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Pulmonary Rehabilitation

An APCCMPD Ambulatory Care Curriculum Teaching Script

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Pulmonary Rehabilitation

Scenario 1:

Mr. Jones is a 65-year-old man with a history of Chronic Obstructive Pulmonary Disease (COPD) with a Forced Expiratory Volume 1 of 50% predicted, obesity, and diabetes presenting to your office for ongoing management of his COPD and chronic dyspnea. He is on inhaled budesonide/formoterol twice a day and tiotropium daily. He uses his albuterol inhaler 3-4 times a day. He often runs out of his albuterol inhaler and is not sure if it helps him. He has not had any exacerbations, emergency room visits, or hospitalizations for his COPD since he quit smoking 7 years ago. He notes progressive exercise limitation. He has a small dog he walks but now must stop every ½ a block to catch his breath, whereas 2 years ago he could make it around a whole block without stopping. He spends much of his time on the couch watching the news. Though he would like to be more active, he found this to be too difficult. His weight is stable, and although he would like to lose weight, he has struggled to do so.

Question 1: What are the indications for pulmonary rehabilitation?

Question 2: What is the physiology behind the benefits of exercise training?

Question 3: What should be considered prior to referral to pulmonary rehabilitation?

Question 4: What are the benefits of pulmonary rehabilitation?

Question 5: Mr. Jones asks, "What does pulmonary rehabilitation consist of?"

Question 6: Mr. Jones loved the program that you recommended and is using his rescue inhaler less (with improved technique!). What can he do now that his program is ending?

Question 7: Mr. Jones loved his pulmonary rehabilitation program so much that he started chatting about it with several of your patients in the waiting room. They are now all asking you about pulmonary rehabilitation and you are wondering whether patients with other respiratory diseases might also benefit from it?

Question 8: Mrs. Lee is a 65-year-old patient of yours with COPD. She too would like to start an exercise program after hearing about its benefits from Mr. Jones in the waiting room. She wants to know if there are any alternative or complementary exercise programs that have been shown in studies to benefit patient with COPD?

Question 9: Mr. Jones returns to see you in clinic 1 month after the completion of his pulmonary rehabilitation program. He was happy with the progress he made during that time but is disappointed in his lack of physical activity currently. He asks if there is anything he can do to maintain physical activity at home?

Pulmonary Rehabilitation

Educational Objectives:

1. Discuss the indications for pulmonary rehabilitation
2. Understand the physiology behind pulmonary rehabilitation
3. Identify and prepare patients for pulmonary rehabilitation
4. Understand what components constitute a traditional pulmonary rehabilitation program and what complementary exercise programs might benefit patients
5. Understand the outcomes and benefits of pulmonary rehabilitation

Scenario 1:

Mr. Jones is a 65-year-old man with a history of Chronic Obstructive Pulmonary Disease (COPD) with a Forced Expiratory Volume 1 of 50% predicted, obesity, and diabetes presenting to your office for ongoing management of his COPD and chronic dyspnea. He is on inhaled budesonide/formoterol twice a day and tiotropium daily. He uses his albuterol inhaler 3-4 times a day. He often runs out of his albuterol inhaler and is not sure if it helps him. He has not had any exacerbations, emergency room visits, or hospitalizations for his COPD since he quit smoking 7 years ago. He notes progressive exercise limitation. He has a small dog he walks but now must stop every ½ a block to catch his breath, whereas 2 years ago he could make it around a whole block without stopping. He spends much of his time on the couch watching the news. Though he would like to be more active, he found this to be too difficult. His weight is stable, and although he would like to lose weight, he has struggled to do so.

You think Mr. Jones might be a candidate for pulmonary rehabilitation.

Question 1: What are the indications for pulmonary rehabilitation?

- COPD Global Initiative for Chronic Obstructive Lung Disease (GOLD) stages B and E
- Post-hospitalization:
    - Pulmonary rehabilitation initiated shortly after a hospitalization for a COPD exacerbation is clinically effective, safe, and associated with a reduction in subsequent hospital admissions (Lindenauer, 2020).
    - Exercise rehabilitation commenced during acute or critical illness reduces the extent of functional decline and hastens recovery.
- Patients with other chronic respiratory diseases - such as asthma, interstitial lung disease, bronchiectasis including from cystic fibrosis, and pulmonary arterial hypertension – also benefit (Rochester, 2023).
- Consider in patients with lung disease and any of the following:
    - Severe dyspnea and fatigue
    - Decreased exercise ability

- Inability to perform activities of daily living (ADLs)
- Decreased occupational performance
- Nutritional depletion, such as unintentional weight loss, BMI <21 kg/m^2, or low fat-free mass (≤15 kg/m^2 in females or ≤16 kg/m^2 in males)
- Increased medical resource utilization

Question 2: What is the physiology behind the benefits of exercise training?

