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The Effectiveness of Implementing Standard of Care Best Practices Including Use of
Daily Incentive Spirometry to Improve Dyspnea and Quality of Life in Adults with
Chronic Obstructive Pulmonary Disease (COPD)

by

Christine Gallagher MSN, CRNP, NP-C

Submitted In Partial Fulfillment of the Requirements

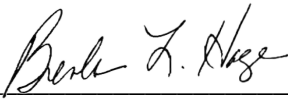
For the Degree of

Doctor of Nursing Practice

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Signature of Faculty Reader



Date

8/24/2015

Signature of Director of DNP Programs

Date

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Abstract

Chronic obstructive pulmonary disease (COPD) is a common preventable and treatable disease characterized by symptoms of dyspnea, cough, and wheezing. Many patients with COPD are on daily medications for their symptoms yet these symptoms continue to persist, impairing their quality of life. Patients with COPD experience respiratory muscle weakness that contributes to dyspnea and an inability to participate in daily activities. GOLD (2014) guidelines state that the goal of therapy in these patients is to reduce symptoms, increase participation in activities, and restore the highest level of independent functioning. The guidelines recommend the use of inspiratory muscle training (IMT) in the plan of care for these patients in order to reduce symptoms and studies have shown that an incentive spirometer can be used to perform IMT effectively. The incentive spirometer is a simple, cost-effective device that encourages deep breathing, which promotes lung expansion. The purpose of the EBP project was to improve quality of life and dyspnea in adult patients, ages 45-70, with COPD through the daily use of incentive spirometry. The project was based on the GOLD (2014) guidelines. The St. George's Respiratory Questionnaire and Visual Analogue Scale for breathlessness were administered before and after the protocol and scores were compared. The project showed a decrease in dyspnea and improvement in quality of life after an eight week intervention period. The results of this project demonstrated that including IMT in the plan of care for patients with COPD can reduce dyspnea and improve quality of life, leading to quality, cost-effective, accessible care and optimal outcomes in these patients.

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Chapter 1

Introduction and Overview of the Problem of Interest

Chronic Obstructive Pulmonary Disease (COPD) is a significant chronic disease affecting about 1.5 million individuals in the United States (Yang, Taylor & Blackstock, 2010). Approximately 25% of individuals with COPD are admitted to an acute care hospital each year with an exacerbation of the disease (Yang, Taylor & Blackstock, 2010). The estimated direct costs of the disease are \$29.5 billion with exacerbations accounting for the greatest proportion of the burden (GOLD, 2014). COPD is the fourth most common cause of death in the United States and is expected to be the third most common cause of death by the year 2020 (Heydari, Farzad & Hosseini, 2013). Mortality from the disease has more than doubled over the past twenty years (Celli, MacNee, Augusti, Anzueto, Berg, Buist, ...ZuWallack, 2004).

COPD has been known to substantially impair quality of life and increase the risk of premature death (Petrovic, Reiter, Zipko, Pohl & Wanke, 2012). Patients with COPD experience respiratory muscle weakness which contributes to the sensation of dyspnea (Heydari, Farzad & Hosseini, 2013). Dyspnea is a cardinal symptom of the COPD and a major cause of disability and anxiety associated with the disease (GOLD, 2014). Daily activity is frequently limited and health related quality of life is reduced due to dyspnea (Shinde, Kiran, Khatri & Hande, 2012). The Disability Adjusted Life Year (DALY) estimates the fraction of disability attributable to major diseases and COPD is projected to be the seventh leading cause of DALY's lost worldwide by 2020 (GOLD, 2014).

Early literature on the use of inspiratory muscle training in patients with COPD presented a mixed opinion but current GOLD (2014) guidelines recommend the use of inspiratory muscle training as part of a pulmonary rehabilitation program for these patients to improve dyspnea and quality of life (Geddes, Reid, Crowe, O'Brien & Brooks, 2005).

This evidence-based practice change project focuses on the use of incentive spirometry for inspiratory muscle training to decrease dyspnea and improve quality of life in individuals with COPD. The project and its implication for advanced nursing practice will be discussed in this paper.

Background

COPD is a common preventable and treatable disease that is characterized by persistent airflow limitation, air trapping, and hyperinflation of the lungs, which puts the inspiratory muscles at a mechanical disadvantage (GOLD, 2014; Shinde, Kiran, Khatri & Hande, 2012). The airflow limitation is usually progressive and associated with a chronic inflammatory response in the airways and lungs due to noxious particles and gases (GOLD, 2014). The disease can be characterized by chronic cough, dyspnea, wheezing, and increased mucous secretions and is associated with a functional weakness of the inspiratory muscles (Satani, Khuman & Nambi, 2013). COPD can substantially impair the individual's quality of life and increase the risk of premature death (Petrovic, Reiter, Zipko, Pohl & Wanke, 2012).

COPD produces obstruction to the flow of air which affects the mechanical function and gas exchange of the lungs (Satani, Khuman & Nambi, 2013). These patients

also experience alterations in the mechanics of the chest wall that reduces the effectiveness of the diaphragm and increases the work of breathing (Shinde, Kiran, Khatri & Hande, 2012). The respiratory muscles must work harder in order to overcome this resistance which in turn leads to respiratory muscle weakness (Satani, Khuman & Nambi, 2013). Respiratory muscle weakness contributes to hypercapnia, dyspnea, oxygen desaturation, and reduced walking distance (Gosselink, DeVos, van den Huevel, Segers, Decramer & Kwakkel, 2011). Dyspnea is an important and most debilitating symptom in these patients and frequently limits daily activity and reduces a patient's health related quality of life (Shinde, Kiran, Khatri & Hande, 2012). Drug therapy is the mainstay in treatment for patients with COPD, followed by physical rehabilitation, which has been the only method proven to reduce dyspnea (Satani, Khuman & Nambi, 2013).

Respiratory rehabilitation has been recognized as an important part of the management in patients with COPD (Shinde, Kiran, Khatri & Hande, 2012). It is a multidisciplinary program of care that can be individually tailored and designed for each patient to optimize physical and social performance, and patient autonomy (Celli et al., 2004).

Controlled breathing is included in respiratory rehabilitation programs and has been shown to relieve dyspnea by increasing strength and endurance of the respiratory muscles (Gosselink, 2003). The aim of respiratory rehabilitation is to improve ventilation and gas exchange and it has been shown to improve respiratory function, decrease dyspnea, and improve exercise tolerance and quality of life in patients with COPD (Shinde, Kiran, Khatri & Hande, 2012). Respiratory rehabilitation is recommended by the GOLD guidelines (2014) for a non-pharmacologic therapy in patients with COPD. Inspiratory

muscle training (IMT) is an important and common component of respiratory rehabilitation that improves the strength and endurance of the respiratory muscles (Satani, Khuman, Devi & Nambi, 2013). Studies have shown that placing a load on respiratory muscles during inspiration can increase the strength of respiratory muscles, causing a meaningful reduction in dyspnea (Heydari, Farzad & Hosseini, 2013). GOLD guidelines (2014) list the many benefits of respiratory rehabilitation which include improved quality of life, reduced anxiety and depression associated with COPD, improved survival, and reduced sensation of breathlessness. One of the devices used for inspiratory muscle training is the incentive spirometer, which offers resistance while performing inspiration (Satani, Khuman, Devi & Nambi, 2013). The incentive spirometer is a simple, cost-effective device which provides visual feedback to the patient while performing inspiration so that the patient can achieve goals (Satani, Khuman, Devi & Nambi, 2013). Incentive spirometry encourages deep breathing and sustained inspiration, a more controlled flow of breathing, and greater enthusiasm to practice IMT in patients (Satani, Khuman, Devi & Nambi, 2013). The device is designed to mimic natural sighing or yawning by encouraging the patient to take slow, long, and deep breaths (Restepro, Wettstein, Wittnebel & Tracy, 2011). This mechanism decreases pressure in the lungs, promoting increased lung expansion and when repeated on a regular basis, has the ability to prevent or reverse atelectasis (Restepro, Wettstein, Wittnebel & Tracy, 2011). Studies have shown that the daily use of incentive spirometry resulted in improved quality of life and decreased dyspnea in patients (Basoglu, Atasever & Backagolu, 2005; Satani, Khuman, Devi & Nambi, 2013). Guidelines for the use of incentive spirometry

recommend the use of the device in the presence of pulmonary atelectasis or in conditions that may predispose individuals to atelectasis when used in the presence of restrictive lung defects (Restepro, Wettstein, Wittnebel & Tracy, 2011).

Significance

COPD is a leading cause of morbidity and mortality worldwide and results in an economic and social burden that is substantial and continues to increase (GOLD, 2014). The prevalence and burden of the disease are expected to increase in the coming years due to the continued exposure of COPD risk factors and the aging of the population (GOLD, 2014). COPD is a major health problem in the United States with the mortality rate rising yearly (Halpern, Stanford & Borker, 2003). The disease is associated with a significant economic burden as well. In the United States, the economic burden of COPD is estimated at \$29.5 billion for direct costs and exacerbations of the disease account for the greatest proportion of the total burden to the healthcare system in the United States (GOLD, 2014). In addition to direct costs, COPD has been shown to have a major impact on non-medical costs as well, due to lost productivity, at a cost of \$14.1 billion (Halpern, Stanford & Borker, 2003). When taking into consideration the burden that this disease places on patients with the disease and the healthcare system, one can see the significance of the problem in primary care and the importance for healthcare providers to work with these patients to improve respiratory muscle function. COPD remains a chronic public health problem and its systemic effects have been recognized in other body systems which can further impair the lives of these patients, resulting in lost work days (Heydari, Farzad & Hosseini, 2013). One-third of patients reported that they were

prevented from going to work because of their COPD symptoms and approximately seven percent of caregivers of these individuals have reported work loss (Halpern, Stanford & Borker, 2003). Airflow limitation and hyperinflation affect cardiac function and gas exchange, inflammatory mediators in the circulation may contribute to skeletal wasting and cachexia, and the disease may irritate or worsen comorbidities such as ischemic heart disease, heart failure, osteoporosis, normocytic anemia, diabetes, metabolic syndrome, and depression (GOLD, 2014). Individuals with the disease also experience a social burden as well and are limited in their participation in daily activities and many may experience social isolation due to their limitations (GOLD, 2014). Advanced practice nurses (APN's) play an important role in identifying potential candidates for respiratory muscle training and in facilitating and reinforcing the material learned in the program (Heydari, Farzad & Hosseini, 2013). Advanced practice nurses have the ability to define, identify and analyze outcomes to improve the health status of individuals and populations (Curley & Vitale, 2012). Advanced practice nurses can facilitate care processes that can result in the achievement of outcomes for individuals or groups of patients through education, counseling, direct clinical practice, and coordination of care (Hamric, Spross & Hanson, 2009). When considering the morbidity and mortality of COPD, the APN can use the information to find available resources and develop innovative interventions for patients in order to improve their quality of life and decrease the sensation of dyspnea they experience (Curley & Vitale, 2012).

System and Population Impact

COPD affects individuals from all socioeconomic levels and not all patients have

access to formal rehabilitation programs which makes it important for the advanced practice nurse to facilitate these services for patients in need (Heydari, Farzad & Hosseini, 2013). Using a simple tool such as incentive spirometry for respiratory rehabilitation can greatly improve the ability of the advanced practice nurse to provide these individuals with more feasible and accessible care (Heydari, Farzad & Hosseini, 2013). The device is inexpensive and easy to use, which makes its use in areas of health disparities, such as in the underinsured and uninsured, essential (Restepro, Wettstein, Wittnebel & Tracy, 2011).

Question Guiding Inquiry

Considering the importance of reduction of dyspnea and improvement in quality of life for patients with COPD, the advanced practice nurse may ask the following question: “In adults ages 45-70 with COPD, does the daily use of incentive spirometry result in decreased dyspnea and improved quality of life over an eight week period?”

Purpose

The population of interest for this evidence-based project are male and female adults, ages 45-70, with a documented diagnosis of COPD, are compliant with care, and are English speaking. These patients may currently be using medications for COPD, which may include bronchodilators, long and short acting beta-agonists, systemic corticosteroids, and inhaled corticosteroids (ICS). Patients excluded from the proposed project would be those with co-morbid conditions, non-compliant patients, and those with a history of pneumothorax.

