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Evidence-Based Pulmonary Rehabilitation Reduces Hospital Readmissions in Adults With COPD

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Walden University

College of Health Sciences

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Christiana Otuwa

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Walden University
2018

Abstract

Evidence-Based Pulmonary Rehabilitation Reduces Hospital Readmissions in Adults With COPD

by

Christiana Otuwa

MS, Loyola University, 2009

BS, Lewis University, 2002

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2018

Abstract

Many patients are affected by chronic obstructive pulmonary disease (COPD), a progressive lung disease that obstructs air flow, resulting in dyspnea and inability to carry out daily activities. Despite optimal pharmacological management, COPD patients make frequent emergency room visits and are hospitalized due to exacerbations of COPD. Literature has suggested that pulmonary rehabilitation (PR), a nonpharmacological treatment, could help to decrease the symptoms that lead to illness exacerbation, hospital readmissions, and decreased quality of life in patients with COPD. The purpose of the project was to increase the quality of life and reduce admission rates for patients diagnosed with COPD through the development and implementation of patient education material that would increase PR awareness, increase patient motivation, and promote participation. The ACE star model was used to guide the project development, and the theoretical framework of the health belief model was used to enhance patients' perceptions and desires to participate in a PR program. Evaluation of the pretests and posttests revealed significant improvement in various variables, reduction of dyspnea, improved exercise tolerance, and increased knowledge. The evaluation of health-related quality of life using the short form 36 showed significant improvement in some subscales namely: general health, role emotional, with slight significance in bodily pain. There were no readmissions among the participants. The implementation of comprehensive PR has implications for positive social change because it helps patients with COPD to be more knowledgeable about their disease and allows for more independence and a higher quality of life.

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Dedication

I dedicate this paper to the Almighty God who gave me the ability to get thus far, and endowed me with the strength, wisdom, and perseverance. Also dedicate this project to my ever-caring husband, Rev. Dr. Israel Otuwa for all his support, patience and understanding especially for all the hours I spent on my school work and giving less time to activities in the home. I am very appreciative of the time you sacrificed to proof read my papers, sharing your wisdom and intelligence. You contributed immensely in making me a better writer. This dedication also goes to my children who were there to encourage me and render their support. Finally, I dedicate my work to my late father, Mr. Augustine Nwankwo Echeme, whom I wished was alive to witness my academic pursuits to this point. It had always been your desire for all your children to excel academically. I never forgot what you always told us about being successful in life, “suffering comes before pleasure”. That was to say that perseverance and hard work are sine qua non of success.

Acknowledgments

I would especially like to thank Dr. Mary Verklan, the chairman of my committee for her expert guidance, patience, and time. Her immense contribution has helped to get me this far in my academic pursuit. I also appreciate and thank Dr. Nancy Hadley, my committee member for her time and support. Special thanks to my husband and children who were there for me, encouraging and supporting me all these years. I could not have made without all of you.

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Section 1: Nature of the Project

Introduction

Chronic obstructive pulmonary disease (COPD), a progressive lung disease that causes air flow obstruction, results in constant and progressive breathlessness or dyspnea that impairs a patient's ability to live a normal life (Casey, Murphy, Cooney, Mee, & Dowling, 2011). The prevalence of COPD has become a worldwide challenge (Vestbo et al., 2013) and is currently the third leading cause of death in the United States (Corbridge, 2012). COPD-related intolerable dyspnea has a substantial effect on patient's health-related quality of life (HRQL), and leads to hospital admissions as well as increased health care costs (Suh, Mandal, & Hart, 2013). Despite the documented benefits of exercise in the reduction of shortness of breath related to COPD, and enhanced physical endurance, patients were not optimizing its use, creating a gap in their health care outcome (Johnston & Grimmer-Somers, 2010; Keating, Lee, & Holland, 2011; Marcinuik et al., 2010). Pulmonary rehabilitation (PR) program, a nonpharmacological treatment that involves exercise, self-management, and educational components for patients with COPD, is a measure for reducing dyspnea associated hospital admissions, and increased health care costs (Suh et al., 2013). Increasing awareness of a PR program and participation in the population with COPD helps to relieve their symptoms and improve health outcomes. In this project, I discuss the effects of a PR program and how to optimize its use to enhance health outcomes by reducing the symptoms of dyspnea and improved activity tolerance (both of which are the primary outcomes), and subsequently, reduction of hospital admissions and health care costs. In Section 1, I discuss the project planning, which includes the overview of the evidence-based project, the introduction, problem statement, purpose statement, project objectives, nature of the project, the significance and project questions, implication for social change, definitions of terms, assumptions, limitations, and delimitations.

Background

The rate of hospital admissions for patients with COPD is high in the facility under study because of the exacerbation of patients' illnesses. Although the facility has an existing PR program for optimizing treatment for these patients, it has been underused according to the director of the PR program (N. Quesada, personal communication, July 10, 2015). The problem was attributed to a lack of motivation on the part of the patients to use the PR program. Those who started the program indicated that they could not complete the full course for reasons such as hospital admissions due to acute illness, weather changes, and nonavailability of transportation (N. Quesada, personal communication, July 10, 2015). Improving attendance at PR and achieving the goals would require consideration of how information regarding the benefits of PR can be delivered to patients with COPD, using models that facilitate access and prevent exacerbations. I sought to apply an evidence-based intervention that would help in reducing exacerbation, improve quality of life, and decrease hospitalizations for patients diagnosed with COPD.

Problem Statement

COPD is a worldwide burden affecting 65 million people and is responsible for 3 million deaths in 2005 (World Health Organization, 2015). Per the National Heart, Lung, and Blood Institute (2009), COPD leads to approximately 800,000 hospitalizations and approximately $50 billion annually in health care expenditures in the United States. Approximately 23% of patients hospitalized with COPD exacerbation are rehospitalized within 30 days (Centers for Medicare and Medicaid Services, 2011), and health care costs for rehospitalization in this population ranked the third highest among Medicare beneficiaries (Jencks, Williams, & Coleman, 2009). These issues posed significant challenges in the facility at which I work because Medicare beneficiaries make up the bulk of this population that we care for. Since the inclusion of COPD in the Hospital Readmission Program and its penalty,

which makes hospitals liable to financial penalties for readmissions occurring within 30 days after discharge, many hospitals, including the one at which I work, are seeking ways to reduce readmissions.

In my facility, readmission rates are high in the population with COPD due to exacerbations of the disease. One of the evidence-based interventions practiced in this facility is the PR program. PR consists of a patient assessment, exercise training, education, nutritional counseling, and psychosocial support (Marciniuk et al., 2010). However, the program was found to be underused because the patients lack awareness and knowledge of the benefits of this program (Keating et al., 2011; Marcinuik et al., 2010). It then became crucial to find ways to increase use of PR to reduce the gap existing in achieving effective management of these patients. The problem that I investigated was whether patients with COPD who participate in PR will have improved symptoms and quality of life with subsequent reduction in hospital readmissions.

Purpose

My purpose in this DNP project was to assess the effects of the PR program in the reduction of exacerbations and resultant hospital readmissions, as well improvement in HRQOL, among adults with COPD. Despite the documented benefits of exercise in reduction of shortness of breath associated with COPD, and enhanced physical endurance, its use at Stroger hospital was not optimized. Conducting initial need assessment would aid the identification of factors that lead to exacerbation of the illness, and lack of motivation and participation in PR. I identified existing problems with the current discharge process, and I assessed the patients' knowledge base and their awareness of PR. I developed an evidence-based educational intervention that provided better discharge information and referrals to the PR program, and I initiated a multidisciplinary approach to cover all aspects of the PR program

based on current guidelines. The aim of the intervention was to achieve a reduction in the 30-day readmission rate in the facility. The expected outcome measure evaluated focused on the short-term outcomes that included increased awareness and increased motivation within four weeks. The intermediate outcomes included reduced dyspnea, increased activity level, and reduced hospitalization within 8 weeks. The long-term outcomes assessed for sustained decrease in dyspnea, increased endurance, decreased admission rate and improved quality of life among patients with COPD.

Practice-Focused Question and Objectives

To measure the effects of PR on the reduction of 30-day hospital readmissions in patients with COPD, I focused on whether there is a relationship between increasing patient's knowledge and awareness of PR through nursing education, and the reduction of illness exacerbation and readmissions. Therefore, using the population, intervention, control, and outcome (PICO) format, I asked the following question: How does participation in PR as compared to nonparticipation impact or affect reduction of symptoms or exacerbations, and resultant hospital readmissions in patients with COPD?

The aim of the intervention was to achieve a reduction in the 30-day readmission rate in the facility. COPD exacerbation is associated with hospital readmissions and a significant negative effect on HRQOL among patients (Suh et al., 2013). The goals of care for patients with COPD are to improve their major symptoms of breathlessness, reduce related hospitalizations with associated resource use, and improve health-related quality of life. The ability of the health care providers to deliver interventions that increase understanding and motivate participation in health improvement activities is a fundamental component to reducing 30-day readmissions.

My first objective was to increase awareness of the PR program for patients with COPD and encourage their ability to participate in the program. I evaluated patient awareness

using the COPD awareness questionnaire to identify the current level of awareness of PR and the disease in patients with COPD. The validity of the COPD awareness questionnaire had been determined and the instrument was a useful tool for determining awareness about the disease and PR among the patients with COPD (Thakkar et al., 2014).

The second objective was to promote and maintain improvement in functional or physical activities. People that live with COPD often have limited activity capability due to bothersome symptoms of breathlessness, resulting in chronic inactivity and a sedentary lifestyle (Pessoa et al., 2011). The reduction of dyspnea and improvement in activity tolerance was measured using the 6-minute walk test (6MWT) and was done before and after the program. The 6MWT has been found to be cost effective in determining functional capacity in patients with COPD (Pessoa, 2014). I used the chronic respiratory disease questionnaire (CRQ) as a tool to measure reduction in dyspnea. The CRQ assesses for dyspnea, fatigue, emotion, and functional capability, and is recommended as a valid measurement tool (Nici, Laureau, & ZuWallack, 2010). The dyspnea and associated inactivity affect the physical and emotional well-being of the patient giving rise to dependence on family or health-care provider. Patient participation in PR promoted decreased symptoms, improved lung function, and muscle strength (Corbridge et al., 2012).

The third objective was to improve HRQL of patients with COPD. I measured HRQL using the chronic respiratory disease questionnaire (CRDQ) (Holland et al., 2013). The CRDQ has 20 questions that assess the areas concerning dyspnea, and emotional function of patients with COPD and is formatted in a 7-point Likert scale, with the higher score indicating better HRQOL (Holland et al., 2013). Structured educational pulmonary programs that focus on empowerment, self-efficacy, and behavioral change was effective in improving patients' quality of life by improving their perception of dyspnea and HRQL (Murphy et al. 2011).

Framework for the Project

Motivation was an essential psychosocial element affecting participation in PR, and it was influenced by multiple internal and external factors. The health belief model (HBM) is a well-established theoretical framework that focuses on the attitude and behavior of the patient toward involvement or participation in healthy health care preventive services that promote better outcome. The use of HBM as a framework for PR enhanced self-efficacy and decision-making capability of patients with COPD to participate in the PR, an action that was proposed to reduce symptoms, improve HRQOL, and subsequently decrease hospital admissions.

The model presented specific components such as cue to action, perceived severity of the COPD, and perceived benefits of and barriers to the behavior change. The application of these components increased the likelihood of behavioral change and participation in PR. I provide a detailed explanation of the model in Section 2.

Nature of the Doctoral Project

The overall purpose of this project was to increase quality of life and reduce admission rates for COPD patients through the development and implementation of patient education material that would increase PR awareness, increase patient motivation, and promote participation. The quality improvement initiative used a one-group pretest-posttest experimental design in a hospital-based PR program. I examined outcome of interest (decreased dyspnea, increased activity tolerance) prior to application of the intervention (PR) and after completion of intervention. A pretest served as a baseline to assess the patient's current level of performance. I also used the health belief model as a framework to guide the development of the project. The intention of the evidence-based educational intervention was to develop a standardized discharge instruction guideline to decrease the readmission rate of patients with COPD. The nurses provided patient education and materials prior to hospital

discharge. I collected data using the short-form 36 (SF-36) survey and the COPD awareness questionnaire by gathering information that assessed patients' motivation for the program, attitudes and belief, and any knowledge of PR. The respiratory therapist that coordinates the PR program and I collected data before and after the PR program. I analyzed the data using the paired *t* test that will be performed with the SPSS 24.0 version. I discuss the methodology in more detail in Section 3.

Definitions

Below, I define relevant terms that I used in this project:

Exacerbation of illness: Exacerbation of COPD is an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication (Celli & Barnes, 2007).

Structured education program: "A planned program that is comprehensive in scope, flexible in content, responsive to an individual's clinical and psychological needs, and adaptable to his or her educational and cultural background" (National Institute for Health and Clinical Excellence, 2003, p. 14, cited in Casey et al., 2011).

Chronic obstructive pulmonary disease: A progressive but preventable disease characterized by airflow limitation that is not completely reversible and is associated with an abnormal inflammatory response of the lungs to inhaled noxious particles or gases (GOLD, 2014).

Pulmonary rehabilitation: An evidence-based multidisciplinary and comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies that include, but are not limited to, exercise training, education, and behavior change, designed to improve the physical and psychosocial health conditions of people with chronic respiratory

disease, and to promote long-term adherence of health-enhancing behaviors (Spruit et al., 2013).

30-day readmission rate: Unplanned hospital admissions within 30 days of discharge for similar or same health problem (Albany, 2014). The rate would be the number of patients readmitted within 30 days of discharge for a specific condition (COPD exacerbation) divided by the total number of patients readmitted (Prescott, Sjoding, & Iwashyna, 2014).

Assumptions

I assumed that finances would be available after proper financial analysis and budgeting to include cost for staffing, providing educational material, and transportation have been thoroughly considered. I also assumed that patients with COPD would be referred and be willing and available to participate in the program. In addition, I assumed that the site would remain accredited for delivering PR services and would be available for the project plans to be implemented. I also assumed that the patients with COPD would have increased knowledge of their disease and the benefits of PR program, and, subsequently, enhance their willingness, cooperation, and decision to fully participate in the program. Finally, I assumed that the HRQL in patients with COPD would improve as their symptoms and hospitalizations decrease.

Scope and Delimitations

Incidents of exacerbation cause patients with COPD to be frequently hospitalized, a problem that results in a concomitant decrease in the quality of life, as well as an increased utilization of health care resources. Even though PR has been recognized as an effective nonpharmacological standard of care for patients with COPD, gaps still exist in the facility due to its underuse. PR is designed to reduce symptoms, optimize functional status, increase participation, and reduce health care costs.

The delimitation was that the participants would be from one hospital and would include adults of both genders, who are 40 years and older and have been diagnosed with COPD based on the global initiative for obstructive lung disease (GOLD) standards. The participants have respiratory symptoms without associated coronary artery disease or heart disease, significant orthopedic or neurological problems that reduce mobility or cooperation with physical training. The GOLD standards are forced vital capacity (FVC) and the ratio of forced expiratory volume 1 and forced vital capacity (FEV1/FVC) of less than 70% (Corbridge, 2012). The selection of this population was based on the gap in PR use and the increase in hospital readmissions.

Limitations

Patients with COPD can be faced with several issues that could limit their ability to participate in PR program. These limitations could be classified as disease related, transportation and financial, and environmental issues. Inadequate or lack of knowledge of the benefits of participating in the program could hinder decision of patients with COPD to participate PR. Health-related barriers included problems that arise from the disease itself, such as shortness of breath, hospital admissions, and lack of oxygen for those who were oxygen dependent. Lack of available transportation to the treatment site as well as the ability to secure a parking space and pay for the cost could posed as barriers to the population being able to participate in the PR program. Environmental factors such as the seasonal weather changes or patterns could affect the health of patients with COPD, thus reducing their ability to leave their homes to attend PR program.

Significance

Nursing can play a pivotal role in initiating and coordinating care for patients with COPD. The demonstration of knowledge of the disease progression and use of evidence-based

guidelines in the management of the disease is crucial in preventing exacerbations and hospital admissions. Evidence has shown that when PR was performed early after acute exacerbation of COPD it resulted in better health outcomes (O'Donnell et al., 2007). According to Kelleher et al. (2009), nurses are essential for successful integration of and delivery of programs such as PR.

One of the greatest barriers that affect the use of PR is lack of knowledge or awareness of the usefulness of the PR program, because the COPD patients are discharged without being well educated on the benefits of PR; therefore, they are not motivated to consider it as an option for reducing exacerbations with associated hospitalizations. Another potential factor was not involving patients in their care. Patients do not understand why they should participate in the PR program; as such, they are not interested or motivated. One of the major challenges was that the patients are not well educated about their disease process as stated earlier, and the benefits of PR in the relief of their most serious symptom, which is shortness of breath. All these factors create difficulty in successfully getting the patients motivated and willing to participate in the PR program because they lacked understanding of why they should be in a program for exercise when, according to some of them, walking around the house could also serve as exercise. In addition, some of the patients who started the PR did not complete the program due to lack of perceived need.

Because of shorter length of stays in the hospital, the emphasis now focused on better self-management, which could be improved through a quality discharge process. For patients to carry out better self-care management and effectively adhere to the action plan in a PR program, they must have full knowledge of their illness and treatment (Scott, Baltzan, Dajczman, & Wolkove, 2011). Therefore, there was great need to evaluate the current patient education strategies and incorporate measures that would enhance patient's knowledge base,

motivation, PR utilization, and improve their self-management skills to reduce symptoms, improve quality of life and subsequently, decrease the readmission rate for exacerbation.

Reduction of Gaps

The effect of COPD on hospital resource use and costs to the patient are of significant concern. According to the National Institutes of Health (2009), COPD annual treatment cost was estimated to be $29.5 billion in direct costs, and an indirect cost of $20.4 billion in the United States. Many of the patients who were readmitted into the hospital as a result of COPD exacerbation were Medicare patients. The financial burden was substantial, leading to the inclusion of COPD in Hospital Readmission Reduction Program (HRRP) policy by the U.S Centers for Medicare and Medicaid Services (CMS) in October 2014 (Feemster & Au, 2014). With this policy, hospitals are financially responsible for patients readmitted within 30 days of discharge (Feemster & Au, 2014). Strong evidence showed that patients with COPD could benefit from effective PR program, which is a program that is designed based on recommended PR guidelines. According to Casey et al. (2014), PR program is the key strategy used to improve care of patients with COPD. The program consists of assessment, exercise training to strengthen and recondition the patient, education and psychosocial support to motivate and empower patients to engage in self-care, and to continue with PR participation even after the program (Casey et al., 2014).

Maintenance programs are designed to sustain the improvement in exercise capacity and HRQOL acquired from the main PR program (Soysa et al., 2012). Maintenance programs may be supervised or unsupervised, but both have been found to be effective (Soysa et al., 2012). A meta-analysis done by Soysa et al. (2012) showed that maintenance program provided improved and sustained exercise capacity, and enhanced quality of care. The benefits include reduction of dyspnea, improved exercise tolerance, improved HRQL, and reduction of

readmissions and hospital days (Corbridge, Wilken, Capella, & Gronkiowicz, 2012). A wide range of evidence has shown that implementing this outcome improvement project reduced the gap in practice and positively impacted overall quality of life for patients with COPD.

Implications for Social Change

Patient participation in PR promotes social support and interaction. Patients with COPD often have limited activity level due to bothersome symptoms such as breathlessness, causing them to leave a sedentary life (Pessoa et al., 2011). PR is a highly recommended nonpharmacological management for these patients and was intended to help them with the demands of their chronic illness (GOLD, 2008). The goal is to reduce symptoms, optimize functional status, and increase participation in daily activities to improve quality of life (GOLD, 2008). The use of structured education as intervention strategies in a PR program assisted in promoting self-management and autonomy in patients with COPD (Murphy et al., 2011). The activities of PR program allowed patients to interact and socialize during a monthly support group meeting while receiving health topics from health care providers.

To ensure that patients with COPD benefited from the program, their management involved exploring issues that could possibly deter their motivation and participation in the program, and subsequently prevent the achievement of optimal benefits of PR. Social psychology theories are beneficial in planning strategies that would enhance peoples' awareness to health problems and propose positive behavioral changes that would positively affect their health outcome. Health care providers could apply the health belief model interventions to enhance patient's health beliefs regarding PR and self-efficacy towards management of COPD.

Summary

COPD is associated with intolerable dyspnea that results in exacerbations, decreased HRQOL, and subsequent hospitalizations. It has been documented that PR, when delivered appropriately by incorporating all the components, helps to decrease the aforementioned symptoms (Marciniuk et al., 2010). PR programs, however, has been underused because of the lack of awareness and knowledge of the benefits in helping to optimize the treatment of adults with COPD and reduce the 30-day readmission rate. The aim of the quality improvement project was to reduce the 30-day readmission rate by identifying and addressing the factors that impede patients' awareness and participation in PR program, thereby reducing the existing gap in achieving effective management of patients with COPD, which will subsequently decrease hospital readmissions. Evidence-based educational intervention included the development of a better discharge information and referrals to the PR program, and the use of a multidisciplinary approach to implement a structured educational PR program that was based on current guidelines. The program focused on patient empowerment, self-efficacy, and behavioral change, all of which increased PR utilization, and effectively improved the quality of life and reduction of incidents of dyspnea in this population. In the next section, I explore the evidence that supported the implementation of PR for effective management of patients with COPD. I address the theoretical and conceptual framework of this study, including the method and background context of the project, as well as my role as a DNP student.

Section 2: Background and Context

Introduction

Managing patients with PR involves exploring issues that deter patients' motivation and participation in the program, subsequently preventing the achievement of optimal benefits of PR. Hence, the purpose of this DNP project was to assess the effect of the PR program in the reduction of exacerbations and resultant hospital admissions, as well as HRQOL in adults with COPD, and to find ways to guide and assist them in achieving the goals. Studies have shown that PR, a nonpharmacological management of COPD, is an effective multidisciplinary measure that helps to prevent exacerbation and reduce unplanned emergency department visits as well as hospital admissions (Casey et al., 2011; Suh et al., 2013). However, in my review of literature, I found that the utilization of PR was not optimal, thus preventing the individuals with COPD from enjoying the benefits of the program (Gou & Bruce, 2014; Marciniuk et al. 2010). Therefore, it was essential to find ways to address the barriers to effective use of PR program by creating awareness through patient education incorporated in an improved discharge process to motivate patients with COPD to participate in the program. When the knowledge of the disease process and benefits of PR program increase, the possibility of having a positive effect on the patients' decision to participate in the health-promoting behavior and self-management capability would be enhanced. In Section 2, I discus the literature search strategy, theoretical and conceptual frameworks, literature review related to the method, background, and context. I also discuss my role as a DNP student, and then I provide a summary of the findings.