- Chronic lung disease has systemic effects which can be targeted by exercise training. Patients with lung disease not only have muscle atrophy but also altered muscle fiber type distribution and decreased metabolic capacity. Ventilatory or gas-exchange limitations are common in more advanced lung disease and can certainly limit exercise. However, these patients also often have decreased exercise capacity due to peripheral muscle and cardiovascular deconditioning. As a result, they experience early-onset anaerobic metabolism and lactic acid production during exercise. Peripheral muscle deconditioning does respond to exercise training.
- Upper extremity muscle weakness can also contribute to dyspnea, especially in advanced lung disease when they are used as accessory muscles of respiration. Training of the upper extremity muscles is another important component of pulmonary rehabilitation programs and has been shown to be effective in randomized clinical trials.
- Patients with obstructive lung disease have dynamic hyperinflation, which leads to decreased effectiveness and fatigue of respiratory muscles. As exercise training improves muscular strength and efficiency, ventilatory requirements decrease during exertion. Thus, patients are able to breathe at lower respiratory rates and reduce dynamic hyperinflation.
- Exercise has been shown to improve mood and can reduce symptoms of anxiety and depression that increase morbidity in chronic lung disease.

Question 3: What should be considered prior to referral to pulmonary rehabilitation?

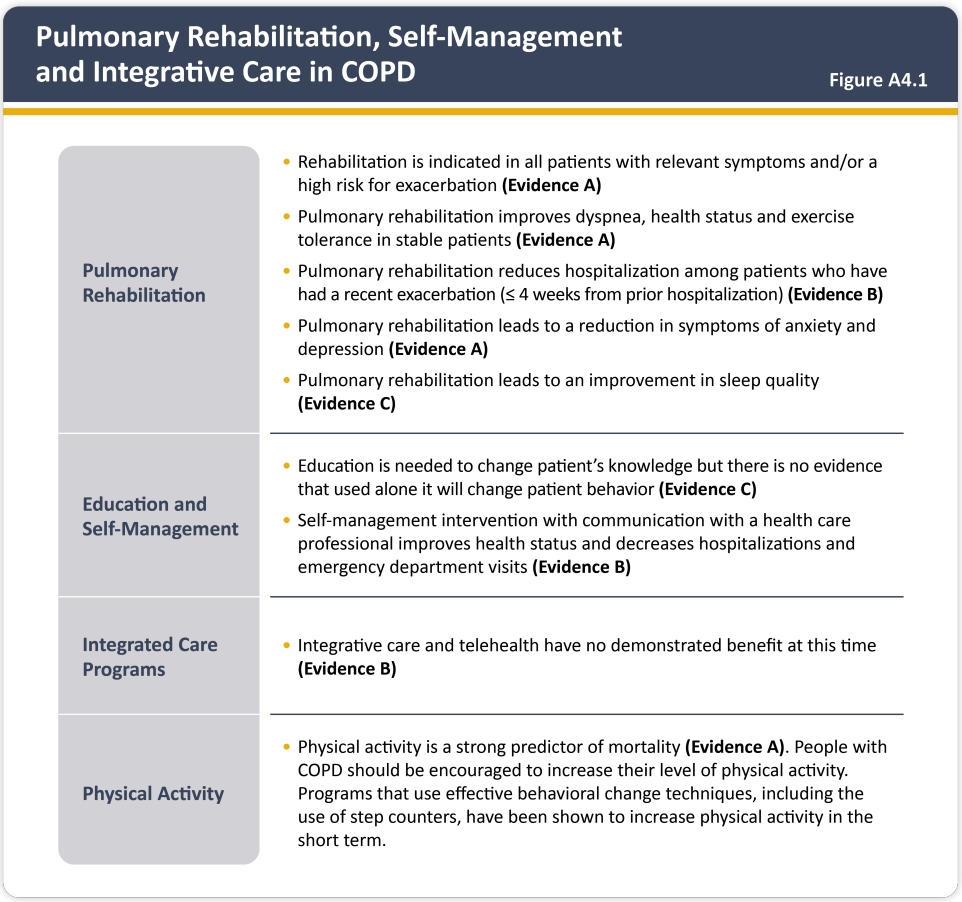
- Patients should be medically optimized as best as possible prior to referral to pulmonary rehabilitation. This includes the use of appropriate inhalers and supplemental oxygen, if indicated. Patients should receive teaching around inhaler use, though this can sometimes also be covered with pulmonary rehabilitation. Patients with optimized lung function can exercise at higher intensities, with greater improvements in their overall exercise capacity. Mr. Jones appears to be optimized, although proper inhaler technique should also be confirmed.
- For patients with significant cardiac comorbidities, consider whether a referral to cardiac rehabilitation may be more appropriate (Spruit, 2013).
- For patients with barriers to accessing an in-person program, virtual pulmonary rehabilitation should be offered.
    - Transportation is the most common barrier to participation. 38.5% of Medicare beneficiaries with COPD do not live within 10 miles of a pulmonary rehabilitation center. In rural areas, this rises to 88.7% (Malla, 2023).
    - There is no significant difference in 6-minute walk distance or symptom-based questionnaire scores between in-person and virtual programs, both at time of completion and 12 months post-completion. Virtual pulmonary rehabilitation has also been shown to reduce healthcare utilization (Zanaboni, 2023).

