COPD/Lung Transplant Case Final Assignment

In determining the success of a pulmonary rehabilitation program for a patient with chronic obstructive pulmonary disease (COPD), one must have the appropriate tools to measure change. There are two main categories of assessment tools: ones that measure physical progress and ones that measure functional progress1. The two most commonly used measures are the lung function test, forced expiratory volume in one second (FEV1), a measure of physical progress; and the six-minute walk test (6MWT), a measure of functional progress. Martinez explains that FEV1 is so commonly used because it is easily assessable and reproducible, and is consistent in its prediction of airway function. FEV1 has also been shown to be a reliable predictor of mortality5. However, FEV1 may not be the best indicator of change over a period of rehabilitation because it does not always have a positive correlation with changes in symptoms such as dyspnea and cough, exercise tolerance, or quality of life1. Another important part of COPD that should be evaluated is the inflammatory effects. FEV1 does not address these factors5. The 6MWT is commonly used because of its high reliability in determining change in patients’ endurance levels. This test is simple to administer, inexpensive, objective, and not time consuming1. Change in results overtime on the 6MWT have been shown to have high predictive value for patients in the final stages of COPD5. However, some disadvantages of this test are its inability to predict changes in dyspnea during activities of daily living (ADL) and its ability to be affected by extraneous factors outside of one’s pulmonary status such as age, sex, height, and weight6. Because of the limitations of these two measures, there is a need for other reliable outcome measures for use in a pulmonary rehabilitation setting1.

Other lung function tests that may be beneficial in determining change in status are the FEV1/FVC ratio and the percentage predicted FEV1 value2. Lung volume tests are also helpful in measuring progress during rehabilitation2. Even if FEV1 remains unchanged, other lung volumes can change significantly. The hyperinflation that occurs during COPD causes limited airflow and decreased elastic recoil of the lungs. This makes inspiration very difficult and decreases the reserve volumes, making one feel as though they are experiencing shortness of breath. Total lung capacity, functional residual capacity, residual volume, and inspiratory capacity should all be assessed during rehabilitation2. Furthermore, there are several symptoms of COPD that will change over the course of treatment.

Dyspnea, or shortness of breath, is a common factor for patients with COPD and relief is often high on one’s personal therapy goal list. Dyspnea can be evaluated through use of the Borg scale of dyspnea (CR-10), the Medical Research Council (MRC) dyspnea scale, the Baseline Dyspnea Index/Transition Dyspnea Index (BDI/TDI), and the dyspnea domain of the CRQ2,5. The CR-10 is a patient-reported scale measuring how short of breath one is, 0 being ‘no shortness of breath’ and 10 being ‘shortness of breath so severe you need to stop’7. The MRC similarly is a patient-reported scale of 5 items concerning perceived breathlessness. It has been shown to be a better predictor of mortality than the FEV1, but lacks sensitivity and precision5. The BDI/TDI asks the patient to rate their dyspnea on a scale of 0-12 (BDI) and -9 to 9 (TDI) during an activity in terms of functional impairment, magnitude of task, and magnitude of effort. A clinically important change occurs when the TDI increases or decreases by 15. The dyspnea domain of the CRQ is multidimensional and can detect clinically important change with a 0.5 unit difference5.

Exercise capacity is commonly decreased due to airflow obstruction because exercise exacerbates the occurrence of hyperinflation2. Decreased physical activity is a vicious cycle as it is caused by the effects of COPD, but worsens the disease simultaneously. Some measures of exercise capacity are the 6MWT, the shuttle walk test (SWT), ergometry, and physical activity sensors. The SWT measures one’s maximum walking distance as the speed is incrementally increased2. The minimum important difference is 47.5 meters. It is a well-controlled, easy to administer test; but its measures of validity are not as high as the 6MWT2. Bicycle and treadmill ergometry are used to test one’s sub-maximal levels of exercise intensity and are the gold standard for measuring exercise tolerance5. This steady-state test allows one to simultaneously measure factors such as peak O2 levels, CO2 output, minute ventilation, heart rate, dyspnea, and leg discomfort2,5. Peak O2 levels are positively correlated with mortality rates in patients with COPD5. Motion sensors can also be helpful to measure the amount of physical activity performed daily2.

Functional capacity is another important indicator of progress for patients with COPD in pulmonary rehabilitation. Function can be measured through use of performance-based tests such as the 6MWT, the Assessment of Motor and Process Skills (AMPS), the Glittre ADL test, and the Patient Specific Functional Scale (PSFS)1,3. The AMPS is a 26-item test that measures the quality of a patient’s functional ability to complete ADLs. This test is highly applicable to patient’s daily lives; however, it takes a long time to administer and results are often skewed by the effects of dyspnea. For this reason, it has not been validated in patients with COPD that are highly affected by dyspnea1. The Glittre ADL test measures one’s ability to perform functional activities such as standing from a seated position, walking 10 meters, stepping up 2 stairs, and moving cartons to shelves. It was shown to have good validity, test-retest reliability, and was responsive to change. The MCID has yet to be determined however the statistically significant difference between pre- and post- test scores in a study determining the psychometric properties of this test was a 1 minute decrease in time needed to complete ADL activities1. Derghuis-Kelley showed that the PSFS may be a beneficial measure to assess a change in disability of patients with COPD during pulmonary rehabilitation3. It was found to have high test-retest reliability with ICC’s between 0.82 and 0.923.

Exacerbations occur in about 20% of patients with moderate-severe COPD and are predictive of reduced quality of life and mortality2,5. These occurrences are more common in patients with normal sputum production which is correlated with decreased FEV1. It is predicted that exacerbations are caused by a respiratory infection5. Exacerbations are measured based on patient interview, healthcare database, or from a patient’s health diary. It is important to note the frequency, severity, and duration of the exacerbations2.

The patient’s health status should be assessed to determine one’s well-being. This can be measured via objective assessments of functional health status or subjective descriptions of one’s perceived health-related quality of life. Some generic measures of quality of life are the Sickness Impact Profile, the Short Form 36-item questionnaire (SF-36), Extended Activities of Daily Living, and the Nottingham Health Profile2,5. The disease-specific measures related to COPD are the Chronic Respiratory Questionnaire (CRQ), St. George’s Respiratory Questionnaire (SGRQ), the Pulmonary Functional Status and Dyspnea Questionnaire and the Seattle Obstructive Lung Disease Questionnaire (SOLQ)1,2,5. The MCID is 4 points, 10 points, and 5 points on the SGRQ, CRQ, and SOLQ respectively5. Many of these measures are questionnaires. They are commonly used because they are inexpensive, quick, and allow the patient to define how the disease is affecting them. However, questionnaires often lack validity and responsiveness because patients are likely to answer a question based on expectations or based on a single event that does not describe the full extent of the effects of the disorder1.

Assessing response to pulmonary rehabilitation should be as comprehensive and as multidimensional as possible. Though the 6MWT and FEV1 are reliable measures for detecting change in status, other measures should also be used to complete the full picture of the patient. There are many outcome measures available to assess parameters such as exacerbations, mortality, health-related quality of life, exercise tolerance, and dyspnea. Other outcomes to be aware of are mortality, hospital admission and re-admission, cognitive function, cough, and sputum production4. Making use of these resources can help one to practice more efficiently and provide the best possible outcomes for each patient.

References

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