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Reducing Home Health COPD-Related 30-Day Hospital Readmissions Using Telehealth Technology

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has been found to be complete and satisfactory in all respects,
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the review committee have been made.

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Walden University

2018

Abstract

Reducing Home Health COPD-Related 30-Day Hospital Readmissions Using Telehealth

Technology

by

Steven E. Stammer

MS, Walden University, 2014

BS, Lakeview College of Nursing, 2010

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

November 2018

Abstract

Chronic obstructive pulmonary disease (COPD) is a collection of chronic conditions that results in irreparable lung damage and stress to patients. COPD also has considerable financial impacts on health care entities due to frequent hospital readmissions of COPD patients. The Centers for Medicare and Medicaid Services penalize care entities for 30-day hospital readmissions. Many rehospitalizations attributed to COPD are due to exacerbations, often preceded by physiologic and emotional changes that can be monitored, allowing action to be taken to prevent readmissions. The practice problem for this quality improvement project explored whether the use of remote home monitoring of COPD patients discharged to home health care, coupled with the use of a medication rescue pack, would reduce rehospitalizations within 30 days after discharge. The purpose of the project was to evaluate the effectiveness of telehealth remote monitoring and initiation of a medication rescue pack in decreasing 30-day readmissions of COPD patients. The self-efficacy model was used to encourage health-promoting actions that are necessary for chronic disease management. Data from the project agency's records of COPD patients were evaluated for readmission rates. Analysis of the data from 8 preintervention patients showed that 3 (38%) were readmitted. Postintervention data showed that of the 9 participants, only 1 was readmitted (11%). Comparison of the data showed a 27% decrease in readmissions because of the intervention. The results of this project have the potential to bring about positive social change by improving care management remotely in real time, thus decreasing rehospitalization in COPD patients.

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Section 1: Nature of the Project

Introduction

Chronic obstructive pulmonary disease (COPD) is a collection of chronic diseases that afflicts greater than 15.7 million Americans and is the third leading cause of death in the United States (Centers for Disease Control [CDC], 2016). The reported number of COPD cases is likely low because researchers believe that an equal number of people with reduced pulmonary function have yet to be diagnosed with COPD (CDC, 2016). COPD is debilitating and irreversible, meaning that preventing lung function decline through increased monitoring of the patient is of utmost importance. COPD affects more than just lung function, it also results in decreased activity, leading to more sedentary lifestyles that in turn lead to weight problems, cardiac issues, and exacerbations in conjunction with increased medications, more frequent physician office visits, and frequent hospitalizations (Terzikahn et al. 2016). Exacerbations are taxing to the patient's physical condition and often contribute to financial burden. With each exacerbation episode requiring hospitalization, researchers have shown that lung function is irreparably damaged (Dransfield et al. 2017).

Medical treatment costs for adults with COPD reached \$32.1 billion in 2010, with a projected rise to \$49.0 billion by 2020 (Guarascio, Ray, Finch, & Self, 2013). Costs of this magnitude are reason for concern, especially when considering the increase in the number of Americans becoming eligible for Medicare. Medicare has been saddled with a significant portion of the cost, paying 51% of those costs in 2010 (Guarascio et al. 2013). This is the cost of medical care for COPD, but additional costs involve other losses, time

at home, shortened life span, and family costs to take the patient to doctor visits. These costs can be addressed by using technology to improve the quality of care and prevent repeated hospitalizations attributed to exacerbations. Exacerbations of COPD are acute flares of the disease that need rapid response to prevent loss of lung capacity, function, or death. Of patients diagnosed with COPD, 77% experienced exacerbations during the year, costing greater than \$7,000 per occurrence (Guarascio et al. 2013). Exacerbations are incidents that usually do not get recognized initially and by the time the symptoms are realized, the patient's condition has deteriorated to the point of needing hospital admission. Medicare records revealed that 23% of patients with COPD have experienced an exacerbation resulting in hospital readmission within 30 days after discharge (CDC, 2016). The resulting costs of exacerbation have been the impetus for changes in the health care arena. As of fiscal year, 2014, the Centers for Medicare and Medicaid Services (CMS) expanded its Hospital Readmission Reduction Program (HRRP) to include COPD. Care entities with high 30-day unplanned readmission rates for COPD exacerbation have been assessed penalties in the form of reduced reimbursement for the treatment of Medicare recipients. Better management of these patients using telehealth is key to improving quality of care for patients with COPD and avoiding financial penalties, two priorities for home health agencies.

I designed this quality improvement project to reduce the incidence of hospital readmission of COPD patients discharged to home health care within the first 30 days. After hospitalization, patients who have extreme difficulty leaving their residences are typically discharged to home health care. This population often is unable to make

follow-up appointments with physicians due to transportation limitations. Because of this, care may be sporadic. With home health nurses visiting the patient weekly, changes in the patient's condition may go unnoticed until the deterioration progresses to the point of severe respiratory distress and hospitalization is required for the exacerbation. Self-management of their disease has been an admirable goal, but until patients have become comfortable with the nuances of their health and the disease, they need assistance. This assistance may come in the form of telehealth to remotely monitor patients in their home. Telehealth equipment is used to collect pulse oximetry, heart rate, and blood pressure along with yes-or-no self-assessment questions. In a systematic review, Al Rajeh and Hurst (2016) found that up to 5 days prior to an exacerbation, patients had decreases in oxygen saturation and elevations of heart rate. If oxygen saturation and heart rate alterations were recognized before the patient even felt any change in their condition, it would be a significant step in improving the care of the COPD patient. These changes in vital signs are recognized as an indicator of a change in condition that can result in hospital readmission. By identifying these changes by remote monitoring using telehealth, the readmission may be avoided.

Social change is the alteration of a behavior or norm and is achieved on both large and small scales. The key is to identify a modifiable social issue and strive to disseminate the information that can influence a society to change. I conducted this project to help create a shift in the mentality of people with COPD who may think that a COPD diagnosis means there is nothing that can be done for the patient. Because of this impression, the homebound patient experiences social isolation and depression

(Hernandez, Mallow, & Narsavage, 2014). By using remote monitoring to help detect early signs of decline that precede an acute exacerbation, patients can learn what to monitor and become empowered to participate in their care and disease management (Hernandez et al. 2014). This allows patients to focus on things they can change to protect their existing lung function, slowing the eventual decline and permitting the patient to be socially active. Reducing the number of rehospitalizations and emergency room visits will alleviate some of the stress on a busy health care system.

Problem Statement

The problem addressed through this project was the high rate of rehospitalization of COPD patients within 30 days after hospital discharge to home health care. In this project, I sought to determine if the use of telehealth technology and a medication rescue pack would reduce these readmissions. Rehospitalizations, especially those that occur within 30 days post-discharge, are an important focus related to poorer patient outcomes and increased health care costs. Medical treatment costs for COPD totaled \$32.1 billion in 2010 and are projected to increase to \$49.0 billion by 2020 (Guarascio et al. 2013). The Medicare program has been seeing increasing numbers of people reaching the age of 65 when they become eligible for benefits, and the increase in eligible members is matched with greater costs assumed by the agency. Medicare reported that 51% of its payments were for COPD-related care in 2010 (Guarascio et al. 2013). When greater than 50% of the budget is spent for care of one specific disease, that condition should become a focus not just for financial benefit, but for better patient care and disease control. Organizations that care for patients with COPD have the potential for financial

loss through readmission penalties. Home health agencies have been tasked with reducing the incidence of hospital readmissions that occur within 30 days. If readmissions occur, a penalty will be assessed, realized as a reduction in reimbursement by Medicare (McIlvennan, Eapen, & Allen, 2015). The shift from focusing on volume to focus on value in the Medicare system is a significant alteration for home health agencies, hospitals, health facilities, and physicians. The Hospital Readmissions Reduction Program is one specific example of how the practice of medicine must change to meet value-based goals. While there is no exact formula to reduce COPD readmissions, telehealth is establishing solid clinical base and offering providers a means to meet this challenge.

COPD is a disease that has affected millions. In Illinois, COPD affects about 6% of the population, putting the state in the second-highest percentage range for the country (CDC, 2013). Locally in central Illinois where I conducted the project, 7.69% of residents have been diagnosed with COPD (Illinois Department of Public Health, [IDPH], 2016). This has been attributed to farming activities, coal mining, and smoking. The home health agency that covered these counties in central Illinois consistently has had about 100 patients admitted, with around 12% of the patients having a diagnosis of COPD. With estimates of only 50% of patients with shortness of breath being tested for and diagnosed with COPD, increased attention needed to be paid to this population in anticipation of increased patient rolls. As new patients have been admitted, a concerted effort has been made by the home health agency to identify all patients with a diagnosis of COPD. The issue that drove this project was the high incidence of patients discharged

from hospitals to home health with a diagnosis of COPD who experienced hospital readmissions within 30-days post discharge.

The nursing profession benefitted from the project by allowing nurses to be better informed of their patient's condition, remotely, without going to the patient's house. At a glance, the home health nurse could quickly review all patients on remote monitoring for abnormal vital signs. Anytime a patient was admitted and discharged from home health care, there were additional costs in time and paperwork for the home health agency. Eliminating re-admissions reduced these costs and permitted better continuity of care, something that nurses and patients have desired. An additional benefit was that telehealth monitoring has been adapted to other chronic diseases, heart failure, diabetes, and even anticoagulation management (Barcellona, Fenu, Cornacchini, & Marongiu, 2013). As technology evolves, more applications will be recognized for using telehealth technology. The Institute of Medicine (IOM, 2012) stated that telehealth has played and will continue to have a significant role in cost containment, increased quality, and improved access to care. The IOM (2012) also stated that improving rural health care access and quality could be accomplished by using telehealth technology.

Purpose Statement

The gap in nursing practice project addressed by the project was the reduced frequency of monitoring of COPD patients, which impairs the nurse's ability to detect changes that require treatment or medication adjustment. The idea that frequent hospitalizations for COPD-related causes are to be expected is a way of thinking that needed to be addressed. Most hospitalizations for COPD-related issues are associated

with COPD exacerbations. A COPD exacerbation, as defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2017), is an occurrence that happens during the course of the disease that results in an alteration in a patient's baseline dyspnea, with increased sputum and coughing that is greater than normal, is acute in onset, and requires a change in medication. Exacerbations have been costly, resulting in morbidity, mortality, and declines in health. Over 50% of the total cost of COPD has been due to care in response to exacerbations (Qureshi, Sharafkhaneh, & Hanania, 2014). COPD exacerbations have many consequences including reduced physical activity, decreased quality of life, loss of independence, and death. When exacerbations recur, research has shown that declines in lung function accelerate (Qureshi et al. 2014). Another cost associated with re-hospitalization of COPD patients involves financial penalties imposed on home health agencies for readmissions within 30-days post discharge. A hospital readmission occurs when a patient is admitted to a hospital within a specified period after being discharged from an earlier, or initial, hospitalization. CMS has defined this period as 30 days and includes hospital readmissions to any hospital, not just the hospital from which the patient was initially discharged (McIlvennan et al. 2015). Since October 1, 2013, the penalty for readmission within 30 days has ranged from 1% to a max of 3% of Medicare reimbursements received by health care facilities (McIlvennan et al. 2015). When looking at the cost for care of COPD exacerbations, costs associated with the decline of the patient's health, increased care, and financial penalties for exacerbations indicate the need for measures to reduce readmissions.

Re-admittance for COPD exacerbation has a negative effect on patients because they experience declining lung function that does not recover to pre-exacerbation levels. This has been frustrating for nurses who empathize and identify with their patients and share the patients' emotional reactions, which has led to a depletion of emotional resources, frustration, even a decline in work-related satisfaction for some (Kupryś-Lipińska, & Kuna, 2014). In addition, the family of the COPD patient may experience costs similar to those of the patient including loss of meaningful employment, loss of expectations of the future, loss of retirement plans, loss of personal freedom, along with anticipatory grieving by the spouse and family (Kupryś-Lipińska, & Kuna, 2014). Patients with chronic diseases have had a special need for close monitoring, and with COPD, it has been especially important.

In this project, I evaluated if telehealth technology was an effective method for increased monitoring of COPD, with daily assessment of patient's vital signs, coupled with three yes-or-no questions to provide early indications of a variation in condition that could lead to hospitalization. COPD is irreversible but avoiding exacerbations and associated complications is a potentially achievable goal.

The practice gap addressed by this project was the reduced frequency of monitoring of COPD patients, which impairs the nurses' ability to detect changes that require treatment or medication adjustment. Rehospitalization has been a common consequence of COPD as lung function deteriorates over time. But, while rehospitalization is not unexpected, it should not be accepted as inevitable because of the associated accelerated decline in lung function that results from exacerbations and

hospital admission (Qureshi et al. 2014). It is daunting to face a disease that will most likely be the cause of one's demise. By ignoring this gap and not addressing the rehospitalization issue has done a disservice to the medical community, taxpayers, and the COPD patients.

Nature of the Doctoral Project

In this project, I explored the effectiveness of using telehealth remote monitoring of COPD patients to identify and recognize early signs of exacerbations and initiate actions that would decrease hospital 30-day readmission rates. The self-care model of chronic illness was used to teach patients the health promoting actions needed for chronic disease management. Home monitoring to determine physiologic indicators of COPD exacerbation has had varied levels of support, but Al Rajeh and Hurst (2016) found that pulse oximetry and patient self-reporting had highest reported success of indicating exacerbation onset. The only systematic review of remote monitoring of COPD patients reported little benefit in blood pressure changes in predicting exacerbations, while SPO2 and heart rate monitoring were the most commonly observed indicators showing success (Al Rajeh & Hurst, 2016). Rescue medication packs have been used in the United Kingdom as a method for patients to self-determine exacerbation signs and symptoms and administer the rescue pack as they saw fit (Davies et al. 2014). This method has been met with mixed results, including non-recognition of exacerbation symptoms until the patient is in severe distress and proceeds to the emergency department and use of the medication pack for non-exacerbation events such as upper respiratory infections (Davies et al. 2014). Remote monitoring of physiological indicators may be useful in earlier

identification of COPD exacerbations; the challenge lies in determining alert parameters for individual patients given that the individuals' responses leading up to exacerbations may be significantly diverse.

To develop this project, I gathered sources of evidence from peer review literature, publications of professional organizations, best practice protocols and guides, and from telehealth professionals. Some of the professional organizations whose materials I reviewed included The U.S. COPD Coalition, The COPD Foundation, American Association of Respiratory Care, American College of Chest Physicians (ACCP), American Thoracic Association, American Thoracic Society, Area Agencies on Aging, The CDC, COPD Alert, and GOLD. Veteran's Administration research was also included because of its work in researching and developing protocols for chronic diseases seen in veterans. European professional organizations were included due to the more widespread use of telehealth in Europe. The organizations identified included the European Lung Foundation, European Respiratory Society, and The British Lung Foundation. Peer reviewed journals that I used included *The Lancet Respiratory Medicine*, *American Journal of Respiratory and Critical Care Medicine*, *European Respiratory Journal*, *Thorax*, *Chest*, *Journal of Thoracic and Cardiovascular Surgery*, *The Journal of Pulmonary & Respiratory Medicine*, *Annals of the American Thoracic Society*, *Respiratory Research*, *COPD: Journal of Chronic Obstructive Pulmonary Disease*, *Respiratory Medicine*, *Clinics in Chest Medicine*, *Heart & Lung: The Journal of Acute and Critical Care*, *BMC Pulmonary Medicine*, and *Canadian Respiratory Journal*. Each of these journals have distinguished themselves in publishing COPD-related studies

and promoting further research and projects focusing on COPD care, management, and working towards a cure.