The intervention the PICO-T is proposing is the daily use of incentive spirometry as a form of inspiratory muscle training over an eight week period combined with telephone follow up every two weeks, to reduce dyspnea and improve quality of life in patients with COPD. The outcome of interest is the reduction of dyspnea and improved quality of life, self-reported by patients, using St. George's Respiratory Questionnaire (2005) and a Visual Analogue Scale (1999) for dyspnea. These measurements would be evaluated at the start and end of the project. Patients will also be provided with a daily symptom diary to record their symptoms and to document the use of the intervention in order to reduce the potential for participant recall bias. The follow up telephone calls every two weeks would be used as a way to assess compliance and to respond to any concerns or questions at that time.

Aims/Objectives

The objective of the project is to implement an evidence based practice protocol using incentive spirometry as a means of inspiratory muscle training when treating patients who present to the urgent care setting with complaints of dyspnea and impaired quality of life. The objective is to determine if the use of daily incentive spirometry would result in patients reporting a decrease in dyspnea and improvement in their quality of life. Intended users of the protocol would include advanced practice nurses, physician assistants, and physicians. Impaired functional status and dyspnea are critical features of COPD and the goals of using respiratory rehabilitation in these patients is to reduce symptoms, improve activity, and restore the highest level of independent function possible (Lan, Chu, Yang, Lee, Wu & Wu, 2013). Exercise capacity is important because

it directly correlates with mortality in patients with COPD, so if this can be improved, mortality from the disease can be reduced and thus, hopefully improve the health of this population (Lan, Chu, Yang, Lee, Wu & Wu, 2013). When evaluating the many benefits of respiratory muscle training in patients with COPD and upon review of evidence presented in clinical guidelines, it is essential that this is included in the plan of care for these patients in order to improve their quality of life and decrease associated symptoms and mortality from the disease.

Chapter 2

Review of the Evidence/Literature

Patients with COPD experience respiratory muscle weakness that contributes to dyspnea, which is the most debilitating symptom in these patients and can reduce health related quality of life (Gosselink, DeVos, van den Huevel, Segers, Dekramer & Kwakkel, 2011; Shinde, Kiran, Khatri & Hande, 2012). Guidelines recommend the use of respiratory rehabilitation as a therapy in patients with COPD (GOLD, 2014). COPD is the leading cause of morbidity and mortality in the world and has resulted in an economic and social burden that is substantial and continues to increase daily (GOLD, 2014). Considering this, it is important for clinicians to seek out the current best evidence and apply it in their daily practice in order to improve outcomes in this population. One of the most important reasons for implementing evidence based practice (EBP) is that it leads to the best quality of care and the best patient outcomes (Melnyk & Fineout-Overholt, 2011).

Evidence evolves continually, so it is important that clinicians include the latest evidence in their practice (Melnyk & Fineout-Overholt, 2011). Without current best evidence, practice can become rapidly outdated, which can be detrimental to patients (Melnyk & Fineout-Overholt, 2011). The purpose of a literature review is to provide information about existing current evidence related to a question of inquiry (Melnyk & Fineout-Overholt, 2011). The literature review supports the value or the need to study a phenomena of interest and is used to present data that support the need for the project and how the project is needed to address the findings (Moran, Burson & Conrad, 2014). This literature review was performed based on a systematic, thorough, and rigorous approach in

order to ensure the quality of evidence obtained. The literature obtained describes concepts related to the use of inspiratory muscle training in COPD patients in relation to improving inspiratory muscle strength and improving dyspnea and quality of life as well as to identify areas where further inquiry is needed.

Methodology

The purpose of this section is to briefly describe the strategy that was used to select and review the articles that were used in the literature review. In order to find evidence to support the evidence based practice project, a systematic database literature search that encompassed the years 2005 to 2014 was performed using the keywords or terms “chronic obstructive pulmonary disease”, “COPD guidelines”, “incentive spirometry guidelines”, “incentive spirometry”, “inspiratory muscle training”, “quality of life”, and “dyspnea”. Delimiters were used during the literature search such as “incentive spirometry and COPD”, “inspiratory muscle training and COPD”, and “inspiratory muscle training and incentive spirometry”. Databases searched were CINAHL, Academic Search Premier, Medline, and PubMed. The databases were chosen due to the fact that they are well known and credible sources that contain current information related to the area of interest in the evidence based practice project. Inclusion criteria for the search were adults, male and female patients, ages 45-70, diagnosed with COPD. Those studies not published in English or not using inspiratory muscle training were excluded. Literature that appeared as letters to the editor was also excluded. The above mentioned search terms resulted in twenty four results in Academic Search Premier, 164 results in CINAHL, 164 results in Medline, and 287 results in PubMed. Abstracts of the results were then read to determine if the area of

interest, inclusion and exclusion criteria, intervention, and outcomes of interest were similar to those in the proposed evidence based practice project. After a review of the literature, nine articles were identified that met the criteria to support the proposed evidence based practice project. Those that were chosen are Level I and II evidence which consist of randomized controlled trials, systematic reviews, meta-analyses, and clinical guidelines, because these are the strongest levels of evidence and are the least biased way to demonstrate with confidence that the interventions will consistently bring about an outcome (Melnik & Fineout-Overholt, 2011).

Findings (Critical Appraisal of the Literature)

Randomized Controlled Trials

Basoglu, Atasever & Backagoglu (2005) conducted a randomized controlled trial to evaluate the effects of incentive spirometry on pulmonary function tests, arterial blood gases, dyspnea, and health related quality of life in patients with COPD. The incentive spirometer was used as an inspiratory muscle trainer in this study.

The participants in the study were thirty two (n=32) patients hospitalized with an exacerbation of COPD and were either given medications for COPD and asked to undertake incentive spirometry (n=16) or given only medical treatment (n=16). The intervention and comparison were the addition of daily use of incentive spirometry in addition to typical COPD medications and the outcome was to determine if there was an improvement in pulmonary function tests, arterial blood gases, dyspnea, and quality of life. Patients received follow up telephone calls every two weeks during the intervention period and had a follow up visit at two months from the start of the intervention period.

After patients were recruited for the study, they were randomized to either the medical treatment group (n=16) or the group with incentive spirometry plus medical treatment (n=16), through a computer random generator. Due to the computerized randomization, the study and control groups were not matched, however when demographics for both groups were reviewed, they appeared similar and a chart was provided to substantiate this. There was no mention of concealment or blinding in the study. Prior to the beginning of the study, a power calculation was done. The authors provided the number of patients who withdrew from the study and the reasons for withdrawal.

Participants in the study had arterial blood gases and pulmonary function tests and completed visual analogue scales (VAS) for breathlessness and the St. George's Respiratory Questionnaire (SGRQ) at the beginning and end of the study and the authors provided a chart to compare the pre- and post-treatment values for these. P values were reported as $p < 0.0001$ for both. Based on the above, the study should be considered valid with some caution.

The study states that the researchers used the student's t-test to analyze parametric measures. The analysis of categorical variables was done using the X^2 test, Fisher's exact test, or the Mann-Whitney U-test. Results are expressed with a 95% confidence interval (CI) and p values are expressed when there was statistical significance. Between the two groups, the activity impact and total SGRQ scores were improved by the use of incentive spirometry (95% CI; $p < 0.0001$). VAS scores in the incentive spirometry treatment group decreased from 8.3 ± 1.2 to 7.7 ± 1.4 . The PaCO₂ decreased in the incentive spirometry

group (95% CI; $p=0.02$) and the PaO₂ increased as well (95% CI; $p=0.01$). These findings show that the use of incentive spirometry along with medical treatment improved arterial blood gases, dyspnea, and health related quality of life. The use of incentive spirometry was shown to increase inspiratory muscle performance in this study. The authors do suggest that the study may be performed in the future using a larger number of subjects and also in stable COPD patients. There were several limitations noted in the study, one of these being a small amount of participants. Results would vary in relation to a larger number of participants and may provide more support for the intervention. Most participants in the study were males. This is not representative of most COPD patients because the disease affects both males and females. Based on the findings, the study should be considered reliable with some caution.

Petrovic, Reiter, Zipko, Pohl & Wanke (2012) conducted a randomized controlled trial to analyze the effects of inspiratory muscle training (IMT) on exercise capacity and dyspnea in patients with COPD. The participants in the study were twenty ($n=20$) patients with COPD who were recruited from an outpatient clinic and either underwent IMT or didn't. The outcomes measured were inspiratory muscle capacity and dyspnea. The timing of follow up was eight weeks.

After participants were recruited into the study, they were randomized to either the IMT group ($n=10$) or the control group ($n=10$). Although the authors state that the participants were randomized to the groups, no mention is made as to how the randomization occurred or if there was blinding. There is no mention made of a power calculation or ITT analysis being performed prior to the start of the study. There was no

mention of patient withdrawal from the study. A chart was provided to show the characteristics of both groups at baseline and both groups appear similar. The intervention and control management were described in the article. Based on the above, the study should be considered valid with some caution.

The study states that the authors used the Shapiro-Wilk test for preliminary testing to evaluate if the grouped data were normally distributed ($p < 0.05$). Results are expressed with a 95% CI and p values are expressed when there was statistical significance. The IMT training group showed a significant increase in inspiratory muscle performance after eight weeks of daily IMT when compared to the control group (95% CI; $p < 0.001$). The level of dyspnea showed a significant decrease after eight weeks of daily IMT (95% CI; $p < 0.01$). Inspiratory capacity also increased in the treatment group when compared to the control group (95% CI; $p < 0.001$). Charts were provided for comparison of spirometric data values at the start and end of the intervention period. ANOVA was done for analysis of between group effects analysis. No limitations of the study were mentioned by the authors, however, the small number of participants can be considered a limitation. Another limitation of the study was that participants only performed inspiratory muscle training once per day. Based on the above, the study should be considered reliable with some caution.

Heydari, Farzad & Hosseini (2013) conducted a randomized controlled trial to examine the effect of incentive spirometry on pulmonary rehabilitation in COPD patients compared to using inspiratory resistive muscle training technique. The participants in the study were 30 ($n=30$) patients with COPD that were randomized to either an IMT group

(n=15) or an incentive spirometry group (n=15). The outcomes measured were respiratory function test values. The timing of the follow up was four weeks.

After patients were recruited for the study, they were randomized to either the IMT group (n=15) or the incentive spirometry group (n=15), however no mention is made as to how the randomization occurred. Prior to the beginning of the study, a power calculation was done in order to reduce the risk of a Type II error. There was no mention of any patient withdrawal and all participants completed the study. There is no mention of blinding in the study. A chart was provided to show baseline characteristics of both groups and both groups appear similar except that there were more male subjects than female subjects in both groups. P values are provided in this chart. The intervention and control management were described in the article. Based on the above, the study should be considered valid with some caution.

The study states that ANOVA was performed for within group analysis of variance. Results are expressed with a CI of 95% and p values are expressed where there was statistical significance. The findings showed significant differences between the mean values of each respiratory function test for both techniques (95% CI; $p < 0.001$). For the value of peak expiratory flow rate (PEFR), incentive spirometry was shown to be more effective than IMT (95% CI; $p = 0.021$). A chart was provided to compare respiratory function tests before, during, and after intervention, with p values listed. It was determined by the authors that breathing exercises improved dyspnea in the incentive spirometry group as a result of improved inspiratory muscle performance. The authors of the study listed that they limited time to pursue long term effects of the interventions and that the findings

may not be generalizable to patients with severe COPD or an unstable cardiovascular status. Based on the above, the study should be considered reliable with some caution.

The findings of the appraised RCT's support the proposed evidence based practice project because the goal of the project is to use incentive spirometry as an inspiratory muscle trainer to improve quality of life and decrease dyspnea in COPD patients. Results from these studies show that inspiratory muscle training can be an important aspect of treatment in this population of patients in order to improve patient outcomes.