Search Strategy

According to Kable, Pich, and Maslin-Prothero (2012), a search strategy has been is used in translating clinical inquiry or research questions into a format that is understandable by

search engine. Relevant articles were identified by searching the Google Scholar search engine of Walden University library, Cumulative Index to Nursing and Allied Health Literature (CINAHL) Plus with Full Text and PubMed's Medline Databases, OVID Full Text Database, Cochrane Library databases, and ProQuest. The key words or search terms included *COPD patients, PR, benefits of PR,* and *30-day readmissions*. I searched both quantitative and qualitative articles and used Boolean operator "AND" to help the search engine with information about the relationship between different terms in the search query, for example, 30-day readmission *AND* COPD.

Inclusion Criteria and Exclusion Criteria

I selected original research studies that reported whether increased awareness of PR program contributed positively to patient motivation to participate in the program, decreased hospitalization, and improved quality of life in patients with COPD. I included practice guidelines and statements, systematic reviews and peer-reviewed articles published between 2006 and 2016 in the literature search. Excluded in the search were studies or literature that were written in languages other than English or health problems that were focused on diseases other than COPD in adults. I selected twenty-two articles from the literature search for review and grouped them into three themes that included; those related to improvement in breathlessness, improvement in exercise tolerance, and improvement in HRQL. Grouping them in themes helped in the organization of the articles and getting familiarized with the articles as well. I assessed every article retrieved to ensure relevance by reading the abstract or the entire paper using the inclusion and exclusion criteria as guide to exclude irrelevant ones.

Concepts, Models, and Theories

I used the HBM to support this project. The HBM is a social psychology model that helps to predict or assess health behavior and has been used in health promoting behavioral

change (McEwen & Hills, 2011). The HBM has been applied to the management of various chronic conditions (Wang, Zang, Bai, Liu, & Zhang, 2014), as well as a health promotion strategy (McEwen & Hills, 2011). In a randomized controlled trial conducted by Wang et al. (2014), the HBM was used as a framework for a nursing intervention directed toward the improvement of outcomes in patients with COPD. Results showed that the HBM enhanced the patients' health belief and self-efficacy toward their disease management, reduced dyspnea, and improved exercise tolerance and activities of daily living (ADL) (Wang et al., 2014). The HBM focuses on the attitude and behavior of the patient toward involvement or participation in healthy health care preventive services that promote better outcome (McEwen & Hills, 2011). I used the HBM to assess patients' perceptions of health benefits, health barriers and readiness to participate in the PR program and self-management of COPD after completion of the PR program. Perceived benefit was described as the individual's opinion of the effectiveness of PR on reduction of breathlessness or dyspnea, activity intolerance, and HRQL.

The model consists of three components that addressed individuals' perceived susceptibility of the health problem. The first component was the perceived severity of the disease, in this context the stage of COPD and its progressive nature. When the patient perceived the seriousness or severity of COPD and its progressive nature, there was likelihood that the patient with COPD would be motivated to participate in PR.

The second component was the perceived benefits and barriers to change. When patients with COPD perceived that PR could improve symptoms such as dyspnea and activity tolerance, the chances of participating in the program increased. Patients who perceive that their symptoms can not improve were less likely to take part in the PR program. As such, perceived barriers were factors that impede participation.

The last component was cue to action. Cue to action referred to variables that help to motivate the individual's readiness to act and change their behavior (Rosenstock, 1990 as cited in McEwen & Wills, 2011). The diagnosis of COPD or recent hospitalization were cues or variables that could motivate patients with COPD to participate in PR.

Frameworks

The ACE Star Model is an evidence-based framework that can be used to guide the development of an outcome improvement project (Terry, 2015). The ACE Star Model of Knowledge Translation was developed to provide a comprehensive approach to translate evidence into practice (Terry, 2015). The model has five stages (Figure 1). Stage one is the identification of the problem. Stage two involves obtaining the summary or review of the evidence on the problem issue. The third stage, or the translation stage, guides the recognition and identification of evidence-based clinical practice guidelines related to the problem. Stage four, integration into practice, can be referred to as evidence-in-action, during which practice is aligned to reflect the best evidence. Stage five is the evaluation stage, and involves the measurement of identified outcomes to determine the impact that the evidence-based practice has on patient health outcomes (Terry, 2015).

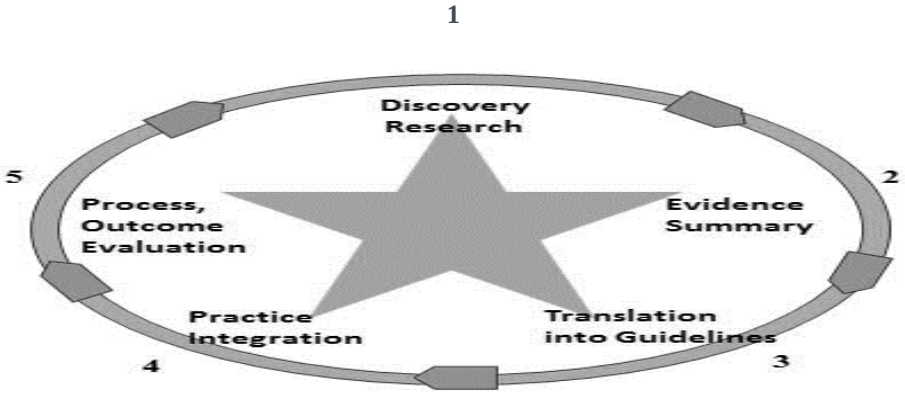


Figure 1. ACE star model knowledge translation. Adapted from Steven, K. R. (2013). The impact of evidence-based practice in nursing and the big ideas. *The Online Journal of Nursing, 18*(2), 4. doi:10.3912/OJIN.vol18no02man04

The five stages or star points of the Ace Star Model were used as a framework for translating evidence-based knowledge to influence the effect of the PR Program on healthcare and patient outcomes improvement in adults with COPD. The first stage involved identifying how a PR program could be used to improve the symptoms of dyspnea, HRQL and reduction of hospitalization in this population. In the second stage, the literature review provided background information and results of studies related to the effect of PR in management of patients with COPD. Current recommendations for best practices regarding PR guided knowledge as the best guidelines were selected for planning the program. The third stage, or translation stage, involved the application of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) evidence-based guidelines for managing PR. These guidelines guided patient assessment prior to, during and after the program, types of exercise training, patient education, and psychosocial support. The fourth stage was the integration of findings from translating the evidence into practice. The PR components comprised of patient education, exercise, and psychosocial support will be incorporated into the PR program. A multidisciplinary team approach was used to address patient's educational needs and PR administration. The team was composed of the nurses, respiratory therapists, social worker, and dietician. The fifth stage was the evaluation stage in which the effectiveness of the program was measured. PR effectiveness was measured using the 6-minute walk test (6MWT) and chronic respiratory disease questionnaire (CRDQ) for evaluation of dyspnea and HRQL.

Literature Review Related to the Methods

The review of literature elucidated the knowledge of mechanisms through which PR benefits patients and provided the evidence-base to guided nursing decisions regarding patient education and health promotion related to patients with COPD. I discussed the specific

literature in subsections of Effectiveness of PR on the Improvement of Breathlessness, Exercise Tolerance in Patients with COPD, and Quality of Life in Patients with COPD and The Effect of Patients' Attitudes on Promoting PR Uptake.

Effectiveness of PR on Improvement of Breathlessness

Evidence has consistently shown that an exercise program such as PR improved exercise performance and reduced dyspnea in patients with COPD, and was recommended as an integral and essential management option for COPD (Suh et. al., 2013; Lacasse, Goldstein, Lasserson, & Martin, 2006). Patients with COPD have trouble with breathing which negatively affect their ability to perform activities thus, leading to inactivity. Kyung and Chin (2008) examined the impact of PR on breathing capacity and activity tolerance in patients with COPD. The study design was a one group pre-test and post-test design with the sample consisting of eighteen males and two females, with a mean age of 68.7 years. The findings showed improvement in dyspnea and exercise performance after four weeks of participation in the program, evidenced by the measurement scores on Borg Scale $p < 0.01$ after Six-Minute Walk Test (Kyung & Chin, 2008). The Borg Scale is one of the psychosocial scales that has been tested and found to be valid and reliable in the assessment of the intensity of symptoms experienced during physical exercise such as in PR by patients with COPD or chronic lung diseases (Crisafulli & Clini, 2010). It was suggested that an outpatient PR program is a cost-effective approach to be included in the management of patients with COPD. Because the findings showed that older adults with COPD could achieve significant improvement in exercise performance and dyspnea through participation in a collaborative and monitored PR program, the research served as strong basis for including the older adults in this project. The findings in the Kyung and Chin (2008) study support the objectives of the PR project at Stroger

hospital and the recommendations were incorporated in planning and implementation of the project.

Wadell et al. (2013) aimed to determine the aspects of dyspnea relief that are achieved following a PR program in patients aged 40 – 80 years with COPD. The aspects of dyspnea studied in the pre-and post-intervention assessment included the sensory perception, such as the intensity of exertional dyspnea, and description of dyspnea upon completion of exercises, the severity of breathing-related anxiety with exercise, and self-efficacy. Also, included in the evaluation was the impact of PR on activity-related dyspnea as measured using the dyspnea components of the Chronic Respiratory Disease Questionnaire, activity component of the St. Georges Respiratory Disease Questionnaire, functional performance using the six-minute walk test, shuttle walk, and pulmonary function test (Wadell et. al.,2013). It was found that PR significantly decreased dyspnea resulting in increased functional capability in patients with COPD. The study provided valid tools that was used to evaluate the effect of PR on the relief of dyspnea, which was one of the goals for the project.

Lacasse, et al. (2006) performed a systematic review of 31 randomized controlled trials to assess the effect of PR on the overall quality of life and exercise capacity in patients with COPD. The impact of PR on relief of dyspnea was measured using the Chronic Respiratory Questionnaire (CRQ) to evaluate all four domains or subscales of the CRQ. The domains included dyspnea, fatigue, emotional function, and mastery or comprehension. Lacasse et al. (2006) found statistically significant improvement in the CRQ scores for all the domains, including dyspnea relief. The findings confirmed that PR relieves dyspnea and fatigue associated with COPD and allows the patients to improve their emotional functioning while promoting self-management capability. PR, therefore, would assist in improving the management and health of patients with COPD in the facility where the practice initiative was

implemented. Although the duration of PR programs in the meta-analysis varied, the findings strongly supported the administration of at least four weeks of exercise training to improve symptoms of breathlessness in patients with COPD. The study supports the objectives for this project as it demonstrated statistical significance of improvement of impact and effective dyspnea domain after PR program.

Effectiveness of PR on Exercise Tolerance

PR was found to improve functional capacity of patients with COPD. Lin et. al. (2012) conducted a randomized clinical trial on 44 patients with COPD to evaluate the effect of PR on activity tolerance, relief of dyspnea and promotion of quality of life. The treatment for the intervention group included the usual health education and a 12-week respiratory training program consisting of pursed-lip breathing, abdominal breathing, and exercise of the upper extremity. The control group received the routine health education but did not receive the respiratory training program. The outcomes in both groups were evaluated pre- and post-intervention using the spirometry parameters of the pulmonary function test, the six-minute walking test, and the St. George's Respiratory Questionnaire scores (Lin et. al. 2012). The findings showed a significant increase in exercise tolerance as evidenced by increased six-minute walking distance from 350.30 to 393.00 meters in the intervention group. The study supported the hypothesis that PR can increase activity tolerance and relieve symptoms of dyspnea as well as promote quality of life in patients with COPD.

Ahmed, Begum, and Ali (2014) performed a one-year retrospective study on 116 male subjects, ages 50 – 65 years with COPD to assess the impact of the PR components of pursed-lip breathing, diaphragmatic breathing, and lower and upper extremity endurance exercise training on activity tolerance in this population. The intervention group received 30 minutes PR twice daily for two months in their home, and the control group received no PR. There was

a significant improvement in the six-minute walk distance, SPO2% and the level of dyspnea and fatigue in the intervention group. It was concluded that consistent exercise and the utilization of every component of PR improves exercise tolerance in patients with COPD. The findings are consistent with previous studies including that of Lin et al. (2012) and Lacasse et al. (2006), and was useful for implementation of the project.

Erguin et. al. (2011) aimed to assess if an eight-week PR program would improve exercise tolerance, breathlessness, and HRQOL in 55 adults in both early and late stages of COPD. Subjects selection into groups was based on classification of severity of COPD according to the 2009 Global Strategy for the Diagnosis, Management, and Prevention of COPD (Ergün et. al. 2011). COPD stages I and II were grouped as early stages while COPD Stages III and IV were grouped as late stages. Both groups received the same treatment, eight-week all-inclusive PR program which consisted of exercise, training, educational sessions, nutritional and psychosocial counseling. Exercise capacity was evaluated before and after intervention using incremental shuttle walking test (ISWT) and endurance shuttle walking test (ESWT), dyspnea was assessed using the BORG dyspnea score, and HRQOL was assessed using the St. George's Respiratory Questionnaire (SGRQ). There was a significant improvement in exercise tolerance or capacity in both the early and late stages of COPD as well as a significant level of improvement in FVC (Forced Vital Capacity), FEVI, and in HRQOL in both groups. It was concluded that the PR program improved exercise capacity in patients with all disease severity in COPD. Ergün et. al. (2011) recommended motivating and increasing awareness of PR program to all patients who are in GOLD Stages I to IV of COPD to improve exercise capability, psychosocial status and resultant improvement in HRQOL. The knowledge gained from Ergüin et al. (2012) study guided the delivery of comprehensive PR to our population, through out at all the stages of COPD.

Effectiveness of PR Improvement of Quality of Life

Several studies as well as systemic reviews showed the importance of a PR program in reducing symptoms and improving HRQL in patients with COPD. In a systematic review involving 432 participants from nine randomized controlled trials, Puhan et al. (2011) assessed the effect of physical exercise offered during PR programs of different durations on the improvement of vital outcomes such as HRQL (HRQOL), capability, and future hospital admissions in patients with COPD who were recently treated for exacerbations of the illness. The intervention group received physical exercise while the control group received no treatment. To assess for the effect of PR on HRQOL two instruments were used, the Chronic Respiratory Questionnaire (CRQ), and St. George's Respiratory Questionnaire (SGRQ. It was found that PR effectively relieved symptoms, improved HRQOL, and reduced subsequent exacerbations in patients with COPD. Puhan et al (2011) however, advised against starting PR immediately after exacerbation of COPD due to the possibility of re-exacerbating within weeks after starting the program. Puhan et al. (2011), also found that patient education during the program had a positive impact on patient motivation, making it possible for patients with COPD to adopt a change in their behavior after exacerbation. The findings in Puhan et al. (2011) guided care management decisions for referring patients with COPD for PR program, avoiding commencement of PR soon after exacerbation of COPD.

Amany and Doaa (2013), investigated the effect of a PR program on the disease outcome in 27 adult patients of both sexes, aged 40 years and above with COPD. The participants received hospital care in addition to a supervised two-month home-based PR program, and the subjects were followed for two to six months after discharge from the hospital to evaluate the effect of a PR program on quality of life, pulmonary function, functional capacity and perceived dyspnea. The outcomes were evaluated within 2 and 6

months after PR using the St. George's Respiratory Questionnaire (SGRQ) to assess the effect of the program on quality of life, and the modified Borg scale for dyspnea assessment. The six-minute walk test evaluated functional capacity. There was a significant improvement in the quality of life in patients with moderate, severe, and very severe stages of COPD. The results indicated that patients in these stages of COPD could benefit from PR program. The results are in congruence with the study conducted by Ergün et al (2011), in which comprehensive PR program in out-patient setting revealed significant improvement in QOL and the improvement was evident in the patients at all levels or stages of the COPD. Hence, Amany and Doaa (2013) study corroborates with the objectives for this project.

In a longitudinal study, Bentsen, Rokne, and Wahl (2010), examined the health status and quality of life in 100 adults, aged 35 and above with COPD, after a six-week PR program. The aim was to evaluate if PR improves the quality of life and the influence of self-efficacy in the process. The assessment was performed before and three months after the intervention using a multi-disciplinary team of pulmonary physicians, nurses, physical therapist with specialization in pulmonary disease, a social worker, a dietician, and an occupational therapist. The Bandura's Social Cognitive Agent Theory was used, focusing on self-efficacy aspect. The theory informs the knowledge relating to patients' social interactions, identifying their perception and ability to successfully perform PR program with the belief that the action (participation in PR) is necessary to achieve the desired goal. Outcomes were measured using the Quality of Life Scale (QOLS) to assess patient satisfaction and the St. George's Respiratory Questionnaire (SGRQ) measured health status (Bentsen et al.,2010). There was a significant improvement in the physical activity, quality of life, and total health status ($p < 0.05$) immediately after PR in patients with COPD (Bentsen et al., 2010). The Bentsen et al. (2010) study supported the hypothesis of this project suggesting that PR positively impacts quality of

life in patients with COPD. The results of Bentsen et al. (2010) was vital in the development, implementation and evaluation of this project as well as in nursing practice, as it informed the knowledge that patients' belief influences self-efficacy, motivation to participate in PR, reduce symptoms, and subsequently improve quality of life in patients with COPD. Hence, in addition, PR should focus on ways to promote perceptions of self-efficacy and thereby increase patients' motivation and participation in PR, which are issues that negatively impact PR utilization in this facility.

Effect of Patients 'Attitude on Promoting PR Uptake

It is essential that patients with COPD understand the aim, expected outcomes of the program, and their commitment (Sohanpal, Steed, Mars, & Taylor, 2015). PR requires patients' motivation and self-management skills. Health behavior theories were used in many other studies to envision or explain participation issues, especially attendance in therapeutic interventions for variety of chronic illnesses (Cooper, Weinman, Hankins, Jackson, & Home, 2007). Fischer et al. (2009), studied the attitudes or beliefs of 12 patients with COPD towards participation in PR, anticipated goals as well as factors that influence drop-out from the program. The authors found that patients' beliefs in the effectiveness of treatment strongly predicted attendance in PR. Although Fischer et al. (2009) used a small sample size which could potentially limit its generalizability, the findings were consistent with other studies. Thus, the findings were used to guide the development of the project as it supported the hypothesis that perceived burden of COPD influences patients' decisions for PR uptake or drop-out. More so, as the patients' decisions to participate in PR program helped to fill the gap in PR utilization and positively impacted the outcome of patients with COPD.

Simon (2013) investigated health-related behaviors of patients with chronic pulmonary diseases using the Health Belief Model. 145 and 161 subjects diagnosed with COPD and

asthma respectively answered a questionnaire using a 1-5-point verbal Likert scale to measure HBM elements. The results indicated that patients were willing to participate or adhere to a treatment plan or health enhancing behavior if they believed or thought they were susceptible and considered the disease severe and threatening, and if they thought that there are some actions that they could take to prevent the disease, in this case, actions that would prevent progression and exacerbations. The application of the components of the HBM and the findings in Simon (2013) study informed this project.

Relevance to Nursing Practice

Nurses play a pivotal role in educating and assisting patients to increase their knowledge base regarding the progressive nature of COPD, acquaint them with the benefits of PR and thus, impact their ability to make appropriate decisions regarding plan of care. The involvement of the nurse in a PR program helped in the identification of factors that motivate the patient, assisted in determining realistic outcomes expectations, and provided patient teaching opportunities. COPD results in dyspnea which leads patients to lack the confidence to engage in activities. As a consequence, many patients may lose their sense of control in terms of self-efficacy to perform activities based on their belief of the outcome. The PR program served as a measure for providing not only symptom relief, but also heightened perception of self-efficacy. A PR program utilizes a multidisciplinary approach, with the nurse as a member of the interdisciplinary team. Nursing plays an essential role in minimizing symptoms and improving exercise capacity and quality of life as the patient learns to cope, and adjust to life with COPD. The result of this project improvement initiative informed guidelines for improving patient education and discharge process, improved participation in the PR program, and significantly impacted the delivery of health care to individuals with COPD.

Background and Context

The United States Centers for Medicare and Medicaid Services (CMS) included COPD in its Hospital Readmission Reduction Program (HRRP) policy in October 2014. With this policy, hospitals are financially responsible for patients readmitted within 30 days of discharge who are diagnosed with similar problems (Feemster & Au, 2014). According to Linsuwat, Mankongpaisarnrung, Dumrongmongcolgul, and Nugent (2014), the cost drivers for COPD are emergency visits and hospital admissions for acute exacerbation which account for 70% of total costs for the treatment of COPD (Limsuwat, et al., 2014). Application of evidence-based intervention becomes essential to prevent or reduce prevalence of COPD. Evidence on the management of COPD indicated that PR reduces future hospitalizations. Donesty, Citron, Hilling, Cayou, and Milic (2015) studied the long-term effect of PR on 128 participants who completed the six weeks PR program. The findings showed a decreased emergency department visits and hospitalization among patients with COPD who continued with regular exercise after PR (Donesty et al., 2015). The management of patients with COPD emphasized the importance of maintaining the benefits that were obtained from PR through consistent exercise to reduce the impact of COPD and improve the quality of life.

The facility, which is one of the facilities that make up the Cook County Bureau of Health Services in the state, is a 464-bed community medical surgical teaching hospital, and a renowned level 1 trauma center in the nation (Cook County Health & Hospital System [CCHHS], 2016). The mission of the organization is to serve diverse populations with the commitment of promoting health and wellbeing. One of their goals is to provide quality and cost-effective healthcare services to patients. Over 40% of the hospital's space is devoted to serve as outpatient specialty care centers, which includes the pulmonary clinic and outpatient PR center. The PR program is designed to support patients with COPD to improve their skills

to better self-manage their health condition. Previous reviews and studies found variations in duration of PR program, thus, raising the question of what the appropriate duration of a PR program should be to optimize and maintain benefits (Marciniuk et al., 2010).

One of the greatest barriers that impact the use of PR is the lack of knowledge or awareness of the usefulness of the PR program. The patients with COPD are discharged without being well educated on the benefits of PR, and therefore, are not motivated to consider it as an option for reducing exacerbations with associated hospitalizations. Another potential factor for the underuse of the PR program was not involving patients with COPD in their care. One of the major challenges was that the patients were not well educated about their disease processes and the benefits of PR in the relief of shortness of breath, which is their most serious symptom. In addition, some of the patients did not complete the PR program due to lack of perceived need. Patients who failed to attend or complete the PR program did not believe that it could contribute to the improvement of their health outcome (Sohanpal, Steed, Mars, & Taylor, 2015). Conversely, those that understood the need or benefits of the PR program were motivated to start and complete it. Therefore, helping the patients with COPD understand the benefits of the PR program prior to participation in it, would improve their ability to attend and participate in the program, and enhance their potential in self-management, health outcomes, and subsequently, reduce the rate of hospitalization.

Because of shorter length of stays in the hospital, the emphasis now focused on better self-management, which could be improved through a quality discharge process. For patients to carry out better self-care management and effectively adhere to the action plan in a PR program, they must have a good knowledge of their illness and treatment (Scott et al., 2011). Therefore, there was a great need to evaluate the current patient education strategies and incorporate measures that would enhance patient's knowledge base, motivation, PR utilization,

and improve their self- management skills in order to reduce symptoms, improve quality of life and subsequently, decrease the readmission rate for exacerbation.