Specific data that I collected to answer the project question included 30-day readmission rates for COPD patients in the project agency 2 months prior and for 2 months after project implementation. Demographic data was collected from the electronic medical records (EMR) that are used by the home health agency. I used patient demographics including age, gender, ethnicity, and home oxygen use to describe the project population. In addition, vital signs and pulse oximetry, combined with information provided by every participant regarding changes from normal of sputum color and amount, anxiety, and dyspnea was collected remotely every day through telehealth equipment installed at the patient's home.

I used a pre-post design for the project to assess if the use of telehealth remote monitoring of COPD patients reduced the incidence of 30-day hospital readmissions. The pre-implementation data was gathered from the home health agency records of COPD patients and their associated readmittance rates. Post implementation data was gathered from discharge records with dates that were earlier than the end date of each COPD patient's episode of care. I used descriptive statistics to summarize the data and provide a picture of the project's population. Telehealth equipment allowed daily collection of heart rate, blood pressure, pulse oximetry, patient self-observations of anxiety, changes in volume or color of sputum, and dyspnea. Changes noted in heart rate, oxygen concentration, and positive answers to at least two of the three questions were required to initiate use of the medication rescue pack.

The medication rescue pack was a standing order from the primary physician and was placed in the patient's home at the initiation of home care. As telehealth vital signs were completed and transmitted to the project agency, a staff member—a clinical assistant during the week and the on-call nurse on weekends and holidays—reviewed the vital signs to check if they fell within the individually determined parameters that I calculated during the admission process. If the vital signs were outside the set parameters, the clinical assistant or on-call nurse called the patient and asked them to retake their vital signs. If the values were still outside the parameters, the patient's nurse (or on-call nurse) called the patient and had them start the rescue pack.

The rescue pack contained a corticosteroid, antibiotic, and instructions to increase rescue inhaler use. The purpose of this project was to address the problem of frequent 30-day rehospitalization of COPD patients discharged to home health care; many of these readmissions have been due to exacerbation. Increased occurrence of rehospitalization has had costs for the patients, their families, and the home health agency. The use of telehealth equipment allowed for early recognition of exacerbation onset and promoted instigation of medication to prevent deterioration of the patient's condition to the point of needing hospitalization.

Significance

A stakeholder in a project is any individual, group, or organization that might affect, be affected by, or perceive itself as affected by a decision, activity, or outcome of a project (Pandi-Perumal et al. 2015). Stakeholders can be internal or external to the project and may affect the project, population, outcomes, or the team, sometimes to

satisfy their own agenda. Stakeholders can fall into three main groups. Primary stakeholders are those who have been directly affected, either positively or negatively, by the project, decisions, or actions of the project (Pandi-Perumal et al. 2015). Secondary stakeholders are those who have been indirectly affected by the project, or decision, or actions of the project (Pandi-Perumal et al. 2015). The last group are key stakeholders. Stakeholders are part of either the primary or secondary stakeholder groups, but they have had a vested interest in the project because the success or failure of the project would have a significant effect on them (Pandi-Perumal et al. 2015). The primary stakeholders for this project included the COPD patients, Dr. Sgro, who was the preceptor, the home health agency's administration, and the agency's nurses who were responsible for installing the telehealth system, training patients on its use, and monitoring the telehealth data every day. Other primary stakeholders included the primary care physicians, the consulting pulmonologist who has been contracted by the home health agency, Honeywell International (the company that manufactured the telehealth equipment), and the discharge planners and associated hospitals from which the patients were discharged to home care. Secondary stakeholders included the public health department that follows incidence of COPD hospitalizations, pulmonary rehabilitation centers, the American Lung Association, and family members of the patients. Key stakeholders included the patients and their families, me in the role as project designer, the home health administration, and the preceptor. These stakeholders had interest in this project, and I applied their input to the project as appropriate.

Telehealth has been defined by the Health Resources and Services Administration (2017) as using electronic information and telecommunications technology in a support role for clinical health care, patient and professional health-related education, public health, and health administration. The reality is that after discharge from the hospital to home health care, the patient is responsible for his or her own health monitoring. After being discharged, most COPD patients return home with an abundance of follow-up appointments, medications, and instructions, but they may be intimidated, scared, or unable to participate in their own care.

Patients discharged to home health have a slight advantage in having a nurse come to their home to help them with their care as they get stronger and gain a handle on the disease. The downside to being on home health is that the patients are unable to get out without significant difficulty, meaning that except for when they can obtain transportation, the patients are often isolated. Telehealth monitoring of vital signs allowed the patient to learn to monitor their condition with knowledge that nurses were reviewing the information, a sort of safety net. The traditional plan of care for COPD called for self-collection of vital signs, which required patient cooperation with the home health personnel. The problem with the standard plan of care was patients often failed to follow the plan due to multiple factors. Some of these factors included miscommunication or poor comprehension of the treatment plan, inability to get to follow-up appointments, and difficulty following intricate medication regimens required by the plan of care. The result is often negative outcomes and creates safety issues for the patient.

To alleviate patient safety concerns, telehealth allowed the nurses to better monitor the patients' conditions daily. Nurses at the home health agency see COPD patients on a weekly basis. Such infrequent monitoring made it almost impossible to identify trends that might have been able to predict a decline in patient's condition signaling exacerbation and that could have been used to initiate medication administration to prevent hospitalization. Remote monitoring of patients consisted of more than data collection, it allowed for rapid recognition of complications and initiation of interventions, promoted greater engagement between home health nurses and patients, and increased motivation of patients to participate in management of their disease (see Farrar, 2015). Patient safety was further enhanced through remote monitoring by the nurses' ability to advise patients to seek care or to alert providers of potential complications see (Farrar, 2015).

There are ever increasing amounts of evidence that shows remote home monitoring will expand access to health care services and generate cost savings which is important due to the costs of caring for chronic disease patients is increasing yearly (Ambrosino et al. 2016). Home monitoring has been used for several chronic diseases, such as chronic heart failure (CHF), diabetes and COPD to decrease hospitalizations, improve self-management and improve quality of care. Ambrosino et al. (2016) reported that in the U.S., 63% of healthcare providers used telehealth, and of these 72% were in hospitals and health systems, 52% were in physician groups and clinics, and 36% were in other provider organizations, such as ambulatory centers and nursing homes. Telehealth technology in one form or another is being applied to other specialties and conditions

such as stroke, behavioral health, neurology, pediatrics, and cardiology, are reported to use telehealth in <20% of cases (Ambrosino et al. 2016). Pacemaker manufacturers have developed home monitoring systems for pacemakers and implantable defibrillators that collect data while the patient sleeps being available for physician review in the morning (Dario, Delise, Gubian, Saccavini, Brandolino, & Mancin, 2016). Greenwood, Blozis, Young, Nesbitt, and Quinn, (2015) reported on the success of the application of telehealth remote monitoring of blood glucose values and an improvement in patient self-management. Anticoagulant management via telehealth eliminates repeated trips to a lab for blood draws and uses a finger stick for blood work which is preferable to traditional laboratory blood draws (Bussey, H. I., Bussey, M., Bussey-Smith, & Frei, 2013). Future directions for home monitoring might be in the direction of cholesterol and thyroid medication management (Car, Tan, Huang, Sloot, & Franklin, 2017). With more applications for telehealth being trialed, there is the opportunity to individualize telehealth care for people to alleviate the routine visits to the physician office for lab work, education, and, using remote video software, conduct face-to-face virtual visits between the patient and health care professionals. As technology evolves, new practice areas will be opened to help patients at a distance, allowing them to stay in their homes longer.

Positive social change is any change affected in a community's cultural, economic, political and social institutions and relationships over time. Social change might seem inevitable, but its causes and pace vary over time. Today, social change is often linked to technology. Social change may be achieved through grassroots efforts,

non-profit organizations, businesses, and professional organizations. This project has fostered positive social change in several ways. COPD has no cure; one does not get better when one has COPD because lung function declines over time. There are some people whose attitudes towards COPD patients has been one of judgement, where there may be criticism for partaking in a habit that caused them harm (Rose, Paul, Boyes, Kelly, & Roach, 2017). COPD patients have experienced isolation, loss of social support and depression over their future health decline and death, but they should not have to face negativity from others (Rose et al. 2017). Positive social change was achieved through the reduction of patient isolation through increased contact with home health personnel. Positive social change was also addressed through the nurses' acceptance of COPD and demonstration that self-management helped slow the decline in lung function, which gave the patients some sense of control. Having addressed COPD as a disease and not a death sentence changed how participants viewed the disease.

This project also promoted positive social change through providing better access to care for patients who were limited in their transportation resources to get to doctor visits and patients who may have been limited in their ability to manage their COPD by themselves. Many home health patients reside in rural areas that are traditionally underserved, and many of these patients were Medicare recipients on a fixed budget (see Guarascio et al.2013). When a COPD patient experiences an exacerbation and subsequent hospitalization, costs are incurred that can be difficult for the patient to reconcile. Elderly patients are a vulnerable population and sometimes are forgotten in the current health care climate. Telehealth allows home health agencies to increase the care

services provided without more frequent home visits, which provides relief to shortages of personnel in home health while improving patient access to care (Rheuban, 2006). Many telehealth patients found the idea that having someone monitoring their vital signs reassuring, and if something happened where the patient was unable to communicate, follow up by the agency would occur. Financial sustainability of telehealth care has been a challenge despite the Patient Protection and Affordable Care Act (2010), which promoted use of store-and-forward technology to decrease response time for treatment without causing the patient to leave their residence. Financial payments have been focused more on care processes in health care organizations instead of interventions that altered patient outcomes (Dineson et al. 2016). As home monitoring technology becomes more widely accepted and proven effective, a change in the current reimbursement models will have to change, opening other chronic diseases to telehealth monitoring. Nursing has a long history of affecting positive social change and telehealth technology is the impetus to continue that practice.

Summary

Telehealth is an emerging use of technology to extend health care to home bound and rural populations as a tool to manage chronic diseases. Home health agencies face numerous challenges. One of the most significant has been how to help patients manage chronic conditions like COPD without extra home visits. Remote home monitoring using telehealth technology is the ideal application. As the numbers of elderly increase, the number of patients with COPD has risen proportionally. COPD has been steadily increasing and has surpassed stroke as the third leading cause of death in the United

States. In Illinois where the project was implemented, 7.69% of residents have been diagnosed with COPD, which is above the national average of 6% (IDPH, 2016).

COPD is a progressive, irreversible decrease in lung function that places the patient in a cycle of exacerbations and recovery of the disease. If these exacerbations are not identified rapidly and treatment initiated immediately, readmittance to the hospital usually resulted. Rehospitalizations are not only difficult on the patient and their family; the resulting decrease in lung function continues a progressive spiral of exacerbations and hospitalizations, eventually ending in the death of the patient. In addition to the effect on the patient, rehospitalizations within 30-days post discharge have been grounds for financial penalties by CMS under the HRRP. In this project, I asked if the use of remote monitoring using telehealth technology for COPD to identify and recognize early signs of exacerbations and initiate actions would decrease hospital 30-day readmission rates.

I drew evidence to support the project from peer reviewed journals and publications from professional organizations that specialized in telehealth and COPD. The project was evaluated using a pre-post intervention comparison. Telehealth technology is becoming more adaptable and lends itself to monitoring and treatment of many diseases including diabetes, heart failure, as well as to remote virtual provider visits and patient education. This transferability makes telehealth attractive to provide better care to remote rural patients, especially as costs continue to drop for equipment. Along with increasing availability of care to rural residents, this project promoted positive social change by aiding COPD patients with their care self-management and decreasing social isolation and the stigma associated with COPD.

Section 2: Background and Context

Introduction

In this project, I addressed the high rate of rehospitalization of COPD patients within 30 days after hospital discharge to home health care. This problem has been a significant contributor to congested emergency rooms and hospital units along with increased health care spending. The increase in hospital use aside, these rehospitalizations for acute exacerbation involve 77% of COPD patients each year, with a cost per exacerbation of over \$7,000 (Guarascio et al. 2013). In this project, I asked if the remote monitoring of COPD patients using telehealth technology could recognize early signs of exacerbations and promote actions that decreased hospital 30-day readmission rates.

The purpose of this DNP project was to evaluate if the use of telehealth remote monitoring in conjunction with the initiation of a medication rescue pack decreased 30-day readmissions through improved patient monitoring and rapid detection of deterioration and rescue pack administration. Readmissions have been a problem of concern for several years, but minimal success in reducing rehospitalizations has been achieved. The term telehealth encompasses a wide variety of methods including video-conferencing, remote monitoring, virtual visits, and at-home blood glucose or anti-coagulation testing. The equipment can be live-stream over the Internet, asynchronous, where data is transmitted via cellular network, or store-and-forward, where instruments collect data and transmit it at set times. In this project, I used the store-and forward method where the data was collected, and the date was sent at a set time. This method

was used because if the patient forgot to take vital signs, the nurses quickly realized the oversight and made a reminder call to the patient. This project was designed to be a part of the solution to the readmission problem plaguing healthcare facilities and organizations in the United States.

I designed this quality improvement project to reduce the number of COPD readmissions within 30 days post discharge to home health care. The following section includes a description of the self-efficacy theory that I chose as the theoretical basis for the project and an explanation of the reasons why this theory was appropriate for this project. The self-efficacy theory has been applied reliably in health research and continues to have applications in many fields and specialties. I also define terms used in this project that have meanings specific to this project. Further, I describe the project site of the project and discuss my role, noting any connections between me and the project topic, site, and population. Next, I discuss potential biases in the project and describe the project team including members' contributions to the project, my plan for disseminating results to the team for feedback, evaluation of the project and of me as project leader, and team members' opinions of the project.

Concepts, Models, and Theories

In this project, remote patient monitoring for COPD patients in home health care occurred after discharge from a hospital when the disease was in the maintenance phase and the patient was in a stable condition. This maintenance has traditionally relied on the patient to self-monitor their condition and act (via contacting provider) if their vital signs exceeded the pre-determined limits. COPD patients have days where they do not feel

well, and the challenge lies in the patients' ability to determine between these bad days and an early acute exacerbation event. Telehealth can be a way to monitor the condition and teach the patient to discern the difference between exacerbation and the normal ebb-and-flow of daily disease manifestations. Through monitoring, the patients' confidence was elevated and their effectiveness in managing their disease was advanced.

For this project, the self-efficacy theory was the most appropriate theoretical model. The self-efficacy theory holds that an individual has the ability to perform needed behaviors to achieve specific goals (Bandura, 1977). Self-efficacy is the confidence individuals possessed in their ability to take command of their social, emotional, and health environments. Self-efficacy in COPD management means that patients have the means to attend to the issues that are inherent in the disease process. These issues include following prescribed medication regimens, prompt recognition of symptoms of acute exacerbations, access to treatment for exacerbations, exercise, pulmonary rehabilitation and exercises, proper diet and nutrition, and management of stressors. To what extent these activities are important differ depending on the stage of the disease.