Systematic Reviews/Meta-Analyses

Geddes, Reid, Crowe, O'Brien & Brooks (2005) conducted an analysis of nineteen randomly controlled trials (RCT's) to determine the effect of IMT on inspiratory muscle strength and endurance, exercise capacity, dyspnea, and quality of life for adults with COPD. The criteria for considering studies to include in the review was explained and only studies that used randomized design to allocate patients to groups, English publications, and adult participants were used. The authors performed a structured search of Medline and CINAHL from the inception dates of the databases up to 2003 for limits. The search strategy was included in the text of the review. Reference lists from pertinent articles and books were searched, authors were contacted personally, and targeted journals were hand searched to identify any relevant articles for inclusion. Studies were chosen if they compared IMT to another comparison group. A flow chart was provided that showed the amount of RCT's that were included and excluded and the reasons as to why. Data from the articles was extracted independently by two reviewers onto data abstraction forms. Methodological quality of the studies was assessed by two reviewers using criteria by Jadad

et al. for randomization, double-blinding, withdrawals/dropouts, and group similarities at baseline. No mention was made as to the settings for the included RCT's. Outcomes of interest in the review were inspiratory muscle strength, dyspnea, and exercise capacity. A table of studies was provided that compared the various modes of IMT that were used. Sensitivity analyses were performed in the presence of significant heterogeneity to determine the robustness of the findings. Funnel plots were presented in the review to decrease the possibility of publication bias. Based on the above, the systematic review should be considered valid.

Data was analyzed using computer software and outcomes were analyzed as continuous outcomes using the random effects model to calculate the mean difference and 95% CI. Main findings of the review showed inspiratory muscle strength improved by 12.3cm H₂O (95% CI; p<0.00001) in groups using targeted IMT and inspiratory muscle endurance increased by 1.0kPa (95% CI; p=0.005) in these groups as well. Dyspnea was also found to be improved in these groups (95% CI; p<0.00001). A large clinically significant change was found for an increase in quality of life for those in IMT groups.

Main findings of the review were that targeted IMT significantly improves inspiratory muscle strength, inspiratory muscle endurance, quality of life, and decreases dyspnea in patients with stable COPD. All results were tested for heterogeneity and the authors acknowledged that there was significant heterogeneity (p<0.00001) between the studies in regards to the different forms of IMT. Based on the above, the systematic review should be considered reliable.

Gosselink, De Vos, van den Huevel, Segers, Decramer & Kwakkel (2011) conducted a meta-analysis of thirty two RCT's to investigate the effect of IMT as a single therapy or added to general exercise training, and identify the most appropriate training modality in terms of strength or endurance training for IMT. The criteria for considering studies to include in the review was explained and only studies that used randomized design to allocate patients to groups were used. The authors performed a standardized search of databases using the publication dates up to May 2009 for limits. The search strategy was included in an online supplement. No language restrictions were used in the search. The search was performed by two independent reviewers and if data were not in a form suitable for pooling, authors were contacted for additional information. Studies were selected if they were randomized to groups, included patients with COPD, used IMT or respiratory muscle endurance training, or if outcomes were described in terms of inspiratory muscle strength, dyspnea, or health related quality of life. No flow chart was provided to show the inclusion and exclusion of the RCT's but the process was explained in the analysis. The I^2 statistic was calculated to determine heterogeneity and funnel plots were presented in the review to decrease the possibility of publication bias. Heterogeneity was defined if the I^2 was beyond 50%. Based on the above, the meta-analysis should be considered valid.

Data was analyzed using summary effect size (SES). The meta-analysis for inspiratory muscle strength demonstrated a significant increase of 13 mm H₂O (SES 0.68; 95% CI 0.54-0.82; $p < 0.001$) in the treatment group compared to the control group. A significant effect was found for dyspnea scores (SES -0.45; 95% CI -0.66- -0.24;

p<0.00001) in the IMT training group. A significant improvement in quality of life was also seen for the IMT training group (SES 0.34; 95% CI 0.09-0.60; p<0.01). Main findings of the review were that IMT was superior to endurance training for improving inspiratory muscle strength, dyspnea, and quality of life. All results were tested for heterogeneity and the authors acknowledged that there was significant heterogeneity between the studies in regards to the superiority of IMT for COPD patients. Based on the above, the meta-analysis should be considered reliable.

The findings of the systematic review and meta-analysis support the proposed evidence based practice project because the goal of the project is to use incentive spirometry as an inspiratory muscle trainer to improve quality of life and decrease dyspnea in COPD patients. Results from these studies show that inspiratory muscle training can be an important aspect of treatment in this population of patients in order to improve patient outcomes. The evidence has shown that IMT is an effective treatment modality in COPD patients to improve inspiratory muscle strength, dyspnea, and quality of life.

Guidelines

The Global Initiative for chronic Obstructive Lung Disease (GOLD) guideline (2014) were reviewed using the AGREE instrument. GOLD (2014) clearly stated that the objective of the guideline is to provide recommendations for management of COPD based on the best scientific information available. Guideline developers are clearly listed and are known to have expertise in COPD research and patient care and represent a variety of disciplines. The areas the guideline covers are specifically described throughout and targeted users are defined as “those working in clinical settings anywhere in the world

providing COPD treatment” (p. xiv) and for healthcare professionals to use as a tool to implement effective management programs based on available health care systems. The guideline was first piloted in 2001 with the first GOLD report.

Systematic methods were identified to search for evidence to develop future updated versions. Members of the committee evaluate abstracts and indicate if the scientific data impacts on the recommendations of the GOLD report. The methods for formulating recommendations were clearly defined. Criteria for selecting the evidence is clearly defined in the guideline. Health benefits, risks, and side effects of the various treatment modalities were considered with discussion of treatments. Recommendations are linked to supporting levels of evidence. Review of the guideline occurs internally and externally. Updates are made as new data becomes available and the GOLD science committee meets twice yearly to discuss the addition of the data to the GOLD report, either as a reference or to change the report.

The guideline is specific and unambiguous and clearly identifies management options. Key recommendations are identified throughout using various levels of evidence and are presented clearly using charts and tables for easy identification. Organizational barriers and cost effectiveness are not specifically mentioned. No conflicts of interest were identified.

Recommendations are made for pulmonary rehabilitation in COPD patients to reduce symptoms, improve quality of life, and increase physical participation in everyday activities which closely relates to the proposed evidence based practice project. GOLD recommends that IMT can be beneficial in patients with COPD. Differing types of non-

pharmacologic therapies are included for application with COPD patients. The social and economic burden of the disease is discussed. The GOLD guideline is appropriate for the proposed practice change project and closely relates to the population indicated. The recommendations can be used by healthcare providers and applied to the population of COPD patients to improve their quality of life, decrease dyspnea, and to ensure that best practices are used to improve outcomes in this population.

The AARC Clinical Practice Guideline on Incentive Spirometry (2011) was reviewed using the AGREE instrument. Restepro, Wettstein, Wittnebel & Tracy have presented the guideline to provide users with the proper use of the tool, indications and contraindications for use, monitoring during use, frequency of use, infection control methods, and key recommendations. Guideline developers are noted to be individuals from various hospitals and medical centers and all are respiratory therapists. Targeted users are identified as those in critical care, acute care inpatient settings, extended care and skilled nursing facilities, and those in home care. No piloting of the guideline is mentioned.

Systematic methods were identified to search for evidence and the criteria for selecting the evidence was defined. Methods for formulating key recommendations were clearly defined using the Grading of Recommendations Assessment, Development, and Evaluation scoring system (GRADE) and the recommendations are linked to supporting evidence. Health benefits and risks are considered and noted. No mention is made of the review process for the guideline. No procedures are listed for updating. There are no tables for dissemination of recommendations but they are clearly listed at the end of the guideline. No sources of funding are indicated and no conflicts of interest were identified.

The recommendations can be applied to the proposed evidence based practice project using incentive spirometry and can ensure that it is done with proper technique and frequency. It is recommended that a volume oriented device be used, which is the typical device used in healthcare today. No barriers to application were identified and incentive spirometry has been shown to be an inexpensive, convenient tool to use and has been used routinely in postoperative patients to prevent complications. The target population can benefit from the use of the device and it is applicable to the population and users considered in the proposed practice project.

Integrative Review of the Literature

After a thorough review of the literature, it appears that there is evidence to support the implementation of the proposed evidence based practice project. The clinical usefulness of the findings in the review provide APN's with the ability to advance care in this population. Patients with COPD experience respiratory muscle weakness which may contribute to dyspnea and decreased quality of life (Heydari, Farzad & Hosseini, 2013). Improvement in care for this specific population must include the addition of pulmonary rehabilitation in order to improve quality of life (GOLD, 2014). Multiple systematic reviews and RCT's suggest the use of IMT for COPD patients in order to improve inspiratory muscle function. The literature has shown that the use of IMT has resulted in increased respiratory muscle performance, decreased dyspnea, and improved quality of life in patients with COPD who have used the technique daily (Basoglu et al, 2005; Petrovic et al., 2012; Geddes et al., 2005). The early literature on the use of IMT with individuals with COPD had not been supportive of this intervention, which prompted the

Geddes et al. (2005) systematic review to examine the effects of IMT on inspiratory muscle strength, dyspnea, and quality of life in these individuals. IMT was found to produce significant improvements in inspiratory muscle strength, dyspnea, and quality of life for this population. Guidelines recommend the use of pulmonary rehabilitation in patients with COPD in order to reduce the frequency of exacerbations and improve the quality of life in these patients, with IMT being a modality of this. The literature has shown that an incentive spirometer can be used to perform effective inspiration as a form of IMT in patients with COPD (Heydari et al., 2013).

Limitations

There were several limitations that were found during the review of the literature. Geddes et al. (2005) and Heydari et al. (2013) noted that most of the participants in their studies were male, which doesn't lend the findings applicable in most situations considering that COPD affects both male and female individuals. Several of the studies noted small sample sizes which isn't representative of the true population of COPD patients since a large number of patients are affected by the disease (Petrovic et al. 2012; Basoglu et al. 2005). Most of the studies contained an intervention period from two to eight weeks, and this was a limitation noted by Heydari et al. (2013) because it didn't provide the investigators with the opportunity to pursue the long term effects of the intervention.

Conclusion

The GOLD guidelines recommend the use of pulmonary rehabilitation in patients with COPD in order to decrease exacerbations in this population. IMT has been shown to

be effective in increasing inspiratory muscle function thereby decreasing dyspnea and improving quality of life. COPD morbidity and mortality is increasing worldwide and a large majority of the population is afflicted by the disease. The disease places a large burden on patients and the healthcare system and it is a significant problem in primary care (Heydari et al., 2013). Implementing evidence based care such as IMT into direct clinical practice shows improved inspiratory muscle strength, decreased dyspnea, and improved health care quality of life in this population of patients (Basoglu et al., 2005; Heydari et al., 2013; Petrovic et al., 2012). APN's are in the ideal position to implement evidence based practices in this specific population of patients. By including IMT in the plan of care for patients with COPD, this population will receive quality care and improved outcomes.

Chapter 3

Organizational Framework of Conceptual Model for EBP Change

In today's rapidly changing healthcare environment, healthcare professionals are typically very motivated to be evidence-based practitioners in order to ensure they provide high quality care (Melnik & Fineout-Overholt, 2011). Evidence-based practitioners are encouraged to consider internal evidence, the patients' preferences and actions, healthcare resources, and clinical expertise when making clinical decisions (Melnik & Fineout-Overholt, 2011). Evidence based practice (EBP) is "the integration of best research evidence with clinical expertise and patient values to facilitate clinical decision making" (Melnik & Fineout-Overholt, 2011, p. 242). Evidence based practice is a problem solving approach to clinical care that incorporates the use of current best practice from well-designed studies, the expertise of clinicians, and the values and preferences of patients (Fineout-Overholt, Melnyk & Schultz, 2005). When provided in a context of caring, EBP leads to the best clinical decision making and outcomes for patients and their families (Fineout-Overholt, Melnyk & Schultz, 2005). The Institute of Medicine (IOM) recognizes the importance of EBP and recommends its use as one of the five core competencies for healthcare (Fineout-Overholt, Melnyk & Schultz, 2005). Advanced practice and staff nurses as well as administrators must have a foundational knowledge as well as strong beliefs about the importance of EBP and critical skills to support evidence-based care (Fineout-Overholt, Melnyk & Schultz, 2005).