Question 4: What are the benefits of pulmonary rehabilitation?

- Pulmonary rehabilitation has not been shown to directly improve lung function in chronic lung disease. However, a significant amount of disability from the systemic effects of the disease has been shown to respond to treatment (McCarthy, 2015).
- Pulmonary rehabilitation has been most widely studied in patients with COPD.
    - Traditionally, patients with moderate to severe COPD were felt to be appropriate for pulmonary rehabilitation, however decreased activity likely starts early in COPD and is under-recognized.
    - Studies have shown that pulmonary rehabilitation improves specific symptoms and quality of life (Puhan, 2016):
        - Improved 6-minute walk distance
        - Improved dyspnea scores
        - Improved Quality of Life on St. George Respiratory or the Chronic Respiratory Disease Questionnaire
- There is conflicting data about whether pulmonary rehabilitation reduces healthcare utilization in patients with chronic respiratory disease.
- Pulmonary rehabilitation has not been shown to reduce mortality consistently, though strong association has been demonstrated (Lindenauer, 2020. Choi, 2024).

Given this, the 2025 GOLD Report recommends pulmonary rehabilitation as a cornerstone of non-pharmacological interventions for COPD as noted in Figure 1.

Figure 1. Pulmonary Rehabilitation, Self-Management, and Integrative Care in COPD