The self-efficacy theory was first advanced by Bandura in 1977 (Bandura & Adams, 1977). The basic tenet is that the belief an individual holds regarding their power to affect situations significantly influences both the strength a person has to face said challenges and the choices a person makes (Bandura & Adams, 1977). Basically, if one believes they can achieve something, then they are likely to achieve that goal. Self-efficacy is the central concept of Bandura's social-cognitive theory (Bandura, 1977). Social-cognitive theory highlights the importance of observational learning and exposure

to social experiences in the formation of one's personality. Self-efficacy evolves from a person's outside experiences along with one's perception of themselves and the impact of these in effecting the outcome of events. Bandura theorized that the higher the self-efficacy a person possessed, the better the chance that a difficult task was viewed as something to conquer instead of something to avoid (Bandura, 1977). Low self-efficacy is associated with retarded skill development and personal growth, but when self-efficacy exceeds the person's ability, there is the tendency to overestimate one's ability to finish those tasks (Bandura, 1977). Personal motivation for completing tasks is affected by self-efficacy. Possessing a high self-efficacy tends to make people try harder and longer to complete a challenge, in contrast to those with low self-efficacy (Bandura, 1977).

The importance of patient participation in this project cannot be underestimated. I used self-efficacy theory because of the need for participants to view tasks as being achievable, especially where technology is concerned since it can be intimidating to elderly patients. Self-efficacy gave the participants the ability to use the equipment and understand what changes are important. If patients had low self-efficacy, they would not have been able to use the telehealth equipment as needed to collect their vital signs as scheduled or to recognize changes in their condition, making an exacerbation event more likely. Self-efficacy has been shown to affect health, and measurements of self-efficacy are commonly used in studies where a behavior change is desired (Heijmans, Waverijn, Rademakers, van der Vaart, & Rijken, 2015).

Definitions

I used the following definitions in the planning, implementation, and evaluation of this project:

FEV₁: Forced expiratory volume is the quantity of air expelled in the first second of a forced exhalation (GOLD, 2017).

FVC: Forced vital capacity is the volume of air that can be maximally forcefully exhaled and by default, contains the FEV1 within it (GOLD, 2017).

FEV₁/FVC: Ratio indicative of obstructive lung disease if ≥ 0.70 (GOLD, 2017).

Chronic disease: Conditions that last longer than 1 year or refer to uncertain long-term conditions requiring ongoing medical attention while limiting activities of daily living (ANA, 2012).

Self-management: The ability of the individual with the assistance of family, community, and health care professionals to actively manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions (ANA, 2012).

Telemedicine: Telecommunication technology used for medical diagnosis and patient care (Bentley et al. 2014).

Telemonitoring: Communication technology used to collect and transmit information related to patient health status among geographically separated individuals (Ho et al. 2016).

Rescue pack: Prescribed medications to be initiated upon RN instructions.

Contained a corticosteroid and antibiotic along with instructions to increase rescue inhaler use (American Medical Group Association [AMGA], 2012).

Vital sign data: The collection of heart rate, pulse oximetry, blood pressure, and a three-question patient self- assessment.

Relevance to Nursing Practice

COPD presents multiple complications for the patient, ranging from physical components including dyspnea, coughing, and weight loss, and social effects like isolation, depression, and anxiety. Nursing care has always played a significant part in COPD care, and home health nursing has been no different. Nursing care in the home for COPD patients used to be focused on medication regimen adherence and followed a holistic approach regarding management of chronic disease. For COPD, nurses traditionally focus on non-pharmacological interventions for symptoms with a goal of improving the quality of life of patients (Fletcher & Dahl, 2013). These approaches included smoking cessation, exercise, and pulmonary rehabilitation.

Nurses have often perceived COPD in a fatalistic manner; when patients reported that the disease prevented them from doing activities they previously enjoyed, nursing care turned to managing the disease instead of aiding the patient (Fletcher & Dahl, 2013). The somewhat pessimistic attitude was not lost on patients, which contributed to the patient's depressive symptoms and unwillingness to see the disease as anything but a death sentence (Fletcher & Dahl, 2013). The patients were identified by the disease, not as patients with the disease. These attitudes had the combined effect to prevent nurses

from striving to change the behaviors of the patients, and the patients from attempting any self-initiated changes (Fletcher & Dahl, 2013). These attitudes and approaches needed changing if the patient is to have the ability to manage their disease and initiate changes in their behaviors. To change patient behaviors, education is required on the disease including what to expect, what to watch for, and what they could do to maintain their current level of functionality.

The practice of nursing care for COPD patients has evolved into a partnership. Nurses still utilize the holistic approach, but they combine the pharmacologic and behavior modification approach to provide better care. In addition to stressing smoking cessation, medication requirements, exercise and diet recommendations, nurses also strive to educate patients on the management of the disease (Utens et al. 2013). Many patients know the fear of struggling to breathe and shortness of breath, but are they able to tell the difference between a bad day and the onset of an exacerbation? This distinction is one that needs to be made and reinforced. Nurses have been at the forefront of COPD care today, they are often the first healthcare professional the patient has seen, and in many cases, nurses are the first ones to recognize the symptoms of COPD (Utens et al. 2013). As the scope of nursing practice has expanded, nursing at all levels has had an impact on COPD. Nurses have influenced all stages of COPD from prevention measures, to disease management and exacerbation mitigation, to palliative care in the end stages of the disease. Fletcher and Dahl (2013) reported that patient outcomes achieved through nurse-led care were equivalent with physician-led care, as was patient safety. The evaluation of patient satisfaction with nurse-managed care reveals that

patients experienced higher rates of satisfaction with nurses compared to physician-managed care, with most patients responding that they were provided more information about self-management and self-medication by the nurses (Fletcher & Dahl, 2013). The impact of clinic and hospital nurses is evident; the same can be said about home health nurses.

Home health nurses have been positioned to have a positive impact on COPD patients. Patients discharged to home health care are homebound at discharge, and during the first 30 days after discharge, COPD patients are at risk of rehospitalization. Home health nurses have strived to form cooperative alliances with the patient. This alliance is one where the nurses have educated the patient on self-management, often reiterating the information presented to them in the hospital (Farrar, 2015). Combining the nurse visits and patient monitoring of their disease was a good start, but too many times these patients were re-admitted to the hospital for exacerbation within 30 days (Farrar, 2015). Remote monitoring of the COPD patient at home is an important component in achieving the goal of reducing rehospitalizations.

There have been many approaches taken to attempt prevention of rehospitalization of COPD patients within 30-days post discharge, most have been used in the home for patients who were not homebound. Kripalani, Theobald, Anctil, and Vasilevskis (2014), reported that COPD management was hospital based and focused on three fronts, pre-discharge teaching, post-discharge interventions, and bridging actions. The pre-discharge teaching included teaching the patient about their disease and care strategy, discharge planning, medication reconciliation, and scheduled follow-up visit

prior to leaving the hospital. Post-discharge interventions included follow-up phone calls, nurse navigators, dedicated patient emergency phone line, and a visit to the home by a nurse to check up on the patient. Bridging actions encompassed use of patient centered coaching, individually defined discharge instructions, and follow-up appointments with providers seen in the hospital for continuity and patient comfort. Kripalani et al. (2014), found that the interventions that were used most in systematic reviews was the patient teaching, discharge planning, post-discharge phone calls, individually designed discharge instructions, and personal coaches that contacted the patient while at the hospital and after returning home. These interventions worked for people who were able to be discharged to home without the need for home health, but patients unable to leave their residence without significant effort, needed more detailed teaching and monitoring. Balaban et al. (2015) and Krishnan et al. (2015) focused on the use of nurse navigators, nurses who focused on the patient after discharge having made regular phone contact with the patient to ascertain if medications were being taken as prescribed, changes in the physical or mental state, and activity levels. This method resulted in little change in the number of readmissions within 30 days as reported by Balaban et al. (2015) and Krishnan et al. (2015). It is evident that the contact and follow up is needed but not always successful in reducing readmissions.

Telehealth efforts in the United States have been varied. Video conferencing for virtual visits with the primary provider have been utilized with some success, but in the elderly population, the technological aptitude required for these visits may not be present. Sorknaes et al. (2013) studied the effect of daily teleconferences between pulmonary

nurses and patients for one-week post discharge and followed the control and intervention groups and found little difference between the two populations. A drawback with the virtual visit was the loss of personal connection with the provider, which may have increased the isolation homebound COPD patient's experience. Remote monitoring of COPD patients has been trialed in multiple regions, and while some studies reported little or no change in readmissions, other studies supported the use of monitoring technology. One successful attempt was a small-scale study by Ding, Karunanithi, Kanagasingham, Vignarajan, and Moodley, (2014), that used smart-phone monitoring of COPD patients where symptoms were entered into a phone application and transmitted to a facility where the data was monitored and changes that signaled an onset of exacerbation were relayed to a physician for medical interventions. Ho et al. (2016) reported that their study using telehealth technology for remote COPD patient monitoring was successful in reducing the incidence of rehospitalizations. On the other side, Hernandez et al. (2014) report that efficacy of telehealth in preventing hospitalizations from exacerbations is unclear. Most telehealth intervention studies have focused on the recognition of exacerbation symptoms, but do not address the issue of 30-day readmissions. Most studies have not addressed the use of a medication 'rescue packs' that the patient would be ordered to initiate when signs of exacerbation appeared. This approach has been used in the United Kingdom, where patients were instructed to self-assess themselves and start the medication when they determined their condition warranted it. There was no literature found in searches to determine the extent to which this method has been applied or successes. A concern regarding antibiotic stewardship came to mind when reading

what information was available. This led to the decision to set parameters before the rescue pack was initiated in the project.

COPD exacerbations can irreparably harm the patients' lung function, cost the home health agency funds from Medicare, and cost thousands of dollars for care that could have been avoided with better patient monitoring (Al Rajeh, & Hurst, 2016). These exacerbations and resulting admission to the hospital was due, in part, to a lack of patient monitoring which was the gap in practice that this project addressed. A result of exacerbations that required hospital admission was a functional decline in respiratory status that was never recovered, and in turn made the patient more likely to experience exacerbations that increased in frequency (Qureshi et al. 2014). The use of telehealth equipment has expanded applications in home health care, and the potential benefit has been recognized for COPD patients. Nurses continuing to educate the patient, promoting exercise, diet, and self-assessment in conjunction with telehealth monitoring has provided a safety net of sorts, where if the patient missed the signs, the nurse could intervene and potentially avoid exacerbation events.

Patient self-management has been necessary to avoid hospital 30-day post-discharge readmissions, but self-management alone is not able to achieve significant results. Reduction has been accomplished through cooperative ventures where home health care staff remotely monitored patients' vital signs, combined with patient education on early detection and response to imminent flares have demonstrated encouraging results. Many times, patients were not trained on how or what they needed to self-monitor and as a result waited too long to respond when an exacerbation starts

before reaching out for treatment (Al Rajeh, & Hurst, 2016). Home health nurses are involved with patient's lifestyle, disease, health literacy, and personal commitment to the plan of care. The cause of many of the of 30-day readmissions of COPD patients was found in the unfortunate fact that when patients are discharged to home health care, it is highly unlikely that they remembered much of the information provided regarding their disease management needs during the discharge process (Fletcher & Dahl, 2013).

Telehealth is a tool that can help patients to better monitor their disease with the home health agency as a safety net of sorts and help prevent hospital readmissions.

Local Background and Context

COPD readmissions within 30 days post discharge have been a problem in every state. The threat of penalties has been a concern of administrators of hospitals, skilled nursing facilities and home health agencies. In 2015, Illinois ranked eighth in the nation for average penalties, behind Kentucky, Virginia, West Virginia, Arkansas, Washington, D.C., New York and New Jersey (Rau, 2015). Roughly one quarter of Medicare recipients discharged from the hospital are readmitted within 30 days, costing \$25 to 45 billion, a hefty sum that is largely unnecessary (Zuckerman, Sheingold, Orav, Reuht, & Epstein, 2016). For senior citizens, hospital readmittance can be traumatizing, and in many cases, is avoidable. Up to 75% of Medicare hospital readmissions (4.4 million patients) may be avoidable, with a potential savings around \$12 billion in annual Medicare spending (Zuckerman et al. 2016).

Across Illinois in 2015, 113 hospitals, or 62%, received reduced payments due to readmission within 30 days, and was assessed on all Medicare patients, readmitted or not,

with an average cut of 0.72% in Medicare reimbursements, a penalty that has reached millions of dollars (Rau, 2015). For 2016, CMS national total 30-day readmission penalties amounted to approximately \$420M, down slightly from \$428M in 2015 (Rau, 2016). The 30-day readmission data was calculated based on the previous three fiscal years of data preceding the year completed, which provided more precise estimates of hospital readmissions and reliable identification of variation in performance. This meant that for 2015, the data was accumulated from 2011-2014, and the data was reported for 2015. When looking at All Patient Refined Diagnosis Related Groups (APR DRG) figures for the state of Illinois, COPD was one of the top 5 causes of 30-day readmissions (State of Illinois, Department of Healthcare and Family Services [DHFS], 2014). Diagnosis Related Groups (DRGs), are used by Medicare to measure the typical resource use of an inpatient stay. The APR (All Patient Refined) DRG is a classification system that aligned patients by their reason for admission, severity of illness and risk of mortality (DHFS, 2014). This project targeted the issue of continued levels of hospital readmissions, particularly those for COPD.

The HRRP has forced facilities and institutions to focus on readmissions and propelled them to determine ways to reduce 30-day post discharge hospital readmissions. The tactic utilized by CMS was through financial penalties, in the way of incremental increases of Medicare reimbursement deductions. One of the chronic diseases targeted by CMS is COPD, and the facilities targeted included hospitals, skilled nursing and home health agencies. These readmissions have been costly, in finances paid for care, in financial penalties, and in the patient's health. The setting for this project was a multi-

faceted home health care organization located in central Illinois. It is a privately-owned agency licensed by the State of Illinois and accredited by the Joint Commission. This agency serves patients in 31 counties in central and west-central Illinois, and is a significant provider of home health services, nursing, therapy, and wound management. The counties covered are rural and spread out making access to their physicians difficult for appointments. COPD has been a problem in Illinois, with between 6% and 7% of Illinois residents afflicted with COPD (CDC, 2016). The region where the project was conducted was mostly agricultural with a history of coal mining, two occupations with increased incidence of COPD. The Illinois Department of Public Health, [IDPH] 2016), reported that 7.69% of residents in central Illinois have been diagnosed with COPD. The home health agency, as with most agencies, has had constantly changing number of home health care patients who were seen for 60-day episodes, on average carrying a component around 80-110 patients, including many patients with COPD. The patient mix consisted of mostly of Medicare patients, with Medicaid and private insurance making up the remainder, and the occasional private payor patient. This means that CMS was the primary financial factor in the agency's operations.

The project agency has implemented a nationally recognized Disease Management Program (DMP), to try and reduce hospitalizations and emergent care visits for heart failure and diabetes. Working closely with the patient's primary care physician, the nursing staff provides education to the patient and their family and collaborates with consulting specialist physicians. This program saw a decrease in the number of patients with heart failure being readmitted within 30 days after discharge, but COPD

readmissions were remaining where they were prior to this program. This program provided the genesis of the project, attempting to change the status quo, where it was accepted that COPD patients would experience exacerbations, despite the increased attention paid by the home health nurses, and return to the hospital. The project agency has a stated mission to preserve the dignity and independence of the patients through compassionate and collaborative care. The strategic vision of the agency is to become the premier home health agency in the area providing the highest quality of care. The project agency is currently the only home health agency in the area with a CMS STAR rating of 4/5. Their mission aligned with the mission of this project which was to support and monitor COPD patients who received home health care, in a cooperative environment with telehealth technology to manage conditions, detect and react to early changes that indicated exacerbations to prevent unnecessary hospital admissions.