Even though EBP is important, changing clinical practice is complex and

challenging and because of this, conceptual models and frameworks have been developed to guide the implementation of EBP with a systematic approach (Melnik & Fineout-Overholt, 2011). The Model for Evidence Based Practice Change by Rosswurm and Larrabee (1999) (Appendix A) is the conceptual model used in this evidence based practice change. This evidence-based model is derived from theoretical and research literature related to evidence-based practice, utilization of research, and change theory (Rosswurm & Larrabee, 1999). It was revised to integrate the principles of quality improvement, use of teamwork tools, and evidence-based translation strategies to promote the adoption of a new practice (Melnik & Fineout-Overholt, 2011).

The model guides practitioners through the process of evidence-based practice change, beginning with the assessment of the need for a change practice, and ending with the integration of an evidence-based protocol (Rosswurm & Larrabee, 1999). The model has six phases that include (1) assess the need for change in practice; (2) link the problem to interventions and outcomes; (3) synthesize the best evidence; (4) design a practice change; (5) implement and evaluate the change in practice; and (6) integrate and maintain the change in practice (Rosswurm & Larrabee, 1999).

Conceptual Definitions

Assess the need for change in practice. Key actions in this step include identifying a practice problem or opportunity for improvement in practice, creating a team of stakeholders to address the problem in practice, collecting internal data about the practice, collecting external data to compare with the internal data, and linking the practice problem with possible interventions and desired outcomes by developing a

clinical question (Melnyk & Fineout-Overholt, 2011). It is important to justify the focus of the EBP project because these projects can become resource intensive (Melnyk & Fineout-Overholt, 2011). The internal and external data collection may either substantiate current practice or support the need for the specific change in practice (Rosswurm & Larrabee, 1999).

Link the problem interventions and outcomes. Healthcare practitioners need to define the problem using standardized language and classifications and link the problem with interventions and outcomes (Rosswurm & Larrabee, 1999). Using these classification systems facilitate communication among practitioners, provide standards for determining if care was of quality and cost-effective, and identify the needed resources (Rosswurm & Larrabee, 1999). Key actions in this phase include identifying the types and sources of evidence, planning the search for evidence, and conducting the search for this evidence which should be planned and rigorous in order to find evidence of quality (Melnyk & Fineout-Overholt, 2011). The types of quality evidence include practice guidelines, systematic reviews, randomized controlled trials, and expert committee reports (Melnyk & Fineout-Overholt, 2011).

Critically analyze the evidence. In this step, the selected interventions and outcomes are refined and the best evidence is synthesized and combined with clinical judgment (Rosswurm & Larrabee, 1999). When critically appraising the literature, the practitioner evaluates the strengths and weaknesses of studies and identifies gaps in the available knowledge (Rosswurm & Larrabee, 1999). The practitioner also assesses the feasibility, benefits, and risks of implanting the new practice (Melnyk & Fineout-Overholt, 2011).

After the synthesis of evidence, the members of the EBP team must judge whether the body of evidence is sufficient and strong enough to support the change in practice (Melnyk & Fineout-Overholt, 2011).

Design practice change. After the synthesis of the best evidence, practitioners describe the process variables or the sequence of activities in the change in practice and this usually is in the form of a protocol, procedure, or standard (Rosswurm & Larrabee, 1999). When considering a change, the practice environment, its resources, and feedback from stakeholders are important considerations (Rosswurm & Larrabee, 1999). The protocol should only include activities that are evidence-based and it should be designed to guide care only for the populations that are similar to those identified in the evidence base (Rosswurm & Larrabee, 1999). The evidence based is used in this step to guide practitioners in identifying the anticipated patient outcomes of the practice change (Rosswurm & Larrabee, 1999). This is the step where needed resources should be identified and the implementation plan designed (Melnyk & Fineout-Overholt, 2011).

Implementing and evaluating change in practice. Key actions in this step include the implementation of the protocol; evaluating the process, outcomes, and costs; and developing conclusions and recommendations (Melnyk & Fineout-Overholt, 2011). The implementation of the protocol will be more successful if the practitioner closely monitors its progress and is available to answer questions throughout and follow-up reinforcement of the practice change by the practitioner is essential (Rosswurm & Larrabee, 1999). At the conclusion of the protocol, the data obtained are analyzed and disseminated in charts and graphs to facilitate the interpretation of the data and the

practitioner can then interpret the results to decide whether there were differences in the indicators before and after the protocol was administered (Rosswurm & Larrabee, 1999). Members of the EBP team can then use the data with verbal feedback to decide if the new practice should be adapted, adopted, or rejected based on the feasibility, risks, and benefits (Melnik & Fineout-Overholt, 2011).

Integrate and maintain change in practice. If the results of the protocol support the change in practice, strategies to initiate the change begin (Rosswurm & Larrabee, 1999). Key actions of this step include sharing recommendations about the new practice with stakeholders, incorporating the new practice into the standards of care, monitoring the process and outcome indicators, and disseminating results of the project (Melnik & Fineout-Overholt, 2011). Continuing education and staff inservices facilitate the change in practitioners' behavior and can reinforce the implementation of the new evidence-based practice change (Rosswurm & Larrabee, 1999). Plans should be made for ongoing monitoring of the change because this data can be used to identify the need for further refinements in the new practice or the need for a new EBP project (Melnik & Fineout-Overholt, 2011). Maintaining the change in practice is ensured by providing practitioners with the necessary resources to implement the practice change, monitoring the process and outcomes, and by rewarding quality performance with incentives (Rosswurm & Larrabee, 1999).

Relationship of Model to Project

When examining this model, it can easily be applied to this proposed evidence-based practice project to facilitate the proposed change in practice for patients with

COPD. This type of model can be applied in the primary care setting or any acute setting in order to facilitate a change in practice (Rosswurm & Larrabee, 1999). The proposed practice change is to use incentive spirometry for daily inspiratory muscle training in patients with COPD in order to reduce the sensation of dyspnea and improve quality of life in these patients.

Individuals with COPD experience inspiratory muscle dysfunction and weakness due to the effects of increased work of breathing, hyperinflation, and hypoxemia which results in decreased respiratory muscle strength and significantly impairs quality of life for these patients (Geddes, Reid, Crowe, O'Brien & Brooks, 2005). It is a major health problem in the United States with the mortality rate rising yearly (Halpern, Stanford & Borker, 2003). In reviewing patient charts, discussions with patients presenting with frequent episodes of dyspnea, and through discussions with other clinicians and collaborators, the sensation of dyspnea and its impact on daily activities and health related quality of life was recognized as a problem within this population. Knowing this, it was determined that a change in practice was needed when caring for patients with COPD. Stakeholders included patients, practitioners, and administrators and the proposed practice change was discussed with all involved. Internal and external data was collected regarding current problems in patients with the disease, cost and burdens associated with COPD and current practices in the treatment and management of the disease. Data sources included patient charts, quality improvement data, and discussion with patients and caregivers. Once collected, the data was compared to determine which intervention would be of benefit to these individuals to improve inspiratory muscle

strength, decrease dyspnea, and improve quality of life. After analyzing the data, it was determined that impaired respiratory muscle strength was a problem in this population and that improvement in this area would be of great benefit to those with the disease.

Once the problem was identified, potential interventions were examined to determine which would be useful to this population and outcomes were determined to be a decrease in the sensation of dyspnea and the improvement of quality of life for these individuals. The problem of decreased respiratory muscle strength was linked with the intervention of daily inspiratory muscle training with an incentive spirometer which was then included in a protocol for adult patients with COPD. Outcomes identified were that of decreased sensation of dyspnea and improved quality of life as measured by a Visual Analogue Scale for breathlessness and the St. George's Respiratory Questionnaire.

The literature was then reviewed, which focused on COPD, incentive spirometry, inspiratory muscle strength, quality of life, and dyspnea. The obtained literature was then critically analyzed and placed on a table of evidence in order to evaluate the strength of the literature available. The research evidence was then synthesized to determine which interventions were most effective for the desired outcomes in this population and the evidence was then combined with clinical judgment to determine the best possible intervention for these individuals. The evidence determined that inspiratory muscle training significantly improved inspiratory muscle strength, decreased dyspnea, and improved the quality of life in patients with COPD and that an incentive spirometer was a common tool used for IMT (Basoglu, Atasever & Backagolu, 2005; Heydari, Farzad & Hosseini, 2013; Petrovic, Reiter, Zipko, Pohl & Wanke, 2012) Once the intervention was

determined, the feasibility, risks, and benefits of the intervention were determined in order for the intervention to be applied successfully in this population of individuals. An incentive spirometer is an inexpensive and simple device that can be used at the bedside for inspiratory muscle training and also gives patients visual feedback to monitor and encourage their progress (Basoglu, Atasever & Backagoglu, 2005).

The proposed change in practice was defined and discussed with office practitioners, nursing staff, office managers, faculty mentor, and physician mentor. Needed resources were identified and incentive spirometers were obtained for use by the patients involved in the protocol. Tools that would be used to measure outcomes were determined to be the Visual Analogue Scale for breathlessness and the St. George's Respiratory Questionnaire (SGRQ). Visual analogue scales for breathlessness were developed along with a daily symptom diary and the St. George's Respiratory Questionnaire was obtained. Nursing staff and stakeholders were educated in the use of the evidence-based protocol.

The evidence-based practice protocol was implemented in an outpatient care setting and the protocol was monitored throughout the entire process. Data was collected and findings were analyzed to determine if the protocol was effective in this population and if the desired outcomes were met. After analysis, findings supported the change in practice, and adoption of the protocol was recommended with minor revisions as needed.

A meeting was held with all stakeholders involved to review the protocol and proposed revisions if needed. The evidence-based protocol was then presented to the hospital and practice administrators and information about the protocol and its results

were communicated to administrators and collaborating practitioners. Inservice education was conducted with clinic staff about the protocol and its use. An ongoing monitoring plan was devised to ensure quality outcomes for this population of patients and to revise protocol as needed.

Use of the Rosswurm and Larrabee (1999) model can prove to be beneficial in the development and implementation of this evidence-based practice protocol to provide quality care to adult individuals with COPD. The model is easy to use and follows a systematic process in order to ensure successful implementation of the practice change. Today's healthcare environment is supportive of evidence-based practice that will improve the quality of patient care and enhance clinical judgment and this framework can be useful to practitioners seeking to successfully change to evidence-based practice in a variety of healthcare settings (Rosswurm & Larrabee, 1999).

Chapter 4

Chronic obstructive pulmonary disease (COPD) is a common preventable and treatable disease that is characterized by persistent airflow limitation and currently affects about 1.5 million individuals (GOLD, 2014). The airflow limitation is usually progressive and can substantially impair one's quality of life and increase the risk of premature death (Petrovic, Reiter, Zipko, Pohl & Wanke, 2012). Individuals with COPD experience inspiratory muscle dysfunction due to the increased work of breathing and hyperinflation, resulting in decreased inspiratory muscle strength and endurance, which presents as dyspnea (Geddes, Reid, Crowe, O'Brien & Brooks, 2005). The airflow obstruction affects both the mechanical and gas exchange functions of the lungs and the respiratory muscles must work harder to overcome the resistance which leads to weakness of the respiratory muscles (Satani, Khuman, Devi & Nambi, 2013).

Inspiratory muscle training (IMT) is an important part of pulmonary rehabilitation which improves the strength and endurance of the respiratory muscles (Satani, Khuman, Devi & Nambi, 2013). Incentive spirometry has been widely used as a form of inspiratory muscle training to improve inspiratory muscle strength and to reduce dyspnea (Satani, Khuman, Devi & Nambi, 2013). IMT has also been associated with structural changes in the inspiratory muscle fibers (Geddes, Reid, Crowe, O'Brien & Brooks, 2005). Improving inspiratory muscle strength and endurance is a strategy that may help to relieve the sensation of dyspnea, which leads to an increased level of activity and improved quality of life in individuals with COPD (Geddes, Reid, Crowe, O'Brien & Brooks, 2005). Improving the quality of life and decreasing dyspnea in these individuals

can lead to optimal outcomes in disease management.

This chapter will provide an overview of the planning stages and design of this evidence based practice project.