Role of the DNP Student

Nursing scholarship demands that nurses apply knowledge acquired from college and practical experience in solving problems (Terry, 2015). The DNP student worked as a change agent or facilitator to engage in the project planning, implementation, and evaluation of the program. As a change agent, the DNP student identified the gaps in the quality of health care delivery to patients with COPD and explored ways for improving their health outcomes and hospitalizations through improved participation in the PR program. The DNP student assessed the knowledge of the unit nurses who assisted in educating the patients on COPD progression and the effect of PR in the management of COPD as well as provided access to evidence-based guidelines. Patient assessment would begin from admission and the teach back method would be used to evaluate the patient's understanding of COPD and the benefits of PR. The student created evidence-based handouts that consisted of a brief overview of COPD and the role of PR in helping to maximize the treatment of patients with COPD. The handouts were included in the admission package of this population on admission. With the collaboration of the manager, and the director of pulmonary medicine, our discharge process was revised to include information about PR program in the discharge booklet to increase patients' awareness of PR. The goal was to increase patients' motivation and willingness to participate in the PR program and subsequently impact their outcomes positively. The DNP student would ensure that evaluation tools for assessing the outcomes of the PR program are based on the knowledge deduced from evidence.

The project utilized a team approach in delivering care to the population. The DNP student based the team formation on the knowledge learned by incorporating the four phases of

forming, storming, norming, and performing, as presented in Zaccaganini and White (2011). The goal was to select team members who possess the skills to assist and educate the patients based on areas of expertise. The DNP student effectively communicated with the team members and stakeholders and facilitated collaboration. A supportive healthcare team was instrumental to achieving the set goals and objectives for improving the health outcome of patients with COPD.

The DNP student collected the data and identified reliable and valid tools for measuring the outcomes. During the implementation stage, the student (leader) monitored the progress of the interventions, guided by not only the goals and objectives, but also the mission statement of the facility, and the project's evaluation plan and timeline. The project leader moved the project forward in collaboration with the team through regular communication, providing updates and making changes to resolve issues.

Summary

The review of literature showed strong support that PR is an integral part in optimizing care to achieve improved outcome in patients with COPD. Lack of knowledge and understanding of PR hamper decision to participate and adhere to the program. The key to success was to increase the knowledge of patients with COPD about the disease process, create awareness of the benefits of PR program, and enhance self-management skills of the patients. Exploring and addressing barriers that could hinder patient participation in PR were essential. The use of evidence-based model such as the ACE Star Model guided the project development while utilization of theoretical framework such as the HBM enhanced patients' perception and desire to participate in PR program as self-management in patients with COPD are vital elements for a successful project outcome. Health -related quality of life of patients with COPD was dependent on patients' perception of their illness and their knowledge and

understanding of their disease process (diagnosis, prognosis, and management). It is crucial for nurses to be acquainted with possible enabling factors to participation in PR to effectively support patients to undertake PR. The result of this study would possibly inform guidelines for providing PR and may significantly impact the delivery of health care to individuals with COPD. The development of the project not only included research translation but also included the dissemination and integration of new knowledge and being able to utilize the findings in the advancement of nursing practice, improvement in quality of care and patient outcomes. Section 3 of the project focused on the design, population, data collection, data analysis, and the method of evaluation.

Section 3: Methodology

Introduction

In this project, I evaluated the influence of the PR program in the management of adults diagnosed with COPD. Exacerbations of COPD result from worsening symptoms of which breathlessness or dyspnea is the primary or major factor. Evidence gathered from literature suggested that a PR program was effective in improving outcomes in patients with COPD, but I found that its use was suboptimal as most patients were not motivated and willing to participate in the PR program. Moreover, patients with COPD who completed the program seek to return to the PR program due to worsening symptoms and hospitalizations resulting from lack of continuity of care. The purpose of the project was to assess the effect of a PR program in the reduction of exacerbations and resultant hospitalizations, as well as HRQOL, in adults diagnosed with COPD. Increasing awareness of COPD and the benefits of PR would increase participation in the PR program, while also promote self-management in patients with COPD. In Section 3, I incorporate the approach and rationale, including the project design, population and sampling, data collection, data analysis, and evaluation plan.

Project Design and Methods

I used a one-group pretest-posttest quantitative design in a PR unit located within a teaching hospital. The design was a pre-experimental methodology that is commonly used for outcome improvement interventions (Burns & Grove, 2009). The decision for choosing this design was based on the recommendation in Terry (2015) that this design would be suitable for a DNP project carried out in a clinical setting. The pretest-posttest design examined the outcomes of interest, decreased dyspnea and increased activity tolerance, prior to application of the intervention (PR) and after completion of intervention (Terry, 2015). The outcomes of

interest were the dependent variables, while participating in a PR program was the independent variable.

Approach

The overall purpose of the project was to increase the quality of life and reduce admission rates for patients diagnosed with COPD through the development and implementation of patient education material that would increase PR awareness, patient motivation, and promote participation. I applied the Academic Center for Evidence-Based Practice (ACE) star model to guide the development of the project. The ACE star model has been successfully used in outcome improvement projects to improve health outcomes (ACE, 2010). After obtaining IRB approval, I collected data to assess the knowledge of COPD (Appendix A) and the benefits of PR among the patients with COPD prior to implementation of an improved discharge papers, which incorporated educational materials on overview of COPD and benefits of PR. The activities included patient and staff education on the discharge papers, and implementation. The goal of improving the discharge process was to increase patient awareness of PR program and the benefits in the management of COPD. Increasing the knowledge of the disease process and PR benefits prior to hospital discharge was essential to achieving outcome improvement in patients with COPD. I proposed that the intervention would increase motivation and decision to participate in PR and subsequently, improve their outcomes. The constructs of the HBM assisted in enhancing participation in PR (Figure 2). Subjects were selected for the PR program based on the set criteria and the treatment included a ten-week comprehensive PR program. The delivery of PR was fundamental to the reduction of bothersome symptoms or exacerbations and subsequent decrease in 30-day readmissions. Prospective data included the post-test (Appendices A and C) which I collected after

completing PR to evaluate knowledge of the disease and the effect of the program on outcome improvement among the population.

Population and Sampling

The project initiative was conducted in a hospital-based PR unit of a 464-bed teaching hospital of Cook County. The sample was collected from the medical records of eligible patients who have been referred, have undergone intake evaluation, and were waiting for PR. The participants were adults who were 40 years and older, and diagnosed with mild to very severe COPD based on the classification criteria by the Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Disease (GOLD). Exclusion criteria included other chronic lung diseases other than COPD, acute cardiac disease, impaired memory, impaired mobility or unsteady gait.

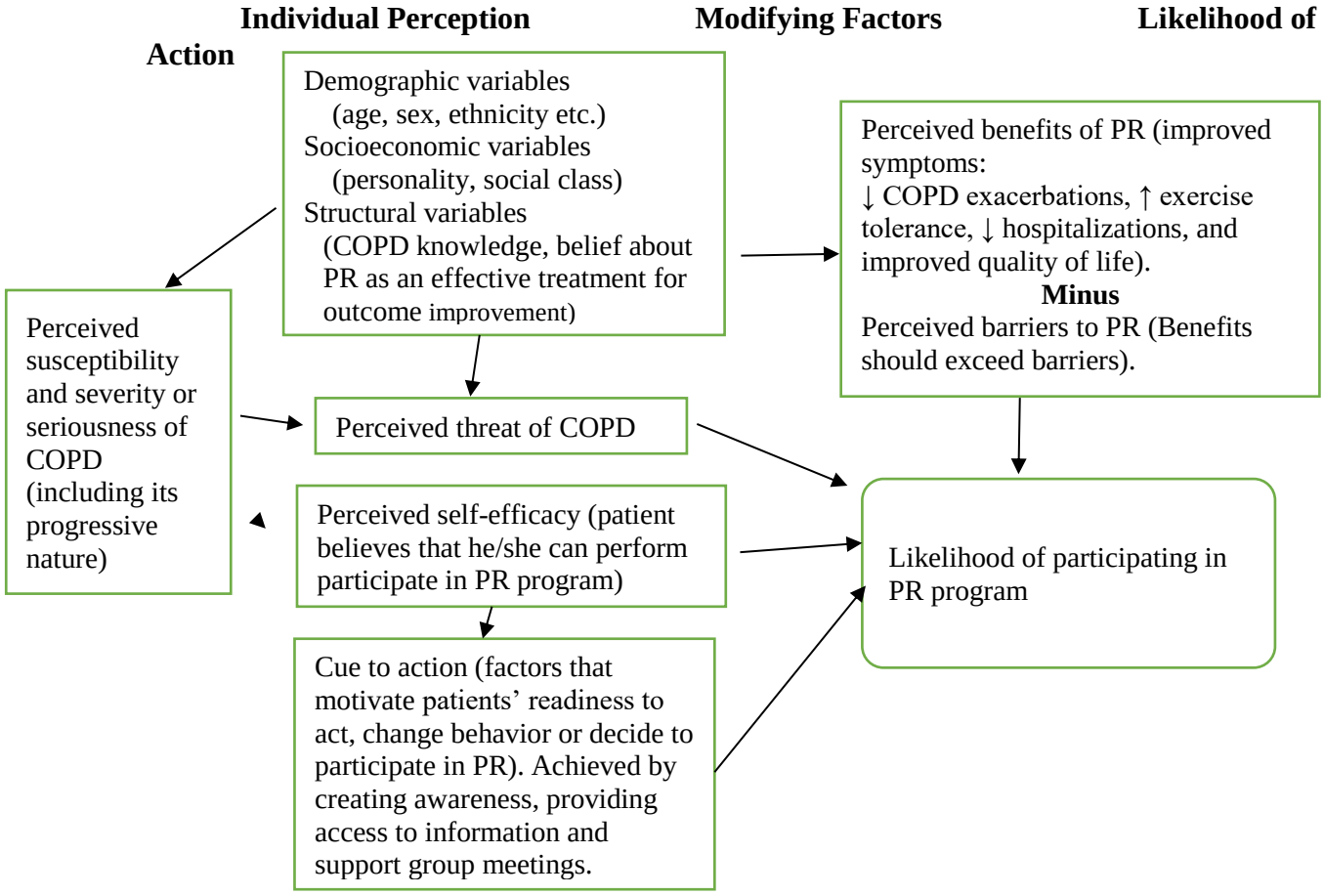


Figure 2. Application of the health belief model to enhance participation in pulmonary

rehabilitation. Adapted from McEwen, M. & Wills, E. M. (2011). *Theoretical basis for nursing* (3rd ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Data Collection

I obtained ethical approval for the study from Walden University Institutional Review Board (IRB) and the project site prior to the study. The discharge process was communicated with the unit manager and the nurses through a face-to-face meeting. Educational materials that would enhance the knowledge of COPD and the benefits of PR were selected from the American Thoracic society (ATS), and the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR). The nurses were educated and instructed to include the materials in the discharge papers with instructions for patients with COPD who were being discharged home.

Prior to PR, electronic PR consult referrals made by the providers through the Iris referral system were assessed daily by myself, to search for new referrals using a set login and password. I made telephone calls to the patients to schedule their PR intake evaluation. During the evaluation, patients were educated on what was involved in the PR program, including attendance in the 10-week class that would occur three times a week for a total of 30 sessions with each session lasting 60 to 90 minutes. Patients who met the criteria for inclusion and were motivated to participate completed the Bristol COPD Knowledge Questionnaire (BCKQ) (Appendix A) and the Modified Outcomes Study Form (SF-36) Questionnaire (Appendix F) which served as some of the baseline or pretests. The BCKQ, which took approximately twenty minutes, and the Medical Outcomes Study Form (SF-36) which required ten minutes for completion (Zhang et al., 2012) were completed immediately after the intake evaluation. Each subject was given a code number as identification (e.g. 001) for confidentiality. I asked the participants to place the identification numbers on all the forms or questionnaires they completed. I also instructed the patients to complete the questionnaire by

themselves, selecting or circling the number that best described their answers. Once the pretests were completed, the participants were asked to place them in an envelope marked Pretest. I collected the envelope, sealed it and placed it in the secured cabinet in my locked private office. A master list of the patients' names and their code numbers was kept in a locked cabinet with a secure lock located in my private office in the pulmonary department.

The PR, which is a comprehensive multidisciplinary, patient-centered intervention involved exercise training, self-management education, and social support. The PR program was offered for a 10-week period and participants attended a 60-90-minute session of education and exercise, three times weekly for 10 weeks. The classes were offered by various disciplines including nursing, physicians for disease related education, dietician for nutritional intervention, social worker for psychosocial support, and respiratory therapist for the exercise, breathing techniques and other self-management strategies. Self-management education included teaching on illness control and health behavior modifications. The exercise training was done by the respiratory therapist and included strength training, upper and lower extremities endurance training using the free weights, arm cycle ergometry, the bio step, treadmills, and recumbent bicycles. The participants were monitored and worked with one-on-one by the respiratory therapist, each performed activities as tolerated.

To schedule their PR start date, the participant received a telephone call from the respiratory therapist who coordinated and teaches the exercise. On the first day of PR, prior to starting the program, a Six Minute Walk Test (6MWT) and the Modified Borg Dyspnea Scale (Borg Test) (Appendix D) were completed as the remaining baseline tests. The six-minute walk was performed along a pre-marked 100-foot-long indoor corridor in the PR unit. The purpose of the walk was to determine how far the participant can walk in six minutes. During the test, the therapist encouraged the participants to walk to their maximum distance possible,

and might stop if short of breath, fatigued or if unusual symptoms are experienced. The participant walked alone from a starting line and made as many laps as possible. When the participant was unable to continue, no words of encouragement or persuasion were used. The participant's performance was recorded on the worksheet (Appendix G). The distance walked was recorded in the 6MWT worksheet and report Form (Appendix G) using the same pre-assigned ID number. The participant's respiratory rate, heart rate, and peripheral capillary oxygen saturation (SPO2) were measured before and after the six-minute walk and recorded in the same worksheet. The respiratory therapist conducted the test, recorded the data in the worksheet, placed them in an envelope marked Pretest and locked the data in a cabinet in the PR unit. I eventually collected the sealed envelope and placed it in a secured cabinet in my private office.

The Borg Test was administered in the PR unit by the respiratory therapist and myself. The Borg test is a subjective and objective dyspnea assessment test that was completed by the participants, prior to and immediately after the 6MWT was completed, using their pre-assigned ID code. The participant was made to sit on a chair at the designated test area in the PR unit to complete the Borg Test. The BORG Test rates dyspnea on a scale of zero to ten, where zero signified absence of dyspnea and ten being the maximal level of dyspnea. I provided a pen for the participants and asked them to grade their level of shortness of breath. Upon completion of the Borg Test, the participants were asked to place them in an envelope marked Borg Test Pretest. I collected the envelope, sealed it and placed it in the secured cabinet in my locked private office.

On their last day of class in the PR unit, I asked the participants to complete the BCKQ, the SF-36 and the Borg Test using the same identification number on the tests. The 6MWT was conducted by the respiratory therapist using the same pre-assigned ID number.

Once the posttests were completed, the participants were asked to place them in specific envelopes marked Posttest for each test. I also collected the envelopes, sealed them and placed them in the secured cabinet in my locked private office. The pretest scores served as the baseline used to compare with the posttest scores after the PR. A data entry spreadsheet I developed (Figure 3) was used to enter the data collected prior to and post intervention for use during the analysis. After both tests were completed, the initial log of participants names was destroyed in the facility's shredder.

Pretest (Baseline)				Posttest (After PR)				
Instruments and Scores				Instruments and Scores				
Participant Code	BCKQ	SF-36	Borg Scale	6MWT	BCKQ	SF-36	Borg Scale	6MWT
e.g. 001								

Figure 3. Data Entry Spreadsheet. Notes: BCKQ = Bristol COPD Knowledge Questionnaire, SF-36 = Modified Short Form 36, 6MWT = Six-Minute Walk Test

Instrumentation

The Bristol COPD Knowledge Questionnaire

The Bristol COPD Knowledge Questionnaire (BCKQ) was used to assess the knowledge of patients with COPD on both the disease process and PR before and after participation in the PR program (Appendix A). The BCKQ is an instrument developed by a group of medical professionals and consists of 13 topics, each of which has five statements, for a total of 65 questions. The questionnaire was in the form of a paper and pencil pretest and posttest. The patients chose between true, false and don't know answer choices (White et al.,

2006). Each correct answer received a point while the incorrect answers or don't know choices received no point (White et al., 2006). The instrument was first developed to specifically test the knowledge of patients with COPD and has also been found to be a valuable tool for testing the knowledge of the healthcare staff as well (Edwards & Singh, 2012). The BCKQ is a valid instrument for measuring the knowledge of patients about COPD. Test-retest reliability of the BCKQ was good, r = 0.71, and its internal consistency for all the items showed Cronbach's alpha of 0.73 (White, Walker, Roberts, Kalisky & White, 2006), made the questionnaire a useful instrument for this project.

Modified Borg Scale (Test)

Dyspnea was assessed using the Modified Borg Test, a questionnaire that consists of 12 numerical descriptions for dyspnea assessment (Appendix D). The participants were instructed to mark the boxes that best reflected their perception of their dyspnea (Pollock et al., 2013). The participants were asked to report their subjective dyspnea perception by marking the most suitable description or number of their shortness of breath in the boxes before 6MWT (at rest), during and after the walk or exercise. The Borg scale was modified by Mahler and Horowitz in 1994 from the original Borg scale that consisted of 6-20 items and specifically describes perception of dyspnea before, during and after activities as well as fatigue. The Modified Borg Scale has been very much used as assessment tool in rehabilitation, evaluating clinical significance of outcome of rehabilitation and COPD in relation to dyspnea perception, and has been found to be valid and reliable with a Cronbach alpha greater than 0.8 (Gerlach, Williams, & Coates, 2013). Also, test-retest reliability of the Modified Borg Scale with other dyspnea scales such as Visual and Vertical Analogue Scales showed a correlation coefficient (*r*) that ranged from 0.81 to 0.97 and satisfactory validity (Powers & Bennett, 1999).

Six-Minute Walk Test

The 6-minute walk test (6MWT) was used to determine the functional capacity or functional exercise performance of the patients. The 6MWT was identified as one of the guidelines for evaluating the effect of PR exercise program and was also found to be cost-effective (Pessoa, 2014; Nonoyama et al., 2010). The 6MWT was used to measure the distance that the patient can walk quickly on a flat hard surface for six minutes and reflected their ability to perform daily physical activities (Farias et al., 2014). The 6MWT is an objective assessment of the functional capacity of patients, including patients with chronic diseases. The test was initially designed for patients with heart and lung disease to assess the impact of the disease on activity performance (Guerra-Balic, et al., 2015). The 6MWT has been reviewed and found to be easy, well tolerated and reflects the patients' activity of daily living. The test has been broadly used as the instrument of choice in the evaluation of functional capability in clinical evaluations and research, and its use was highly recommended for this purpose (Solway, Brooks, Lacasse, Thomas, & 2001). The test-retest reliability of the 6MWT in patients with cardiac disease has shown a high level of reliability with a correlation coefficient of 0.94 (Hanson, McBurney, & Taylor (2011). Similarly. Hernandez et al. (2011) study found the 6MWT to be a reproducible or reliable measurement tool in a study of sample patients with COPD, *r* 0.93. Thus, the instrument was useful for the evaluation of the effect of PR in the improvement of functional capability in this population.

Medical Outcomes Study Short Form 36

HRQL was assessed using the Medical Outcomes Study Short Form 36 (SF-36) (Appendix F). The SF-36 is a self-administered questionnaire with 36 questions consisting of an eight-scale profile of functional health (physical component) and well-being (mental component) scores. The questionnaire assesses quality of life in several domains, physical, mental, emotional, pain, and functional. The Medical Outcome Study SF-36 (SF-36) had gone

through several test-retest evaluations for reliability and validity. Irvine et al., (2000) evaluated outcomes of home care nursing using the SF-36 to assess their quality of life and determined the Cronbach alpha ranged from .76 to .94 in all eight subscales of the tool. Similarly, test-retest reliability of the SF-36 evaluated in Zhang et al. (2012) study revealed the overall Cronbach alfa to be 0.791. The SF-36 had been used in previous studies that assessed quality of life in patients with COPD and other chronic pulmonary diseases (Ding, DiBonaventura, Karisson, Bergstrȍm, & Holmgren, 2017). Thus, making the tool a reliable and valid instrument for assessing quality of life.

Protection of Human Subjects

To ensure that the participants were treated following the ethical guidelines, I sought approval from the teaching hospital and Walden University Institutional Review Board. The Health Insurance Portability and Accountability Act (HIPAA) was put into consideration by maintaining confidentiality and ensuring that patient identifiers were well protected. Information or data from the participants were not shared with any entity without the consent of the facility. I stored the data obtained from the pre-tests and post-tests securely in a locked cabinet in the pulmonary department. The participants' demographic data were protected to ensure privacy and confidentiality. To comply with the HIPPA Privacy Rule, the participants' identifiable health information such as the demographic data collected, including their names and medical records, (Burns & Grove, 2009) were de-identified. I performed the de-identification of the participants' data by removing the identifiable health information, particularly names and medical record numbers, and assigning a code number to every participant for use for all data before and after intervention. A master list of the participants' names and assigned code numbers were kept separately from the data collected from instruments for confidentiality. The master list, as well as the consents obtained from

participants, were securely locked in a cabinet in the student's office in the department. The same number code for each subject was used for both the pre-and posttest and the data collected before PR were used to compare the data that were collected after the PR program to evaluate if there were any differences or outcome improvement. In addition, the computers in the facility were well protected with password prompts and had updated firewall and antivirus protection to ensure that they could only be accessed by authorized users. These were safety measures that ensured data protection and the participant's confidentiality.

Data Analysis

The project's practice focused questions were: In patients with COPD, does participation in PR lower readmission rates than non-participation? Do patients who participate in PR have less frequent symptoms of dyspnea compared to patients with COPD who refuse PR? Data were analyzed using the paired *t*-test which was a recommended type of analysis when pre-and post-samples from the same subjects were being analyzed. The paired t-test was used to calculate the differences within each pretest and posttest measurements and determined if the mean differences are statistically significant. The analysis was performed using SPSS statistics software, the 24.0 version.

Reliability

The degree of dependability or consistency of a measurement tool to produce the same result when the test is repeated is referred to as reliability (Terry, 2015). The Bristol COPD Knowledge Questionnaire (BCKQ) for assessing the knowledge of patients with COPD had undergone test-retest reliability and was found to have a good internal consistency for the items evidenced by a Cronbach alpha 0.73 (White, Walker, Roberts, Kalisky, & White, 2006). The subscale of the SF-36 Items Questionnaire had been tested for internal consistency and found to have a very good reliability for all subscales (Eshaghi, Ramezani, Shahsanaee & Pooya,

2006). The Six-Minute Walk Test (6MWT) for evaluating the functional capacity of patients with COPD had undergone test-retest reliability and found to be reproducible or reliable (Hernandes et al., 2011). The Modified Borg Scale has been tested for reliability and found useful in assessing subjective dyspnea in patients with COPD (Kendrick, Bari, & Smith, 2000).