The following terms were relevant to the project and are essential to understanding the doctoral project.

Rescue pack: A prescribed set of medications that consisted of a steroid and antibiotic which are the most common medications used for acute COPD exacerbations.

Project agency: Independent home health agency located in central Illinois, site of project implementation.

Service area: The 31 counties serviced by the project agency Home Health

Telehealth Monitor: Technology that gathered vital signs collected by patient and transmitted them to the agency to agency for review.

Remote Monitoring: The collection of vital signs and physiologic self-assessment data from chronically ill patients and the transmission of that data to a provider in a separate location.

Genesis Touch: Telehealth equipment made by Honeywell International, that consisted of touch screen tablet and blue tooth connected blood pressure cuff and pulse oximeter.

Genesis DM: Telehealth equipment with monitor made by Honeywell International, with yes/no buttons and display with wired connection to blood pressure cuff and pulse oximeter.

Nationwide, about 19.6% of COPD patients hospitalized are readmitted within 30 days, costing \$17 billion in annual expenses. In Illinois, COPD has affected about 6% of the population is reported to have COPD, which ranked in the second highest percentage range for the country (CDC, 2013). Illinois is a state with a heavy agricultural influence with 77% of its land being used for crop farming (Illinois Department of Agriculture, 2014). Illinois has been a state where Medicare has seen multiple problems. Fraud in the home health arena has made Illinois a target for fraud reduction measures such as the CMS Home Health Pre-Claim review, which requires home health agencies to submit their expected claims to CMS prior to care being initiated (Dean, 2017). Illinois hospitals were identified in 2013, as having a significant problem with 30-day readmissions (DHFS, 2014). With CMS data as a national standard, Chicago had the highest readmission rate in the country at 26.7%, which was approximately 40% higher than the national average of 19.3% (DHFS, 2014). In 2015, Illinois ranked eighth in the nation

for average penalties, behind Kentucky, Virginia, West Virginia, Arkansas, Washington, D.C., New York and New Jersey (Rau, 2015). Across Illinois in 2015, 113 hospitals, or 62%, received reduced payments for each Medicare patient, readmitted or not, with an average cut of 0.72% in Medicare reimbursements, a penalty that will reach millions of dollars (Rau, 2015). For 2016, CMS national total readmissions penalties amounted to approximately \$420M, down slightly from \$428M in 2015 (Rau, 2016). The readmission estimated data was calculated on the previous three fiscal years of data preceding the year completed, which provided more precise estimates of hospital readmissions and reliable identification of variations in performance. This meant that for 2015, the data was accumulated from 2011-2014, and then was reported as 2015 data. This project aimed to address the issue of continued levels of hospital readmissions, particularly those for COPD.

Role of the DNP Student

A career as an Advanced Practice Nurse has carried with it an expectation of broader knowledge of needs assessments and application of evidence-based practice methods to advance patient care quality in all nursing settings. This career currently has been in primary care provided to senior citizens in their homes, while collaborating with their primary care provider. This has been provided as a service of the patient's insurance and provided time for practitioners to assess the patient's health, review their health history, and broaden their health literacy and knowledge of their self-management of their health and diseases. Working for an insurance provider has been perceived as working at cross-purposes with physicians, but the purpose of these visit was to identify

gaps in care, address them, and facilitate communications with the primary providers.

The DNP project took place in home health care, that occurred in limited episodic parcels, with patients who were recovering post-hospitalization. The setting was similar as the career, but the career visits were yearly opposed to weekly as was seen in home health. While seeing patients with COPD, educating them on the disease, management strategies, medication use, exercise, diet, and preventing social isolation, the patients seen in day-to-day career do not overlap with the practicum site patients.

My role in the DNP project encompassed multiple positions. The roles assumed by this student included project development, training nurses on the physiologic and self-reported changes that may have signaled impending exacerbation, reviewing vital sign data, evaluating and reporting progress to stakeholders, and oversight as the project progressed. The size and scope of the project required limited personnel to implement the intervention. COPD has touched family, friends, co-workers, and after having seen these struggles, interest had germinated into a desire to help COPD patients and their management of the disease. This interest helped to drive the design and run the project. As a nurse practitioner, COPD has been seen regularly in the elderly population, and suspected undiagnosed cases have been regularly identified and referred to their primary doctor for spirometry testing. The idea for the project originated from a discussion with the mentor, Dr. Kathy Sgro, DNP, MBA, RN, at the first meeting to see if she would act as this student's DNP mentor. Dr. Sgro mentioned that her project for her DNP program was implementing a disease management program for cardiac and diabetes patient that utilized professional collaboration with consulting endocrinologist and cardiologist to

better manage this patient population and prevent rehospitalizations. During the conversation, the topic of COPD and readmissions came up. Subsequent research and communication with Dr. Sgro helped to focus the project to telehealth monitoring and medication rescue pack to reduce readmissions with a secondary goal of promoting patient self-efficacy to manage their disease and prevent exacerbations in the future. My career had no overlap with the patients seen in the home health setting, and outside of practicum experience and this project, I had no further affiliation with the project agency or any of its associated companies. During the practicum, I had very minimal patient contact and regular involvement in the DNP project, mainly setting parameters, reviewing patient vitals retrieved via telehealth, continued evaluation of the project, and collaboration with the nurses who saw the patients.

The motivation for undertaking the project to reduce the incidence of 30-day hospital readmissions for patients discharged to home health was difficult to narrow down to one reason. There has been a school of thought that cardiac diseases have been the most important health care concern, and the impression of many people has been that COPD patients contributed to their condition. This created a stigma where the patient believed that they were to blame. Many elderly patients with COPD had started smoking in their teens, at a time when cigarettes were advertised using doctors extolling the health benefits of smoking and promoting specific brands of cigarettes (White, Oliffe, & Bottorff, 2012). Also, many of these patients were veterans of World War II, Korea, and Vietnam, many of whom had cigarettes provided to them in their meal rations. The U.S. military stopped including cigarettes in the ration kits in 1975 after damage had been

done to innumerable people. It is understandable how this generation started smoking. The desire to bring light to COPD and often-unnecessary hospital readmissions was a part of finding a solution to the readmission problem, saving money that can be used to extend care to underserved and neglected.

The project used a pre-post intervention comparison which eliminated the need to randomly assign patients to control and intervention groups and eliminated selection bias. The only potential selection bias could have come through the exclusion of patients with multiple chronic diseases that might have made them more likely to be readmitted. This bias was eliminated through the process of accepting the patient to home health and the nurse admitting them, regardless of other illness. The nurse ascertained if the patient had been diagnosed with COPD and entered it into the diagnosis portion of the OASIS documentation as either a primary or secondary diagnosis. If COPD was listed for either diagnosis, the patient was automatically tagged as probable participants for the project. There are no other sources of bias encountered.

Role of the Project Team

The team was made up of several people. I was the designer of the project, and I also trained the home health nurses on the enrollment and consent process for patients. I determined the parameters that were used for the COPD patients to determine when the medication rescue pack was initiated. The parameters were determined for each patient individually based on their resting pulse oximetry, heart rate, and combined with the patient's response to three yes or no questions. The medication rescue pack was requested as part of the standing orders from the primary care providers and the choice of

steroid and antibiotic was decided based on patient history of allergy or adverse reaction. The other members of the team included the agency clinical assistant who was responsible during weekdays to review vital signs and the self-assessments and direct the patient to redo vitals and alert nurses to vital signs outside defined parameters. The registered nurses (RNs) who went to the patient's residences to admit the patient, installed the equipment, and taught the patients how to operate the equipment. The primary care providers gave the standing orders for the medication rescue packs. The last member of the team was the DNP mentor Dr. Sgro. Dr. Sgro was instrumental in scheduling nurses who monitored the vital signs daily and arranged for coverage on weekends and holidays.

The project team members included experienced nurses who had prior experience with COPD patients in their homes and have experienced the dismay when these patients repeatedly were readmitted to the hospital. The project provided information that included the evidence backing the project along with definition of their role in the project at a staff meeting, the only time when all the staff were present at the agency office. The clinical assistant and nurses who were tasked with monitoring the vital sign data were met with separately after the staff meeting to review the process designed for assessing and responding to the vital sign data. The vital sign and self-assessment collection were the daily responsibility of the patient, and the clinical assistant or on-call nurse looked in the patient's chart for the parameters that were determined by the project designer during the admission process. If the vital sign results exceeded the parameters determined, the patient was contacted and asked to retake their vital signs. If the subsequent vital signs

were also outside the parameters, the patient's nurse, or on-call nurse, was contacted by phone or home visit, and provided the patient with directions to start the rescue pack medications that were ordered by the provider on admission. The primary care physicians were contacted with information about the project after the Walden University Institutional Review Board had given their approval to proceed with the project. There was a wide variety of experience and knowledge in the members of the team and the goal is to use this expertise to the full extent to benefit the patient and contribute to the success of the project.

The team that was assisting in the project implementation was small, but there were areas where the expertise of each person came into play. The primary care physicians were contacted prior to the project implementation, appraising them of the project plan, the medication standing order, the proposed vital sign monitoring and intervention, along with the plan for regular updates on their patient if the rescue pack medications were implemented. This allowed for follow up appointments at the primary providers discretion. The primary doctors were urged to contribute their opinions on the medication used for their patient's rescue pack. The home health nurses were critical during the initial admission process where they ascertained if COPD was a diagnosis and noted it accordingly to initiate placement of the telehealth equipment. It was the expertise of the nurse who gave their input as to the normal oximetry, heart rate and the assessment of the patient's literacy regarding COPD and ways to manage the disease. These nurses applied their experience in the monitoring of the vital sign data and helped the patient to complete the vital sign collection. The CNAs used their experience in

installing telehealth equipment as needed, in the homes of patients with COPD. The CNA's also used their experience in teaching patients how to use the equipment and providing simple, clear instructions that were easy to follow. Dr. Sgro remained an essential part of the team, being there to lend assistance where needed to ensure that resources and support needed from the agency and staff was available.

The team was included in the project design, implementation and evaluation, with nursing staff regularly involved in the project process, while administration was updated at regular intervals that were determined to be done on a weekly basis. The plan that revealed the results of the project to the nurses, CNAs, and the administration of the project agency took place within 30 days after the conclusion of the project. The results were disseminated to the staff and administration at project agency in a staff meeting with printed results available for their perusal. Any feedback, positive and negative was requested to be returned within 14 days after presenting the results. There was no feedback returned. The nurses and CNAs were encouraged to provide feedback on their areas of expertise or requests for clarification on the rest of the project. These team members were asked to provide their insight as to why the project succeeded or not. The physicians were provided the results via email within 30 days post project and requested any feedback within 14 days, no comments were received. Both the nursing staff and administration were asked to evaluate the student on their effectiveness of leadership for the project and if there was proper communication during and after the project. All feedback was positive.

Summary

This project was geared toward improving the percentage of COPD patients readmitted within 30 days after discharge was an ambitious project that took clear vision, a solid theoretical footing, and clear concise definitions of terms utilized for the project to ensure that all team members agreed. In this section the concern with 30-day readmissions was explained and how solid theories and models support the structure of the project. Commonly used terms were defined as was the relevance of the project to nursing practice. The impact COPD has had locally was revealed and the project agency area description of locations where patients were located was described. Lastly the role of the DNP student and the roles of the team members at the project agency were described. The team members all have experience in areas that are beneficial to the success of the project, the key was to make sure that their contributions are included in the planning and execution of the project. In addition to the contributions of the project team, the results of the project will be released to them and ask for their feedback on the project, the methods, the results, and opinions of what could have been done differently, and an evaluation of this writer to analyze areas where improvement can be targeted. In the following section, the gap in practice that was identified was the reduced frequency of monitoring of COPD patients by nurses' which impaired the ability of nurses to detect changes that required treatment or medication adjustment, was associated with methods previously and currently used in attempts to curb the issue. The methods proposed for this project to reduce readmissions of COPD patients during the first 30 days after being admitted to the home health agency included the use of telehealth technology to remotely

monitor COPD patients. The reason for monitoring the patients is twofold. One reason was to identify early physiologic and self-assessed changes that signaled onset of exacerbation, and the second was to initiate the use of a rescue pack of medications to halt progression of an exacerbation event before hospitalization was necessary. The literature that was discussed will be recent reports and studies published within the last 5 years to present the most up-to-date evidence supporting this project.

Section 3: Collection and Analysis of Evidence

Introduction

In this project, I targeted the problem of the elevated rate of 30-day rehospitalization of COPD patients post-discharge to home health care from hospitals. Medical treatment for COPD totaled \$32.1 billion in 2010, and costs are projected to total \$49.0 billion by 2020 (Guarascio et al. 2013). The elderly population has been growing with the aging baby boomer generation and advances in medicine and health care. This increase has been mirrored in the increased numbers of Medicare beneficiaries. Guarascio et al. (2013) reported that in 2010, 51% of Medicare spending was associated with care related to COPD alone. To draw provider and facility attention to the readmittance problem, CMS has made the issue of home health COPD patient rehospitalizations an agency responsibility. For any hospital readmission that occurs within 30 days of a patient with a diagnosis, new or existing, home health agencies have incurred a financial penalty in the form of a reduction in reimbursement by Medicare through the HRRP (McIlvennan et al. 2015). COPD is costly, and exacerbations have added to the overall costs and are a contributor to crowded emergency rooms and a congested health care system.

Concerns with COPD are not focused solely on financial costs, but on the better care for homebound patients. Patients with home health care are receiving this service due to the significant difficulty experienced when leaving their residence for health care appointments. In this study, the problem was that many COPD patients experienced acute exacerbations and returned to the hospital within 30 days. Guerrero et al. (2016)

reported that about 20% of COPD patients were re-hospitalized for acute exacerbation events, while the majority of admits were non-respiratory related. These visits to the emergency room have been a drain on finances, both for emergency room fees, and transportation. These readmissions are also detrimental for the patient and are emotionally taxing for the patient and their families. With each exacerbation-related rehospitalization, lung function declines as the risk of mortality increases (Guerrero et al. 2016). The exacerbations are also related to worsened cardiovascular comorbidities, decreased health status, and negative impacts on activities of daily living.

The purpose of this project was to evaluate if the use of telehealth remote monitoring in conjunction with the initiation of a medication rescue pack could decrease 30-day readmissions. The use of remote monitoring provided the home health nurse with a daily snapshot of the patient's condition, eliminating the uncertainty that comes from seeing a patient once a week while not knowing how they have been doing the other six days. A specific challenge inherent in a patient self-identifying exacerbation lies in the difficulty in identifying the symptoms. Agusti, Calverley, Decramer, Stockley, and Wedzicha (2014), found that increases in symptoms are often disguised as normal fluctuations in COPD disease progress, going unreported until the patient's condition has become severe, prompting hospital visits. These are unnecessary occurrences, most likely avoided by better monitoring and patient education on symptom recognition. Another concern for COPD patients at home is that where there has been poor social or familial support networks, COPD patients tend to have increased reports of exacerbation symptoms (Agusti et al. 2014). Patient training and support after discharge and

promotion of better support systems through reduction of societal stigmas related to COPD are vital for improved outcomes.