Purpose of the Project

This evidence based practice change project was designed to improve the sensation of dyspnea and improve the quality of life in individuals with COPD. The purpose of this project is to use incentive spirometry as IMT in conjunction with normal medical care to improve outcomes in this population. IMT has been shown to decrease dyspnea and improve quality of life in these individuals, which thereby leads to increased productivity and decreased work days lost due to exacerbations of the disease. The project will evaluate the effectiveness of implementing standard of care best practices in the care of patients with COPD.

IRB Approval

Human Subjects Certification was completed through the National Institutes of Health on November 5, 2014 (Appendix B). Misericordia University IRB forms and documentation to include participant consent forms, permission letter from institution/mentor to conduct the project, and data collection tools (St. George's Respiratory Questionnaire and Visual Analogue Scale for Breathlessness) were completed in March 2015. Institutional review board approval for the evidence based practice change project as a Type 1 review was granted through Misericordia University's Institutional Review Board on May 11, 2015 (Appendix C).

Potential Risks and Benefits

There is a low potential risk with participation in this project and any risks for participation are the same as those for usual care. The project does not involve the administration of any medications or other interventions that would expose the participants to unnecessary risks. Benefits of this project may include symptom relief and the improvement in the quality of care for patients with COPD. Participants will be provided education on the proper use and frequency of incentive spirometry. The Advanced Practice Nurse (APN) who practices in the location where the project was conducted led the educational interventions. There are vulnerable populations that are served by the clinical site, such as the underinsured and uninsured.

Project Design

The evidence based practice change project, *The Effectiveness of Implementing Standard of Care Best Practices Including Use of Daily Incentive Spirometry to Improve Dyspnea and Quality of Life in Adults with Chronic Obstructive Pulmonary Disease (COPD)*, was designed to be implemented at the time of visit to the urgent care setting for COPD patients experiencing the sensation of dyspnea and reporting a decreased quality of life. Educational sessions were designed to last for a period of 30 to 60 minutes, depending on patient participation and readiness to learn.

The Rosswurm and Larrabee (1999) Model for Change to Evidence-Based Practice was chosen to serve as the conceptual framework for the design of this evidence based practice change project. The primary aim of the model is guide healthcare professionals through a systematic process for the change to evidence-based practice (Rosswurm & Larrabee, 1999). The model guides practitioners through the entire

process of change in evidence-based practice, beginning with the assessment of need for the change and ending with the integration of an evidence-based protocol (Rosswurm & Larrabee, 1999).

Planning of the practice change project focused on methods to improve quality of life and dyspnea in patients with COPD. Goals and objectives of the project were identified as the improved sensation of dyspnea, improved quality of life, and improved outcomes achieved in the care of these individuals.

The project plan was to identify those individuals with COPD upon presentation to the clinical site. Once identified, these individuals were to be instructed on the use of incentive spirometry to improve inspiratory muscle strength and decrease dyspnea and improve quality of life. The plan included patient instruction on the proper use and frequency of incentive spirometry. Individuals were to be given the St. George's Respiratory Questionnaire and Visual Analogue Scale for breathlessness to complete prior to their participation in the project and at the end of the project in order to assess the effectiveness of the intervention. The plan included giving patients a daily symptom diary to keep track of their symptoms and also to assess compliance with the intervention. The plan included telephone calls to participants every two weeks for the duration of the project to ensure compliance and provide encouragement. Prior to participation in the project, participants were required to sign informed consent.

Data Collection Tools

The St. George's Respiratory Questionnaire (SGRQ) (Appendix D) is a disease-specific instrument that was designed to measure impact on overall health, daily life, and

perceived well-being in patients with obstructive airway disease (St. George's University of London, 2005). It was developed and validated in patients with COPD and asthma (St. George's University of London, 2005). Test-to-test reliability has been shown to be 0.795 to 0.900 and the questionnaire's validity, reproducibility, and response to change over time have been demonstrated (Basoglu, Atasever & Backagolu, 2005; St. George's University of London, 2005). The tool has three components: symptoms, activity, and impact and the responses to these scores in these components can be aggregated into an overall score, from 0 to 100, with higher scores indicating a poorer quality of life (Basoglu, Atasever & Backagolu, 2005). The St. George's University of London Medical School grants permission for clinicians to use the SGRQ free of charge (St. George's University of London, 2005).

The Visual Analogue Scale (VAS) (Appendix E) is a tool to measure the intensity or frequency of various symptoms, including breathlessness (Dauphin, Guillemin, Virion & Briancon, 1999). The VAS has been used for its simplicity and adaptability to a broad range of populations (Dauphin, Guillemin, Virion & Briancon, 1999). It is more sensitive to small changes and is of most value when looking at changes within individuals (Dauphin, Guillemin, Virion & Briancon, 1999). The VAS is available in public domain at no cost and its test-retest reliability has been shown to be reliable (0.90; 95% CI; 0.88-0.92) (Badia, Monserrat, Rose & Herdman, 1999; Dauphin, Guillemin, Virion & Briancon, 1999).

The daily symptom diary (Appendix F) was created by this author as a way for participants to record their COPD symptoms on a daily basis and as a way for the patients

to keep track of their IMT performance.

Resources Needed

Resources needed for the successful implementation of this evidence based practice change project include copy paper, ink cartridges, a printer to print out the initial SGRQ, VAS, and daily symptom diary, a copier to make copies for other participants in the study, a telephone line and telephone available to call participants every two weeks for compliance, an exam room in the clinical site to perform the education necessary for participation in the proposed project, incentive spirometers, and a medical assistant to obtain vital signs and place the participants in an exam room.

Budget Justification

A budget is the financial expression of a project and should accurately reflect the costs of the proposed evidence based project and includes proposed direct costs, proposed indirect costs, and estimated program income (USF Health, 2015). The proposed evidence based practice change project will not be receiving funding from any local, state, or federal governments or other outside sources. No participants of the project will be provided with fringe benefits for their participation in the project. Salaries and wages of the staff involved, which include the medical assistant and advanced practice nurse, are paid for by the clinical site.

The direct costs of the proposed practice change project include one case of copy paper at \$27.29 per case, one set of printer cartridges in black ink at \$35.99 per package, incentive spirometers from Voldyne Medical Corporation at approximately \$7.98 each.

The total cost of incentive spirometers will vary depending on the amount of participants in the project. If the project included twenty participants, the total estimated cost of the incentive spirometers would be \$159.60. Indirect costs include the time spent by the project mentor in supervising the project and offering services for mentorship during the project which are being provided by the project mentor as a voluntary effort.

Summary

Improving inspiratory muscle strength and endurance is a strategy that may help to relieve the sensation of dyspnea, which leads to an increased level of activity and improved quality of life in individuals with COPD (Geddes, Reid, Crowe, O'Brien & Brooks, 2005). Improving the quality of life and decreasing dyspnea in these individuals can lead to optimal outcomes in disease management. The use of incentive spirometry and inspiratory muscle training has been shown to improve both muscle strength and endurance and improve the sensation of dyspnea in patients with COPD (Heydari, Farzad & Hosseini, 2013). This project serves to implement standard of care best practices in the care of adults with COPD to improve outcomes in this population and to lead to improved disease management.

Chapter 5

Implementation Procedures and Processes

According to GOLD (2014), non-pharmacologic therapies are used as adjunctive therapy in the treatment of individuals with COPD. One of these therapies is known as pulmonary rehabilitation, which has a goal of reducing symptoms, improving quality of life, and increasing physical participation in everyday activities (GOLD, 2014).

Inspiratory muscle training is a form of pulmonary rehabilitation. There are many benefits to pulmonary rehabilitation such as reduction of dyspnea, improved health related quality of life, reduced hospitalizations, and improved strength of respiratory muscles when IMT is used (GOLD, 2014). This EBP change project attempted to strengthen the respiratory muscles in these individuals, leading to decreased dyspnea, improved quality of life, and improved outcomes in these patients.

Setting for Practice Change

The setting for the project was a small outpatient clinic located in the Pocono Mountains of Pennsylvania. Clinical staffing included three nurse practitioners, a collaborating physician, practice manager, office manager, and one medical assistant. Teaching activities were conducted in patient exam rooms, which provided for comfort and privacy during visits to the clinic. Permission was obtained from the Practice Manager to conduct the project at the practice site (Appendix G). The clinic was easily accessible to all participants and was handicapped accessible if needed, with ample parking.

Participants

Participants were adults, ages 45-70, with a diagnosis of COPD and who may be currently taking medications for their symptoms. For inclusion in the project, patients had to be English speaking and medically compliant with treatment. Participants would be required to read and sign the consent form prior to participation in the project (Appendix H).

Justification of the Practice Change

The current clinical site for the implementation of the practice change has provided care to patients with COPD since its inception. Many of these patients are on daily medications and treatment regimens for their disease yet continue to experience the effects of dyspnea and decreased quality of life. The addition of inspiratory muscle training to the treatment regimens of these patients may lead to a decrease in dyspnea and improvement in their quality of life, leading to improved outcomes in the care of these patients.

Implementation Procedures

The practice change project was implemented as described below.

Phase I: After the EBP project was approved by the Institutional Review Board at Misericordia University, staff at the clinical site was educated on the purpose of the project and which patients would benefit from participation. The training was conducted at the clinical site of the proposed practice change. Only individuals with a diagnosis of COPD, who were ages 45-70, English speaking, and were known to be compliant with medical care were eligible for participation in the project.

Phase II: When patients meeting the inclusion criteria presented to the clinic with symptoms, the EBP project was explained to them in detail with the opportunity to ask questions. Once they agreed to participate in the project, informed consent for a retrospective chart review was obtained. Each participant completed a baseline SGRQ and VAS and was educated in the use of the incentive spirometer. Participants were enrolled in the project on a rolling basis and were given daily symptom diaries to keep track of their symptoms and received follow up telephone calls every two weeks.

Phase III: When each participant reached a participation period of eight weeks in the project, they were asked to complete a second VAS and SGRQ to gauge their symptoms and a retrospective chart review was performed to extract data for analysis. Once all participants completed the study and data was extracted, an analysis of the data was performed.

Task List with Timeline

A timeline for the project was developed to ensure that goals and objectives were successfully completed (Appendix I). The timeline allowed for advanced preparation of project activities and to make adjustments to the project as needed. A summarization of the timeline for the evidence based practice change project can be found in Appendix A.

Summary

Implementation of this project targeted dyspnea and decreased quality of life, which are the most common symptoms that patients with COPD experience. Improving these symptoms in these individuals allows them to live a more productive and meaningful life without the stressful burden that these symptoms create. Incorporating

standard of care best practices in the routine care of individuals with COPD can lead to improved outcomes in this population.

Chapter 6

Evaluation and Outcomes of Practice Change Project

Clinical outcomes are used to measure the success of interventions and treatments in research and clinical trials. Measurement of outcomes is important to determine and document the impact of the evidence-based practice change on patient outcomes (Melnyk & Fineout-Overholt, 2011). Evaluation is an important component of the evidence based practice project because it determines the effectiveness of the intervention. The purpose of this evidence-based practice project was to implement an evidence-based intervention from the literature to decrease dyspnea and improve quality of life in individuals with COPD. This chapter describes the outcomes, statistical analysis of the data, comparison of the results to project objectives, and the evaluation of the evidence-based practice project.

Expected Outcomes

GOLD (2014) guidelines have established the primary goal for patients diagnosed with COPD is to reduce symptoms, reduce the frequency of exacerbations, improve health status, and restore effective daily functioning. The expected outcomes of the evidence-based practice change project were based upon the premise of these guidelines. Expected outcomes were to improve the symptom of dyspnea and improve quality of life in individuals with COPD through the use of daily incentive spirometry.

The Visual Analogue Scale (VAS) and St. George's Respiratory Questionnaire (SGRQ) were tools used to measure the outcomes of dyspnea and quality of life for the evidence-based practice project. The instruments, as described in Chapter Four, are a

self-reported scale and questionnaire that are condition specific to COPD. The VAS addresses perceived level of breathlessness on a scale of one to ten. The SGRQ is a 14 item questionnaire that addresses the symptoms of the disease, the impact of the disease on the patient, and how the disease affects the patient's activity level.