Validity

Validity refers to the extent at which an instrument measures what it is intended to measure (Terry, 2015). The BCKQ is a valuable measurement tool developed for both clinical and research purposes to assess patients' knowledge and effect of education. It was specifically tested in patients with COPD and showed a high validity score. The SF-36 Items Questionnaire was assessed and validated by many studies as a valid instrument for assessing the quality of life in adults and had a Cronbach alpha of 0.79 overall score (Zhang, QU, Lun, Guo, & Liu, 2012). The result made the tool a valid instrument for use for this project. The Modified Borg Dyspnea Scale was the instrument used to rate perceived difficulty in breathing which was one of the major outcomes of interest. The scale consists of numbers zero to 10, absence of dyspnea was scored zero and 10 the maximal difficulty in breathing. The Modified Borg Scale was found to be a valid instrument for rating the perceived exertion during exercise such as walking, running, and cycling (Pollock et al., 2013), some of which were components of PR.

Project Evaluation Plan

Program evaluation helped in the verification of success or failure of the program by noting if objectives were met or not; and if unmet, issues concerning causality and improvement were addressed Cornielje et al., 2008). The potential outcomes of the impact of PR in the management of adults with COPD included the primary outcome of decreased dyspnea, as well as increased exercise tolerance, and improved HRQL, that subsequently lead to reduced health care utilization. Evaluation is a method of monitoring, and a management

tool used to assess activities that have occurred in a specific time, it also assists in planning and improving future work (Cornielje, Velmaa, & Finkenflugel, 2008). The expected outcome for the PR project was a reduction of breathlessness and readmissions after fully participating and completing the 10-week exercise program.

Evaluation Model

Project evaluation was the process used to determine how a program works, it's effectiveness or impact (Kettner, Moroney, & Martin, 2013). The main purpose was to provide feedback on what was accomplished, the impact or outcome, and inform the planner or stakeholders on how to improve the project. Two forms of evaluation methods were applied. The formative evaluation and summative evaluation. The formative evaluation was an ongoing evaluation of the program that took place throughout the entire project, that is, from the development through implementation (Miake-Lye, et al., 2011). Summative evaluation on the other hand, was done after the program implementation using results of the posttests. The goals for the evaluation included documentation of data such as the pretests and posttest to know if the project was implemented according to plan, and if the objectives of the project were met and sustained. To achieve this, data were collected through review of the electronic health records to monitor patients' participation records, symptom relieve as was evidenced by reduced exacerbations and readmissions within 30 days, all of which would cause reduction of healthcare utilization in the facility. Follow up calls were made by me to assess sustainability of intervention and patient adherence after the program. The Plan, Do, Study, Act (PDSA) quality improvement model was ideal for the development, implementation, and evaluation of my project. The fact that the PDSA could be approached in stages, beginning from need assessment, development of the project question, implementation of the quality improvement project to evaluation of the outcomes, allowed the program leader to review the progress and

success at each stage, thus, permitting necessary changes to be made during the process (Terry, 2015). The PDSA model has been successfully used in the facility to evaluate quality or outcome improvement projects.

Summary

The purpose of the project was to evaluate the impact of PR in improving the health status of adults with COPD. Project design and methods, population sampling, data collection, and evaluation plan were all essential elements in the project implementation. Determining and choosing appropriate project design was essential as it influenced reliability of the project result. Using reliable and valid instruments to measure the outcomes enhanced usability and generalizability. Programs are often formed to accomplish specific goals. The goals-based evaluation assesses the extent to which programs meet goals and how they could progress in the future. The adoption of PR program required the patients with COPD to make decisions about engaging in healthy behavior. Facilitating factors that assisted patients in decision making included having a good knowledge of the program, knowing what the goals and outcomes of participating were. This was particularly important as PR involved multidiscipline. The next section summarized the findings, implications for practice and social change, identification of the project strength and limitation, and analysis of self as a DNP project leader.

Section 4: Findings and Recommendations

Introduction

The purpose of this quality improvement (QI) project was to assess the effect of a PR program in the reduction of dyspnea, activity intolerance, and quality of life with resultant decrease in hospitalization in patients with COPD. To increase awareness of PR and the knowledge of the patient with COPD on the benefits of PR, I used educational tools from the American Thoracic Society and the American Association of Cardiovascular and PR (Appendix E) to educate patients with COPD. I incorporated the same instruments into their discharge summary. I selected fifteen participants with COPD who met the criteria for inclusion during the intake evaluation to participate in the 10-week exercise program. A baseline test using the Bristol COPD Knowledge Questionnaire (BCKQ) to assess their knowledge of the disease (Appendix A) was completed by the participants. In addition, on the first day of PR, prior to starting the excise program, the participants also completed the following baseline tests: The Medical Outcome Study Short Form 36-Item (SF-36) questionnaire (Appendix F) to assess the impact of the disease on their overall health, the 6-minute-walk test (6MWT) to assess exercise tolerance (Appendix G), and the Modified BORG Dyspnea Scale (BORG Scale) (Appendix D). The patients completed the same questionnaire and tests after the program (posttest). In Section 4, I will discuss the findings, implications, recommendations, strength and weaknesses of the project as well as the social implications and analysis of self.

Summary of Findings and Implications

The primary purpose for the DNP project was to help in reducing breathlessness, which is the major symptom, improve activity tolerance, and quality of life in patients with COPD who participate in PR with subsequent reduction in hospitalization. The practice-focused

questions were: Do patients with COPD who participate in PR have less frequent symptoms of dyspnea compared to patients with COPD who refuse PR? The second question was: Do patients with COPD who participate in PR have lower admission rates than patients with COPD who do not participate in PR? There were three objectives for the practice project. The first objective was to increase awareness of the PR program for patients with COPD and encourage their ability to participate in the program. The second objective was to promote and maintain improvement in functional or physical activities. The last objective was to improve HRQL of patients with COPD. HRQL will be measured using the Chronic Respiratory Disease Questionnaire (CRDQ) Statistical analysis was conducted using the statistical package, IBM SPSS version 24.0, downloaded from the Walden University Center for Research Quality and research resources (Laureate Education, 2017). Data were analyzed using demographic descriptive analysis and paired sample t-tests, comparing the pre- and post-PR scores of all the outcome measures.

Demographics

Table 1 summarizes the descriptive statistics of the participants' demographic characteristics (age, gender, ethnicity, marital status, educational level, and severity of COPD) including the mean and standard deviation. The participants consisted of seven males and eight females (n = 15). Their ages ranged from 51 to 77 years, mean of approximately 60 years, mostly African Americans, and most of them have college degree. The lung function of the participants was assessed to determine the severity of COPD of the group using the GOLD standard as guideline. Most of the participants were found to have moderate to severe obstructive lung dysfunction.

Table 1

Participants Characteristics (n = 15)

Demographic characteristics	Frequency	Percentage	*M* (*SD*)
Gender			1.53 (.516)
Male	7	46.7%	
Female	8	53.3%	
Age (years)			59.87 (6.74)
40-49	0	0%	
50-59	7	46.7%	
60-69	7	46.7%	
70 and older	1	6.7%	
Ethnicity			2.0 (.756)
White	3	20%	
African American	10	66.7%	
Hispanic	1	6.7%	
Asian	1	6.7%	
Marital status			1.87 (1.06)
Single	7	46.7%	
Married	5	33.3%	
Widow/widower	1	6.7%	
Divorced	2	13.3%	
Education			2.33 (.816)
Less than high school	3	20%	
High school	4	26.7%	
College	8	53.3%	
COPD severity (FEV1)			46.47 (15.87)
Moderate FEV1 50 – 79% predictive	6	40%	
Severe FEV1 30 – 49% predictive	7	46.7%	
Very severe FEV1 < 30%	2	13.3%	

Note. Male = 1, female = 2, White = 1; African-American = 2, Hispanics = 3, Asian = 4; single = 1, married = 2, divorced = 3, widow/widower = 4; less than high school = 1, high school = 2, college = 3. *M* = mean, *SD* = standard deviation. GOLD guideline for COPD classification: Mild/GOLD 1 (FEV1 ≥ 80% predicted), moderate/GOLD 2 (50%, FEV1 ≤ 80 FEV1 predicted, 50 -79%), severe/GOLD 3 (30%, ≤ FEV1 < 50 predicted, 30%-49%), and very severe/GOLD 4 (FEV1 < 30% predicted).

Objective 1. To increase awareness of PR to enhance participation and increase the knowledge of the disease for patients with COPD.

The implementation of the intervention of the project were guided by using the HBM as the framework to understand the patients' attitudes or beliefs and self-management skills required for participation in PR. Patient motivation and knowledge of the COPD self-

management and the benefits of PR are essential for participation in the program. Studies found that patients who believe in the effectiveness of their treatment are most likely to participate in the program (Fischer et al., 2009). Understanding patients' beliefs or attitudes, their self-management skills, and the provision of health education helped to encourage the adoption of healthy behavior enhancing their willingness to participate in PR. The positive impact of the use of the HBM for this project was evidenced by the subjects' willingness to participate in PR and hundred percent participation in the program with no attrition.

The Bristol COPD Knowledge Questionnaire (BCKQ) was used to measure the patients' knowledge of the disease (Appendix A) before and after the intervention. The first questionnaire was completed during the intake evaluation and repeated at completion of PR. The scores increased after PR education from 38.5 and 75.5% pre-rehabilitation (Figure 4) to 81.45 and 90.3% post rehabilitation (Figure 5). A paired *t* test was used to determine the difference in pre-and post-rehabilitation. The result for all the subjects (n = 15) revealed a mean score of 61.01 (SD = 11.084) prior to educational intervention in PR, while the BCKQ post test score after PR showed a mean of 81.45 (SD = 9.095). It can be seen that the participants' knowledge improved after the education in the PR program. The result is consistent with the findings in the study that was conducted by White, Walker, Roberts, Kalisky and White (2006). The results demonstrated that patient education can improve the knowledge of their illness and self-care management.

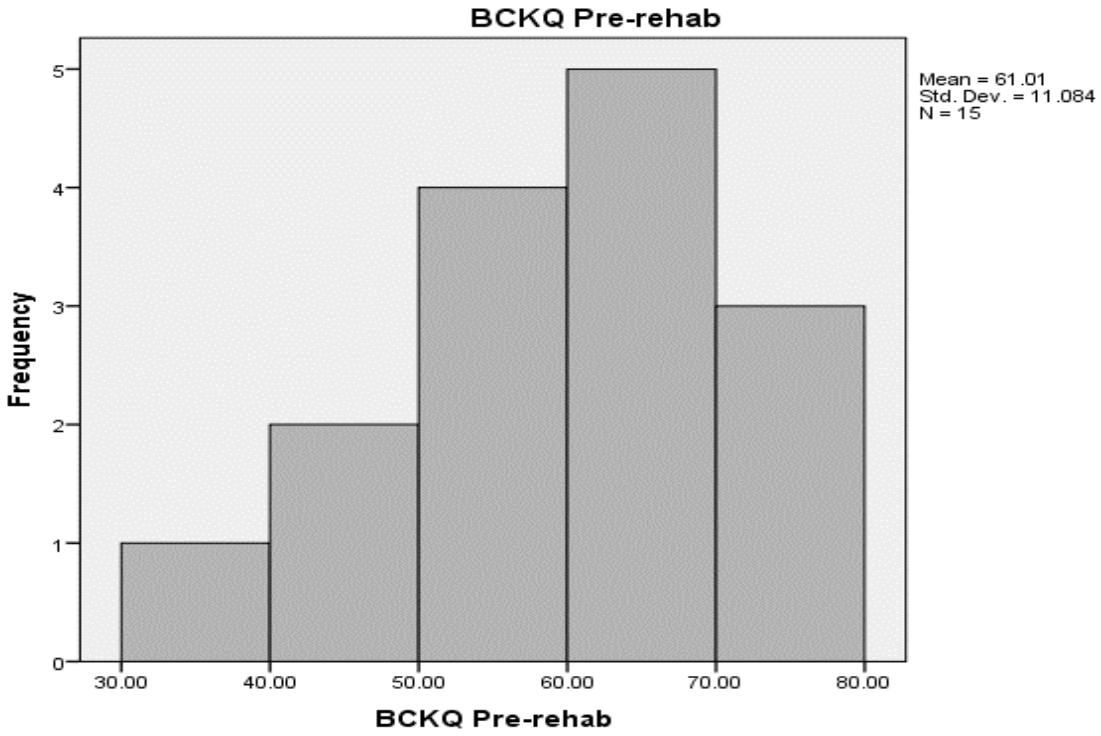


Figure 4. Bar chart showing BCKQ scores before PR. Knowledge of participants varied considerably probably due to their levels of awareness and education. The chart showed a minimum score of 38.5% and maximum of 75.4%

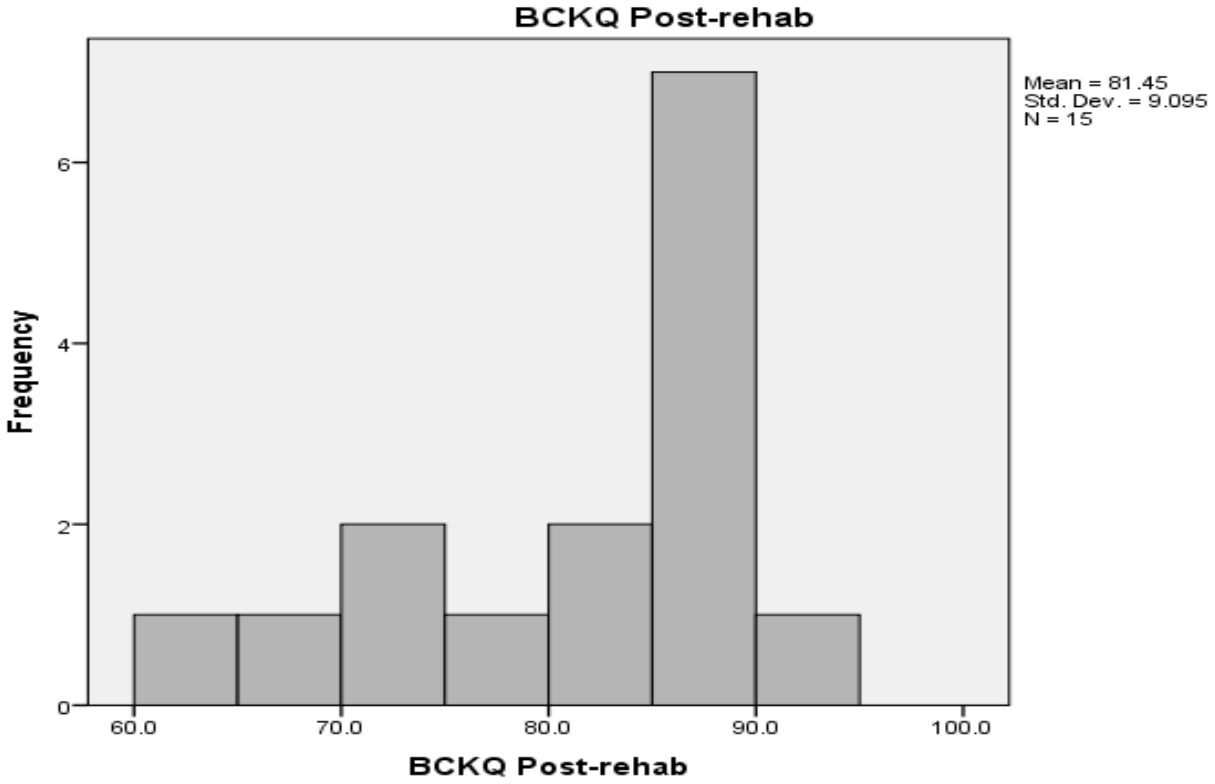


Figure 5. Bar chart showing BCKQ scores after PR., Scores improved after PR showing minimum score of 63.1 percent and maximum of 90.3%.

Objective 2. To determine if participation in PR would improve dyspnea and functional capability or physical activity for patients with COPD.

The variables were measured by performing the Six-Minute Walk Test (6MWT) (Appendix G), and the BORG test (Appendix D) before and after PR. On the first day of starting PR, the participants completed a 6MWT and the BORG scale test concurrently. The PR intervention was comprehensive consisting of patient-tailored exercise training (strength training and upper and lower extremities endurance training), self-management education, and social support that was offered three times a week for ten weeks. On the last week of PR, both the 6MWT and BORG test were repeated. Exercise tolerance increased for all the patients as they were able to walk longer distances. The outcome of the 6MWT was measured based on the total distance the patient was able to walk in six minutes. Pre-rehabilitation recorded a

minimum of 450 feet and maximum of 930 feet while post-rehabilitation recorded 610 feet minimum and 1120 feet maximum (Table 2).

Table 2

Statistical Analysis of Individual Outcome Variables Before and After PR Showing the Mean, Standard Deviation, and the Range

Measure	*n*	*M*	*SD*	Minimum	Maximum
Pre-rehabilitation					
BCKQ %	15	61.01	11.08	38.5	75.4
Borg scale	15	1.33	1.50	0	3
6MWT in feet	15	657.33	140.74	450	930
Post-rehabilitation					
BCKQ %	15	81.45	9.095	63.1	90.3
Borg scale	15	.33	.724	0	2
6MWT in feet	15	817.33	141.85	610	1120

Paired sample tests were used to determine if the pre-rehabilitation 6MWT and BORG test differed from the post-rehabilitation scores (Table 3). The results showed a significant increase in the patients' exercise tolerance and reduced breathlessness. The paired t test found a mean of 146.67, *SD* = 86.41; mean of 1.00 *SD* 1.25 and *p* = .000 and .008. It was noted that the comparison of the pre- and post-rehabilitation test results of the three pairs of variables resulted in significant improvement of the average scores (mean). After the educational intervention, the post intervention BCKQ when compared with the pre, showed an increased average score, which is the mean. The participants were also able to walk longer distance in the 6MWT with a

decreased breathless as evidenced by the result of the subjective Borg scale test, when both the pre and post intervention data were compared. The results indicate that PR is an effective treatment measure for symptom relief and exercise tolerance for patients with COPD.

Table 3

Paired Sample Tests of Variables Showing Confidence Intervals With Upper and Lower Limits and Level of Significance

				Paired differences 95% CI			
Variables in Pairs	*n*	*M*	*SD*	*LL*	*UL*	*df.*	*P value*
Pair 1 BCKQ % Pre-rehab and BCKQ % Post-rehab	15	-20.44	4.76	-23.07	-17.80	14	.000
Pair 2 Borg Scale Pre-rehab and Scale Post-rehab	15	1.00	1.25	.31	1.70	14	.008
Pair 3 6MWT in feet Pre-rehab and6MWT in feet Post-rehab	15	-146.67	86.41	-194.52	-98.81	14	.000

Note. *N* = participants, *M* = mean, *SD* = standard deviation, LL = lower limit, UL = upper limit, *p* = level of significance. *p* values were highly significant in all pairs of variables at 95% CI.

A decrease in the score of the BORG test was noted as well. The scores ranged from 0 (none) to 3 (moderate breathlessness) pre-rehabilitation (Figure 6). Prior to the intervention, more than 40% of the participants experienced moderate level of dyspnea on the Borg scale.

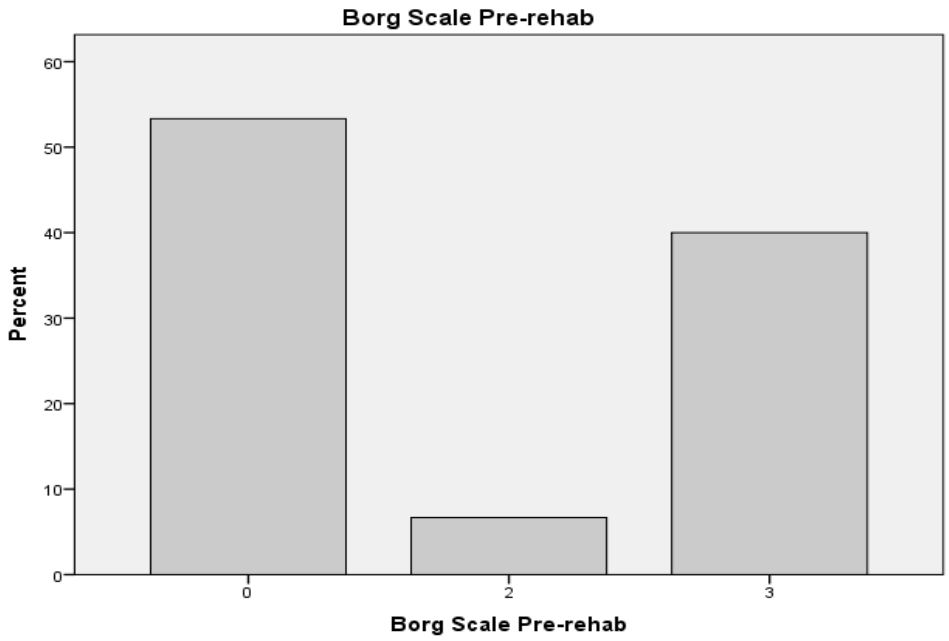


Figure 6. Modified Borg Dyspnea scale score chart before PR

As shown in Figure 7, PR improved symptoms of dyspnea among the participants. Eighty percent of the participants had no dyspnea during the post intervention 6MWT as compared with the pre-intervention. In addition, less than 20% reported slight dyspnea and no participant experienced severe dyspnea after the intervention. The results of the Borg tests were statistically significant at *p* value of .008 (< 0.01) (Table 3). The results indicated improved or reduced breathlessness with the intervention and supports the effectiveness of PR as an essential part of treatment for the population diagnosed with COPD.

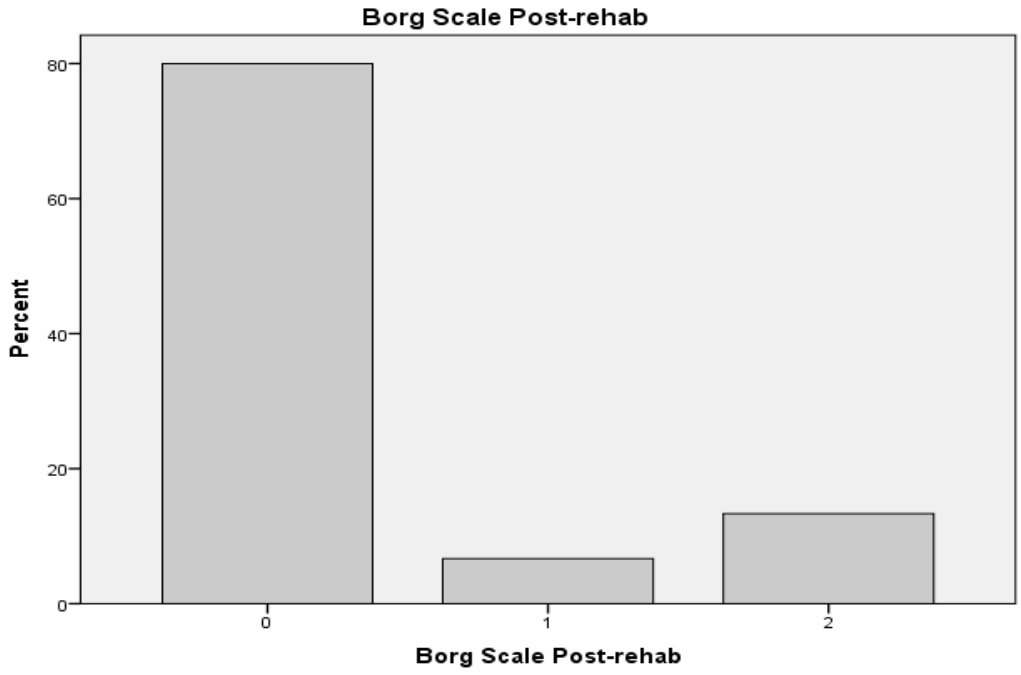


Figure 7. The Modified Borg Dyspnea Score chart after PR

Objective 3. To determine if PR will improve HRQL of patients with COPD.