In this section, I review the practice question addressed in this project along with the data collection methods I used. I also address the sources of evidence and relate this evidence to the project's purpose. Data sources and types are discussed, relating their relevance to the identified practice problem. I also discuss tools and techniques used in data collection. Further, I describe the methods used to ensure ethical protections of human participants, data storage procedures, gaining and institutional approval for the project. Finally, I discuss the methods and software that I used in the collection, manipulation, and analysis of data for the project.

Practice Focused Question

Hospital readmissions have been pushed to the forefront of home health agencies' consciousness, partly due to the increased diagnosing of COPD, but also through the HRRP. In Illinois, COPD afflicts 6.1% of the population, levels that are greater than any of the neighboring states according to the CDC (2013). Due to its history as an agricultural state, heavy manufacturing presence, and coal mining, Illinois has multiple environmental factors that have contributed to COPD, and combined with smoking, the residents are increasingly being diagnosed with COPD. Hospitals in Illinois have been penalized for 30-day COPD readmissions by CMS. In 2015, 113 (62%) Illinois hospitals received reduced payments for each Medicare patient, readmitted or not, with an average cut of 0.72% in Medicare reimbursements, a total that was in the millions of dollars range (Rau, 2015). In the project agency patient population, the percentage of patients with

COPD varies, but is usually around 8%, above the average for the state. This project closed the practice gap of the reduced frequency of monitoring of COPD patients, which impairs the ability of the home health nurses to detect changes that require treatment or medication adjustment through the application of telehealth remote monitoring and use of a COPD rescue pack to achieve a decrease in 30-day readmissions for COPD patients. Rehospitalization has unfortunately been a common result of COPD caused by declining lung function over time. Hospital readmittance is not unexpected, but it should never be viewed as normal (Qureshi et al., 2014). COPD is a disease that can be managed, permitting the patient to have more good days instead of being caught in a declining spiral of exacerbation, rehospitalizations, discharges, and exacerbations until they expire. This problem exists due to the inability of health care providers to closely monitor the patients' conditions once discharged to home health care. This gap in practice has been a serious concern, and the medical community is responsible for finding a way to change the current way of managing COPD.

In this project, I asked whether remote monitoring of COPD patients using telehealth technology was effective in identifying early signs of exacerbations and initiating actions that would decrease hospital 30-day readmission rates. Telehealth remote monitoring has been used for anti-coagulant monitoring, heart failure patients, and diabetes management, but has had mixed results for COPD patients. The project question was designed to ask if an individually-designed parameter for each patient will changes that exceed a specified parameter prompted the nurse to start a pre-ordered

medication pack to stop the progression of an exacerbation, which allowed the patient to remain in the home.

The purpose of the project was to evaluate if the use of telehealth remote monitoring with the initiation of a medication rescue pack could decrease 30-day readmissions. When patients have been diagnosed with COPD, they traditionally have been given instructions and sent home to monitor their disease. Many times, the patients grow discouraged and distracted from the diagnosis, and the knowledge that the disease is incurable results in depression. When discharged to home health, the burden remains with the patient to detect symptoms that signal exacerbations. The patient needs support while learning how to manage their condition. In this project, I used telehealth during the home health episode of care to cooperatively monitor the patient's condition while educating them on symptoms of exacerbations. The nurse who was tasked with checking the telehealth patient's vital signs was trained on the project parameters. When the COPD patient vital signs exceeded the parameters designated for the project and had at least two out of three positive self-assessment answers, the clinical assistant who was monitoring the telehealth vital signs called and asked the patient to retake their vital signs. If the readings remained outside the parameters, the assistant called the nurse and informed them of the change. The nurse then instituted the standing order for the rescue pack. The nurse instructed the patient via telephone call to start the steroid and antibiotic immediately and then notified the physician of the change in patient condition. Notification of the physician was a new requirement of the CMS Conditions of Participation that were instituted in 2018.

The remote data collection allowed the home health nurse to keep up to date with the patient's condition. The daily vital signs collected included pulse oximetry, heart rate, and blood pressure—three clinical indicators of exacerbations (Melbye, Al-ani Salwan & Spigit, 2016). The telehealth equipment also had three self-assessment questions for the patient to select a yes or no answer as an effort to determine the patient's view of their condition. The idea was that if the patient's heart rate rose greater than two standard deviations (*SD*) above the individually determined baseline and the pulse oximetry dropped below 92% from baseline or a specially defined value based on patient normal values, unless the patient has a baseline oxygen saturation at or below 92% where a specially defined value would be determined, and the patient answered yes to at least two of the three self-assessment questions, the patient was contacted to redo their vitals and if the vitals still were outside the parameters, the nurse monitoring the values called and initiated the medication rescue pack. The goal of reducing the occurrence of 30-day readmissions post hospital discharge was the predominant factor in my decision to conduct this project.

Operational Definitions

Alert threshold (parameters): The values at which the home health nurse contacted the patient to initiate the rescue pack medications.

Project agency: Independent home health agency located in central Illinois, site of project implementation.

Episode: length of a home health contract, 60 days in duration.

Exacerbation: Acute condition characterized by dyspnea, coughing with increased sputum, color of sputum changed, anxiety, increased heart rate and decreased pulse oximetry

Genesis DM: Telehealth equipment with monitor made by Honeywell International, with yes/no buttons and display with wired connection to blood pressure cuff and pulse oximeter.

Genesis touch: Telehealth equipment made by Honeywell International, consisting of touch screen tablet and blue tooth connected blood pressure cuff and pulse oximeter.

Kinnser: Electronic medical record (EMR) software used by project agency.

Population: Patients with home health with a new or existing diagnosis of COPD, regardless of severity.

Remote monitoring: The collection of vital signs and physiologic self-assessment data from chronically ill patients and the transmission of that data to a provider in a separate location.

Rescue pack: A prescribed set of medications that consisted of a steroid, antibiotic, and instructions for increased use of inhalers.

Self-assessment: Three yes/no questions about how the patient was feeling. The three questions were: Are you feeling anxious today? Are you short of breath today? And are you coughing up more sputum today or has it changed color?

Service area: The 31 counties serviced by Project agency Home Health

Store and Forward: Type of telehealth equipment that allows only one-way communication, where vital sign and self-assessment data are collected and forwarded to the agency and uploaded to the EMR.

Heart rate threshold: Value determined individually for each patient according to recorded resting heart rate history available from hospital discharge records.

Sources of Evidence

This project was founded upon many studies that have been conducted that used telehealth for COPD management, and these studies have been published in peer reviewed journals from around the world. The experiences related in these studies were valuable to this project success. The focus of this project was to address the problem of readmissions that occurred during the first 30 days after being discharged from the hospital. Home health care agencies are facing financial penalties for these readmissions. The data that was collected consisted of the number of patients with any diagnosis of COPD who are readmitted to the hospital within 30 days after being discharged to home health care if they were readmitted within the first 30 days. The project was designed to evaluate telehealth used to reduce the occurrence of readmittance of COPD patients. The preintervention data will be determined by using the Kinnser EMR. The census was searched using COPD as a tag for sorting responses. The date range was restricted to 60 days before the intervention was started. To ensure that all admissions were covered, any time a COPD patient was readmitted to the hospital, the 30-day telehealth monitoring period started anew when discharged back to home health.

The data that needed to be collected had to align with the purpose of the project. The purpose of the project was to determine if telehealth remote monitoring of patient vital signs along with patient self-assessments and use of medication rescue packs when needed would reduce the number of readmissions that occurred in the first 30-days after discharge to home health care. The desired outcome was a decrease in the number of home health patients with a diagnosis of COPD readmitted to the hospital in the 30 days after project implementation. Preintervention data was obtained from the EMR for 60 days prior to initiating the project, which reported the number of readmissions that had occurred within 30 days after any hospital discharge. This data made up the preintervention comparison or control group. The self-assessment data was collected via three yes or no questions which called for patient reflection on their condition compared to the day before. This data supported the decision to institute the medication pack and was collected via the telehealth equipment. The combination of the vital signs and personal reflection was used to evaluate if the project resulted in fewer readmissions.

The proposed project entailed the comparison of 30-day post-discharge hospital readmissions of COPD patients admitted into home health care. The determination of a successful intervention called for a comparison of readmission data before and after the implementation of the intervention. The preintervention data was compiled through review of EMR records for all COPD patients admitted during the 60-day period including preadmitted patients back to home health. The post intervention data was compiled from current patient records and the notification in the electronic records that alerted the home health agency of a patient being admitted to the hospital, thus placing

home health care on a hold until the patient is discharged. These two pieces of information provided the components of the pre-post intervention analysis to determine if there is a reduction of readmissions for COPD patients.

To identify literature that applied to the project search terms such as telehealth, remote patient monitoring, COPD, rehospitalization reduction, rescue medication packs, and home health were used in different configurations in multiple databases to identify applicable literature. MEDLINE, CINAHL, Google Scholar, Cochrane Collection and PubMed databases were searched using the terms telehealth, remote monitoring, COPD, exacerbations, and rehospitalization, with a date range from 2013 to 2017 ensured the most recent literature with 1239 results. The search was further refined using the keywords: telemedicine, telehealth, COPD, home health, remote monitoring, COPD exacerbation detection, and reducing rehospitalizations. These results were pared down and individually considered for applicability. Of those articles, fifteen studies directly addressed the project, all these studies are level III, II, or I and are considered high quality evidence. These articles guided the development of the project proposal.

Sources of evidence were selected from peer reviewed literature, best practice protocols and guides, and as well as from telehealth professional journals. Professional organizations that dealt with COPD were also used for research and literature review to support or oppose the basis of this project. Some of the professional organizations identified included; The U.S. COPD Coalition, The COPD Foundation, American Association of Respiratory Care, American College of Chest Physicians (ACCP), American Thoracic Association, American Thoracic Society, Area Agencies on Aging,

The Centers for Disease Control and Prevention (CDC), COPD Alert, and Global Initiative for Chronic Obstructed Pulmonary Disease (GOLD). The Veteran's Administration research has been useful for developing protocols for chronic diseases seen in veterans were included in the sources of evidence. European professional organizations were included due to the advanced and widespread use of telehealth in Europe. These organizations included the European Lung Foundation, European Respiratory Society, and The British Lung Foundation. There are multiple journal articles that discussed the use of different parts of the proposed DNP project. There has been little or no current (within the past 5 years) material where more than one part of the project has been studied, and no recent work that amalgamated all the parts of this project together. Using the peer reviewed journals to help form the operating parameters of the vital sign and self-assessment monitoring and the selection of medications that were discussed with the primary care physicians for the rescue packs. The early detection of COPD exacerbations permitted early intervention with the medication rescue pack to halt progression of the exacerbation which avoided readmissions for COPD exacerbation within the first 30 days after being admitted to home health.

There has been a lot of interest in the use of telehealth technology to benefit chronic conditions like COPD. To substantiate this project, a literature review was necessary. This review presented all previous research on a subject and used this knowledge as a base for the project. It was necessary to demonstrate that telehealth technology has been effective in monitoring patients with COPD and cooperatively assessed changes in the patient's condition that reduced the need for rehospitalization

within 30 days. All literature was peer reviewed and were published within the period of 2013 through present.

COPD has been defined as a collection of chronic diseases that has exceeded more than 15.7 million Americans affected and has become the third leading cause of death in the United States (Centers for Disease Control (CDC), 2016). COPD is debilitating and irreversible, meaning that preventing lung function decline through increased monitoring of the patient is of utmost importance. COPD effects more than just lung function, it also results in decreased activity, leading to more sedentary lifestyles, and in turn lead to weight problems, cardiac issues, and exacerbations in conjunction with increased medications, more frequent physician office visits and frequent hospitalizations (Terzikahn, Verhamme, Hofman, Stricker, Brusselle, & Lahousse, 2016). In 2010, the cost of medical treatment for adults with COPD reached \$32.1 billion and has been expected to rise to an estimated \$49.0 billion by 2020 (Guarascio et al. 2013). Medicare has been responsible for paying 51% of the cost, in 2010 (Guarascio et al. 2013).

The project was concerned with reducing the number of 30-day readmissions from home health for COPD patients. The result of these readmissions has been realized in financial penalties from CMS through the CMS Hospital Readmission Reduction Program. Home health agencies that have had high, 30-day unplanned readmission rates for COPD exacerbation have been receiving reduced reimbursement for the treatment of Medicare recipients as a penalty. Key to improving quality of care for patients with

COPD, and avoiding financial penalties is to better manage the care of these patients with telehealth.

In the review of the literature for this project, there were four areas of focus that needed to be supported by research to address the gap in practice identified. These concepts were the keys to assessing if the use of telehealth remote monitoring would reduce the incidence of 30-day hospital readmissions from home health care. The three foci included the use of telehealth to monitor chronic disease, specifically COPD, the use of vital signs and self-assessments to identify early signs of exacerbation, and the use of the medication rescue packs to prevent exacerbation events that caused deterioration of conditions which resulted in readmissions.

The first area of focus was if telehealth remote monitoring was beneficial in the monitoring of COPD. There are numerous studies that used telehealth for monitoring COPD, and the literature utilized was the use of remote store-and-forward technology where the data has been collected and relayed to a provider for review. The use of this equipment has been supported by healthcare because of the difficulties that some COPD patients encountered when attempting to make regular appointments with their providers. The literature that addressed the monitoring of COPD is supported, by the research as reported in the systematic reviews by Mclean et al. (2013) and Hernandez et al. (2014). The cooperative nature of the monitoring by professionals and the patient demonstrated better control of the disease. Another potential benefit revealed in literature was the effect of telehealth technology on nursing practice and was related to time management for nurses and nurse practitioners alike. The technology allowed for nurse multi-tasking,

monitoring one patient daily while completing other patient visits (Taylor et al. 2015). Telehealth has been cost effective and convenient, if patient vital signs are not received at the home health agency by midmorning, an automated call goes out to the patient to remind them, no nurse visit to check needed. Nursing specialties are adapted to telehealth permitting more complete nursing care with minimal interruption for the patient and better efficiency for the nurse (Taylor et al. 2015). Multiple benefits to remote home monitoring are being realized as more applications of the technology are implemented. The use of wearable store and forward technology that assessed the patient's activity level and pulse oximetry to identify exacerbation events has been trialed with mixed success (Tabak, Brusse-Keizer, van der Valk, Hermens, and Vollenbroek-Hutten, 2014). There are numerous studies that supported the applications of telehealth for chronic diseases, especially since the bulk of management of these conditions has become the responsibility of the patient who may not have a high level of health literacy. Patients who have been unsure how to manage their disease, as with COPD, may have also encountered difficulty getting to physician appointments, so communication with patients or remotely monitored patients benefit (Hernandez et al. 2014). In cases where the patient forgets to complete their vital sign collection, some systems used algorithms so that a patient would receive computer generated or telephony prompts to remind them to take their vital signs and continued participation in their care (Hernandez et al. 2014). Beyond patient safety, nurses can be more efficient with telehealth monitoring of conditions and relaying changes that need to be addressed to the provider via phone, fax, or electronically transmitted message (Ambrosino, Vagheggini, Mazzoleni, and Vitacca,

2016). Literature has shown that the gap in patient care identified was that less nurse oversight often ended with unnecessary hospital stays and have been factors in increased morbidity (Taylor, Coates, Brewster, Mountain, Wessels, & Hawley, 2015). This was where telehealth had a positive social impact by reducing disparities in care available in remote regions where access to providers has traditionally been low. The literature has not altogether been positive when looking at telehealth technology.