Outcomes were evaluated based on the numerical scores from the VAS and the total scores from the SGRQ. The evidence-based practice project was designed for participants, ages 45-70, with a diagnosis of COPD. Ten individuals were approached regarding participation in the project, one refused. The project was implemented with nine participants.

The participants were examined and evaluated in the outpatient setting by this investigator. The initial visit consisted of agreement to participate, instruction on the use and frequency of incentive spirometry, and completion of the VAS and SGRQ for baseline scores pre-intervention. Telephone calls were placed to participants every two weeks to assess compliance. At the end of the eight week intervention period, participants completed a post-intervention VAS and SGRQ. At the end of the intervention period a retrospective chart review was also performed to determine if there was a decrease noted in the participant's symptoms.

Data Analysis and Results

In accordance with published scoring instructions for the SGRQ, each positive answer was given a predetermined weighted score and a total score was determined by the addition of each positive score and dividing that number by the total possible score for the entire test, then multiplying the answer by one-hundred. The VAS scores were

subjective numerical scores based on the sensation of symptoms pre- and post-intervention.

A significance level was established at 0.05 prior to implementation of the project to be considered effective and to weigh the strength of the evidence. Data was entered into Excel when questionnaires were completed for pre- and post-intervention VAS and SGRQ scores. Once all data were obtained, a two-tailed, paired t-test was performed through Excel to determine the effectiveness of the intervention.

Improvement was noted in VAS scores of most participants, with a reduction of one to two points in eight participants noted after the intervention period (Appendix J). One participant did not note a change in the sensation of dyspnea during the protocol. The two-tailed p-value was less than the significance level of 0.05 and the t-value was 2.306, which indicates statistical significance of the results and effectiveness of the intervention in decreasing dyspnea in patients with COPD (Table 1). There was a 23% decrease noted in scores on the VAS after the use of IMT.

Mean 1	SD 1	Mean 2	SD 2	p-value	Percent Change
5.22	1.30	4	0.87	0.0006	23% decrease in scores

Table 1. Mean 1: The mean of pre-intervention scores; SD1: The standard deviation of pre-intervention scores; Mean 2: The mean of post-intervention scores; SD 2: The standard deviation of post-intervention scores.

Improvement was noted in SGRQ scores of all participants at the end of the intervention period (Appendix J). The two-tailed p-value was less than the significance level of 0.05 and the t-value was 2.31, which indicates statistical significance of the

results and effectiveness of the intervention in improving quality of life in patients with COPD (Table 2). There was a 21% decrease in scores of the SGRQ after the use of IMT.

Mean 1	SD 1	Mean 2	SD 2	p-value	Percent Change
51.9	17.8	40.9	16.1	0.00002	21% decrease in scores

Table 2. Mean 1: The mean of pre-intervention scores; SD1: The standard deviation of pre-intervention scores; Mean 2: The mean of post-intervention scores; SD 2: The standard deviation of post-intervention scores.

Relationship of Results to Framework/Objectives

An evidence-based practice project was implemented over an eight week period with COPD patients in the outpatient care setting. The objective of the project was to implement an evidence-based practice protocol using incentive spirometry as a form of inspiratory muscle training when treating patients with COPD who present with dyspnea and impaired quality of life. Measurement outcomes were identified and measurement tools were chosen. Benchmarks for the measurement of outcomes were determined through literature review.

The first defined outcome was a decrease in dyspnea in patients with COPD through the daily use of incentive spirometry. Having achieved a reduction in VAS scores that was statistically significant is an encouraging finding that enables the practice change to be introduced into practice and expanded upon to optimize outcomes.

The second defined outcome was improvement in quality of life in patients with

COPD through the daily use of incentive spirometry. Having achieved a reduction in SGRQ scores that was statistically significant is encouraging, and enables the change to be introduced into practice to improve outcomes in this population.

The findings of a positive correlation between a reduction in dyspnea and the use of daily incentive spirometry is not unexpected. The implications of the need to add IMT to the plan of care for COPD patients became apparent as a result of this evidence-based practice project. There are direct project implications that will make an impact locally with the COPD population.

The Model for Evidence Based Practice Change by Rosswurm and Larrabee (1999) was the conceptual model used in this evidence-based practice change project. The model integrates the principles of quality improvement, use of teamwork tools, and evidence-based translation strategies to promote the adoption of a new practice (Melnyk & Fineout-Overholt, 2011). It was determined that impaired respiratory muscle strength was a problem in patients with COPD and that improvement of this would be of great benefit to those with the disease. Multiple interventions were explored through a review of the literature to determine which would be the most beneficial in this population and the use of incentive spirometry as a form of IMT was determined to provide significant improvement for both outcomes and the change was implemented in the practice setting. Once data is obtained from the protocol, it can be used as feedback to decide if the practice change should be adapted, adopted, or rejected based on the feasibility, risks, and benefits (Melnyk & Fineout-Overholt, 2011), which was done in this practice project. When analyzing the data, it was found that daily incentive spirometry did improve the

symptoms of dyspnea and quality of life in patients with COPD. The improvement in dyspnea was found to be statistically significant for this population, however, the improvement in quality of life was found to not be statistically significant for this project population. These results lead this investigator to question how the new practice should be adapted or revised in order to provide more significant results and implemented into everyday practice. A potential revision for the project would be to implement the change in a larger population in order to get a sample size that is may show more of an effect from the intervention. Another revision for the project would be to implement the change for a longer period of time such as twelve weeks or sixteen weeks, which would provide information regarding the long term effects of the intervention in this population.

Today's healthcare environment is supportive of evidence-based practice that will improve the quality of patient care and enhance clinical judgement and this practice change project has the potential to do just that. With some minor revisions, this evidence-based practice change project has the potential to improve the quality of care in patients with COPD and lead to improved outcomes and standards of care.

Chapter 7

The profession of nursing involves the protection, promotion, and optimization of health, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities, and populations (American Nurses Association (ANA), 2015). Advanced practice nursing is defined as:

Any form of nursing intervention that influences health care outcomes for individuals or populations, including the direct care of individual patients, management of care for individuals and populations, administration of nursing and health care organizations, and the development and implementation of health care policy (AACN, 2006, p. 4).

The Doctor of Nursing Practice (DNP) graduate is prepared to investigate and solve problems facing our healthcare system and to deliver the highest level of nursing practice in order to achieve optimal outcomes (Zaccagnini & White, 2014). The DNP must be constantly aware of and knowledgeable about changes in practice to ensure that current best practice is maintained (Zaccagnini & White, 2014).

This chapter will discuss the strengths and limitations of the evidence-based practice project, the implications for nursing practice, and the linkage of the project to the eight Essentials of Doctoral Education for Advanced Nursing Practice introduced by the AACN (2006).

Limitations of the Project

It should be noted that there was a significant decrease in the number of patients

seen within the population of interest once implementation of the project began in late May. A larger sample size may have yielded more positive results and may have been more representative of the population of interest. The project proceeded despite the limited number of patients presenting with symptoms of COPD. Another limitation of the project was the limited time period of 12 weeks within which to complete the project. If individuals presented with symptoms of COPD after the enrollment period, they were excluded due to the inability to perform the intervention for a period of eight weeks. Replication of the project for an extended period of time such as four to six months may strengthen the evidence based practice project and provide information regarding the long term effects of the intervention. Extension of the end age range of participants from 70 to 80 may provide for more participants in future projects, lending strength to the practice change project.

Implications for Nursing Practice

DNP prepared nurses have the ability to integrate nursing science with knowledge from other areas such as ethics, the biophysical, psychosocial, analytical, and organizational sciences and use it as the basis to provide the highest level of nursing practice (AACN, 2006). Strategies are needed to improve care delivery in individuals with COPD. The DNP possesses a wide array of knowledge from the sciences and has the ability to translate that knowledge to effectively benefit patients in the daily demands of the practice environment (AACN, 2006).

All of the participants of this evidence based practice project were on daily medications for their COPD and still experiencing symptoms daily, yet not one has ever

participated in a pulmonary rehabilitation program or performed inspiratory muscle training at an attempt to improve their symptoms. The current state of management of COPD consists of a multidisciplinary approach to patient care and pulmonary rehabilitation is now being recognized as an important part of the management of patients with COPD (Shinde, Kiran, Khatari & Hande, 2012). The APN plays a key role in the identification of potential candidates for pulmonary rehabilitation and in facilitating and reinforcing the material learned in order to ensure optimal outcomes in this population (Heydari, Farzad & Hosseini, 2013). Patients with COPD experience respiratory muscle weakness which may contribute to dyspnea being considered the most debilitating symptom in these patients (Heydari, Farzad & Hosseini, 2013). Using incentive spirometry for inspiratory muscle training is an important component of the routine rehabilitation protocol for patients with COPD and can greatly enhance the APN's ability to provide COPD patients with quality, accessible care and improve outcomes in this population (Heydari, Farzad & Hosseini, 2013).

Linkage to DNP Essentials

Essential I: Scientific Underpinnings for Practice. The DNP possesses a wide array of knowledge gained from the sciences and has the ability to quickly and effectively benefit patients in the daily demands of today's practice environments (AACN, 2006). The DNP is able to use science-based theories and concepts in order to determine the nature and significance of health and healthcare delivery phenomena, describe actions and advanced strategies to enhance, alleviate, and improve health and healthcare delivery in populations, and evaluate outcomes (AACN, 2006). This evidence based practice project

used scientific evidence combined with concepts and theories to enhance and improve care delivery in individuals with COPD. The Model for Change to Evidence-Based Practice by Rosswurm & Larrabee (1999) was used to guide the APN through a systematic process for change to the standard of care that was provided to individuals in this population. Evidence was obtained from various sources in support of the use of IMT to decrease dyspnea and improve quality of life in individuals with COPD and was used to plan and implement the evidence based practice project.

Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking. Using organizational and systems leadership is important to improve patient and healthcare outcomes (AACN, 2006). Using the knowledge and skills of the DNP in these areas is consistent with nursing goals to eliminate health disparities and to promote excellence in practice (AACN, 2006). In order to improve outcomes in populations, the DNP must be proficient in quality improvement strategies and have the ability to evaluate the cost-effectiveness of care in order to ensure effective care delivery strategies (AACN, 2006). COPD is a disease that affects individuals of all socioeconomic classes but poverty has been shown to be a risk factor for development of the disease (GOLD, 2014). The disease can occur as a result of the individual's environment and may be prevalent where health disparities occur. The incentive spirometer is an inexpensive, simple device that can be used to perform IMT and can be used to improve outcomes in this population and enhance access to care.

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice. The DNP prepared nurse is able to translate research into practice and use analytical

methods to critically appraise existing literature to determine and implement the best evidence for practice (AACN, 2006). A methodical search of healthcare databases resulted in evidence that supported the use of IMT in patients with COPD in order to improve dyspnea and improve quality of life. Through critical analysis, only the strongest and most reliable evidence was chosen to support this practice change project. The evidence obtained was then used to design, direct, and evaluate quality improvement methodologies to promote safe, timely, effective, and quality patient-centered care.

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Healthcare. The knowledge of information systems and technology allows the DNP to apply new knowledge, manage individual and aggregate level information, and assess the efficacy of patient care technology (AACN, 2006). The ability to design and use information systems and technology to evaluate programs of care and outcomes of care is an essential skill of the doctorally prepared nurse (AACN, 2006). Information systems and technology were used in this practice change project in order to determine the impact that COPD has within populations, design an evidence-based intervention, predict and analyze outcomes, and identify gaps in evidence for practice. Data analysis was performed using information technology in order to evaluate the outcomes of this project. It was predicted that daily use of IMT in individuals with COPD would result in decreased dyspnea and improved quality of life in this population and through analysis of the data, it was determined that there was an improvement in symptoms in patients who participated in the evidence-based practice project.

Essential V: Health Care Policy for Advocacy in Health Care. Health care policy can facilitate or impede the delivery of healthcare services or the ability of the provider to engage in practice to improve health care needs (AACN, 2006). It is important that the DNP is able to design, implement, and advocate for healthcare policy that addresses issues of social injustice and equity in healthcare (AACN, 2006). This evidence based practice change project applied a cost-effective intervention that can be used in areas of health disparities in order to improve healthcare outcomes within the population, thereby eliminating social injustice in the delivery of healthcare. The results from this practice change project can be used to educate others regarding improving outcomes in patients with COPD.

Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes. Today's healthcare environment depends on contributions from highly skilled and knowledgeable individuals from multiple professions in order to accomplish the Institute of Medicine's (IOM) mandate for safe, timely, effective, efficient, equitable, and patient-centered care (AACN, 2006). This evidence-based practice change project occurred as part of a collaborative effort involving various staff members in the clinical setting in order to improve the standard of care provided to patients with COPD.

Effective communication and leadership skills were employed to lead the interprofessional team in implementation of the EB project and improving population health outcomes.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health. The implementation of clinical prevention and population health activities is

central to achieving the national goal of improving the health status of the population of the United States (AACN, 2006). The DNP can engage in leadership to integrate evidence-based clinical prevention and population health services for individuals and populations (AACN, 2006). Data were evaluated that show the incidence and prevalence of COPD is higher in populations with lower socioeconomic status and that regardless of socioeconomic status, COPD is becoming an ever increasing social and financial burden in the United States. When evaluating patient records, it was determined that many of the patients with COPD have never been involved in any form of pulmonary rehabilitation and continue to present with symptoms of the disease. This information was used to develop an evidence-based practice change project focusing on a cost-effective form of IMT that can be used by anyone diagnosed with COPD in order to improve healthcare outcomes in populations and address gaps in care.

Essential VIII: Advanced Nursing Practice. The DNP is able to design, implement, and evaluate therapeutic interventions based on nursing science as well as develop and sustain therapeutic relationships and partnerships with patients and other professionals to facilitate optimal care and patient outcomes (AACN, 2006). A therapeutic relationship was developed with each participant in order to ensure their trust in the information and care provided to them. The evidence-based practice project was designed to be simple and easy to apply in any type of practice setting. Once a patient met inclusion criteria, the project was explained to them in detail with the opportunity to ask questions. They were then instructed on the protocol and evaluated at the beginning and end of a period of eight weeks. A retrospective chart review was then performed to determine if an

improvement in daily symptoms was seen. Through participation of the participants in the protocol, improvement was shown in the standard of care for patients with COPD.

Summary

COPD is a leading cause of morbidity and mortality worldwide and results in an economic and social burden that is substantial and increasing, which makes control of symptoms and improvement of outcomes important (GOLD, 2014). There are various therapeutic treatment options for COPD encompassing pharmacologic and non-pharmacologic therapies, and IMT has been found to be beneficial to patients with COPD when used as part of a pulmonary rehabilitation program (GOLD, 2014). The principal goals of a pulmonary rehabilitation program are to reduce symptoms, improve quality of life, and increase physical and emotional participation in everyday activities (GOLD, 2014). The DNP has the ability to investigate and solve the problems facing our healthcare system today and deliver the highest level of nursing practice in order to achieve optimal outcomes (Zaccagnini & White, 2014), which would be essential in the care of individuals with COPD. Findings from this project determined a need to include the use of IMT in the care plan of individuals with COPD, along with pharmacologic therapies, in order to improve outcomes and the standard of care in this population. The results of the project also confirmed evidence from existing literature that using IMT can improve dyspnea and improve quality of life in these patients. The DNP can design, direct, and implement quality improvement activities to promote safe, timely, effective, and patient-centered care and must be constantly aware of and knowledgeable about

changes in practice to ensure that current best practice is maintained (AACN, 2006; Zaccagnini & White, 2014).

Chapter 8

Summary and Conclusions

The symptoms of dyspnea and decreased quality of life can be frustrating to individuals with COPD. The desired outcome of this evidence-based practice project was to improve these symptoms in COPD patients with evidence supported IMT and improve outcomes in this population.

The implementation of this project involved a change in practice based upon the best evidence available. A review and analysis of the literature indicated that individuals with COPD can strengthen their respiratory muscles through IMT. Evidence from major studies supports the use of IMT in patients with COPD to improve quality of life and decrease dyspnea. COPD may be treated with systemic corticosteroids, inhaler corticosteroids, and long and short acting beta-agonists, however, many individuals continue to experience daily symptoms of the disease. GOLD (2014) guidelines recommend pulmonary rehabilitation as a form of adjunct therapy in these patients and IMT is an aspect of this.

This practice change project arose out of a need to improve standard of care best practices for COPD patients. Many patients were presenting to the outpatient setting with complaints of symptoms and frequent exacerbations, leading to increased healthcare costs and patient dissatisfaction with care. Planning of the project with preceptor and clinician involvement began seven months prior to implementation of the project.

Development of the protocol provided guidance for the implementation of the intervention and required the clinician and staff to explain the use and frequency of

incentive spirometry and request that participants complete an SGRQ and VAS for a pre-intervention baseline.

Based on project evaluation data, this project accomplished the intended outcomes as evidenced by the improved VAS and SGRQ scores. There was at least a one point improvement in every participant's VAS scores, and activity scores improved in patients that were involved in the protocol.

The successful implementation of this project indicates that evidence-based practice projects can be used to improve the standard of care provided to COPD patients. The strategic planning of the project with all staff involved alleviated barriers to implementation. Using the Model for Change to Evidence Based Practice by Rosswurm & Larrabee (1999) enabled the change to be implemented smoothly.

There is an abundance of research available on the care of COPD patients but there is limited research on the use of IMT and incentive spirometry to improve symptoms in COPD patients. The limited research conducted on the use of IMT for symptom improvement in COPD patients indicates an opportunity for future research in this area. The treatment protocol developed for this project is based on the best available scientific evidence and may be replicated in other practice settings and by disciplines other than nursing.

By developing a treatment protocol for adult patients with COPD, treatment recommendations were appropriate for all ages of individuals with this disease. This project resulted in a reduction of symptoms and improved quality of life, leading to improved outcomes and the provision of optimal care to patients with COPD.

Dissemination Plans

Dissemination of nursing knowledge is essential for APN's (Hanrahan, Marlow, Aldrich & Hiatt (2010). In order to maintain the highest standards of care, nurses need to be aware of the most recent and relevant research and use this knowledge to inform their practice (Cheek, Gillham & Ballantyne, 2005). Being able to contribute, effectively use, and communicate knowledge to nurses, colleagues, policy makers, and the public via publications, posters, and presentations is crucial for the profession of nursing (Hanrahan, Marlow, Aldrich & Hiatt (2010).

Dissemination plans for this evidence-based practice project include a discussion of the results with other colleagues involved in the care of individuals with COPD, the implementation of IMT in current practices for COPD, submission of a manuscript of the project for publication in nursing journals, the implementation of a journal club in the practice site once per month after the staff meeting, and a discussion of the project results with local COPD patients through seminars and workshops. The dissemination of results from this evidence-based practice project can improve the standard of care for individuals with COPD as well as lead to improved outcomes in this population.

Future Ideas/Next Steps Related to Project

Future ideas for this evidence-based practice project include the implementation of IMT in practice with all patients with a diagnosis of COPD. Patients outside of the project age range of 45-70 may also benefit from use of IMT. Even the slightest improvement in symptoms may be meaningful to these individuals. Another thought is to vary the length of the project, with a potentially shorter intervention period of four weeks

to determine if participants would see improvement in their symptoms in a shorter period of time. Consideration should also be given to extending the length of the intervention period to twelve weeks to determine if there is a greater benefit to patients when using IMT for a longer period of time. Various studies (Heydari, Farzad & Hosseini, 2013; Satani, Khuman, Devi & Nambi, 2013) have suggested lengthening the intervention period to determine the long term effects of IMT in this population, to determine if IMT with incentive spirometry has a more permanent effect on pulmonary functions, reduced exacerbations, and the reduced frequency of use of bronchodilators. The short period of eight weeks only shows the short term, immediate effects of the intervention.

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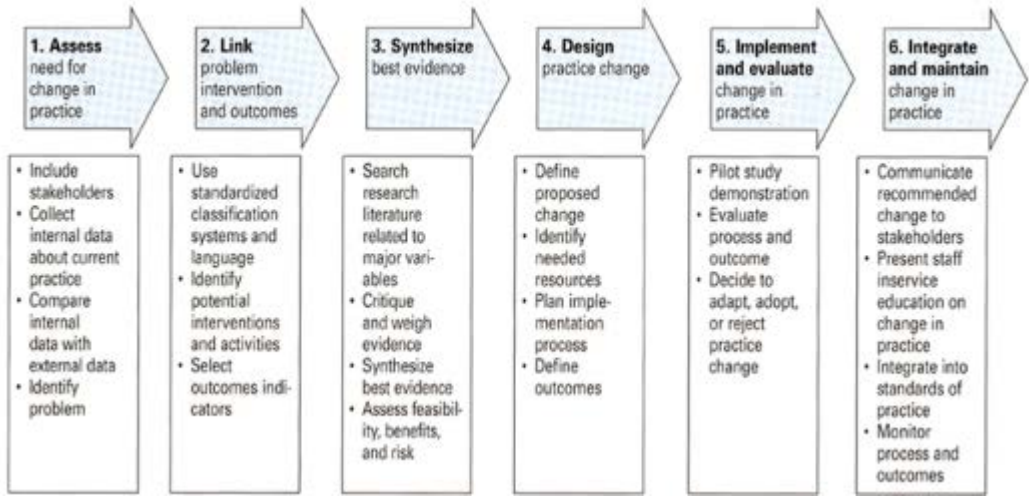
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Appendix A



The Rosswurm and Larrabee Model for EBP Change

Appendix B



Appendix C



Institutional Review Board

MISERICORDIA
UNIVERSITY

May 11, 2015

Brenda Hage, Ph.D.
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Misericordia University
Dallas, PA 18612

Dear Dr. Hage and Ms. Gallagher:

Thank you for submitting the items requested by the IRB for your application *The Effectiveness of Implementing Standard of Care Best Practices Including Use of Daily Incentive Spirometry to Improve Dyspnea and Quality of Life in Adults with Chronic Obstructive Pulmonary Disease (COPD)*, IRB Study Number 08-15-T1. Your study is now approved by the IRB.

As part of the approval, the IRB has received and accepted the consent form as submitted. The attached consent form with a valid period of eligibility is the only consent form to be used. Any modifications must be approved by the IRB. The date stamp indicates the eligible period.

You will be reminded one month prior to end date of your protocol, of your need to complete a Continuation or End-of-Project Report. You also have the responsibility to notify the IRB of any changes in the conduct of this study or injury to study subjects and to retain all approved application documents and signed consent forms for a minimum of three years following completion of the study (this includes student research). Please refer to the IRB Policies and Procedures document for specific details on what is expected.

If you have any questions, please feel free to contact me.

Sincerely,

McKinley H. Manasco, Ph.D.
Chairperson, IRB

Appendix D

ST. GEORGE'S RESPIRATORY QUESTIONNAIRE for COPD patients

(SGRQ-C)

This questionnaire is designed to help us learn much more about how your breathing is troubling you and how it affects your life. We are using it to find out which aspects of your illness cause you most problems, rather than what the doctors and nurses think your problems are.

Please read the instructions carefully and ask if you do not understand anything. Do not spend too long deciding about your answers.

ID: _____

Date: ____/____/____ (dd/mm/yy)

Before completing the rest of the questionnaire:

Please select one box to show how you describe your current health:

Very good

Good

Fair

Poor

Very poor

Version: 1st Sept 2005

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George's University of London, Cranmer Terrace London SW17 ORE, UK.

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UK/ English version COPD

SGRQ-C - United Kingdom/English SGRQ-C_AU1.0_eng-GBori.doc

St. George's Respiratory Questionnaire PART 1

Questions about how much chest trouble you have.

Please select ONE box for each question:

Question 1.

I cough:

- most days a week..... a
- several days a week..... b
- only with chest infections..... c
- not at all..... d

Question 2. I bring up phlegm (sputum):

- most days a week..... a
- several days a week..... b
- only with chest infections..... c
- not at all..... d

Question 3. I have shortness of breath:

- most days a week..... a
- several days a week..... b
- not at all..... c

Question 4. I have attacks of wheezing:

- most days a week..... a

- several days a week..... b
- a few days a month..... c
- only with chest infections..... d
- not at all..... e

Question 5. How many attacks of chest trouble did you have during the last year?