HRQL depicts the participant's perception of their illness, their knowledge of the disease progression, and how it affects their wellbeing, both physically and emotionally. The HRQL was measured using the Medical Outcome Short Form 36-Item Questionnaire (SF-36) (Appendix E). Participants completed the SF-36 questionnaire on the first day prior to starting the PR and on the last day of the program after completing the ten weeks PR. Scoring was performed using the facility's ScottCare telemetry Solution software which has an integrated SF-36 outcome scoring system. The scoring was based on eight health concepts or scales that include: physical function, role physical, bodily pain, general health, vitality, social function, role emotional, and mental health. I analyzed the outcome comparison report before and after PR using the SPSS version 24. The result of the paired samples t-test showed that PR did not improve all aspects of the SF-36 subscales (Table 4). Significant improvement was seen in the general health ($p = 0.028$), and role emotional ($p = 0.16$) subscales. A slight improvement was

also achieved in the relief of bodily pain (p = 0.051). The differences in scores could be influenced by the patient's level of understanding and perception of their illness.

Table 4.

Overall Statistical Analysis of Participants' Mean and Standard Deviation in all 8 Subscales of the SF-36 Pre-and Post-PR (*n* = 15)

SF-36 Subscales	Pre-rehabilitation *Mean (SD)*	Post-rehabilitation *Mean (SD)*	Paired Samples Pre-and Post-PR *Mean (SD)*	95% Confidence Interval Lower Limits	95% Confidence Interval Upper Limits	*df*	*p-value*
Physical Function	28.67 (7.32)	31.93 (6.08)	-3.26 (7.36)	-7.33	.82	14	.108
Role Physical	30.41 (10.80)	32.69 (7.38)	-2.28 (14.50)	-10.31	5.75	14	.552
Bodily Pain	38.90 (7.73)	41.61 (8.19)	-2.70 (4.91)	-5.42	.014	14	.051*
General Health	32.02 (7.21)	36.35 (7.85)	-4.32 (6.82)	-8.10	-.542	14	.028*
Vitality	44.39 (10.07)	48.97 (6.35)	-4.57 (9.21)	-9.68	.519	14	.075
Social Function	32.85 (14.25)	39.03 (11.75)	-6.18 (14.70)	14.32	1.96	14	.126
Role Emotional	40.59 (14.37)	45.25 (11.98)	-4.67 (6.60)	-8.32	-1.01	14	.016*
Mental Health	47.75 (10.91)	53.20 (8.51)	-5.45 (10.45)	-11.24	.34	14	.063

Note. *SD* = Standard deviation in parenthesis, *df* = degree of freedom, "p" = the value of significance at 95% Confidence interval (CI). In this analysis, PR had more effect on some of the subscales of the SF-36 such as general health (*Mean* = -4.32, *SD* = 6.82, *p* - .028), role emotional (Mean = -4.67, *SD* = 6.60, *p* = <.016), and a small effect in relief of bodily pain (Mean = -2.70, *SD* = 4.91, *p* = .051).

Reduction of hospital admissions occurred in previous studies following PR. In this project, retrospective data for COPD related admissions of participants from 2016 to 2017 (one year) were collected from the medical records to compare with the rate of admissions

prospectively all through the period of the intervention (December 2017 to February 2018) (Table 5). All through the 10 weeks of PR, the hospital admission rate was 0% among the participants. Participation in PR was responsible for a significant reduction in hospital admissions and resource utilization ($p < .001$). The benefits of PR were evident in both short-term and long-term assessments.

Table 5.

Participants Hospital Admissions Rates from 6 months Prior to PR

Participants	Number of COPD admissions 12 months prior to PR	Admission Rate (%)	Number of COPD admissions within 10 weeks of PR	Admission rate (%)
15	2	13.3	0	0

Discussion of Findings in the Context of the Literature

The implementation of the evidence-based intervention through patient education and comprehensive PR resulted in an improvement in the patient's knowledge, symptoms and quality of life. Research showed that for patients to be better involved in a self-management program such as PR, and follow the plans effectively, it is crucial that they first understand their illness and the treatment (Thakrar et al., 2014). The finding of the Bristol COPD Knowledge Questionnaire to assess patients' awareness of their disease management before and after the 10 week education during the comprehensive PR, showed that the knowledge of the patients significantly increased after the intervention. Most of the patients had very low scores of less than 50% in the BCKQ prior to PR. Their knowledge improved after the series of education sessions offered by the multidisciplinary team as evidenced by increased scores on the BCKQ post intervention.

The increased scores on the BCKQ were consistent with the study by White et al. (2006) in which the patients with higher levels of education had higher overall scores on the BCKQ. It is pertinent to note that the level of understanding of the patient is important as it impacts the outcome of their self-management intervention, which in turn improves the clinical outcome of exacerbation frequency, and hospitalization. Contrary to the expected finding, the results of the study by Wong and Yu (2016), found that the overall scores of the BCKQ was lower among patients with COPD who had a higher educational level. The goal of patient education is to promote self-management practices to enhance adoption of healthy behaviors, such as participation in PR. Identifying areas where the patients are deficient in knowledge and focusing the educational contents towards those areas, will enhance goal attainment. The GOLD and COPD foundation guidelines proposed that patient education should be an integral part of COPD management (Wong & Yu (2016).

Literature strongly supports the finding that comprehensive PR decreases breathlessness, improves activity tolerance and quality of life, which subsequently reduces hospitalization (Nici, Lareau, & Zuwallack, 2010). The project initiative showed that PR, composed of exercise and education, was associated with a reduction of breathlessness, increased activity tolerance and improvement in quality of life, as well as preventing hospitalizations. The results of the project intervention were consistent with those of previous studies. Schroff et al. (2017) studied the outcome of PR in the improvement of exercise capacity and dyspnea, and other burdens of the illness in 229 participants with COPD, and found significant improvement in the 6MWT. Limsuwat, McClellan, Amiri, and Nugent (2014) also found significant improvement in 6MWT. The 6MWT is, therefore, a valid outcome measure for exercise tolerance after PR in patients with COPD.

Similarly, Kyung and Chin (2007) evaluated the effect of patients' participation in a PR program on breathing capacity and exercise tolerance in older patients with COPD. Kyung and Chin (2007) also found a significant improvement in exercise performance and the level of dyspnea, thus supporting the use of the Borg scale as a reliable instrument for evaluation of outcome in patients with COPD pre- and post-PR. The findings showed PR as an effective treatment for the reduction of symptoms in patients with COPD.

The results of the DNP project are like the findings in Zoeckler, Kenn, Kuehl, Stenzel, and Rief (2013) and Limsuwat, et al. (2014) studies in which PR was found to improve only some domains or subsets of the SF-36. Limsuwat et al. (2014) showed improvement in the scores of only the physical subscales, physical function, role physical, bodily pain and general health. Zoeckler et al. (2013) found improvement in the psychosocial subscales of vitality, social functioning, role-emotional, and mental health, while physical function subscales remained unchanged. Von Leupoldt et al. (2008) on the other hand, found that a three-week PR resulted in improvement in all eight subscales of the SF-36. Schroff et al. (2017) found that a twenty-week PR resulted in significant improvement in most (seven) of the subscales of the SF-36. The findings of this project demonstrated that patients' participation in PR significantly improved their perceptions of change in physical health and role limitations due to emotional problems. PR also provided some relief in bodily pain in patients with COPD.

Prior to the intervention of education in the PR, 13.3% of the participants (n = 15) were admitted for COPD exacerbation within the previous months. Upon completion of the 10-week PR program, the admission rate was 0%. The results are in congruence with the findings in both a systematic review (Puhan, Gimero-Santos, Cates, and Troosters, 2016), and Donesky, Citron, Hilling, Cayou and Milic, (2015). A Cochrane review found hospital readmissions reduced in some of the studies (Puhan et al., 2016) while the findings of Donesky et al. (2015)

showed that hospitalizations and emergency department visits decreased in patients with COPD who participated in PR. Outcomes in these studies support the findings that PR reduces hospital readmissions.

For patients to partake in and gain the positive outcomes of PR they have to be motivated to participate in PR. The perspectives and beliefs of the patients concerning the benefits of PR is crucial (Fischer et al., 2007). All of the participants were willing and motivated, and a hundred percent participation was achieved. The Health Belief Model was a useful framework that elucidated the factors that can promote or hinder participation in PR program. Perceived health benefits as well as social benefits have been found to motivate patients with COPD to participate in PR (Sohanpal, Steed, Mars, & Taylor, 2015). The understanding of these motivating or deterring factors helped to address the issues of participation and resulted in full participation and positive project outcomes in this population.

Implications

Policy

Nursing has been recognized as the largest workforce in the healthcare system, and are essential professionals who are helping America meet her primary and acute care needs (Wyckoff, Solano, & Ellison, 2014). The Institute of Medicine (IOM) demanded that the healthcare system and the health of every individual in America be improved (Zaccaginin & White, 2011). The mandate called for the advancement in nursing education to include a wider scope of practice, effective leadership, and the development of policies that would enhance positive change. Studies showed that advanced practice nurses can deliver care effectively and, are in the position to educate and provide access to evidence-based resources to promote a change (Bonville et al., 2007; Watts et al., 2009).

Following the Medicare Improvement for Patients and Providers Act (MIPPA) of 2008, Medicare began to provide covered benefit for a comprehensive PR program for patients with moderate to very severe COPD under Medicare Part B effective since January 1, 2010 (Centers for Medicare & Medicaid Services, 2012). As a result of the policy for the coverage of benefits of a comprehensive PR program, the patients who participated in this DNP project were not obligated to pay out-of-pocket for cost for the program. For the participants to benefit from the CMS financial package, PR programs, such as this, offered to patients with COPD and other chronic lung diseases, should be evidence-based and reflecting the stipulated guidelines, while also incorporating the policy standards from other bodies like the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) and the American Thoracic Society. The DNP project was evidence based and conformed to these guidelines.

Advanced practice nurses should support and educate patients with COPD to play an active role in self-management of their disease. Patients in various stages of COPD are faced with significant physical and psychosocial challenges. Advanced practice nurses and healthcare providers as a matter of policy, can bring about changes in the quality of life of patients with COPD. Nurses play a vital role in planning, coordinating and ensuring implementation of evidence-based PR built on recommended guidelines. The DNP project would serve as a benchmark or standard for other facilities who would want to embark in quality improvement initiatives such as the evidence-based and comprehensive PR program.

Practice

The results of the project initiative will inform the knowledge that patient awareness of PR and its benefits enhance motivation and willingness to participate in the health improvement initiative. Since the patients have varying levels of health literacy, which could affect their level of understanding, nurses and other healthcare providers should be cognizant

of this, and educate them using the minimum level of education (6th grade). Due to the chronic nature of COPD, patient engagement in management of the disease is essential. Related discussions should be tailored towards, not only the treatment, but also measures for improving motivation and longer participation in the treatment (PR). Patient's engagement or empowerment can facilitate the change process and improve patient outcomes (Hyrkas & Harvey, 2011). Understanding that the patients' beliefs or illness perception can influence their interest or motivation to attend the exercise program, is important.

The results of the project initiative also provide an idea of barriers and enablers of patient motivation to participate in PR and the benefits of participating in a comprehensive PR program. It is very important that nurses and other health professionals recognize the barriers especially, when recommending PR for patients with COPD. One of such barrier identified in this project was transportation issues, preventing the patients from readily participating in the program. To help bridge the gap created by this issue, the facility now provides transportation for motivated patients to promote participation in PR and subsequent improvement of health outcomes. Provision of transportation improved the participation rate of patients who were willing and motivated to do PR. Other organizations can develop means for providing services that could assist patients who are faced with such problems.

The project also showed that patients' performance or exercise capabilities differ, hence, the treatment strategies should vary based on the individual patient to encourage participation in physical activities and ensure the safety of the patient with COPD. Patient referral to PR programs should also be optimized. Healthcare providers should be aware of the benefits of PR, and should use their knowledge to both encourage and motivate the patients by explaining how the program can help them cope and gain control of their illness. Such an

approach according to Johnston, Young, Grimmer, Antic, and Frith (2013), can increase patient understanding and make the referring process easier.

In addition, nurses and health care providers can use the HBM as a framework to enhance patients' belief and self-efficacy towards the management of their illness, and decision to adopt healthy-behaviors which subsequently will improve their outcomes. A well-informed patient is more likely to accept a proposed change and take an active role in managing his/her health. Healthcare providers therefore, play an essential role in helping the patients with COPD make a rightful decision to participate in PR when they clearly explain the importance of participating in PR, and the potential benefits.

Research

The result of the DNP project showed that outpatient PR can reduce dyspnea, improve exercise tolerance, and reduce the rate of associated hospital admissions in patients with COPD. The results of Seymour et al. (2010) and Shah et al. (2016) support these findings. In Seymour et al. (2010), PR performed soon after COPD exacerbation decreased the risk of re-exacerbation and healthcare utilization as well as increased exercise capacity. In the Lacassa et al. (2006) study, PR was found to be cost effective even in stable patients with COPD. The cost effectiveness is associated with improved symptoms and decreased healthcare utilization.

For patients to be motivated to participate in PR, they need to be aware of what PR program entails, and how it can help to improve their illness. The project showed that increasing patients' awareness and benefits of PR through education and provision of resources had positive impact in their participation in the program without drop outs. Getting the patients well informed about PR and its benefits enhance patients' readiness to participate and complete PR program (Guo & Bruce, 2014).

More research should examine the importance of exercise maintenance among the patients who completed PR as the benefits of PR decline overtime when patients fail to continue with exercise. Future research therefore, should incorporate strategies that allows longer period of evaluation of outcomes and sustained adherence to exercise regimen. Also, further research is necessary evaluate the long-term outcomes and sustainability of effectiveness of PR.

Social Change

COPD affects many people in the United States and worldwide. Its progressive nature and resultant deconditioning cause the patient to have deceased daily and social life activities, making psychosocial support essential in helping the patients function better. During the project implementation, activities of the PR program and the monthly support group meetings, enabled the patients to interact and socialize and receive health topics from healthcare providers. Using intervention strategies such as structured education in PR program assisted in promoting self-management and autonomy in patients with COPD (Murphy et al., 2011). The application of social psychology theories such as the Health Belief Model is beneficial in planning strategies used in the project and enhanced peoples' awareness to health problems, which offered positive behavioral changes that positively impacted their health outcome. The strategy used during the project initiative enhanced patient's health beliefs regarding participation in PR and self-efficacy towards management of COPD.

Patients' decision to participate in a healthy-intervention denotes a behavior change which had a huge impact on uptake of PR. PR offers not only health benefits but social benefits as well. The project incorporated a support groups program which served as opportunity for socialization for patients with COPD. They got to move out of the house, met others with same or worse illness progression, and got some encouragements which enhanced their self-

management skills**.** In Sohanpal et al. (2015), perceived social benefits influenced participation and attendance in PR and support group meetings.

The multidisciplinary approach of the project initiative in the facility improved team work, collaboration, care coordination, while enhancing trust and respect among professionals. The DNP project had the potentials for improving not only the knowledge of patients but also that of the nurses. Enhancing the knowledge of nurses and other team members played a role in promoting social change and improving patient outcome.

Strengths and Limitations of the Project

Strengths

The implemented evidence-based change was intended to increase patients and nurses' awareness of the PR program to increase patients' participation. Nurses and provider participation in educating and referring patients to PR improved due to increased awareness that resulted from the initiation and implementation of this project. Awareness of PR as cost-effective treatment intervention for patients with COPD led to more patients being referred for the program. Because of patient education and provision of resources prior to intervention, there was excellent participation to the training program. Patients were better informed as the healthcare professionals explained the short term and long-term benefits of the program in relation to the outcomes. The education resources made available to the patients before discharge from the hospital and at the pulmonary clinic regarding the benefits of PR, contributed in creating patients' awareness and decision to participate in the program.

Another strength was the rigorousness of the project. The use of valid instruments, the BCKQ, 6MWT, Modified Borg Scale, and SF-36, which had been tested for validity and reliability by previous researchers adds strength to the project. The extensive literature search and use of current evidence-based guidelines added strength to the project, especially as most

of the literature were from primary sources. The review of literature enhanced the knowledge of the mechanisms through which PR benefits patients, identified gaps and barriers to its utilization, and provided the evidence-base to guide nursing decisions regarding patient education and health promotion related to patients with COPD. Polit and Beck (2004) noted that retrieving and synthesizing evidence-based information through a literature review increased the knowledge for improving nursing practice.

The use of a theoretical framework, the Health Belief Model, assisted in determining the influence of the patients' beliefs in their decisions to participate in the outpatient PR program, and acquire self-management skills contributed to the strength of the project. Theories provide the foundation for seeking and understanding the patients' needs. Therefore, it is necessary to know that the patients' belief is a motivating factor in participating in PR, and plays a vital role in influencing self-efficacy, which subsequently reduces their symptoms, leading to improvement in the quality of life of patients with COPD (Sohanpal et al., 2015). The use of theoretical framework to conceptualize and guide this project is supported by the Essentials 1 of the Doctoral Education for Advocacy Nursing Practice, which notes that the DNP program prepares the graduate to use science-based theories and concepts to develop and evaluate new practice approaches based on nursing theories and theories from other disciplines (Zaccagnini & White, 2011).

Limitations

Some limitations were identified. The selection of participants did not address some comorbidities such as cardiac disease (except ischemic heart disease), anxiety, depression, and osteoporosis which were found to negatively impact outcome of PR in patients with COPD. In a systematic review, positive changes in quality of life for patients with COPD who have cardiovascular comorbidities decreased, those with musculoskeletal problems such as

osteoporosis had reduced functional exercise capacity, while those with anxiety or depression could have decreased improvement in the relief of dyspnea (Hornikx et al., 2013). Some of the participants in this project had such comorbidities which could have had a negative impact in the overall outcome of the PR. Therefore, broadening the screening criteria for comorbidities for the participants would be beneficial for achieving better outcome for the individually tailored PR for patients with COPD.

Due to the timing for the project, long-term effects of PR through follow-up of cases could not be done. Studies showed that the benefits derived from participation in PR program decline over time (Busy, Reese, & Simon, 2014). For this reason, follow up calls made after the completion of the PR would have helped to evaluate patient adherence to exercise and sustained benefits. In addition, monitoring the patients who chose to join the one year classes post PR program in the facility, would have also helped in evaluating adherence and sustained benefits of PR.

Recommendations for Remediation of Limitation and Future Work

Recommendations

Patients in different stages of COPD who participated in PR benefited from it. Hence, referencing Ergün et. al. (2011), motivating and increasing awareness of PR program to all patients who are in GOLD Stages I to IV of COPD would help to improve exercise capability, psychosocial status and resultant improvement in HRQOL, and as such, should be adopted. Also included in the benefits of patient participation in PR program are reduction in hospital readmission rate and the frequency of exacerbations (Suh et al., 2013).

It is very necessary that the patients retain the benefits they gained from participating in the PR program. As such, patients should be well informed about the importance of continuing with PR after completion of the program in order to maintain and

improve their level of function. Evidence shows that the benefits of PR declined shortly after completion of the program if the patient stopped to exercise or not exercising effectively as when in the program (Soysa, McKeough, & Alison, 2012). Therefore, clinical guideline recommends increased exercise and activities to sustain initial benefits derived from participation in PR (Meshe, Claydon, Bungay & Andrew, 2017).

Due to the nature of the project and short time frame for completion, I was unable to evaluate the patients for a longer period to assess the long-term effectiveness of the program which includes the sustainability of benefits derived from PR and adherence to exercise regimen. A longer period of evaluation, for at least six months to one year, is therefore essential. More so, as the literature review showed that the benefits of PR including relief of dyspnea, improved physical endurance or activity tolerance, and HRQL start to decline after 6-12 months (Bestall et al., 2003). Therefore, after the completion of the program, patients should be encouraged to participate in the maintenance class for one year or continue to exercise in exercise facilities closer to their homes for convenience, and to continue to practice what they learned during the program.

Although PR was found to be effective in relieving symptoms, improve HRQOL and reduce subsequent exacerbations in patients with COPD, Puhan et al (2011) advised against starting PR immediately after exacerbation of COPD due to the possibility of re-exacerbating within weeks after starting the program as this would lead to program interaction. The advantage of PR according to Puhan et al. (2011), was that patient education during the program helps in motivating patients with COPD to adopt a change in their behavior after exacerbation. The referral of patients with COPD who are admitted for exacerbation should be guided by these findings when making care management decisions for referring patients with COPD for PR.

However, there is lack of consistency in timeframe for starting PR after hospital discharge following an acute exacerbation. Puhan et al (2011), as noted earlier, advised against starting PR immediately after exacerbation of COPD due to the possibility of re-exacerbating within weeks after starting the program. In the same vein, Greening et al. (2014) also strongly recommended that enrollment of the patients into PR program during acute admission should be avoided. Conversely, Matsui, Jo, Fushimi and Yasunaga (2017), advocated for early participation in PR. Matsui et al. found that early participation in PR was associated with reduction of 90-day readmission and decreased hospital length of stay. Hence, the special consideration for future research in this aspect of care is for identification of the specific length of time before PR could be started after exacerbation of COPD.

Summary

The section discussed findings of the project initiative, statistical significance, findings in the context of literature, framework, strengths and limitations, and the analysis of the student. The findings of the project demonstrated that comprehensive PR reduce bothersome symptoms, improve exercise tolerance and HRQL, and subsequently decrease hospitalization. Patient education was an important component of PR and was integrated throughout the program. Implications for social change and policy development were evident from the results of the project. PR resulted in psychosocial and physical health changes in patients with COPD.

For patients to be motivated to participate in PR, they need to be aware of what the program entails and how it can help improve their illness. The project showed that patient education and awareness of PR and its benefits enhanced their willingness to start and complete the program. To ensure that patients with COPD benefit from the program, their management should involve exploring issues that could possibly deter their motivation and participation in the program, and subsequently prevent the achievement of optimal benefits of

PR. The application of the HBM helped with the understanding that patient participation in PR is influenced by their attitude and perception of perceived physical and social benefits of PR. The benefits decline with time resulting in exacerbation. The incidents of exacerbation and emergency room visits could be curbed by encouraging continued adherence to exercise to sustain prolonged benefits of PR.