With the support of technology, telehealth has become a promising tool for disease management, but the anticipated positive results must be tempered with the possibility of difficulties. Cruz, Brooks, and Marques (2014) cautioned that monitoring improved disease control when the technology was user friendly and had customized parameters for each patient. This called for individualized care plans which have been one of the hallmarks of modern health care. On the negative side, the use of telehealth has not been an automatic positive tool in the efforts to manage COPD. Brunton, Bower, and Sanders (2015) revealed that the results were often mixed, and the expectations of the provider must be tempered with restraint. While many COPD patients have accepted of the technology, as revealed in the Mclean et al. (2013) and Hernandez et al. (2014) reviews, the actual embracing of technology may have been less than desired.

The second focus of the literature review was the application of vital signs and patient completed self-assessments to help identify early onset of COPD exacerbations that often resulted in hospitalization. Exacerbations may not always have been recognized in early stages which would have allowed the patient's condition to deteriorate to the point of needing hospital admission. Medicare data on patients who

had COPD revealed that 23% have experienced an exacerbation that resulted in hospital readmission within 30 days after discharge (CDC, 2016). The desire to identify exacerbations has been a key component in telehealth use for COPD. This goal was one of the hardest to accomplish due to the difference in presentation of symptoms. One of the issues that has caused rehospitalizations has been the inconsistent early detection of COPD exacerbations due to the vagaries of human perception of their condition. Telehealth technology used in remote monitoring along with the self-assessments has shown promise for detecting events that cause exacerbation.

Exacerbations have been costly to all involved and have deleterious effects on the patient's respiratory state. The proposed project used the telehealth technology that has been supported by literature to be effective in managing the disease and applied it to detect early signs of decline which have resulted in readmissions. Use of the telehealth remote patient monitoring has been unable to do this alone, it took a cooperative collaboration between the patient and the provider (Al Rajeh and Hurst, 2016), (Mohktar et al. 2015). The monitoring of vital signs has been shown to be predictive of exacerbations through the application of a specially created algorithm or individualized protocols (Shah et al. 2017). The challenge with identifying early exacerbation lies in the vagaries of what symptoms precede an exacerbation. While many patients have let exacerbations progress to a critical point, many have been willing to take care of their exacerbations at home (Williams et al., 2014). This attitude was key in this project's success. Patients could distinguish when their symptoms got bad, but the desire was to detect the start of exacerbations. To accomplish this, the use of patient self-assessments

along with the daily data collection is important. The use of multivariate methods to identify exacerbation symptom had better success than the reliance on a single variant such as vital signs (Shah et al. 2014) (Pedone, Chiurco, Scarlata, & Incalzi, 2013).

The use of self-assessments in determining exacerbations has been utilized in differing formats. Different studies have used various approaches to patient self-assessments, question and answer, diary, verbal report, and yes or no questions with varied levels of success (Mohktar et al. 2015). In some studies, the use of patient answers to questions was the sole determining factor in exacerbations identification due to the individual nature of vital signs and stage of the disease (Sanchez-Morillo, Fernandez-Granero, & Jimenez, 2015). The decision to use telehealth for remote home monitoring as part of my project, there were two indicators found in literature to identify any early decline in patient condition. The first indicator was when a decrease in saturated oxygen in the blood was measured by pulse oximetry and an elevated heart rate was seen in the daily vital signs taken at home by the patient (Mohktar et al. 2015). The second indicator was when patients gave positive answers to at least two of three patient self-assessment questions (Mohktar et al. 2015). The three questions, which were in a yes/no format, asked about anxiety, dyspnea, and change in amount or color of sputum. With early recognition of patient symptomology and medication initiation, patients did not experience continued declines normally experienced in exacerbation. This avoided the usual trip to emergency department and re-admittance for treatment. Some of the early signs of exacerbations have been identified 4.5 ± 2.1 days before onset of the acute

event (Sanchez-Morillo et al.2015). The combination of monitored variables has made the identification of exacerbation events a task that is not insurmountable.

The third focus was the effectiveness of using telehealth technology to prevent 30-day readmissions. The literature that supported the use of telehealth to prevent 30-readmissions had some overlap with the previous focus, recognizing acute exacerbations of COPD. Dransfield et al. (2017), found that with each exacerbation episode requiring hospitalization, lung function was irreparably damaged. There was a definite lack of literature that supported the prevention of 30-day readmissions through telehealth applications, and what studies have been completed were small in scale (Udsen, Heyckendorff, Hejlesen and Ehlers, 2014). For COPD patients, the all cause readmission rate within 30 days was 14% (Stanford et al. 2014). COPD patients readmitted for an acute exacerbation was around 23% in the United States (Tiep, Carlin, Limberg, & McCoy, 2015). The incidence of readmission within 30 days has been complicated by many influences. Some of these issues were that patients may have been discharged early, before an exacerbation had been realized while admitted and discharged into a patient care system that often has been reactive to conditions, not pro-active or centered around monitoring of COPD (Tiep et al. 2015). A large contributor to the readmission problem has been the lack of patient training on monitoring their disease. Cooperative monitoring would educate patients on their condition and made them more aware of the early symptoms that may have signaled an exacerbation. Telehealth has been used as a complimentary tool in the struggle to reduce the use of resources such as occurred when being hospitalized (Esteban, 2016). While usual care has been centered around regularly

scheduled office visits every four to six months, telehealth monitoring has provided a much better picture of the patient in their day-to-day state allowing for better control practices and medication adjustment (Esteban et al. 2016). The method of discharging COPD patients to home health and expect the patient to make regular office visits has failed the patient and resulted in frequent hospital readmissions. A more comprehensive plan needed to be developed to elicit a change in patient's behaviors, enhance physician disease management skills along with application of evidence-based recommendations, and having identified system deficiencies that resulted in readmissions (Gaurav, Vaid, Sexauer, & Kavuru, 2015). Many of these issues could have been be changed through the application of remote monitoring technology.

The final focus for the literature review is the use of medication "Rescue Packs". These packs had a steroid taper and an antibiotic which were prescribed upon admission to home health and having been a standing order from the physician which instructed the patient to start the pack upon first signs of COPD exacerbation. The literature was scarce on the rescue pack, and most of applications found had been applied in Europe. The use of discharge care bundles for COPD patients has been documented to help reduce the incidence of COPD exacerbation through a collection of instructions for medication use, self-determination of possible exacerbation, and instructions on caring for themselves (Laverty et al. 2015). One of the most promising strategies for managing COPD has combined the use of telehealth and medication rescue packs as was reported by Rzepka-Wrona et al. (2015), which demonstrated that the rescue pack significantly shortened an exacerbation event. The challenge has remained that time lost during the beginning of

the exacerbation phase was due to the uncertainty of if the symptoms were due to an exacerbation or if the patient was having a bad day. The use of the steroid has been a common pharmaceutical tool in the care of COPD and intervening early in possible exacerbations has promised. The high blood glucose that resulted for diabetic patients has been a concern, especially when exacerbations were not addressed immediately, and recovery plans called for steroids taken for 14 days (Leuppi et al. 2013). Leuppi et al. (2013), found that a 5-day course of the same dosage of steroid as the 14-day treatment had the same result with less impact on blood glucose, and would be a good choice for COPD patients being managed at home (Asher & Mounsey, 2014) (Vogelmeier, 2014). While the medication rescue pack was utilized in the United Kingdom and Europe, there has been very little literature. The National Institute for Health and Care Excellence (NICE) in the United Kingdom, a similar body as the Institutes of Health in the United States had defined protocols for COPD patients discharged home with a short course of antibiotics and a corticosteroid for use in an exacerbation (NICE, 2017). The use of medication packs after discharge have been slow to be accepted in the U.S., but there is a clinical practice guideline (CPG) that was updated in 2014 which supports the use of telehealth and the use of medication packs with antibiotics and corticosteroids for use in exacerbations in patients living at home. These four areas of focus have shown that there was enough information to support the use of telehealth to manage COPD and to reduce rehospitalizations by identifying early onset of exacerbations and using a rescue pack to effectively intervene in the early signs and symptoms of acute exacerbations.

Archival and Operational Data

The data collected was the number of COPD patients readmitted to the hospital within 30 days after discharge into home health care to and assessed to determine if said readmissions decreased. The data was collected by the home health nurses that completed the admission/discharge/readmission paperwork reporting to Medicare and regularly scheduled patient care visits. This data was entered into the electronic record and it was easily searched for hospital readmissions. The preintervention data was gathered from the Kinnser EMR used by the project agency. The EMR permitted searches of current and past patients and returned data on the diagnosis, date of the start of care, readmissions to hospitals, and return to home health. The quality measure identified was 30-day hospital readmissions for COPD. The comparison of the readmission data was the determining factor of a successful project.

The defined practice problem was the rate of 30-day post-discharge readmission to the hospital of COPD patients from the home health agency was assessed 60 days before and after project implementation. The data collected to assess if telehealth monitoring would reduce the number of patients who experienced a deterioration of their condition that resulted in readmission to the hospital within the first 30 days. The plan was to determine if the percentage of COPD of patients that are readmitted to the hospital within 30 days after implementation of the project is less than the preintervention percentage. This was the factor used to assess the success or failure of the project.

For this project, the data that was collected routinely relating to the regular discharges and readmissions of patients within 30-days after starting with home health

was one of the data points collected per CMS requirements. The readmission data collected by the project agency was valid because admissions to home health and hospital readmissions are quality measures that are regularly assessed by Medicare and health care quality organizations. The dates of admission and hospitalization were definite points stored with little chance of error. A limitation anticipated with this data was if the reason for readmission might have been missing. This information would have been included in the readmission paper work from the hospital discharge planner upon return to home health. The readmission orders were scanned into the EMR and are available on demand through the Kinnser EMR. This missing data would have been reconciled at the time of readmission to home health. Validity was not questioned since this data was collected without any bias by the agency and was as accurate as can be expected due to the rigorous standards set by CMS for quality data. There were few limitations and produced information that supported the use of the technology.

The data that was accessed for the preintervention data was stored in the EMR package and is controlled by the administration of the project agency. The preintervention data was collected from the from the EMR, Kinnser, which was used by the project agency. The software package consisted of an electronic record of nurse and therapy notes, messaging and email platform for written communications between nurses, therapists, nurse assistants, and home care companions. The EMR also included the admission, discharge, and quality reports such as the Medicare Outcome and Assessment Information Set (OASIS) forms that are mandated to be completed at every admission and discharge, and at the end of each care episode or return to hospital. The

preintervention data was collected from mining the Kinnser EMR. The mining was conducted by creating a search for all patients with an active diagnosis of COPD who were currently clients of or were admitted to the project agency within the 60 days prior to the project start. The individual patients were then reviewed to verify inclusion criteria. The admission and discharge data were part of the agency quality reporting to OASIS and CMS Certification and Survey Provider Enhanced Reports (CASPER) and was used for independent verification of preintervention data, by searching the 30-day readmission reporting under respiratory disorders, specifically, COPD. The OASIS, Kinnser, and CASPER data was key to the analysis of the success of the project due to the high-quality data collected on readmissions. The admission and discharge data are property of project agency and had already given their permission for use of the historical and collected data in the project. Other data which included vital signs, and self-assessments, was collected via the patient participation daily to support the project.

The goal of this quality improvement project was to determine if the intervention successfully reduced the occurrence of 30-day hospital readmissions. The data that was generated during the project included readmissions, vital signs and answers to the self-assessment questions collected specifically for this project. The self-assessment questions were used to determine if there was a possible exacerbation event starting. When a decrease in oxygen saturation and heart rate rises and positive answers were selected in the self-assessments occurred simultaneously, it triggered the nurse to institute a standing order for the patient to start the rescue medication pack and to notify the physician that there had been a change in the patient's status. Patient vital signs were

collected by the patient and was transmitted to the Project agency for retention in the EMR. Self-assessment questions were subjective, the patient was asked to reflect on their condition from the time of the last self-assessment was completed, ideally, 24 hours prior. These two data sets collected via the telehealth technology with the cooperation of the patients provided the answer to the project question.

Participants

Protection of the participants in this project was of the utmost importance. This protection was ensured through the review process with the Walden University Institutional Review Board (IRB). The Walden IRB approved the project, assigning IRB approval number 04-18-18-0399387. Following the IRB approval, the project agency formally approved the initiation of the project. The facility administration had been appraised throughout the process from problem identification, to the project premise, and during the proposal phase. The facility administration was very supportive of the project. The participants were any home health patient with any diagnosis of COPD, new or existing, regardless of the stage of the disease. The gender distribution was random and associated with the number of COPD patients that were admitted to the project agency during the duration of the intervention data collection. The participants of the project were Medicare aged, as were the preintervention patients identified, which provided a better comparison to the preintervention data from Kinnser and CMS CASPER reports. All home health agency patients who had a COPD diagnosis were considered as potential participants in the project upon admission, or readmission to home health, pending patient consent. Consent was obtained by the nurse who conducted

the admit process and was trained on the project. The nurses were provided a script about the project and the consent form had contact information for contacting me for questions. Since exacerbations can happen at any stage, there was not a distinction between patients and their severity of COPD. The preintervention data retrieved from the EMR was recorded as generic number of readmissions that occurred within 30 days without gender or age identifiers. The maximum time for a patient was included in the project was 30 days after admission. At the end of the 30 days, the patient received the standard care provided by the project agency and the telehealth equipment was removed, cleaned, and reprogrammed for the next COPD patient admitted. This process allowed the maximum number of patients to receive the intervention. The evidence that these participants provided are vital signs and self-assessments that were collected daily by the patient and transmitted via telehealth technology to the project agency for review. This data became the basis for the nurse to make an informed decision based on the project protocol as to if the patient needed to start with the medication rescue pack or not. The result of the project was that there was a decrease in the rehospitalization of these COPD patients when compared to the preintervention

Procedures

The procedure for the project's implementation is quite linear and straight forward. The process started when the discharge planner at the hospital sent a referral to the home health agency that a patient elected to have the project agency provide home health care. This referral was completed within 24 hours of the doctor ordering discharge to home health. The patient was reviewed to see if appropriate for the agency and an

approval or denial decision was made within 48 hours. If the patient was accepted, the clinical assistant looked for any diagnosis of COPD. If the patient was a COPD patient, and email was sent to the project designer/manager. Within 24 hours of email notification, the project manager reviewed the patient's discharge documents and determined appropriate parameters for heart rate and oxygen saturation based on patient history. These parameters were emailed through the EMR to the clinical assistant. Using the email through the EMR made the parameter email a part of the patients record and easily viewed.

Once the patient was discharged to home health, the nurse must visit the patient's home and complete the admitting process within 48 hours. During this initial appointment, the nurse explained the project and asked the patient if they wanted to be a participant in the project, and if they agreed, the patient was asked to sign a consent form. If the patient had any questions, there was contact information about how to reach the project manager who would respond within 4 hours, if not immediately. After having the patient sign two copies of the consent, one copy for their records and one copy was scanned into the electronic chart, the RN installed the telehealth equipment and educated the patient on its use. The nurse also faxed the admitting orders to the primary care provider for signature, including the rescue pack medications, and if the provider had any questions or concerns, the project managers contact information was supplied, if there were no objections, the provider signed, and faxes back the orders.