- 3 or more attacks a
- 1 or 2 attacks..... b
- none..... c

Question 6. How often do you have good days (with little chest trouble)?

- no good days..... a
- a few good days..... b
- most days are good..... c
- every day is good..... d

Question 7. If you have a wheeze, is it worse in the morning?

- no.....
- yes.....

St. George's Respiratory Questionnaire PART 2

8. How would you describe your chest condition?

Please select ONE:

- Causes me a lot of problems or is the most important problem I have a
- Causes me a few problems b
- Causes no problem..... c

9. Questions about what activities usually make you feel breathless.

For each statement please select the box that applies to you these days:

	True	False
Getting washed or dressed.....	<input type="checkbox"/>	<input type="checkbox"/> a
Walking around the home.....	<input type="checkbox"/>	<input type="checkbox"/> b
Walking outside on the level.....	<input type="checkbox"/>	<input type="checkbox"/> c
Walking up a flight of stairs.....	<input type="checkbox"/>	<input type="checkbox"/> d
Walking up hills.....	<input type="checkbox"/>	<input type="checkbox"/> e

10. Some more questions about your cough and breathlessness.

For each statement please select the box that applies to you these days:

	True	False
My cough hurts.....	<input type="checkbox"/>	<input type="checkbox"/> a
My cough makes me tired	<input type="checkbox"/>	<input type="checkbox"/> b
I am breathless when I talk.....	<input type="checkbox"/>	<input type="checkbox"/> c
I am breathless when I bend over	<input type="checkbox"/>	<input type="checkbox"/> d
My cough or breathing disturbs my sleep.....	<input type="checkbox"/>	<input type="checkbox"/> e
I get exhausted easily.....	<input type="checkbox"/>	<input type="checkbox"/> f

11. Questions about other effects that your chest trouble may have on you.

For each statement please select the box that applies to you these days:

	True	False
My cough or breathing is embarrassing in public.....	<input type="checkbox"/>	<input type="checkbox"/> a
My chest trouble is a nuisance to my family, friends or neighbours.....	<input type="checkbox"/>	<input type="checkbox"/> b

- I get afraid or panic when I cannot get my breath..... c
- I feel that I am not in control of my chest problem..... d
- I have become frail or an invalid because of my chest..... e
- Exercise is not safe for me..... f
- Everything seems too much of an effort..... g

12. These are questions about how your activities might be affected by your breathing.

For each statement please select the box that applies to you because of your breathing:

- | | True | False |
|--|--------------------------|----------------------------|
| I take a long time to get washed or dressed..... | <input type="checkbox"/> | <input type="checkbox"/> a |
| I cannot take a bath or shower, or I take a long time..... | <input type="checkbox"/> | <input type="checkbox"/> b |
| I walk slower than other people, or I stop for rests..... | <input type="checkbox"/> | <input type="checkbox"/> c |
| Jobs such as housework take a long time, or I have to stop for rests.... | <input type="checkbox"/> | <input type="checkbox"/> d |
| If I walk up one flight of stairs, I have to go slowly or stop..... | <input type="checkbox"/> | <input type="checkbox"/> e |
| If I hurry or walk fast, I have to stop or slow down | <input type="checkbox"/> | <input type="checkbox"/> f |

My breathing makes it difficult to do things such as walk up hills, carrying things up stairs, light gardening such as weeding, dance, play bowls or play golf g

My breathing makes it difficult to do things such as carry heavy loads, dig the garden or shovel snow, jog or walk at 5 miles per hour, play tennis or swim..... h

13. We would like to know how your chest trouble usually affects your daily life.

For each statement please select the box that applies to you because of your breathing:

- | | True | False |
|-------------------------------------|--------------------------|----------------------------|
| I cannot play sports or games | <input type="checkbox"/> | <input type="checkbox"/> a |

- I cannot go out for entertainment or recreation..... b
- I cannot go out of the house to do the shopping..... c
- I cannot do housework d
- I cannot move far from my bed or chair..... e

14. How does your chest trouble affect you?

Please select ONE:

- It does not stop me doing anything I would like to do a
- It stops me doing one or two things I would like to do..... b
- It stops me doing most of the things I would like to do..... c
- It stops me doing everything I would like to do..... d

Thank you for filling in this questionnaire.

Before you finish, would you please check to see that you have answered all the questions.

Appendix F

Daily Symptom Diary**Week 1**Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 2Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 3

Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 4

Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 5Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 6Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 7

Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Week 8

Day 1

Day 2

Day 3

Day 4

Day 5

Day 6

Day 7

Appendix G

**Community Resource Nurse Practitioners***15 Linden Street Stroudsburg, PA 18360*Phone: [\(570\)424-1235](tel:(570)424-1235) Fax: [\(570\)424-1259](tel:(570)424-1259)

June 3, 2015

Re: Christine Gallagher M.S.N., C.R.N.P.
Misericordia University
Doctoral Candidate

Dear Sir/Madam,

I am writing to you in support of the above named candidate who is currently enrolled in your University's Doctorate of Nursing Practice Program. I am a physician who is also the practice manager of Community Resource Nurse Practitioners, located at 15 Linden St, Stroudsburg, PA. This is a private family practice that employs Nurse Practitioners to provide primary care to adult patients throughout the lifespan. Christine is one of these Nurse Practitioners who provides care to our patients. She has discussed her proposed evidence-based practice change project with me in great detail and I see great potential in this project to enhance the care of patients with COPD and improve their health and well-being. For this reason, I give her full professional support and permission to conduct her project at our clinical site with our patients and provide mentorship to her as needed. I look forward to participating in this project with her.

Respectfully,


Dr. John Matzella D.O., Ph.D.

Appendix H

Informed Consent

The Effectiveness of Implementing Standard of Care Best Practices Including Use of Daily Incentive Spirometry to Improve Dyspnea and Quality of Life in Adults with Chronic Obstructive Pulmonary Disease (COPD)

You are being asked to take part in a quality improvement project to evaluate the outcomes of best practices for the care of patients with COPD. You are being asked to take part in this quality improvement project to help us evaluate the effectiveness of the care of patients with COPD. Please read this form carefully and ask any questions that you have may have before agreeing to take part in this project.

What is the project about: The purpose of this project is to evaluate the effectiveness of care of COPD patients.

What will you be asked to do: There are no special activities you will be asked to do. If you agree to participate in this project, at the end of your 8 week treatment period, a retrospective (after the fact) chart review of your medical record will be conducted. All information will be reported anonymously using de-identified information. No information that can identify you will be used.

Risks and benefits: Risks for participation are the same as those for usual care. Benefits may include symptom relief and helping us improve the quality of care for patients with COPD.

Compensation: There is no compensation for participating in this quality improvement project

Your information will be confidential: Privacy and confidentiality of your medical information will be maintained. No identifying information will be used when reporting the outcomes of the quality improvement project.

Taking part is voluntary: Taking part in this quality improvement project is voluntary. If you decide not to take part in this study, it will not affect your current or future relationship in our practice. If you decide to take part, you are free to withdraw at any time.

If you have questions: the investigator conducting this quality improvement project is Christine Gallagher, MSN, CRNP, DNP student. Please feel free to ask any questions you have now. If you have and questions later, you may contact Christina Gallagher at 570-332-8773 or Dr. Brenda Hage, Director of DNP Programs at Misericordia University, Dallas, PA at 570-674-6760 or at bhage@misericordia.edu If you have any questions or concerns about you rights as a participant in this project, you may contact the Misericordia Institutional Review Board Chairperson at 570-674-8108. You will be given a copy of this form for your records.

APPROVED UNTIL
AUG 15 2015
MISERICORDIA IRB

Appendix H (con't.)

The Effectiveness of Implementing Standard of Care Best Practices Including Use of Daily Incentive Spirometry to Improve Dyspnea and Quality of Life in Adults with Chronic Obstructive Pulmonary Disease (COPD)

Statement of Consent: I have read the above information, and have received answers to any questions I have asked. I consent to take part in this quality improvement project.

Your signature _____ Date _____

Your name (printed) _____ Date _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____ Date _____

This consent form will be maintained by the researcher for at least three years beyond the end of this project.

Investigator Name (printed) _____ Date _____

Investigator's signature _____ Date _____

APPROVED UNTIL
AUG 15 2015
MISERICORDIA IRB

Appendix J

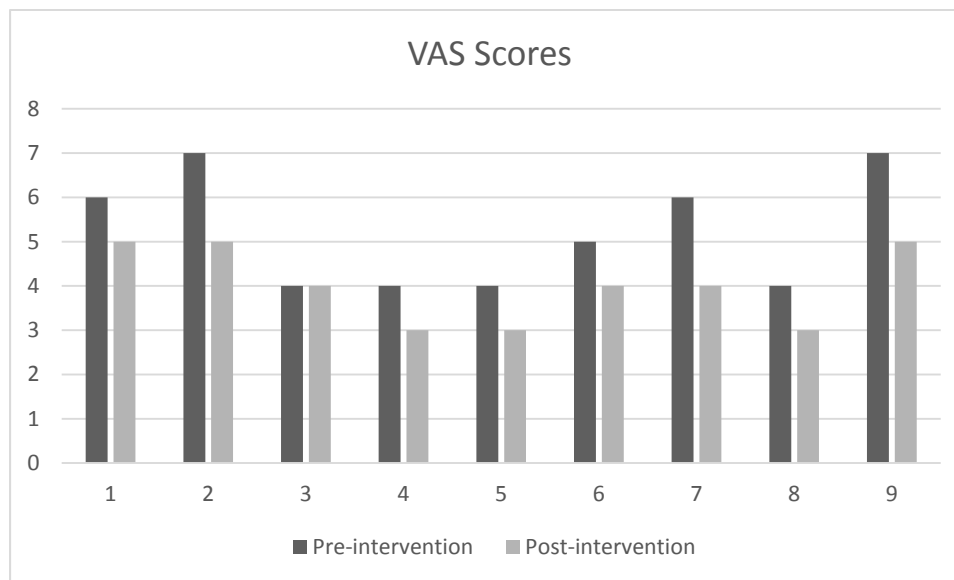


Figure 1. Visual Analogue Scale Scores Pre- and Post-Intervention

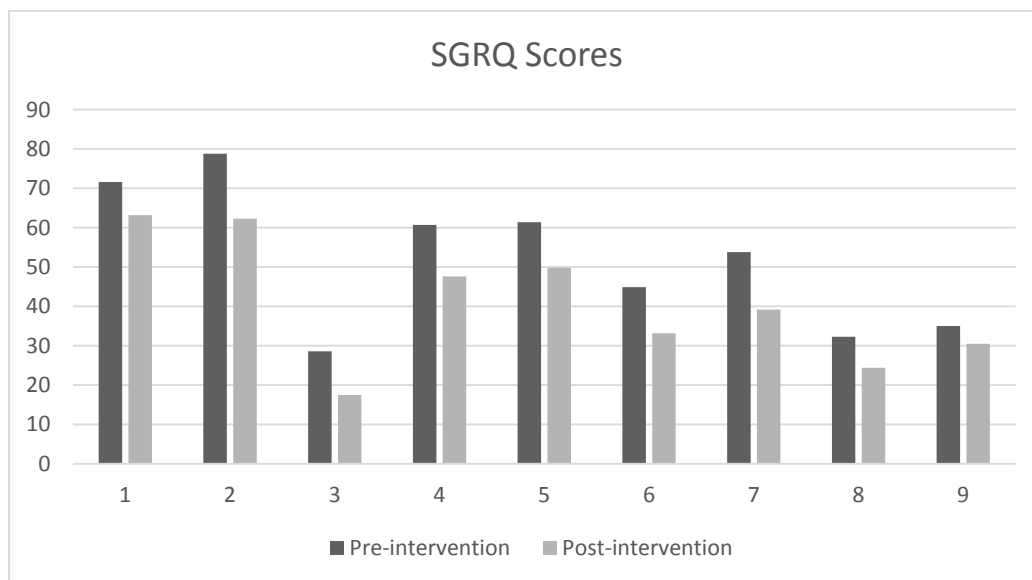


Figure 2. St. George's Respiratory Questionnaire Results Pre- and Post-Intervention