Section 5: Dissemination Plan

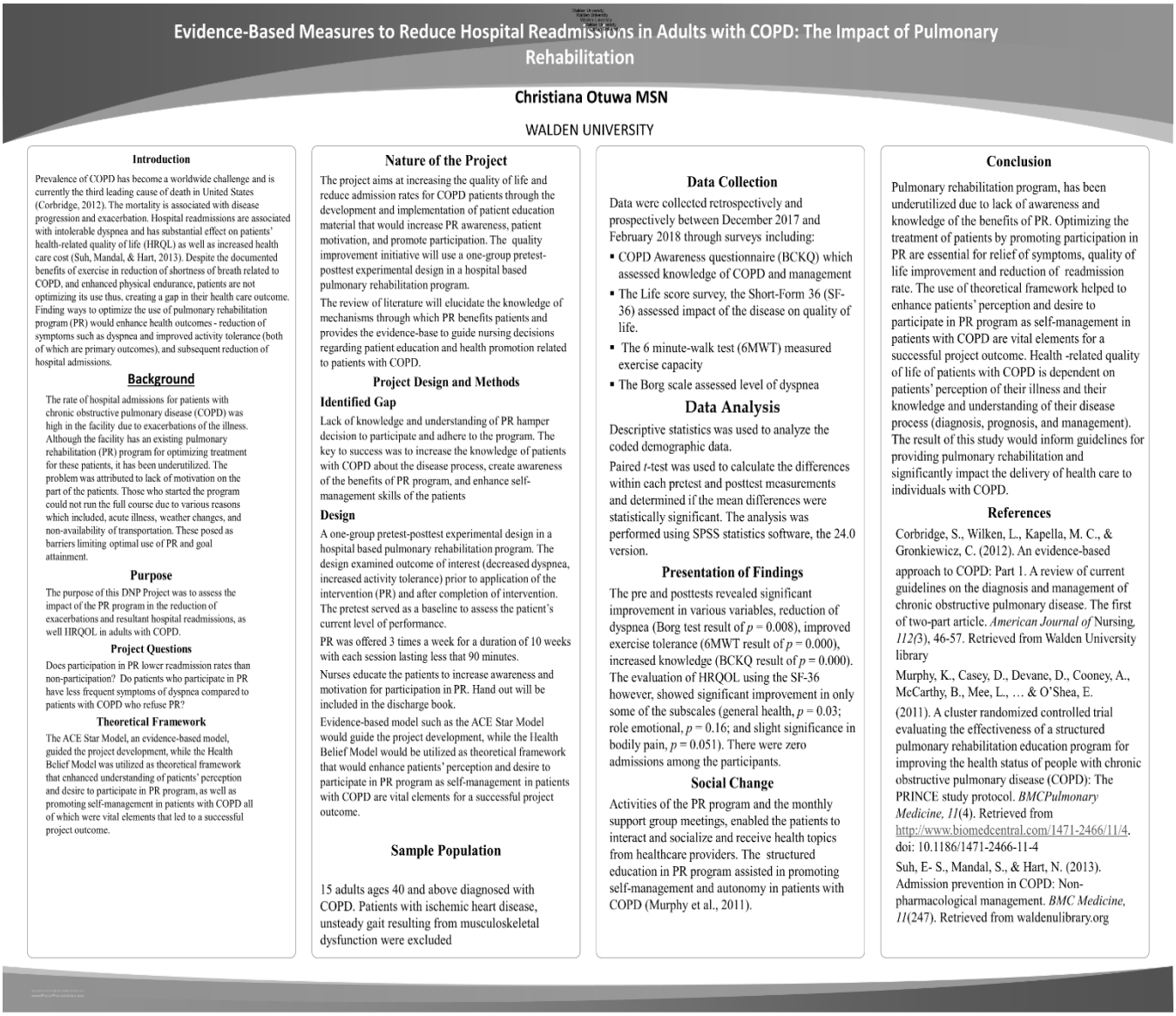
Introduction

Project dissemination is the final stage of the evidence-based project (EBP). To create awareness and increase uptake of PR and subsequently improve the health outcome of patients with COPD, the findings of the project would need to be spread to the target population and healthcare providers such as the nurses who would participate in educating the patient both in the inpatient and outpatient setting. Ousley, Swartz, Milliken, and Ellis (2010) suggested that education is the best method for disseminating project findings. Dissemination of the project findings is in line with the competency of the DNP essentials of promoting the advancement and translation of knowledge in nursing profession. The AACN Essentials three "clinical scholarship and analytic methods for evidence-based practice" (AACN, 2006, p. 6) prepares the DNP scholar to develop research skills needed to discover new knowledge in the profession (Zacagnini & White, 2011). Dissemination of the findings of this project would assist in addressing and solving the problem of underutilization of PR in this facility and reduce resource utilization. By disseminating the findings, I would also contribute to staff development through continued education and presentation of information via the proposed poster presentation and journal publication.

Poster Presentation

Dissemination of the EBP to stakeholders and other health care professionals is crucial so that innovations for practice can be applied to other health care facilities to improve clinical effectiveness and enhance greater quality of care. The oral and written dissemination methods would be utilized. The oral dissemination would be done via poster presentation (Figure 8). Poster presentation has been found to be a valid method of transferring academic knowledge (Rowe & Illic, 2009). The key stakeholders which include the healthcare providers (nurses),

and patients with COPD would be presented with the poster at a support group meeting in the facility. While preparing the poster, the knowledge or level of understanding of the audience was put into consideration.



Evidence-Based Measures to Reduce Hospital Readmissions in Adults with COPD: The Impact of Pulmonary Rehabilitation

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Introduction

Prevalence of COPD has become a worldwide challenge and is currently the third leading cause of death in United States (Corbridge, 2012). The mortality is associated with disease progression and exacerbation. Hospital readmissions are associated with intolerable dyspnea and has substantial effect on patients' health-related quality of life (HRQL) as well as increased health care cost (Suh, Mandal, & Hart, 2013). Despite the documented benefits of exercise in reduction of shortness of breath related to COPD, and enhanced physical endurance, patients are not optimizing its use thus, creating a gap in their health care outcome. Finding ways to optimize the use of pulmonary rehabilitation program (PR) would enhance health outcomes - reduction of symptoms such as dyspnea and improved activity tolerance (both of which are primary outcomes), and subsequent reduction of hospital admissions.

Background

The rate of hospital admissions for patients with chronic obstructive pulmonary disease (COPD) was high in the facility due to exacerbations of the illness. Although the facility has an existing pulmonary rehabilitation (PR) program for optimizing treatment for these patients, it has been underutilized. The problem was attributed to lack of motivation on the part of the patients. Those who started the program could not run the full course due to various reasons which included, acute illness, weather changes, and non-availability of transportation. These posed as barriers limiting optimal use of PR and goal attainment.

Purpose

The purpose of this DNP Project was to assess the impact of the PR program in the reduction of exacerbations and resultant hospital readmissions, as well HRQOL in adults with COPD.

Project Questions

Does participation in PR lower readmission rates than non-participation? Do patients who participate in PR have less frequent symptoms of dyspnea compared to patients with COPD who refuse PR?

Theoretical Framework

The ACE Star Model, an evidence-based model, guided the project development, while the Health Belief Model was utilized as theoretical framework that enhanced understanding of patients' perception and desire to participate in PR program, as well as promoting self-management in patients with COPD all of which were vital elements that led to a successful project outcome.

Nature of the Project

The project aims at increasing the quality of life and reduce admission rates for COPD patients through the development and implementation of patient education material that would increase PR awareness, patient motivation, and promote participation. The quality improvement initiative will use a one-group pretest-posttest experimental design in a hospital based pulmonary rehabilitation program.

The review of literature will elucidate the knowledge of mechanisms through which PR benefits patients and provides the evidence-base to guide nursing decisions regarding patient education and health promotion related to patients with COPD.

Project Design and Methods

Identified Gap

Lack of knowledge and understanding of PR hamper decision to participate and adhere to the program. The key to success was to increase the knowledge of patients with COPD about the disease process, create awareness of the benefits of PR program, and enhance self-management skills of the patients

Design

A one-group pretest-posttest experimental design in a hospital based pulmonary rehabilitation program. The design examined outcome of interest (decreased dyspnea, increased activity tolerance) prior to application of the intervention (PR) and after completion of intervention. The pretest served as a baseline to assess the patient's current level of performance.

PR was offered 3 times a week for a duration of 10 weeks with each session lasting less that 90 minutes.

Nurses educate the patients to increase awareness and motivation for participation in PR. Hand out will be included in the discharge book.

Evidence-based model such as the ACE Star Model would guide the project development, while the Health Belief Model would be utilized as theoretical framework that would enhance patients' perception and desire to participate in PR program as self-management in patients with COPD are vital elements for a successful project outcome.

Sample Population

15 adults ages 40 and above diagnosed with COPD. Patients with ischemic heart disease, unsteady gait resulting from musculoskeletal dysfunction were excluded

Data Collection

Data were collected retrospectively and prospectively between December 2017 and February 2018 through surveys including:

- COPD Awareness questionnaire (BCKQ) which assessed knowledge of COPD and management
- The Life score survey, the Short-Form 36 (SF-36) assessed impact of the disease on quality of life.
- The 6 minute-walk test (6MWT) measured exercise capacity
- The Borg scale assessed level of dyspnea

Data Analysis

Descriptive statistics was used to analyze the coded demographic data.

Paired *t*-test was used to calculate the differences within each pretest and posttest measurements and determined if the mean differences were statistically significant. The analysis was performed using SPSS statistics software, the 24.0 version.

Presentation of Findings

The pre and posttests revealed significant improvement in various variables, reduction of dyspnea (Borg test result of $p = 0.008$), improved exercise tolerance (6MWT result of $p = 0.000$), increased knowledge (BCKQ result of $p = 0.000$). The evaluation of HRQOL using the SF-36 however, showed significant improvement in only some of the subscales (general health, $p = 0.03$; role emotional, $p = 0.16$; and slight significance in bodily pain, $p = 0.051$). There were zero admissions among the participants.

Social Change

Activities of the PR program and the monthly support group meetings, enabled the patients to interact and socialize and receive health topics from healthcare providers. The structured education in PR program assisted in promoting self-management and autonomy in patients with COPD (Murphy et al., 2011).

Conclusion

Pulmonary rehabilitation program, has been underutilized due to lack of awareness and knowledge of the benefits of PR. Optimizing the treatment of patients by promoting participation in PR are essential for relief of symptoms, quality of life improvement and reduction of readmission rate. The use of theoretical framework helped to enhance patients' perception and desire to participate in PR program as self-management in patients with COPD are vital elements for a successful project outcome. Health -related quality of life of patients with COPD is dependent on patients' perception of their illness and their knowledge and understanding of their disease process (diagnosis, prognosis, and management). The result of this study would inform guidelines for providing pulmonary rehabilitation and significantly impact the delivery of health care to individuals with COPD.

References

Corbridge, S., Wilken, L., Kapella, M. C., & Gronkiewicz, C. (2012). An evidence-based approach to COPD: Part 1. A review of current guidelines on the diagnosis and management of chronic obstructive pulmonary disease. The first of two-part article. *American Journal of* Nursing, *112*(3), 46-57. Retrieved from Walden University library

Murphy, K., Casey, D., Devane, D., Cooney, A., McCarthy, B., Mee, L., … & O'Shea, E. (2011). A cluster randomized controlled trial evaluating the effectiveness of a structured pulmonary rehabilitation education program for improving the health status of people with chronic obstructive pulmonary disease (COPD): The PRINCE study protocol. *BMCPulmonary Medicine, 11*(4). Retrieved from http://www.biomedcentral.com/1471-2466/11/4. doi: 10.1186/1471-2466-11-4

Suh, E- S., Mandal, S., & Hart, N. (2013). Admission prevention in COPD: Non-pharmacological management. *BMC Medicine, 11*(247). Retrieved from waldenulibrary.org

Figure 8. Project poster dissemination.

Analysis of Self

As Scholar

My goal as a scholar-practitioner was to influence healthcare arena and nursing practice through identification of the gap in health care by conducting a needs assessment, planning and

implementing evidence-based strategies for solving the practice problem, to improve outcomes. Working on my project and disseminating the findings and the implication to practice, will contribute to the advancement of healthcare in order to achieve better outcomes. Dissemination of the project findings is in line with the competency of the DNP Essential of promoting the advancement and translation of knowledge in nursing profession. The AACN Essentials three "clinical scholarship and analytic methods for evidence-based practice" (AACN, 2006, p. 6) prepared me in developing research skills needed to discover new knowledge in the profession. I have become proficient in reviewing literature and using evidence-based practice skills to translate current best evidence to improve healthcare and health outcome, thus, transforming care in the system. I had the opportunity to contribute to the review and development of care plan that are based on guidelines and best evidence. I was able to put into practice the ability to engage and commit members of staff with the understanding that they play important roles in innovative ideas and development of processes that are instrumental in achieving a successful implementation of the change process.

During the program, the use of the Health Belief Model enhanced the health belief and self-efficacy of patients with COPD, empowering them towards the management of their disease and deciding to participate in the program that led to decreased breathlessness, and improved exercise tolerance and quality of life. My role as a leader provided the opportunity to secure resources that enhanced change efforts while decreasing barriers. I assisted the patients in developing self-management skills through education and provision of resources, which are some of the strategies for promoting outcomes.

As Practitioner

My professional goal is to provide quality, safe, and cost-effective care that will positively impact the health care system. The experience gained through the evidence-based

practice courses has greatly impacted my knowledge of evidence-based project development, and implementation. Evidence based practice is considered the key to improving the health of population in the health care arena (White & Dudley-Brown, 2012). In my role as an advanced practice nurse I engaged in patient education and care coordination, which was necessary for motivating patients to participation in the DNP project and the resultant positive health outcome.

The goal of care for my population was to improve their health outcome and prevent disease progression. I was able to integrate theoretical knowledge and evidence-based research to plan the strategies that improve health outcomes of patients with chronic obstructive lung disease in the ambulatory unit. The strategy could be applied to individuals with complex health problems. The ability to access, appraise and incorporate evidence into practice was made possible through the utilization of evidence-based decision-making skills. The activity conforms with the seventh DNP Essential for competency which focuses on "Clinical Prevention and Population Health for Improving the Nation's Outcome" (AACN, 2006, p. 15). To fulfill this competency, I was able to plan, analyze and integrate scientific data related to health outcome improvement of aggregate (adult COPD patients), and population health (AACN, 2006). Working with patients who have chronic lung diseases requires clinical reasoning during the interaction. It is utilized when collecting information about their current health issues, generating and testing hypothesis, and determining optimal diagnosis and treatment based on the information obtained, both subjective and objective. Clinical reasoning for example guides my judgment in deciding the treatment modality for the population.

As Project Developer and Manager

Prior to the DNP program, my knowledge of evidence-based approach to critically assess health care issues affecting the delivery of cost-effective health care was limited. In

addition, I have realized that having multidisciplinary collaboration skills helps tremendously in communicating and working with other disciplines by noting their input and identifying what needs to be improved in order to achieve a quality outcome. I learned that I could not operate single-handedly without collaborating and communicating effectively therefore, making my thoughts known and considering the opinion of others who make up the team becomes inevitable. Therefore, an approach that could enhance the successful exploration of areas of quality health care in order to identify where and what needs to improve is necessary.

As a project developer, I was able to plan, design, and successfully implement the project based on the identified gap in health care and outcomes of the population. I made sure that sufficient resources or written materials were available while collaborating effectively with the stakeholders. I planned and developed the project with consideration of the goal and mission of the facility, which included but not limited to improved health care for every individual. Newhouse (2010) recommends that leadership team should have the ability to prepare the organization by ensuring that resources (human and materials) are ready to adopt a change, and that the change is in congruent with the vision, culture and processes in the organization.

I played an active role in the healthcare advancement of the population and to the professional scholarship. Since this QI project began, PR has gained increased awareness and recognition as an integral part of management to optimize treatment and improve outcome for patients with COPD. Nurses were taught to incorporate education materials into the patients discharge paper to increase awareness of the disease and the benefits of PR. More patients are now being referred and the patients are more willing to participate in the program after I educated them and provided additional resources during the intake evaluation.

Future Professional Development

I have a passion for contributing to the expansion of nursing profession through actively participating in professional development in nursing. The DNP program has equipped me to play the role. Helping to educate the next generation of nurses will help to increase access to quality health care and improve health care outcomes, more so, as the complexity of care continues to increase. According to Zaccagnini and White (2011), the DNP prepared nurses are able to utilize their expertise to advance and translate knowledge, and to ensure best-quality patient outcomes with the complexity of health care. In addition, the ability to implement the DNP project is a motivating factor for future quality improvement initiatives to be embarked on.

The goal of embarking on a project is to meet the objectives recommended by the American Association of Colleges of Nursing (2006) in the essentials of doctoral education for advanced practice and be able to translate research findings into clinical practice to positively influence health care and patient outcomes. I was met with numerous of obstacles during the program, from delays while searching for practicum site to the process of obtaining IRB approval from both the project facility and Walden University. I considered these as part of training and test for patience, endurance, and perseverance, all of which, helped to mold my character as a leader. The success of a QI starts and ends with effective leadership (White & Dudley-Brown, 2012). Moreover, being a team leader in planning and implementing QI projects require the possession of these attributes to ensure goal attainment in future change process.

The DNP program has contributed immensely to my professional growth. I have developed confidence and the sense of self-actualization that would enable me to function in my future leadership role in nursing. The role of the leader is essential for success. Effective leadership is essential instrument in guiding a change geared towards an improvement in a

clinical setting (Hyrkas & Harvey, 2011). In this project, self-awareness, and empowering of nurses or frontline staff were steps that facilitated the success of implementation of the evidence-based change. For me as a leader, effective communication is a vital element for implementation, evaluation, and dissemination of the project outcome. It is the strategy that helps one to connect to others or convey one's ideas to gain support, improve teamwork, aid decision making, and eventually assist in solving problems. Knowing what is to be communicated and how it should be communicated are essential for effective communication to occur. Hughes (2008) posits that effective communication can lead to better outcomes while ineffective communication deters the success of quality improvement even when there was strong and committed leadership.

As a DNP professional, I hope to also be involved in more projects that will focus on expanding health care to all concerned, while also being apprehensive of the cost. It will only be possible and near hassle free, considering the challenges I had in trying to use software for data analysis, if my future professional development will include a proficiency in technology to the extent that I will not only be current, but always prompted to upgrade in the face of new challenges. Overall, I will strive to be competent in all areas of information technology, as it is applicable to nursing practices and healthcare, as that will help facilitate understanding, cooperation and team work.

Summary and Conclusion

COPD negatively impacts the health of many patients, impairing their ability to breath effectively and perform their usual daily activities even with optimal pharmacological treatment (Schroff et al., 2017). Although practice guidelines recommended PR as cost effective adjunct treatment to improve the symptoms and quality of life for the patients with COPD, its utilization was suboptimal (Keating et al., 2011). Increasing patients' and health

care providers' awareness of the usefulness of the PR through the DNP project, contributed greatly in bridging the gap in healthcare for the population. As a result, many more patients are being referred, and patients are more knowledgeable about the program as education materials about the benefits of PR are incorporated into their discharge papers. The findings of the DNP project demonstrated that PR improved patient outcomes**.** The result of this project improvement initiative will inform the guidelines for improving patient education and discharge process, which subsequently will improve participation in the PR program, and significantly impact the delivery of health care to individuals with COPD.

References

Ahmed, M. N. U., Begum, S., & Ali, T. (2014). Effects of pulmonary rehabilitation on exercise tolerance in patients with COPD. *Journal of Bangladesh Society of Physiology, 9*(2), 65-71. Retrieved from http://www.banglajol.infoindex.php/JBSP

Albany, N. Y. (2014). State health department releases new reports detailing 30-day readmission rates for PCI and CABG. *Department of Health,* New York State. Retrieved from www.health.ny.gov

Al Moamary, M. S. (2010). Health care utilization among chronic obstructive disease patients and effect of pulmonary rehabilitation. *Medicine Principles and Practice, 19,* 373-378. doi:101159/000316376

Altenburg, W. A., de Greef, M. H. G., ten Hacken, N. H. T., & Wempe, J. B. (2012). A better response in exercise capacity after pulmonary rehabilitation in more severe COPD patients. *Respiratory Medicine, 106,* 694-700. doi:10.1016/j.rmed.2011.11.008

Amany, S., & Doaa, F. (2013). Impact of pulmonary rehabilitation program on health outcomes of patients with COPD. *Journal of Education and Practice, 4*(15), 78-86. Retrieved from http://www.iiste.org

American Association of College of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice,* pp. 1-28. Retrieved from www.aacn.nche.edu/DNP/pdf/Essentials.pdf

American Thoracic Association. (2002). ATS statement: Guidelines for the six-minute walk test. *American Journal of Critical Care Medicine, 166,* 111-117. doi:10.1164/rccm.166/1/111

Beaumont, M., Reychler, G., Le Ber-Moy, C., & Peran, L. (2011). The effect of a pulmonary rehabilitation program in relation to the severity of COPD. *Revue des Maladies*

Respiratoires, 28(3), 297-305. doi:10.10.1016/j.rmr.2010.09.034

Bentsen, S. B., Wentzel-Larsen, T., Henriksen, A. H., Rokne, B., & Wahl, A. K. (2010). Self-efficacy as a predictor of improvement in health status and overall quality of life in pulmonary rehabilitation- An exploratory study. *Patient Education Counseling, 8*1,5-13. doi:10.1016/j.pec.2009.11.019

Bentsen, S. B., Rokne, B., & Wahl, A. K. (2013). Comparison of health-related quality of life between patients with chronic obstructive disease and the general population. Scandinavian *Journal of Caring Services, 27*, 905-912. doi:10.1111/scs.12002

Bestall, J. C., Paul, E. A., Garrod, R., Graham, R., J. A., Jones P. W., & Wedzicha, J. A., (2003). Longitudinal trends in exercise capacity and health status after pulmonary rehabilitation in patients with COPD. *Respiratory Medicine, 97*, 173-180. Retrieved from http://www.sciencedirect.com/science/article/pii/S0954611103913977

Bonville, D., Saran, M., Salem, J. K., Clough, L., Jones, R. R., Radwany, S. M., & Sweet, D. B. (2007). Perspectives in ambulatory care: An innovative role for nurse practitioners in managing chronic disease. *Nursing Economics, 25*(6). Retrieved from https://web-b-ebscohost.com.ezp.waldenulibrary.org/ehost/pdfviewer

O'Donnell, D. E., Aaron, S., Bourbeau, J., Hernendez, P., Marcinuik, D. D., Balter, M., … Voduc, N. (2007). Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease. *Canadian Respiratory Journal, 14*(suppl. B). 5B-32B. Retrieved from ncbi.nlm.gov/pubmed/17885691

Burckhardt, C. S., Anderson, K. L., Archenhott, B., & Hägg, O. (2003). The Flanagan quality of life scale. Evidence of construct validity. *Health quality of life outcome. 1*, 159-166. doi:10.1186/1477-75-25-1-59

Burns, N., & Grove, S. K. (2009). *The practice of nursing research: Appraisal, synthesis,*

and generation of evidence (6th ed.). St. Louis, MO: Saunders Elsevier.