The telehealth remote monitoring technology was manufactured and marketed by Honeywell International. The Telehealth data logger was either the Honeywell HomMed

Genesis Touch, or Genesis DM systems. The Honeywell HomMed Genesis Touch used a touch screen tablet for the display and interacting with the patient. The equipment instructed the participant when to complete vital sign collection and then asked the participant three self-assessment questions. The Honeywell HomMed Genesis DM uses a base station with a simple display and speaker to instruct patient to hit the start or stop buttons for their vitals and the questions are displayed and/or vocalized and required the patient to select the yes or no button in answer to the questions. The Genesis DM had wired peripherals, which included a blood pressure cuff and pulse oximetry finger sensor, as did the Genesis Touch. Both systems were store and forward technology, meaning the data was collected and then transmitted via cellular networks to the office where the data was downloaded into the EMR where it was able to be reviewed by the staff member assigned to monitor the vitals that day.

After installation, the patient was responsible for completing the vital signs every morning along with the three yes-or-no questions on the tablet or base unit. During the weekday mornings, the clinical assistant, or on weekends and holidays, the on-call nurse, reviewed the vital signs that were transmitted to the agency office. If the vital signs were missing, the patient was contacted via telephone and asked to complete the vital signs and self-assessment. The staff member then reviewed the vital signs and compared the values to the parameters. If the vital signs were outside the parameters, the staff member contacted the patient and asked them to repeat the vital sign collection. The self-assessment was not be asked to be completed a second time for fear of influencing the answers. Once the vital signs were completed again, the staff member reviewed the

values and compared them to the parameters. If the values were within the set limits, the patient continued doing their vital signs daily, but if their vital signs were still outside the parameters, the reviewing staff member notified the nurse for that patient. The nurse then contacted the patient and directed them to start the medication rescue pack. Within eight hours, the nurse contacted the patient again to see how they were feeling. If the patient was felt the same or better, the nurse instructed them to complete their vital signs in the morning as usual, but if the patient was feeling worse, the nurse instructed them to contact their primary doctor or go to the emergency room for assessment. If the patient was admitted into the hospital, the 30-day interval started again from day zero when the participant returned home. The project was designed to reduce hospitalizations within the first 30 days after discharge into home health, so at the close of the 30 days, the nurse discontinued the telehealth and removed it for cleaning and placement in a newly admitted COPD patient.

Most projects used specific tools that have been designed for other studies or may have created their own custom tool specific for the project. In this project, the data collected came from the discharge of patients back to the hospital within 30 days. This is a statistic that was required to be reported to CMS, especially those patients with a diagnosis of COPD. The outcome data was the number of readmissions of COPD patients within the first 30 days after admission to home health care. The data that determined the effectiveness of the remote patient monitoring in their home was through the OASIS quality report that must be completed at admission and discharge and the notation in the EMR. When a COPD patient was identified and started on remote home

monitoring at admission, the OASIS was started at the same time. If a patient returned to the hospital, another OASIS entry was completed. A regular review of the patients included in the project looked for discharge OASIS reports ensured that this data was accurately reported for the project. The data that was reported to CMS is useable just as reported, a total of patients readmitted to the hospital within 30 days. This is the same data that was distributed back to the agency quarterly, so the project agency administration could assess their quality of care compared to similar sized agencies locally and across the country. All included patients had a banner in the EMR when telehealth was started and the date (30 days post admission), when remote monitoring was to be discontinued. All participating COPD patients were recorded in a spreadsheet, sans identifying information, to maintain an accurate list of active participants and their status and will be used for demographic data. This information was updated three times a week through the data mining capability of the EMR where COPD patients were identified, and readmissions and discharges were reported. The project designer and coordinator checked this information and received emails from the scheduler for admit visits for any COPD patients scheduled to begin home health. The validity of the admission and discharge data was high due to the penalties that were levied on home health agencies for poor reporting practices to CMS.

Protections

In any project where live subjects were involved, the protection of the participants was the top priority. To ensure the project was safe and ethical, the project must be submitted to the Walden University Institutional Review Board (IRB). The Walden

Institutional Review Board (IRB) was asked for their review and approval prior to the recruitment and initiation of the intervention. The IRB ensured that the personal rights of the participants were protected. The process for recruiting participants and informed consent was scrutinized as was the project process. Ethically, the use of a pre-post intervention type project avoided any ethical concerns regarding placing one group with an intervention versus another group that did not receive the intervention. The home health admission process for project agency already has included a statement of using telehealth equipment for monitoring patient vital signs as determined by project agency nurses. The patients already agreed to the use of remote monitoring at time of admission whether the equipment was used or not. Patients were informed of the project at the time of admission and were given the option to participate or not and consent for inclusion in the project was obtained during that initial visit. Evidence from the project agency staff and patient satisfaction results from heart failure patients has shown strong support and enthusiastic participation in the telehealth monitoring. The patient satisfaction was because of the perception of not being alone with the disease, that they were being checked on through their vital signs, as shown by a decrease in readmissions and steady high ratings by patients and families. The same attitude was anticipated from COPD patients. The spreadsheet that was utilized to maintain a record of the admissions/readmissions, and discharges used a unique two letter identifier to follow the patient but was unknown to anyone outside the project designer. Patients admitted into home health signed a consent to the use of telehealth if the agency deemed it necessary, so in discussion with the administration at the agency the determination was to include

information about the project for the COPD patients that was discussed with the patient and family at admission. The consent copy was signed by participant and nurse, with one copy left with the participant and the other was kept in the project agency office and scanned into the EMR (Appendix A). With consent granted by the patient for inclusion into the project, a unique identifier was assigned to that patient for the first 30 days until the project was completed.

One of the most important strategies in a quality improvement project was recruiting and engaging the population to participate. All participation was voluntary and without incentives or enticements. The patients recruited for the project were met with face-to-face by the nurses who during the admit process. Participants were clients of project agency with a COPD diagnosis. The patients were discharged from local hospitals into the home health system. The agency nurses formed relationships with the patients through their regular nursing care visits. The nurses were responsible for the installation of the equipment and trained the patient and family members on the use of the telehealth equipment and the schedule for completing the vitals collection and self-assessment. There was a nurse or clinical assistant who was tasked with monitoring the vital signs in the office every day and if the patient had forgotten to complete the task, a phone call was placed to remind them. The staff member that was responsible for programming the equipment at the office had the equipment ready to be installed before the admission visit so the vital signs and self-assessments were collected immediately. The first data points collected were done at the end of the installation equipment and training of the patient. The patient did one set of vitals and self-assessments while the

nurse was there to ensure that the participant understood how to complete the task. The equipment was then removed at or immediately after the first 30 days had passed and the equipment returned to the office, cleaned and reprogrammed for the next admitted participant. Personal involvement of the project designer/manager with patients was not a factor.

Participants were protected through a process to hide their identity and ensure ethical practices were followed. The patient consent was included in the admission paperwork that was filled out within 48 hours after discharge into home health. The nurses reviewed the admission paperwork and reviewed the project with those patients with a diagnosis of COPD and their family. The patient signed a consent to treatment and a consent to the remote monitoring. The readmission data was stored to be retained in the Project agency archive data for eleven years before being deleted, as per joint commission standards for home health. The data collected from the patient via telehealth was uploaded into the Kinnser EMR used at Project agency. The patient vital signs collected in the project for determining the need for medication rescue pack were protected in the Kinnser EMR. The self-assessment data was uploaded into the EMR as a note for each day where it could be reviewed again and was protected in the secure EMR storage. The Kinnser system uses a secure Cloud storage of agency data which was date stamped and purged at the eleven-year mark. The spreadsheet with the unique identifier was deleted at the end of the project after analysis. Participants who wished to decline the remote monitoring and self-assessment were not included in the project. If there were concerns and the patient wished to discuss them with the project leader, a phone call

would have been arranged or a visit would have been conducted to coincide with a scheduled nurse visit to help the patient understand the project. Patients were free to remove themselves from the project at any time, they only needed to notify the agency, so the equipment can be removed and cleaned in preparation for the next COPD patient. The ethical treatment of the participants was ensured through the Walden University IRB and enrolled in the project without incentives or enticements to the patients to gain their cooperation. Since the design was a pre-post intervention comparison, all participants received equal treatment and there was not a need for randomization. Combined with the strict adherence to the project design, the protection of data and participants was maximized.

The Walden University Institutional Review Board (IRB) was tasked with ensuring that all research associated with Walden University meets the university's ethical standards and protects the rights and welfare of any human subjects. Along with guaranteeing the project meets the university's standards, the IRB ensured that projects met the U.S. federal regulations regarding ethical protection of project participants. Walden IRB approval for use of the collected data as a secondary data analysis was obtained before any project related activity is initiated to ensure that all participants were protected, physically, emotionally, and health data was secured. The project met the IRB's approval prior to initiating the data collection portion of the project. The only other body involved with approval of the project was the administrative section at the home health agency. The approval of the administration of the project agency was granted before project implementation and were very supportive of the project. The

administration asked for and received regular updates of the progress of the proposal process and any changes in the project plan.

Analysis and Synthesis

The Kinnser system was an EMR and agency dashboard system that allowed for easy viewing of patient census, visits, documentation, scheduling, and quality management. The system was web-based, permitting access remotely allowing nurses and therapists to chart from the patient's home and were available to view from the office almost instantaneously. Kinnser was the collection tool that sorted patients by different criteria, in this case COPD patients with telehealth. This sorting feature made sure that all patients with both COPD and telehealth were being viewed at one time eliminating the risk of missing one patient. Analysis of the data was achieved using Microsoft Excel software for descriptive statistics. The analysis of differences between preintervention 30-day rehospitalizations and post intervention readmissions will be accomplished by using comparison of the pre-and postintervention rates of 30-day readmissions.

All evidence collected during the project was acquired according to specific collection and management strategies designed which ensured the accuracy and integrity of the data. These strategies needed to be laid out prior to the beginning of the project. Missing information would be addressed on the day that the data was missing through notification to the patient to remind them to complete vital signs and self-assessment. If the patient refuses or forgot to take their vital signs one day, the participant was called and asked to take their vitals and verbally ask the participant to complete the self-assessment. If there was any concern that an exacerbation was imminent, a nurse would

go by and manually check the patient's vitals, and the rescue pack would be started or referral to the provider would have been given. Outliers are a statistical problem when there is a complex analysis of data, but in this project, the results that were imperative to determine success was the comparison of rates of readmission within the first 30-days after discharge from the hospital before the intervention with the rates of 30-day rehospitalization after implementing the telehealth intervention. Any outliers would have been examined to decide if there was a data entry issue, or another factor that was not anticipated during the planning of the project. Any admissions to the hospital that were not immediately made known to the agency would be investigated by the nurse to determine why and when the patient was admitted, and a note would be placed in the chart and an email would have been sent to the project manager. Any patient who chose to not complete the vital sign collection on a routine basis would have been removed from the project and not included in data reporting.

The analysis of the project question was via descriptive statistics that evaluated the percent difference and basic demographic data which included gender, age, need for supplemental oxygen, and was analyzed using frequency, percent, and mean. For the determination of the success of the project, a percent difference was calculated using Microsoft Excel and represented in tabular format, as an overall result of 30-day readmissions before and after initiating telehealth monitoring and broken down into the demographic categories defined in the descriptive statistic section. The overall percent difference was determined to ascertain the success of the project in the reduction of 30-day readmissions to the hospital.

Summary

In this section, the practice focused question was repeated, a necessary reminder of the specifics of this project. Operational definitions were provided to create a consistent language which ensures that the people involved in the various stages of the project, as well as those who will be reading it are operating with the same information. Sources of evidence were discussed and their tie to the projects purpose was established. Data types are listed and sources for archival, operational, and newly generated data were revealed as were any permissions needed for the use of the data. Participant protection was an important topic that was discussed including a description of the participants anticipated, and protections afforded the participants. The ethical treatment of persons involved in projects must guarantee that the participants were informed before the start of the project and agreed, without coercion or enticement, to be involved in the project and could refuse to participate without any or they could withdraw at any time during the project. The last part of this section discussed the method and tool used to record, analyze, and track data and project progress, and how this data was secured to prevent risk and potential harm to the participant.

In the following section, the gap in practice addressed by this project was reviewed. The findings of the project were reported, as well as limitations and outcomes. The implications of the findings on individuals, populations, communities and organizations were discussed. A discussion of recommended solutions to address the gap-in-practice were reviewed highlighting and protocols, policies, and guidelines that had been applied. The roles and contributions of the DNP project team were discussed

along with any plans to extend the length of the project. Strengths and limitations were assessed and disseminated as well as a self-analysis of the project leader. Lastly, a description of the project completion is revealed and summarized.

Section 4: Findings and Recommendations

Introduction

COPD is one of the leading diseases afflicting home health patients. It is a debilitating disease that is controllable while being incurable. The impetus of this project was the frequent rehospitalization of COPD patients within the first 30 days after being discharged from the hospital into home health care. In central Illinois where I implemented the project, the rate of COPD has been higher than many surrounding states, which translated into higher rates of COPD patients being enrolled in home health. The gap in practice I identified was that reduced frequency of monitoring of COPD patients in home health and lack of understanding or impaired ability of the patient to self-monitor, reduced the nurse's ability to detect changes in condition that required treatment or medication administration. The question I asked in this project was if remote monitoring telehealth technology used for monitoring COPD patients in home health would decrease hospital 30-day readmission rates. The purpose of the project was to reduce 30-day readmissions through telehealth technology, patient self-assessments, and use of medication rescue pack medications when indicated.

One of the most promising ways of managing the COPD disease process is using telehealth technology to cooperatively work with patients to identify normal health status and early signs of exacerbation. The telehealth application used in this project was configured to allow participants to easily complete their own vital sign collections and self-assessment questions. The use of the combination of vital signs and patient self-assessment allowed the home health team to manage patients' COPD while encouraging

their self-efficacy. The combination of vital signs and self-assessments was selected for monitoring patient condition based upon peer reviewed literature.

There are many sources of evidence that contributed to this project, and the documentation compiled helped me define the project design. I obtained evidence used in development and implementation of this project from peer review literature, publications of professional organizations, best practice protocols, and telehealth professionals. Professional organizations that were important to the development of this project included The U.S. COPD Coalition, The COPD Foundation, American Association of Respiratory Care, American College of Chest Physicians, American Thoracic Association, American Thoracic Society, Area Agencies on Aging, The CDC, COPD Alert, and the GOLD collective. I included Veteran's Administration research because of its work in researching and developing protocols for chronic diseases seen in veterans. European professional organizations were identified because of the widespread use of telehealth in Europe for chronic diseases. These organizations included the European Lung Foundation, European Respiratory Society, and The British Lung Foundation. Peer reviewed journals included *The Lancet Respiratory Medicine*, *American Journal of Respiratory and Critical Care Medicine*, *European Respiratory Journal*, *Thorax*, *Chest*, *Journal of Thoracic and Cardiovascular Surgery*, *The Journal of Pulmonary & Respiratory Medicine*, *Annals of the American Thoracic Society*, *Respiratory Research*, *COPD: Journal of Chronic Obstructive Pulmonary Disease*, *Respiratory Medicine*, *Clinics in Chest Medicine*, *Heart & Lung: The Journal of Acute and Critical Care*, *BMC Pulmonary Medicine*, and *Canadian Respiratory Journal*. The

journals listed have been longstanding contributors to health care and have published COPD-related studies that prompted increased research and projects that targeted COPD care, management, and improved quality of care for COPD patients.

