (MAHC-10)
    d. Modified Borg Scale for Perceived Dyspnea (RPD)

11. **A standardized multi-factor screening tool used to determine fall risk that may be used with all home care clients, including those who are bed-bound and those with significant mobility impairments: _____.**
    a. Barthel Index (BI)
    b. Functional Capacity Evaluation (FCE)
    c. Missouri Alliance for Home Care (MAHC-10)
    d. The Montreal Cognitive Assessment (MoCA)

12. **A 10 item ordinal scale used to measure ADL performance that is most commonly used in inpatient rehabilitation, skilled nursing facilities, and home care: _____.**
    a. Barthel Index (BI)
    b. Borg Rating of Perceived Exertion Scale (RPE)
    c. Functional Capacity Evaluation (FCE)
    d. Functional Independence Measure (FIM®)

13. **A process of passive, active, and progressive movement during critical illness to counter the effects of sedation and immobility that may lead to neurocognitive deficits and physical debilitation. It may be performed by any member of the interdisciplinary team, including OTs: _____.**
    a. Early mobilization
    b. Pursed-lip breathing
    c. Self-assessment
    d. Therapeutic exercise programs / upper extremity function

14. **Making larger meals to freeze, letting dishes air dry, grouping task items together to minimize unnecessary searches, sliding rather than carrying items, shopping with someone who can carry grocery bags, or using grocery home delivery services, are all examples of energy conservation techniques commonly embedded into _____.**
    a. ADL re-training
    b. IADL re-training
    c. Stress management / relaxation strategies
    d. Therapeutic exercise programs / upper extremity function

15. **Interventions include simple strategies such as eliminating unnecessary steps, sitting versus standing if possible, setting up task equipment in advance to minimize extraneous effort, and using lightweight tools or utensils: _____.**
    a. Activity tolerance and energy conservation techniques
    b. Stress management / relaxation strategies
    c. Therapeutic exercise programs / upper extremity function
    d. Ventilation strategies / breathing techniques

16. **Pursuant to safe discharge planning, OT/OTAs address _____.**
    a. Caregiver education
    b. Fall prevention training
    c. Home safety training
    d. All of the above

17. **Considerations clients should be aware of when flying with O_2 include _____.**
    a. Airlines are required by the Americans with Disabilities Act (ADA) to provide O_2 service on flights
    b. Federal regulations permit the transportation of personal O_2 canisters aboard
    c. Passengers can often purchase canisters from the airlines for use during the flight
    d. All of the above

18. **Considering Case Study #1: If appropriate for a client with COPD, the inclusion of adaptive equipment during ADL re-training can help to _____.**
    a. Minimize the effort of reaching lower extremities during bathing and dressing, which can exacerbate shortness of breath
    b. Limit the workload on staff during ADLs
    c. Give individuals the opportunity to trial new gadgets
    d. Decrease stress on joints while performing ADL tasks

19. **Considering Case Study #2: When providing energy conservation education an OT or OTA may encourage clients to _____.**
    a. Plan activities in advance to minimize extraneous steps
    b. Perform tasks sitting down to minimize fatigue
    c. Include rest breaks as needed throughout the activity
    d. All of the above

20. **Considering Case Study #3: When preparing an individual for discharge, why is interprofessional collaboration so important?**
    a. It helps the different disciplines learn about each other's roles and responsibilities during the discharge process
    b. It enables the team to develop a more comprehensive and safe discharge plan for the individual
    c. It breaks down communication barriers between disciplines
    d. It helps the client feel supported during the discharge process

ANSWER SHEET

First Name: _____ Last Name: _____ Date: _____

Address: _____ City: _____

State: _____ ZIP: _____ Country _____

Phone: _____ Email: _____

NCBOT #: _____

Other: License/certification # and issuing state/organization _____

Clinical Fellow: Supervisor name and NCBOT account # _____

Graduate Student: University name and expected graduation date _____

** See instructions on the cover page to submit your exams and pay for your course.

By submitting this final exam for grading, I hereby certify that I have spent the required time to study this course material and that I have personally completed each module/session of instruction.

The Role Of Occupational Therapy in Pulmonary Rehabilitation - Final Exam

1. Ⓐ Ⓑ Ⓒ Ⓓ	5. Ⓐ Ⓑ Ⓒ Ⓓ	9. Ⓐ Ⓑ Ⓒ Ⓓ	13. Ⓐ Ⓑ Ⓒ Ⓓ	17. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ	6. Ⓐ Ⓑ Ⓒ Ⓓ	10. Ⓐ Ⓑ Ⓒ Ⓓ	14. Ⓐ Ⓑ Ⓒ Ⓓ	18. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ	7. Ⓐ Ⓑ Ⓒ Ⓓ	11. Ⓐ Ⓑ Ⓒ Ⓓ	15. Ⓐ Ⓑ Ⓒ Ⓓ	19. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ	8. Ⓐ Ⓑ Ⓒ Ⓓ	12. Ⓐ Ⓑ Ⓒ Ⓓ	16. Ⓐ Ⓑ Ⓒ Ⓓ	20. Ⓐ Ⓑ Ⓒ Ⓓ

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THE ROLE OF OCCUPATIONAL THERAPY IN PULMONARY REHABILITATION

(3 CE HOURS)

COURSE EVALUATION

Learner Name: _____ Completion Date: _____

❑ PT ❑ PTA ❑ OT ❑ OTA ❑ SLP ❑ SLPA Other: _____

	Disagree				Agree	
Orientation was thorough and clear	1	2	3	4	5	
Instructional personnel disclosures were readily available and clearly stated	1	2	3	4	5	
Learning objectives were clearly stated	1	2	3	4	5	
Completion requirements were clearly stated	1	2	3	4	5	
Content was well-organized	1	2	3	4	5	
Content was informative	1	2	3	4	5	
Content reflected stated learning objectives	1	2	3	4	5	
Exam assessed stated learning objectives	1	2	3	4	5	
Exam was graded promptly	1	2	3	4	5	
Satisfied with learning experience	1	2	3	4	5	
Satisfied with customer service (if applicable)	1	2	3	4	5	n/a

What suggestions do you have to improve this program, if any?

_____

_____

What educational needs do you currently have?

_____

_____

What other courses or topics are of interest to you?

_____

_____