Busby, A. K., Reese, R. L., & Simon, S. R. (2014). Pulmonary rehabilitation maintenance intervention: A systematic review. *American Journal of Health Behavior, 38*(3), 312-330. http://dx.doi.org/10.5993/AJHB.38.3.1

Casey, D., Murphy, K., Cooney, A., Mee, L., & Dowling, M. (2011). Developing a structured education program for clients with COPD. *British Journal of Community Nursing, 16*(5), 231-237. doi:10.12968/bjcn.2011.16.5.231

Celli, B. R., & Barnes, P. J. (2007). Exacerbation of chronic obstructive pulmonary disease. *European Respiratory Journal, 29*, 1224-1238. Retrieved from http://www.ncbi.nlm.nih.gov/

Centers for Disease Control and Prevention. (2011). *National Center for Health Statistics National health interview survey raw data*. Retrieved from http://www.lung.org/lung-disease/copd/resources/facts-figure

Cluzeau, F., Wedzicha, J. A., Kelson, M., Corn, J., Kunz, R., Walsh, J., & Schunemann, H. J. (2012). Stakeholder involvement: How to do it right. Article 9 in integrating and coordinating efforts in COPD guideline development: An official ATs/ERS workshop report. *Proceeding of American Thoracic Society, 9*(5), 269-273. doi:10.1513/pats.201208-0625T

Cook County Health and Hospital Systems (2016). *About us.* Retrieved from cookcountyhhs.org/locations/john-h-stroger/about-us

Corbridge, S., Wilken, L., Kapella, M. C., & Gronkiewicz, C. (2012). An evidence-based approach to COPD: Part 1. A review of current guidelines on the diagnosis and management of chronic obstructive pulmonary disease. The first of two-part article. *American Journal of* Nursing, *112(*3), 46-57. doi:10.1097/01.NAJ.0000412639.08764.21

Crisafulli, E., & Clini, E. M. (2010). Measures of dyspnea in pulmonary rehabilitation, *Multidisciplinary Respiratory Medicine, 2(*202), 202-210. doi:10.1186/2049-6958-5-3-202

Ding, B., DiBonaventura, M., Karisson, N., Bergstrȍm, G., & Holmgren, U. (2017). A cross-sectional assessment of the burden of COPD symptoms in the US and Europe using the National Health and Wellness Survey. *International Journal of COPD, 12*, 529-539. http://doi.org/10.2147/COPD.S114085

Donesky, D., Citron, T. L., Hilling, L., Cayou, C., & Milic, M. M. (2015). Additional evidence for the long-term benefits of pulmonary rehabilitation. *Respiratory Care, 60*(8), 1120-1129. doi:10.10.4187/respcare03153

Edwards, K., & Singh, S. (2012). P235 the Bristol Knowledge Questionnaire (BCKQ): Assessing the knowledge of healthcare professionals involved in the delivery of COPD services. *Thorax, 67*(suppl. 2), A167. doi: 10.1136/thoraxjnl-2012-202678.296

Ergün, P., Kaymaz, D., Gunay, E., Erdogan, Y., Tura, U., Demir, N., … Kose, S. K. (2011). Comprehensive outpatient pulmonary rehabilitation: Treatment outcomes in early and late stages of chronic obstructive pulmonary disease. *Annals of Thoracic Medicine, 6*(2), 70-76. doi:10.4103/1817-1737.78420

Eshaghi, S-R, Ramezani, M. A., Shahsanaee, A. S., & Pooya, A. (2006). Validity and reliability of the Short Form-36 Questionnaire as a measure of quality of life in elderly Iranian population. *American Journal of Applied Sciences, 3*(3), 1763-1766. doi:10.3844/ajassp.2006.1763.1766

Farrias, C., Resqueti, V., Dias, F. A. L., Borghi-Silva, A., Arena, R., & Fregonezi, G. A. F. (2014). Cost and benefits of pulmonary rehabilitation in chronic obstructive pulmonary disease: A randomized controlled trial. Brazilian Journal of Physical Therapy, 18(2), 165-173. doi:10.1590/S1413-35552012005000151

Feemster, L. C., & Au, D. (2014). Penalizing hospitals for chronic obstructive pulmonary Disease readmissions. *American Journal of Respiratory and Critical Care Medicine, 189*(6), 634-639. doi:10.1164/rccm.201308-1541PP

Fischer, M. J., Scharloo, M., Abbink, J. J., van't Hui, A. J., van Ranst, D., Rudolphus, A., … Kaptein, A. A. (2009). Drop-out and attendance in pulmonary rehabilitation: The role of clinical and psychosocial variables. *Respir Med, 103*(10), 1564-1571. doi:10.1016/j.med.2008.11.020

Fischer, M. J., Scharloo, M., Abbink, J. J., Nies, A. T-V., Rudolphus, A., Snoei, L., … Kaptein, A. A. (2007). Participation and drop-out in pulmonary rehabilitation: A quantitative analysis of the patient's perspective. Clinical Rehabilitation, 21, 212-221. doi:10.1177/0269215506070783

Fisher, M. J., Schaeboo, M, Abbink, J., van 't Hul, A., van Ranst, D., Rudolphus, A., … & Kaptein, A. (2012). Concerns about exercise are related walk test results in pulmonary rehabilitation for patients with COPD. *International Journal of Behavioral Medicine, 19,* 39-47. doi:10.1007/s12529-010-9130-9

Gerlach, Y., Williams, M. T., & Coates, A. M. (2013). Weighing up the evidence: A systematic review of measures used for the sensation of breathlessness in obesity. *International Journal of Obesity, 37,* 341-349. doi:10.1038ijo.2012.49

Greening, N. J., Williams, J. E. A., Hussain, S. F., Harvey-Dunstan, T. C., Bankart, M. J., Chaplin, E. J., … Clahrc, L. N. R. (2014). An early rehabilitation intervention to enhance recovery during hospital admission for an exacerbation of chronic respiratory disease: Randomized controlled trial. *BMJ 349*(g4315), 1-12. doi:10.1136/bmj.g4315

Global Initiative for Chronic Obstructive Lung Disease (2014). *Global strategy*

for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Retrieved from http://tinyurl.com/oj2hdgr

GOLD (2008). *Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease*. Executive summary, Vol. 2009. Medical Communication Resources. Retrieved from http://www.goldcopd.org/Guidelineitem.asp?l1=2&l2=1&intId=989.

Guerra-Balic, M., Oviedo, G.R., Javierre, C., Fortuño, J., Barnet-Lõpez, S., Nino, O., … Ferrhall, B. O. (2015). Reliability and Validity of 6-Minute Walk Test in adults and seniors with intellectual disability. *Research in Developmental Disabilities, 47*, 144-153. doi:10.1016/j.ridd.2015.09.011

Guo, S-E, & Bruce A. (2014). Improving understanding of and adherence to pulmonary rehabilitation in patients with COPD: A qualitative inquiry of patient and health professional perspectives. *PLoS One, 9*(10), e110835. doi:10.1371/journl.pone.0110835

Han, M. K. (2011). Pulmonary, Sleep, Critical Care Update in Chronic Obstructive Pulmonary Disease in 2010. *American Journal of Critical Care Medicine, 183,* 1311-1315. doi:10.1164/rccm.201102-0280UP.

Hanson, L. C., McBurney, H., & Taylor, N. F. (2012), The retest reliability of the six-minute walk test in patients referred to a cardiac rehabilitation programme. *Physiotherapy Research International, 17,* 55–61. doi:10.1002/pri.513

Hernandez, N. A., Wouters, E. F. M., Meijer, K., Annegarn, J., Pitta, F., & Spriut, M. A. (2011). Reproducibility of 6-minute walking test in patients with COPD. *European Respiratory Journal, 38,* 261-267. doi:10.1183/09031936.00142010

Hayton, C., Clark, A., Olive, S., Browne, P., Penny, G., Knight, E., … Wilson, A. M.

(2012). Barriers to PR: Characteristics that predict patient attendance and adherence. *Respiratory Medicine, 107*, 401-407. doi:10.1016/j.rmed.2012.11.016

Hernandez N. A., Wouters, E. F. M., Meijer, K., Annegarn, J., Pitta, F., & Spruit, M. A. (2011). Reproducibility of 6-minute walking test in patients with COPD. *European Respiratory Journal, 38*, 261-267. doi:10.1183/0903.00142010

Holland A. E., Mahal, A., Hill, C. J., Lee, A. L., Burge, A. T., Moore, R., … McDonald, C. F. (2013). Benefits and costs of home-based pulmonary rehabilitation in chronic obstructive pulmonary disease – a multi-center randomized controlled equivalence trial. *BMC Pulmonary Medicine, 13*(57), 1-7. doi:10.1186/1471-2466-13-57

Hornikx, M., Remoortel, H. V., Demeyer, H., Augusto, C., Camillo, M., Decramer, M., … Troosters, T. (2013). The influence of comorbidities on outcome of pulmonary rehabilitation: A systematic review. *BioMed Research International, 2013*, 1- 8. http://dx.doi.org/10.1155/2013/146148

Hughes, R. (2008). *Tools and strategies for quality improvement and patient safety.* An Evidence-based Handbook for Nurses. Retrieved from http://www.ncbi.nlm.nih.gov/books/NBK2682.

Hyrkas, K., & Harvey, K. (2010). Leading innovation and change. *Journal of Nursing Management, 18* (1), 1-3. doi:10.1111/j.1365-2834.2010.01069.x

Irvine, D., O'Brien-Palls, L. L., Murray, M., Cockerill, R., Sidani, S., Laurie-Shaw, B., & Lochhaas-Gerlach, J. (2000). The reliability and validity of two health status measures for evaluating outcomes of home care nursing. *Research in Nursing & Health, 23*(1), 43-54. doi:10.1111/j.1365-2834.2010.01069.x

Jencks, S. F., Williams, M. V., & Coleman, E. A. (2009). Rehospitalization among

patients in the Medicare fee-for-service program. *New England Journal of Medicine, 360,* 1418-1428. doi: 10.1056/NEJMsa0803563

Jones, S. E., Green, S. A., Clark, A. L., Dickson, M. J., Nolan, A-M., Moloney, C., … Man, W. D-C. (2014). Pulmonary rehabilitation following hospitalization for acute exacerbation of COPD: Referrals, uptake and adherence. *Thorax, 69*(2). doi:10.1136/thoraxjnl-2013-204227

Johnson, K., Young, M., Grimmer, K., Antic, R., & Frith, P. (2013). Frequency of referral to and attendance at a pulmonary rehabilitation program amongst patients admitted to a tertiary hospital with chronic obstructive pulmonary disease. *Respirology, 18*(7), 1089-1094. doi:10.1111/resp.12128

Johnston, K. & Grimmer-Somers, K. (2010). Pulmonary rehabilitation: Overwhelming evidence but lost in translation. *Physiotherapy Canada, 62,* 368-373. doi:10.3138/physio.62.4.368

Keating, A., Lee, A. L., & Holland, A. E. (2011). Lack of perceived benefit and inadequate transport influence uptake and completion of pulmonary rehabilitation in people with chronic obstructive disease: A qualitative study. *Journal of Physiotherapy, 57*, 183-190.

Kettner, P. M., Moroney, R. M., & Martin, L. L. (2013). *Designing and managing programs: An effectiveness-based approach* (4th ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Kelleher, H., Parker, R., Abdulwadud, O., Francis, K. (2009). Systematic review of the effectiveness of primary care nursing. *International Journal of Nursing Practice, 15*, 16-24. doi:10.1111/j.1440-172X.2008.01726.x

Kendrick, K. R., & Smith, R. M. (2000). Usefulness of the Modified 0-10 Borg Scale in assessing the degree of dyspnea in patients with COPD and asthma. *Journal of Emergency Nursing, 26*(3), 216-288. Retrieved from

http://www.ncbi.nlm.nih.gov/pubmed/10839848

Kyung, K. A., & Chin, P. (2007). The effect of a pulmonary rehabilitation programme on older patients with pulmonary disease. *Journal of Clinical Nursing, 17*(1), 118-125. doi:10.111/j.1365-2702.2006.01712.x

Lacasse, Y., Goldstein, R., Lasserton, T. J., Martin, S. (2006). Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database Systemic Review, CD0037933*(4). doi:10.1002/14651858.CD003793.pub2

Limsuwat, C., McClellan, R., Amiri, H. M., & Nugent, K. (2014). Pulmonary rehabilitation improves only some domains of health-related quality of life measured by the Short Form-36 questionnaire. *Annals of Thoracic Medicine, 9*(3), 144-148. doi:10.4103/1817-1737.134068

Lin, W. – C., Yuan, S.-U., Chien, J.-Y., Weng, S.-C., Chou, M.-C., & Kuo, H-W. (2012). The effects of respiratory training for chronic obstructive pulmonary disease patients: A randomized clinical trial. *Journal of Clinical Nursing, 21*(19/20), 2870-2878. doi:10.1111/j1365-2702.2012.04124.x

Marcinuik, D. D., Brooks, D., Butcher, S., Debigare, R., Dechman, G., Ford, G., …

Muthuri, S. K. (2010). Optimizing pulmonary rehabilitation in chronic obstructive disease – practical issues: A Canadian thoracic society clinical practice guideline. *Canadian Respiratory Journal, 17*(4), 159-167. doi:10.1155/2010/425975

Matsui, H., Jo, T., Fushimi, K., & Yasunaga, H. (2017). Outcomes after early and delayed rehabilitation for exacerbation of chronic obstructive disease: A nationwide retrospective cohort study. *Respiratory Research, 18*(68), 1-10. doi:10.1186/s12931-017-0552-7

McEwen, M. & Wills, E. M. (2011). *Theoretical basis for nursing* (3rd ed.). Wolters Kluwer: Lippincott Williams & Wilkins.

Meshe, O. F., Claydon, L. s., Bungay, H., & Andrew, s. (2017). The relationship between physical activity and health status in patients with chronic obstructive pulmonary disease following pulmonary rehabilitation. *Disability & Rehabilitation, 39*(9), 746-756. http://dx.doi.org.ezp.waldenulibrary.org/10.3109/09638288.2016.1161842

Miake-Lye, I. M., Amulis, A., Saliba, D., Shekelle, P. G., Vilkman, L. K., & Ganz, D. A. (2011). Formative evaluation of telecare fall prevention project for older veterans. *BMC Health Services Research, 11*(119), 1-9. doi:10.1186/1472-6963-11-119

Murphy, K., Casey, D., Devane, D., Cooney, A., McCarthy, B., Mee, L., … O'Shea, E. (2011). A cluster randomized controlled trial evaluating the effectiveness of a structured pulmonary rehabilitation education program for improving the health status of people with chronic obstructive pulmonary disease (COPD): The PRINCE study protocol. *BMCPulmonary Medicine, 11*(4). doi:10.1186/1471-2466-11-4

National Heart, Lung and Blood Institute (2009). *Morbidity and Mortality:2009 Chart book on Cardiovascular, Lung and Blood Diseases.* Retrieved from http://www.ecopmc.files.wordpress.com/2012/04/2009_chartbook.pdf

Nguyen, H. Q., Chu, L., Liu, I-L. A., Lee, J. S., Suh, D., Korotzer, B., … Gould, M. K. (2014). Association between physical activity and 30-day readmission risk in chronic obstructive pulmonary disease. *Annals of American Thoracic Society, 11*(5), 695-705. doi:10.1513/AnnalsATS.201401-0170C

Nici, L., Lareau, S., & ZuWallack, R. (2010). Pulmonary rehabilitation in the treatment of chronic obstructive pulmonary disease. A*merican Family Physician, 82*(6), 655-660. Retrieved from http://www.aafp.org/2010/0915/p655.html

Nield, M.A., Soo Hoo, G.W., & Roper, J.M. (2007). Efficacy of pursed-lips breathing pattern retraining strategy for dyspnea reduction. *Journal of Cardiopulmonary*

Rehabilitationand Prevention, 27(4), 237-244. doi:10.1097/01/HCR.0000281770.82652.cb

Nonoyama, M. L., Holmes, R., King, J., & Brooks, D. (2010). Lung association's Ottawa COPD program: A successful maintenance pulmonary rehabilitation program. *Canadian Journal of Respiratory Therapy, 46*(3). Retrieved from http://www.web-b-ebscohost.com.ezp.waldenulibrary.org

O'Donnell, D. E., Aaron, S., Bourbeau, J., Hernandez, P., Maeciniuk, D. D., Balter, M., … Voduc, N. (2007). Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease 2007 update. *Canadian Respiratory Journal, 14*(Suppl. B), 5B – 32B. doi:10.1155/2007/830570

Ousley, A. I., Swartz, J. A., Milliken, E. L., & Ellis, S. (2010). Cancer education and effective dissemination: Information access is not enough. *Journal of Cancer Education, 25,* 196-205. doi:10. 1007/s13187-010-0129-3

Pessoa, I. M. B., Costa, D., Velloso, M., Mancuso, E., Reis, M. A. S., & Parreira, V. F. (2012). Effects of noninvasive ventilation on dynamic hyperinflation of patients with COPD during activities of daily living with upper limbs. *Brazilian Journal of Physical Therapy, 16*(1). doi:10.1590/S1413-3555201200100011

Polit, D. F., & Beck, C. T. (2004). *Nursing research: principles and methods* (7th ed.). Philadelphia, PA: Lipincott Williams & Wilkins.

Pollock, B. S., Barkley, J. E., Potenzini, N., Desalvo, R. M., Buser, S. L., Otterstetter, R., & Juvancic-Heltzel, J. A. (2013). Validity of Borg ratings of perceived exertion during active video game play. *International Journal of Exercise Science, 6*(2), 164-170. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4882467/

Powers, J., & Bennett, S. J. (1999). Measurement of dyspnea in patients treated with mechanical

ventilation. *American Journal of Critical Care, 8*(4), 254-261. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10392226

Prescott, H. C., Sjoding, M. W., & Iwashyna, T. J. (2014). Diagnosis of early and late readmissions after hospitalization for pneumonia: A systematic review. *Annals of the American Thoracic Society, 11*(7), 1091-1100. doi:10.1513/AnnalsATS.201404-1420C

Puhan, M. A., Gimeno-Santos, E., Scharplatz, M., Troosters, T., Walters, E. H. & Steurer, J. (2011). *Cochrane Database of Systematic Reviews, 10*(CD005305). doi:10.1002/14651858.CD005305.pub3

Puhan, M. A., Gimeno-Santos, E., Cates, C. J., Troosters, T. (20016). Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews, 12*(CD005305), 1-119. doi:10.1002/14651858.CD005305.pub4

Rau, J. (2014). 364 hospitals have high rates of overall readmissions, new Medicare data show. *Kaiser Health News*, 1-21. Retrieved from khn.org/…364-hospitals-have-high-rates-of-overall-readmissions-new-medicare-data-…

Resqueti, V., Gorostiza, A., & Gladis, J. (2007). Benefits of a home-based pulmonary rehabilitation program for patients with severe COPD. *Arch Bronconeumol, 43*(11), 599-604. doi:10.10.1016/S1579-2129(07)60136-0

Risor, M. B., Spigt, M., Iversen, R., Godycki-Cwirko, M., Francis, N., Altiner, A., et al. (2013). The complexity of managing COPD exacerbations: A ground theory study of European general practice. *BMJ Open, 3:e003861*. doi:10.1136/bmjopen-2013-003861

Rowe, N., & Ilic, D. (2009). What impact do poster have on academic knowledge transfer? A pilot survey on author attitudes and experiences. *BMC Medical Education, 9*(71), 1-14. doi:10.1186/1472-6920-9-71

Schroff, P., Hitchcock, J., Schumann, C., Wells, J. M., Dransfield, M. T., & Bhatt, S. (2017). Pulmonary rehabilitation improves outcomes in chronic obstructive pulmonary disease independent of disease burden. *Annals of American Thoracic Society*, *14*(1), 26-32. doi:10.1513/AnnalsATS.201607-5510C

Scott, A. S., Baltzan, M. A., Dajczman, E., & Wolkove, N. (2 011). Patient knowledge in chronic obstructive pulmonary disease: Back to basics. *Journal of Chronic Obstructive Pulmonary Disease, 8*, 375-379. doi:10.3109/15412555.2011.605402

Seymour, J. M., Moore, L., Jolley, C. J., Ward, K., Creasey, J., Steier, J. S., … Moxham, J. (2010). Outpatient pulmonary rehabilitation following acute exacerbation of COPD. *Thorax, 65*, 423-428. doi:10.1136/thx.2009.124164

Shah, M. D., Press, V. G., Huisingh-Scheetz, M., & White, S. R. (2016). COPD admissions addressing COPD in the era of value-based health care. *Chest, 150*(4), 916-926. doi: http://dx.doi.org/10.1016/j.chest.2016.05.002

Simon, J. (2013). Attitudes of Hungarian asthmatic and COPD patients affecting disease control: Empirical research based on Health Belief Model. *Frontiers in Pharmacology*, *4*(135), 1-10. doi:10. 3389/fphar.2013.00135

Sohanpal, R., Steed, L., Mars, T., & Taylor, S. J. C. (2015). Understanding patient participation behavior in studies of COPD support programmes such as pulmonary rehabilitation and self-management: A qualitative synthesis with application of theory. *Nature Partner Journal (NPJ) Respiratory Medicine, 25*, 15054. doi:10.1038/npjpcrm.2015.54

Solway, S., Brooks, D., Lacasse, Y., & Thonas, S. (2001). A qualitative systematic overview of the measurement properties of functional walk tests used in the cardio respiratory

domain. *Chest, 119*(1), 256-270. Retrieved from http://www.web-b-ebscohost.com.ezp.waldenulibrary.org/ehost/pdfviewer/pdfviewer?...

Soysa, S., McKeough, Z., Spencer, L., & Alison, J. (2012). Effects of maintenance programs on exercise capacity and quality of life in chronic obstructive pulmonary disease. *Physical Therapy Reviews, 17*(5), 335-345. doi:10.1179/1743288X12Y.0000000033

Stillwell, S. B., Fineout-Overholt, E., Melnyk, B. M., & Williamson, K. M. (2010). Evidence-based practice, step by step: Asking the clinical question: A key step in evidence-based practice. *American Journal of Nursing, 110*(3), 58–61. doi:10.1097/01.NAJ.0000368959.11129.79

Suh, E- S., Mandal, S., & Hart, N. (2013). Admission prevention in COPD: Non-pharmacological management. *BMC Medicine, 11*(247). http://doi.org/10.1186/1741-7015-11-247

Terry, A. J. (2015). *Clinical research for the Doctor of Nursing practice.* (2nd ed.). Burlington MA: Jones & Bartlett.