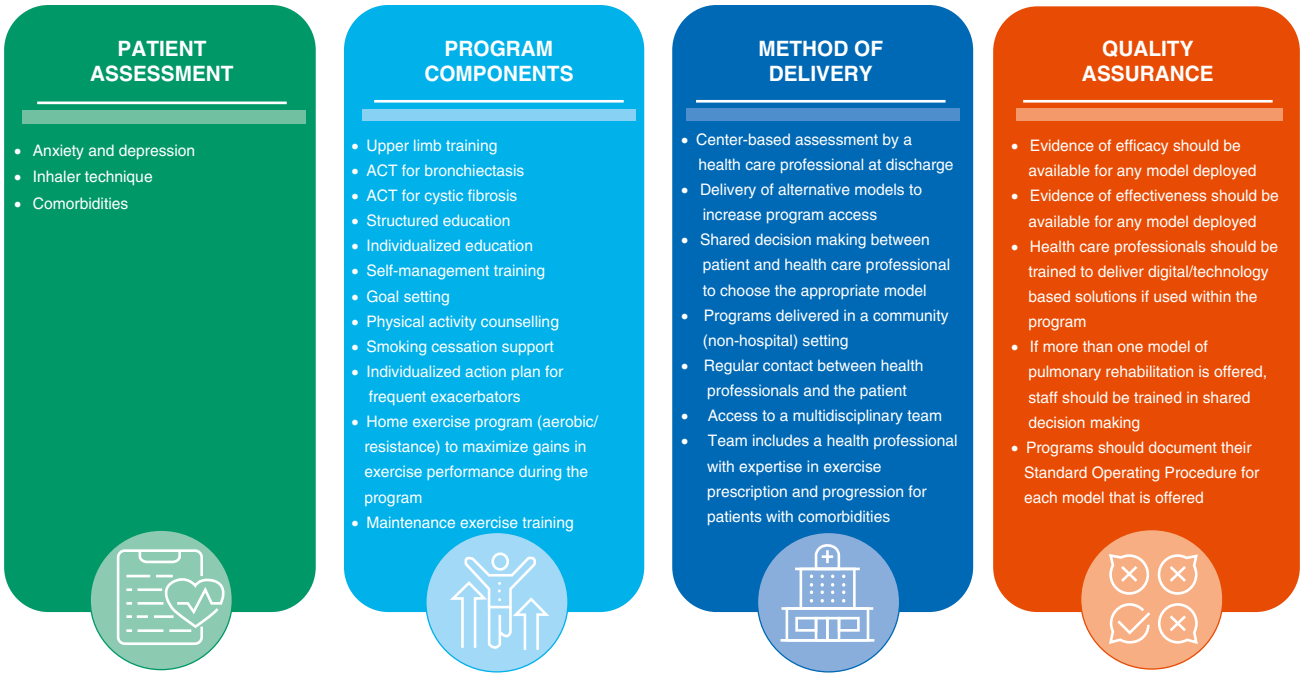


Used with permission, 2025 GOLD COPD Report.

Question 5: Mr. Jones asks, "What does pulmonary rehabilitation consist of?"

According to the ATS/ERS definition, pulmonary rehabilitation is a "comprehensive intervention based on thorough patient assessment, followed by tailored therapies, that are included but not limited to exercise training, education and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote long-term adherence to health-enhancing behaviors" with components as noted in Figure 2.

Figure 2. Desirable Components of a Pulmonary Rehabilitation Program

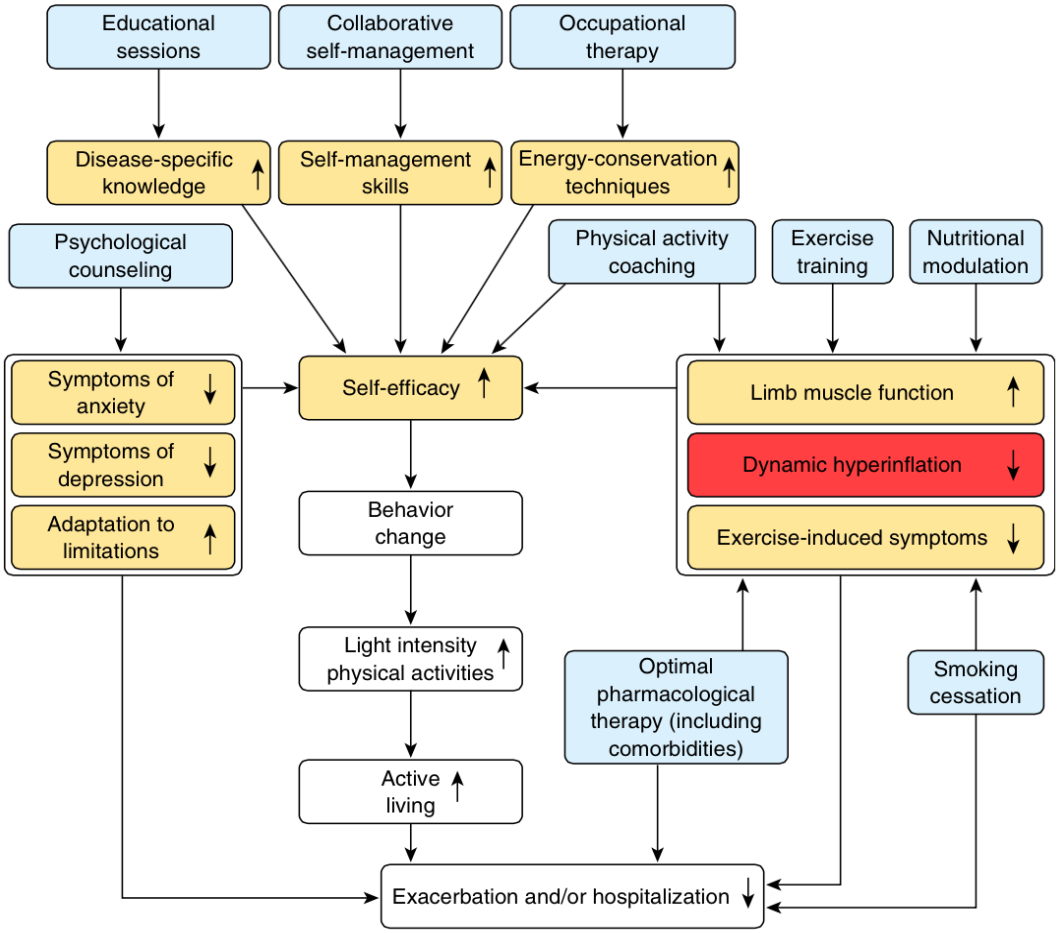


Taken from Holland, 2021.