Thakrar, R., Alaparthi, G. K., Kumar, S. K. K., Vaishali, K., Zulfeequer, C. P., & Aanad, R. (2014). Awareness in patients with COPD about the disease and pulmonary rehabilitation: A survey. *Lung India, 31*(2), 134-138. doi:10.4103/0970-2113.129837

Thorpe, O., Kumar, S., & Johnston, K. (2014). Barriers to and enablers of physical activity in patients with COPD following a hospital admission: A qualitative study. *International Journal of Obstructive Pulmonary Disease, 9*, 115-128. doi:10.2147/COPD.S54457

Tsai, C. L., Hodder, R. V., Page, J. H., Cydwka, R. K., Rowe, B. H., & Camargo, C. A. (2008). The short-form chronic respiratory disease questionnaire was a valid, reliable, and responsive quality of life instrument in acute exacerbation of chronic obstructive pulmonary disease. *Journal of Epidemiology, 6*(5), 489-497. doi:10.1016/j.clineppi.2007.07.003

Vestbo, J., Hurd, S. S., Augusti, A. G., Jones, P. W., Vogelmeier, C., Anzueto, A., … Rodriguez-Roisin, R. (2013). Global strategy for diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. *American Journal of Respiratory and Critical Care Medicine, 187*(4), 347-365. http://doi.org/10.1164/rccm.201204-0596PP

Von Leupoldt, A., Hahn, E., Taube, K., Schubert-Heukeshoven, S., Magnussen, H., & Dahme, B. (2008). Effects of 3-week outpatient pulmonary rehabilitation on exercise capacity, dyspnea, and quality of life in COPD. *Lung, 186,* 387-391. doi:10.1007/s00408-008-9089-3

Watts, S.A., Gee, J., O'Day, M. E., Schuab, K., Lawrence, R., Aron, D., & Kirsh, S. (2009). Nurse-practitioner-led multidisciplinary teams to improve chronic illness care: The unique strengths of nurse-practitioners applied to medical appointments/group visits. *Journal of the American Academy of Nurse Practitioners, 21,* 167-171. doi:10.1111/j.1745-7599.2008.00379.x

White, K. M., & Dudley-Brown, S. (2012). *Translation of evidence into nursing and health care practice.* New York: Springer Publishing Company.

White, R., Walker, P., Roberts, S., Kalisky, S., & White, P. (2006). Bristol COPD knowledge questionnaire (BCKQ): Testing what we teach patients about COPD. *Chronic Respiratory Disease, 3*(3), 123-131. doi:10.1191/1479972306cd117oa

Wong, C., & Yu, W. C. (2016). Correlates of disease-specific knowledge in Chinese patients with COPD. *International Journal of Chronic Obstructive Pulmonary Disease, 11*(1), 2221-2227. http://doi.org/10.2147/COPD.S112176

World Health Organization (2015). *Chronic respiratory disease: Burden of COPD.* Retrieved from http://www.who.int/respiratory/copd/burden/en/...

Zaccagnini, M. E. & White, K. W. (2011). The doctor of nursing practice essentials: A new model for *advanced practice nursing*. Sudbury, MA: Jones & Bartlett.

Zhang, Y., QU, B., Lun, S-S., Guo, Y., & Liu, J. (2012). The 36-Item Short Form health survey: reliability and validity on Chinese medical students. *International Journal of Medical Sciences, 9*(7), 521-526. doi:10.7150/ijms.4503

Zoeckler, N., Kenn, K., Kuehl, K., Stenzel, N., & Rief, W. (2013). Illness perceptions predict exercise capacity and psychological well-being after pulmonary rehabilitation in COPD patients. *Journal of Psychosomatic Research, 76*(2), 146-151. doi:10.1016/j.jpschores.2013.11.021

Appendix A: Bristol COPD Knowledge Questionnaire

BRISTOL COPD KNOWLEDGE QUESTIONNAIRE

ID Code: _____ Date: _____

The questionnaire is designed to find out what you know about your lung problem. It should be completed without help from anyone else. This usually takes between 10 and 20 minutes. Your answers will help us to find out what information you need to help you to understand and manage your lung condition.

Mark the circle which you think is the correct answer.

1	**In COPD:**	**True**	**False**	**Don't Know**
a	In COPD, the word "chronic" means it is severe	O	O	O
b	COPD can only be confirmed by breathing	O	O	O
c	In COPD, there is usually gradual worsening over time.	O	O	O
d	In COPD oxygen levels in the blood are always low.	O	O	O
e	COPD is unusual in people less than 40 years old.	O	O	O
2	**COPD:**	**True**	**False**	**Don't Know**
a	More than 80 of COPD cases are caused by cigarette smoking.	O	O	O
b	COPD can be caused by occupational dust exposure.	O	O	O
c	Longstanding asthma can develop into COPD	O	O	O
d	COPD is commonly an inherited disease.	O	O	O
e	Women are less vulnerable to the effects of cigarette than men.	O	O	O
3	**The following symptoms are *COMMON* in COPD:**	**True**	**False**	**Don't Know**
a	Swelling of ankles	O	O	O
b	Fatigue (tiredness)	O	O	O
c	Wheezing	O	O	O
d	Crushing chest pain	O	O	O
e	Rapid weight loss	O	O	O
4	**Breathlessness in COPD:**	**True**	**False**	**Don't Know**
a	Severe breathlessness prevents travel by air	O	O	O
b	Breathlessness can be worsened by eating large meals.	O	O	O
c	Breathlessness means that your oxygen levels are low.	O	O	O
d	Breathlessness is a normal response to	O	O	O

e	Breathlessness is primarily caused by a narrowing of the bronchial tubes.	O	O	O

	Phlegm (sputum):	True	False	Don't Know
a	Coughing phlegm is a common symptom in COPD	O	O	O
b	Clearing phlegm is more difficult if you get	O	O	O
c	Bronchodilator inhalers can help clear phlegm.	O	O	O
d	Phlegm causes harm if swallowed.	O	O	O
e	Clearing phlegm can be assisted by breathing exercises.	O	O	O

	Chest infections / exacerbations:	True	False	Don't Know
a	Chest infections often cause coughing of blood.	O	O	O
b	With chest infections phlegm usually becomes (yellow or green).	O	O	O
c	Exacerbations (episodes of worsening) can occur in absence of a chest infection.	O	O	O
d	Chest infections are always accompanied by a high	O	O	O
e	Steroid tablets should be taken whenever there is an exacerbation.	O	O	O

	Exercise in COPD:	True	False	Don't Know
a	Walking is better exercise than breathing exercises to improve fitness.	O	O	O
b	Exercise should be avoided as it strains the lungs.	O	O	O
c	Exercise can help maintain your bone density.	O	O	O
d	Exercise helps relieve depression.	O	O	O
e	Exercise should be stopped if it makes you breathless.	O	O	O

	Smoking:	True	False	Don't Know
a	Stopping smoking will reduce the risk of heart disease.	O	O	O
b	Stopping smoking will slow down further lung	O	O	O
c	Stopping smoking is pointless as the damage is done.	O	O	O
d	Stopping smoking usually results in improved lung	O	O	O
e	Nicotine replacement therapy is only available on prescription.	O	O	O

	Vaccination:	True	False	Don't Know
a	A flu jab (shot) is recommended every year.	O	O	O
b	You can get flu from having a flu shot.	O	O	O
c	You can only have flu shot if you are 65 or over.	O	O	O
d	A pneumonia shot protects against all forms of pneumonia.	O	O	O

10	**Inhaled bronchodilators:**	True	False	Don't Know
a	All bronchodilators act quickly (within 10 minutes).	O	O	O
b	Both short and long acting bronchodilators can be taken same day.	O	O	O
c	Spacers (e.g. volumatic, nebuhaler, aerochamber) should dried with a towel after washing.	O	O	O
d	Using a spacer device will increase the amount of drug in the lungs.	O	O	O
e	Tremor may be a side effect of bronchodilators.	O	O	O
11	**Antibiotic treatment in COPD:**	True	False	Don't Know
a	To be effective, the course should last at least 10 days.	O	O	O
b	Excessive use of antibiotics can cause resistant bacteria	O	O	O
c	Antibiotics will clear all chest infections.	O	O	O
d	Antibiotic treatment is necessary for an exacerbation however mild.	O	O	O
e	You should seek advice if antibiotics cause severe diarrhea.	O	O	O
12	**Steroid tablets given for COPD (e.g. Prednisolone):**	True	False	Don't Know
a	Steroid tablets help strengthen muscles.	O	O	O
b	Steroid tablets should be avoided if there is a chest	O	O	O
c	The risk of long-term side effects due to steroids is less courses than with continuous treatment.	O	O	O
d	Indigestion is a common side effect from using steroid tablets.	O	O	O
e	Steroid tablets can increase your appetite.	O	O	O
13	**Inhaled steroids (brown, red or orange):**	True	False	Don't Know
a	Inhaled steroids should be stopped if you are given steroid tablets.	O	O	O
b	Steroid inhalers can be used for rapid relief of	O	O	O
c	Spacer devices reduce the risk of getting thrush in the	O	O	O
d	Steroid inhaler should be taken before your	O	O	O
e	Inhaled steroids improve lung function in COPD.	O	O	O
e	You can have a pneumonia shot and a flu shot on the same day.	O	O	O

Appendix D: The Modified BORG Dyspnea Scale

ID Code: _____ Date: _____

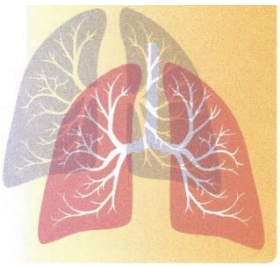
The Modified BORG Dyspnea Scale	Nothing at all (None)
0.5	Very, very slight (just noticeable)
1	Very slight
2	Slight breathlessness
3	Moderate
4	Somewhat severe
5	Severe breathlessness
6	
7	Very severe breathlessness
8	
9	Very, very severe (almost maximal
10	Maximal

Adapted from: Crisafulli, E., & Clini, M. (2010). Measures of dyspnea in pulmonary rehabilitation. *Multidisciplinary Respiratory Medicine, 5(*3), 202-210. doi: 10.1186/2049-6958-5-3-202

AMERICAN THORACIC SOCIETY

Patient Information *Series*

Pulmonary **Rehabilitation**



- If you have shortness of breath because of lung problems, you may have asked yourself:
- Can I exercise or should I avoid exercise because it makes me short of breath?
- How can I get in better shape and have more energy if I am short of breath every time I try to exercise?
- What medications do I really need to take?

Pulmonary rehabilitation can help answer these and other questions. Enrolling in a pulmonary rehabilitation program may reduce your shortness of breath and increase your ability to exercise. You may have heard that pulmonary rehabilitation is only for people with COPD (chronic obstructive pulmonary disease). We now know that people with other lung conditions such as pulmonary hypertension and interstitial lung disease can benefit as well.

What is Pulmonary Rehabilitation?

Pulmonary rehabilitation is a program of education and exercise that helps you manage your breathing problem, increase your stamina (energy) and decrease your breathlessness. The education part of the program teaches you to be "in charge" of your breathing instead of your breathing being in charge of you. You will learn how to pace your breathing with your activities, how to take your medicines and even how to talk with your health care provider.

The exercise sessions are supervised by pulmonary rehabilitation staff that prepares an exercise program just for you. The exercises start at a level that you can handle (some people start exercising while sitting and others on a treadmill). The amount of time you exercise will be increased in time and the level of difficulty will change based on your ability. As your muscles get stronger, you will be more active with less breathlessness and be less tired.

How much time does a Pulmonary Rehabilitation Program take?

The amount of time it takes to complete a pulmonary rehabilitation program will vary depending on your needs. Because the program staff are constantly monitoring your progress and increasing your exercises as you are able, attending every session is important. Most programs meet two to three times a week and programs can last 4 to 12 weeks or more.

How will I know if Pulmonary Rehabilitation is right for me?

Your health care provider will determine if you qualify for pulmonary rehabilitation by:

- Evaluating your current state of health and lung function test results
- Discussing your current activity level and your ability to do the things you want to do
- Determining your willingness and ability to attend.

Pulmonary rehabilitation programs are limited in the number of people who can attend so that you get close supervision. You will be evaluated before you begin the program to make sure you do not have health issues that would limit your ability to join. This evaluation may take place at the rehabilitation site or in a clinic by a physician, advanced practice nurse or physician assistant.

Once the program begins, a team of health care professionals (nurses, respiratory therapists, physical therapists, occupational therapists, psychologists, dieticians, social workers, spiritual advisors such as a chaplain and oth work with you to put you in charge of your breathing.

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What will I learn in Pulmonary Rehabilitation?

The education part of the program happens both in a classroom, one-an-one with the professional staff, and during each exercise session. During group meetings, you will learn new ways to breathe during stressful times and while being active. You will practice these new breathing techniques during your exercise sessions. You will learn about your medications; what the medications do and how to use your inhalers to get the most benefit from them. During the program, you may be given an Action Plan that outlines what you should do when you are having a lung flare-up (exacerbation).

Some people with breathing problems need to use oxygen. During pulmonary rehabilitation, you will be tested at rest and with exercise to see if oxygen may help you. You will learn the reasons why some people with shortness of breath use oxygen and others do not need it.

If you smoke, the program will provide support for you to quit or get you a referral to a program that can help you to quit. You will also learn how and when to call your health care provider, including what key points to share with them and what questions to ask. Also during the program, you can expect to meet others that also have breathing problems. You will have the time to share concerns and successes with others living with lung disease.

What will I do in the exercise sessions?

You may not think that you can exercise when just walking across the room makes you breathless. There are however, standard exercises that have been found to work well for people with breathing problems. The type and amount of exercise you will do will depend on what you can do now and as you get stronger, your exercises will increase. Exercise sessions begin with stretching exercises or warm ups, followed by exercises for your arms and legs. Usually you will do both exercises to build your strength and exercises to build your endurance (stamina). To build your strength, generally weights and lifting devices are used. For endurance, activities might include walking on a treadmill or in a corridor and using a stationary cycle. The amount of time you exercise depends on what you can handle. After attending pulmonary rehabilitation, patients are frequently amazed at how much they can exercise and how much less short of breath they are.

How can I find a Pulmonary Rehabilitation Program and what will it cost?

Ask your health care provider for a referral to a qualified program. Programs are often offered in an outpatient department of a hospital, including Veterans Administration hospitals. Some programs are certified by the American Association of Cardiovascular and Pulmonary Rehabilitation. These programs can be found on the AACVPR website listed below in the Resources Section. The American Lung Association can also help you to locate a program in your area.

The cost to you and insurance coverage of pulmonary rehabilitation can vary greatly depending on where you live and what program you choose. Medicare covers pulmonary rehabilitation for COPD, providing you meet certain requirements. Medicare may also cover rehabilitation for other lung conditions, but this varies with different regions of the country. The pulmonary rehabilitation program coordinator can tell you if you qualify and what the cost to you will be.

What happens after I finish a Pulmonary Rehabilitation program?

It is so very important that you continue to exercise after finishing your rehabilitation program or you will lose all of the benefit you have gained. Before you "graduate", the pulmonary rehabilitation staff will design for you a long-term plan of exercise for you. Many programs offer a "maintenance" plan so that you can continue to exercise with others with breathing problems.

Authors: Suzanne C. Lareau RN, MS, Bonnie Fahy RN, MN
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Resources:

American Lung Association Lung http://www.lung .org/I u ng-d lsease/ copd/livi ng-with-

copd/pulmonary-rehabilitation.html or call Help Line at 1-800-586-4872.

Pulmonary Rehabilitation (AACVPR) http://www.aacvpr.org/Resources/SearchableProgramDirectory/tabid/113/Default.aspx

American Association of Cardiovascular and

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www.thoracic.org

PULMONARY REHABILITATION

An Individualized Supervised Program For You

Pulmonary Rehabilitation Benefits

Pulmonary Rehabilitation helps you to improve your quality of life. Although Pulmonary Rehabilitation (PR) can't cure your lung disease, it can be of great benefit and you may notice improved breathing effort and less breathing problems.

Other benefits include:

- Decrease the symptoms of your disease or condition
- Ability to function better in your daily life
- Increased ability to exercise
- Decreased symptoms and better management of anxiety and depression

Pulmonary Rehabilitation allows you to make the most of the limited lung function you have.

AACVPR

American Association of Cardiovascular and Pulmonary Rehabilitation

Promoting Health & Preventing Disease

What is Pulmonary Rehabilitation?

Pulmonary rehabilitation is a service that is designed for those who experience lung problems such as:

- Chronic Obstructive Pulmonary Disease (COPD)
- Emphysema
- Chronic Bronchitis
- Bronchiectasis
- Sarcoidosis
- Pulmonary Hypertension
- Pulmonary Fibrosis
- Interstitial lung disease
- lung cancer and lung cancer surgery
- lung volume reduction surgery before and after lung transplantation

Pulmonary Rehabilitation includes exercise classes and education about your lung disease or condition. PR may help you participate in activities with less shortness of breath, as well as teach you how to "live" better with your lung condition.

Additional education includes:

- Reduce and control breathing difficulties and other symptoms.
- learn more about your disease, treatment options, and chronic disease coping strategies.
- learn to manage your disease and reduce your dependence on costly medical resources.
- Maintain healthy behaviors such as smoking cessation, good nutrition, and exercise.

Pulmonary Rehabilitation Offers:

Educational programs

The education classes focus on COPD as well as other chronic lung diseases to provide you with information about:

- Medications, including drug action, side effects, using an inhaler, and self-care techniques
- Understanding and using oxygen therapy
- Diet, nutrition, and weight management
- Breathing retraining
- Importance of exercise
- Strategies for managing breathing problems
- Symptom assessment and knowledge about when to seek medical treatment

Monitored and supervised exercise

A physical activity plan is tailored to your needs. Exercise will help improve your endurance and muscle strength, so you're better able to carry out daily activities.

Psychosocial support

People who have chronic lung diseases are more prone to depression, anxiety, and other emotional problems. Many PR programs offer counseling or support groups. If your program doesn't, your PR team can refer you to such services.

Appendix F: Medical Outcome Study Short Form 36-Item Questionnaire

ID Code: _____ Date: _____

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to carry out your usual activities. Please answer every question. Some questions may look like others but each is different. Please take time to read and answer each question.

Please choose one option that best describes your answer in each item.

1. In general. would you say your health is:

o 1 – Excellent

o 2 - Very good

o 3- Good

o 4- Fair

o 5- Poor

2. **Compared to one year ago,** how would you rate your health in general **now?**

o 1– Much better now than one year ago

o 2 - Somewhat better now than one year ago

o 3 - About the same

o 4 - Somewhat worse now than one year ago

o 5 - Much worse now than one year ago

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

	Yes, limited a lot	**Yes, limited a little**	**No, not limited at all**
3. **Vigorous activities,** such as running, lifting heavy objects, participating in strenuous sports	O 1	O 2	O 3
4. **Moderate activities,** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	O 1	O 2	O 3
5. Lifting or carrying groceries	O 1	O 2	O 3
6. Climbing **several** flights of stairs	O 1	O 2	O 3
7. Climbing **one** flight of stairs	O 1	O 2	O 3
8. Bending, kneeling, or stooping	O 1	O 2	O 3
9. Walking **more than a mile**	O 1	O 2	O 3
10. Walking **several blocks**	O 1	O 2	O 3
11. Walking **one block**	O 1	O 2	O 3
12. Bathing or dressing yourself	O 1	O 2	O 3

During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as** a result of your **physical health?**

	Yes	No
13. Cut down the **amount of time** you spent on work or other activities	O 1	O 2
14. **Accomplished less** than you would like	O 1	O 2
15. Were limited in the **kind** of work or other activities	O 1	O 2
16. Had **difficulty** performing the work or other activities (for example. it took extra effort)	O 1	O 2

During the **past 4 weeks,** have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

	Yes	No
17. Cut down the **amount** of time you spent on work or other activities	O 1	O 2
18. **Accomplished less** than you would like	O 1	O 2
19. Didn't do work or other activities as **carefully** as usual	O 1	O 2

20. During the **past 4 weeks.** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

O 1 - Not at all

O 2 - Slightly

O 3 - Moderately

O 4 - Quite a bit

O 5 - Extremely

21. How much **bodily** pain have you had during the **past 4 weeks?**

O r+ None

O 2 - Very mild

O 3-Mild

O 4 - Moderate

O 5- Severe

O 6 - Very severe

22. During the **past 4 weeks,** how much did **pain** interfere with your normal work (including both work outside the home and housework)?

O i -Not at all

O 2 - A little bit

O 3 - Moderately

O 4- Quite a bit

O 5 - Extremely

These questions are about how you feel and how things have been with you **during the past 4 weeks.** For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4** weeks:

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
23. Did you feel full of pep?	O 1	O 2	O 3	O 4	O 5	O 6
24. Have you been a very nervous person?	O 1	O 2	O 3	O 4	O 5	O 6
25. Have you felt so down in the dumps that nothing could cheer you up?	O 1	O 2	O 3	O 4	O 5	O 6
26. Have you felt calm and peaceful?	O 1	O 2	O 3	O 4	O 5	O 6
27. Did you have a lot of energy?	O 1	O 2	O 3	O 4	O 5	O 6
28. Have you felt downhearted and blue?	O 1	O 2	O 3	O 4	O5	O 6
29. Did you feel worn out?	O 1	O 2	O 3	O 4	O 5	O 6
30. Have you been a happy person?	O 1	O 2	O 3	O 4	O 5	O 6
31. Did you feel tired?	O 1	O 2	O 3	O 4	O 5	O 6

ng the **past 4 weeks,** how much of the time has **your physical health or emotional problems** interfered with your social activities (like visiting with friends,
relatives, etc.)?

- O 1 - All the time
- O 2 - Most of the time
- O 3 - Some of the time
- O 4 - A little of the time

O 5 - None of the time

How TRUE or FALSE is **each** of the following statements for you.

	Definitely true	**Mostly true**	**Don't know**	**Mostly false**	**Definitely false**
33. I seem to get sick a little easier than other people	O 1	O 2	O 3	O 4	O 5
34. I am as healthy as anybody I know	O 1	O 2	O 3	O 4	O 5
35. I expect my health to get worse	O 1	O 2	O 3	O 4	O 5
36. My health is excellent	O 1	O 2	O 3	O 4	O 5

Thank you for completing the survey

Appendix G: 6-Minute Walk Test Worksheet and Report

Lap recorder: ___ ____ ____ ____ _____ _____ _____ _____ _____ ____ ____ ____

Patient Code ID #: _____ Date Performed: _____

Walk #: _____ Therapist ID #: _____

Gender: M F Age: _____ Race: _____ Height: _____ centimeters

Weight: _____kg Blood pressure: _____ / _____

Medications taken before the test (dose and time): _____

Supplemental oxygen during the test: No Yes, flow _____ L/min, Type _____

	Baseline (Pretest)	End of Test (Posttest)
Time	____: _____	_____: _____
Heart Rate	_____	_____
Dyspnea	_____	_____
Fatigue	_____	_____
SpO2	_____	_____

Test Stopped or paused before 6 minutes? No Yes, reason: _____

Other symptoms at the end of exercise: angina dizziness Pain – hip leg calf (circle)

Number of laps: _____ (x 100 feet) + final partial lap: _____ feet =

Total distance walked in feet Percent predicted: _____ %

Therapist's comment:

Interpretation (including comparison with pre-and post-pulmonary rehabilitation 6MWD):