- Most programs consist of supervised exercise 2-3 times per week for 8 or more weeks.
    - Endurance training is the most common exercise modality used. Endurance training is more studied with lower extremity exercise, though upper extremity training is also utilized (Spruit, 2013).
    - Programs typically combine treadmill, stationary bicycle, and arm cycle training. Treadmill may be the most effective for improving walk distance.
    - Resistance training may be effective and additive in improving muscle mass.
    - Breathing training has had mixed data, though pursed lip breathing and yoga have been associated with improvement in functional exercise capacity (Holland, 2012).
    - During exercise training, dyspnea, blood pressure, heart rate, oxygen saturation, and breath sounds are monitored.

An educational component is essential to promote health, behavioral change, and improve chronic disease self-management. This generally occurs in a group setting. Figure 3 further delineates the multiple components of an effective program.

Figure 3. Impact of the Components of a Comprehensive Pulmonary Rehabilitation Program



Taken from Spruit, 2015.

Question 6: Mr. Jones loved the program that you recommended and is using his rescue inhaler less (with improved technique!). What can he do now that his program is ending?

- The optimal duration of a pulmonary rehabilitation program is 6-8 weeks. There are no additional benefits from extending the program to 12 weeks (Alison, 2017).
- Positive effects on exercise capacity may dissipate over time, so empowering patients in long-term adherence to exercise is exceedingly important. Rehabilitation programs often provide exercise prescriptions for the maintenance phase. New data suggests that digital applications can help patients adhere to maintenance exercises (Spielmanns, 2023).
- Appropriately resourced home-based exercise training has proven effective in reducing dyspnea and increasing exercise performance in individuals with COPD.

Question 7: Mr. Jones loved his pulmonary rehabilitation program so much that he started chatting about it with several of your patients in the waiting room. They are now *all* asking you about pulmonary rehabilitation and you are wondering whether patients with other respiratory diseases might also benefit from it?

The following groups of patients have been shown in studies to benefit from pulmonary rehabilitation:

- **Interstitial Lung Disease**
  - Improved quality of life scores, dyspnea index, and exercise tolerance
- **Bronchiectasis**
  - Improved exercise tolerance (Lee, 2016)
- **Cystic Fibrosis**
  - Improved exercise tolerance, mobility of secretions, and slower decline of lung function (Williams, 2022)
- **Asthma**
  - Possible decrease in asthma symptoms and anxiety
- **Pulmonary Hypertension**
  - Improved exercise tolerance and quality of life
- **Lung Cancer**
  - Improved exercise tolerance
- **Transplant patients (pre- and post-)**
  - Increased exercise tolerance prior to surgery can lead to improved outcomes (Li, 2013)

Question 8: Mrs. Lee is a 65-year-old patient of yours with COPD. She too would like to start an exercise program after hearing about its benefits from Mr. Jones in the waiting room. She wants to know if there are any alternative or complementary exercise programs that have been shown in studies to benefit patient with COPD?

Yes! Yoga and Tai Chi have been shown to be effective for decreasing respiratory symptoms compared to usual care. Mindfulness-based interventions have also been shown to benefit patients with chronic lung diseases such as COPD, interstitial lung disease, and asthma. Some of these interventions were performed in conjunction with usual pulmonary rehabilitation. There also were signals of improvement in mood, perception of stress and possible reductions in symptoms of depression (Bramanti, 2025).

Question 9: Mr. Jones returns to see you in clinic 1 month after the completion of his pulmonary rehabilitation program. He was happy with the progress he made during that time but is disappointed in his lack of physical activity currently. He asks if there is anything he can do to maintain physical activity at home?

Physical activity is a predictor of mortality in COPD. We should not only encourage our COPD patients to maintain physical activity, but also provide them with tools to help them to do so. Several smartphone applications are available to help patients manage their COPD, such as Kaia COPD, which consists of an exercise training program, education program and breathing exercises. A recent study showed that following pulmonary rehabilitation, the intervention group of COPD patients using a comprehensive program through this smartphone application had improvement in symptoms and maintained physical activity (Spielmanns, 2023).

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