I collected project evidence from the patient records in the EMR system used by the project agency. Dates of admission, daily vital signs, self-assessments, nurses' notes, and any readmissions were easily obtained through regular perusal of the EMR. The preintervention data was obtained through data mining the EMR for the 60-day time frame prior to project initiation. Communications with staff, verbal or electronic, were also essential in the collection of data. I conducted a simple comparison of COPD patients admitted in the 60 days prior to the implementation of the project and for patients who agreed to participate in the project during the 60 days after the start date of the project.

In this section, I discuss the project implementation and describe the project design along with the pre- and post-implementation data I used to evaluate the effectiveness of the intervention and implications for caring for COPD patients. In-depth demographic data on the pre- and postintervention groups show the comparison was between mostly equal groups. Strengths and limitations of the project are reviewed, and I offer recommendations for future applications.

Findings and Implications

The purpose of this project was to determine if the use of telehealth remote monitoring of COPD patients in home health would reduce the high rates of readmission within the first 30-days post hospital discharge. With the scrutiny of governmental

agencies coupled with financial penalties on the rise for these readmissions, all facets of health care, home health included, have been turning to technology to curb these readmission rates. In this project, I introduced telehealth remote monitoring of vital signs and added participant self-assessments of their conditions to determine if conditions might be declining, which would result in hospital readmission. If conditions indicated early deterioration or exacerbation, a medication rescue pack was started, and the patient monitored for improvement or continued decline.

When gathering the preintervention data, patients who were admitted into home health at the project agency were only considered if their start-of-care date was within 60 days of the implementation of the project and they had a diagnosis of COPD. The data revealed eight COPD patients who were admitted into home health during this time frame. Of these eight, all were female with a mean age of 80.4 years and a median age of 78. Six (75%) were White, and the remaining two (25%) were Hispanic. There were no African American patients with COPD admitted during this period. Three of the patients (37.5%) were on home oxygen. Two (33.3%) of the White patients were on home oxygen, while one (50%) of the Hispanic patients was on home oxygen (See Table 1).

Table 1

Demographics of Preintervention Patients

Demographics	<i>N</i> (%)	<i>M</i> (<i>SD</i>)	On O ₂ <i>N</i> (%)	On O ₂ <i>M</i> (<i>SD</i>)
Age (in years)	8	80.38(8.73)		
Gender				
Female	8.00(100)	4.00(5.66)	3.00(37.5)	1.50(2.12)

Male	0			
Race				
White	6.00(75.0)	3.00(4.24)	2.00(33.3)	1.00(1.41)
African American	0	0	0	0
Hispanic	2.00(25.0)	1.00(1.41)	1.00(50.0)	0.50(0.71)

During the post intervention period, the agency had 11 COPD patients admitted, of whom two declined to participate. The participants were identified by having any diagnosis of COPD, and upon being admitted into home health, the admitting nurse explained the project, the prospective participant's rights and responsibilities, and offered the chance to participate or decline. The remaining nine patients had an average age of 79.7 years and a median age of 78 years. In the postintervention group, two (22% participants) were male and seven (78%) were female. Seven (78%) of the participants were White, one (11%) was Hispanic, and one (11%) was African American. Of the nine total participants, two (22%) were on home oxygen, both were female and White. (See Table 2).

Table 2

Demographics of Postintervention Patients

Demographics	<i>N</i> (%)	<i>M</i> (<i>SD</i>)	On O ₂ <i>N</i> (%)	On O ₂ <i>M</i> (<i>SD</i>)
Age (in years)	9	78.7(8.85)	2.00(22.2)	1.00(1.41)
Gender				
Female	8.00(89.0)	4.00(5.66)	2.00(22.2)	1.00(1.41)
Male	1.00(11.1)	1.00(1.41)	0	0
Race				
White	7.00(77.8)	3.50(4.95)	2.00(22.2)	1.00(1.41)
African American	1.00(11.1)	0.50(1.71)	0	0
Hispanic	1.00(11.1)	0.50(1.71)	0	0

The preintervention data was obtained through data review and searches of the EMR used at the project agency. I started the searches by looking for all patients admitted between April 1, 2018 and May 30, 2018, 60 days prior to start of project. By using the term COPD as a sort command, I created a list of patients from the EMR. These charts were then manually reviewed to verify appropriateness. The resulting list was then reviewed for readmissions during the first 30 days after discharge. I found that of the eight patients, three (37.5%) were readmitted during the preintervention period; of the three, two (22%) were White and one (11%) was Hispanic.

Inclusion in the project included a diagnosis of COPD, and admission into home health care between June 1 and July 30. As the potential participants were referred to the project agency, I reviewed the charts and created custom parameters for heart rate and pulse oximetry in anticipation of the patient participation. During the admission visit to

the new patient, the nurse explained the project and asked the patient if they would be willing to participate. When the patient agreed to be a part of the project, the nurse had the participant sign a participant consent form; one copy was provided to the participant, and the other was kept on file at the home health agency. The telehealth equipment was installed at that time and the participant was trained on the use of the technology and reviewed the responsibilities and expectations. The post intervention data was obtained through direct monitoring of daily vital signs, self-assessments, chart reviews and conversations with staff at the project agency.

Three patients (33.3%) had vital signs and self-assessment results that were below the predetermined threshold and called for the initiation of the medication rescue pack. The medication rescue pack was initiated for one participant and the result was that they did not need to be readmitted to the hospital. The one participant readmitted to the hospital was readmitted because the primary care physician declined to authorize the order for the medication pack. The provider's concern was based on the participant having recently finishing a second round of antibiotics that were carried over from the prior hospital stay. The physician for third participant who had vital signs and self-assessment data that fell outside the identified parameters refused to authorize the standing order for his patient to receive the rescue pack once the project was initiated even though he had initially supported the project during the planning phase. The participant was instead referred to the primary provider's office for antibiotics and steroids identical to those included in the rescue pack.

The results substantiated the use of telehealth in reducing readmission of COPD home health patients within the first 30-days. The preintervention data from the chart reviews revealed that there were a greater percentage of patients readmitted to the hospital within the first 30 days (38%), when compared to the incidence post implementation at 11%. These results from the project showed that three participants had telehealth reported vital signs and self-assessments that were outside the calculated parameters, of these three, only one participant was readmitted. This is a positive indication that telehealth technology can be a viable tool to identify and reduce hospital readmissions.

There are two significant studies that agree with the results of the project. The first by Pedone et al. (2013), demonstrated that using remote monitoring of COPD patients experienced a lower rate of exacerbations and COPD-related rehospitalizations than those patients who used the standard model of care. The second study by Hamad, Crooks, & Morice, (2016) identified that changes in telehealth parameters occurred in advance of the majority (80%) of COPD readmissions and community acquired exacerbations. The same agreement was not seen in the patient identification of symptoms indicating conditions that might cause readmission were not as accurate.

The medication rescue pack results were less clear. Only one of the three identified participants that needed to initiate the rescue pack, had their provider order the rescue pack. That one participant did start the rescue pack and did not have to be readmitted. While there was one participant readmitted and one was ordered to see their

primary provider where the identical medications were ordered. The impact of the rescue pack medications is difficult to judge.

The project encountered some unanticipated limitations. The most significant was the lack of COPD patients that were discharged from the hospital. The anticipated number of patients was based on previous year numbers, which were around 15 COPD patients at most times through the spring and summer. The project was planned to run for 60 days, the enrollment of patients into the program was originally planned for a 30-day period with data collection planned for 30 days after enrollment. After the first 30 days, there were 2 patients who refused to participate in the project and only one COPD patient agreeing to be a part of the project. The decision was made to extend the enrollment another 30 days and the Walden IRB was contacted and permission to change the project plan was obtained. This change allowed for a total of nine COPD patients being admitted into home health and agreeing to be a part of the project. The preintervention period was also extended from 30 days before project start to 60 days pre-implementation. Another limitation was a primary physician who supported the project through the planning phase, but when it came time for him to authorize the standing order for the medication rescue pack, he refused, citing that he did not want anyone else to treat his patient. His refusal removed one-third of the participants that had vital signs and self-assessments outside the set parameters and rendered this data undeterminable. A third limitation was the staffing changes that occurred at the project agency where a new DON was not as supportive of the project and this attitude influenced the nurses that admitted

the first two COPD patients. These nurses did not adequately explain the project or have a positive attitude about the project and resulted in the first patients to not participate.

The results of the project demonstrated that telehealth could be used effectively to help individuals with COPD who live in rural areas or urban areas where there is reduced access to regular health care, manage their COPD. By having the equipment in their residence, participants become more aware of their day-to-day condition and alert to changes that may signal exacerbation or systemic decline. After the 30-days, when the equipment was removed, the patients were better prepared to monitor their condition. As telehealth continues to be a subject of investigation, isolated communities will become more connected with providers which will enable patients to remain in their homes longer. Health care facilities will see the incidence of readmissions decline, and with that, a reduction in financial penalties. This loss in capital has had negative effects on health care, especially home health. Home health agencies, specifically small, independently owned agencies, run on a tight margin, and financial penalties can result in reduction of staff, causing the remaining nurses to have to pick up the extra patients, decreased staff engagement, and decreased patient satisfaction. In today's health care marketplace, patient satisfaction is placed in a position of utmost importance.

This project had the potential to impact social change through reducing the stigma patients with COPD encounter. These patients often have been viewed as having made poor choices in lifestyle which resulted in the disease. This stigma can result in social isolation. Mental and emotional engagement, such as that which comes from social interaction can help stave off depression and inactivity which can place the patient in a

position for declines in their health. By using telehealth technology, participants were able accept the disease and learn to manage their COPD instead of the disease controlling their lives.

Recommendations

In the analysis of a project, it was important to note recommendations of anything that should be included, changed, eliminated or created for use in future applications. These recommendations make specific notice of actions that need to be taken regarding policy, practice, theory, or subsequent research. There are several recommendations made because of this project that will help in the promotion of telehealth to manage COPD patients. The first recommendation was to increase the availability of telehealth technology for all COPD patients. The project supported the use of telehealth technology for COPD in home health, and those same results should translate over to other health care arenas. The support that telehealth gave the participants was represented in increased patient engagement. The telehealth monitoring also builds patient self-efficacy by making them be active in their disease management. Many COPD patients become socially isolated, but through the support telehealth provided, this isolation was reduced or negated as patients increased in self-management skills. As these skills improved, patient engagement increased and additional education about managing COPD could be provided to benefit the patient and increased communication with health care staff.

Second, participants who used telehealth technology must have a solid end date. This provided the motivation for each participant to get the most education from their interaction with providers and nurses. Also, a definitive end date helps to keep patients

involved in the daily tasks. While the benefits of the project are considered to encourage participation, there is a better chance of participation if participants understand it is for a short period of time. Along with the fixed end date, limiting self-assessment questions to no more than four questions is recommended. In the project, three questions were used, because there was concern that more questions might deter participant consent. Other applications may find that there are benefits to more questions. When designing the project, there was a concern if there were too many tasks, the participants might choose to withdraw from the project or would have to have multiple calls to urge the person to complete the tasks, which could damage the provider patient trust and relationship.

Thirdly, a work group should be formed at the local level where telehealth information and support can be exchanged. Telehealth is not a technology that should be contained and used for a small sub-section of society. Telehealth has the potential to alter the way health care is provided across the socioeconomic and geographic spectrum. Possibly a collective purchasing of equipment can be arranged for discounts in bulk, so that small facilities, such as the project agency could better afford to invest in the technology. While there are telehealth organizations, the amount of support provided vary from being a research clearinghouse to encouraging research. Telehealth resources within an organization must be assessed and deficiencies in training should be corrected to encourage use of the technology. Connecting with telehealth organizations locally or distant should be used for support and information assistance. Using these organizations can connect home health agencies and health care facilities that are interested in implementing telehealth with public funds earmarked for telehealth technology. Some

states are also participating in promoting the use of telehealth to reduce disparities of health care delivery through financial, technical, and legislative assistance. Kvedar, Coye, & Everett, (2014), outline resources that can be used to create, manage, and ensure continuing telehealth programs. With support, even the smallest of agencies can be able to successfully implement telehealth systems to monitor and manage COPD. Making the technology available in poorer or isolated rural areas will open new research and application possibilities. The last recommendation is to have the data retrieval system with an alarm or hot-list where vital signs and self-assessments that are outside the designed parameters are displayed for easy, rapid identification and actions being taken.

Implementation and evaluation procedures are very easy to accomplish. The project was designed along a simple plan of flow where minimal personnel could be responsible for the monitoring of the data in a facility. Comparison of readmissions is easily accomplished through routine record keeping or chart reviews to verify the decrease in readmissions. Financial studies can also demonstrate the effectiveness of telehealth through the reduction of financial penalties and increased patient satisfaction scores. The project demonstrated that telehealth technology is a tool that can assist home health providers to reduce 30-day readmissions by cooperatively following the COPD patient's vital signs and patient's perception of their day-to-day condition to identify early symptoms of decline that may lead to rehospitalization. Telehealth allows home health nurses to extend their care of the COPD patient without having to be at the patient's residence frequently. The use of the medication rescue pack results was positive but unreliable due to the low number of participant's who showed a need for the pack,

but only one of the participant's having had the pack ordered by their provider. The rescue pack is an idea that should be investigated further.

The project team consisted of the student, two project agency nurses, the project agency DON, and the DNP mentor, Dr. Sgro. The DON during the implementation phase was a different DON than was at the agency during the project. The original DON was very supportive and worked alongside the project designer and Dr. Sgro. Just before the start of the project, the former DON left for a new position and the new DON was less enthusiastic of the project. Multiple phone calls and conferences with Dr. Sgro, the DON, and the nurses helped to generate enthusiasm with the project. This change in staff was not something that was anticipated during the planning phase.

Strengths and Limitations

There are strengths to this project and by identifying these traits; it helps to guide future evaluation of telehealth and its applications to COPD patients and the prevention of hospital readmissions. The literature review conducted is the result of extensive searches of multiple databases and was directed towards the essential concepts of the project. This literature review helped to prepare the project methodology including the evaluation of the outcomes. The project used the self-efficacy model which has been applied to many nursing related projects. The project design is a simple pre-post intervention comparison of readmissions of COPD patients within the first 30 days after admission into home health. Fatehi, Smith, Maeder, Wade, & Gray, (2017), report that pre-post implementation studies are highly effective as a model for telehealth projects and are relatively easy to conduct for low cost. While a study may be designed according

to strict guidelines, the results may be ignored if the assessment and evaluation of outcomes is of poor quality. A well-designed project with clear, rigorous evaluation plans will contribute lasting knowledge to telehealth use and future studies.

The limitations of the project are identified to permit others who follow this project to pay closer attention to these issues to avoid duplication. One of the most significant limitations of this project is the size of the participation pool. The post implementation phase only had nine participants out of eleven total COPD admitted patients. Ideally there would be a larger number of participants, and a mixed group of genders and races. Faber, and Fonseca (2014), related that a too small sample size can result in the assumption of a false premise as a true one.

The small size of the home health agency is also a limitation due to the low numbers of patients admitted during the project enrollment period. During the project period, there was a turnover of nurses, including a new Director of Nursing, who did not share the eagerness of the rest of the staff for the project, and her attitude carried over to the nurses and resulted in the first few patients refusing to be participants. The nurses who admitted these first two patients were not fully invested in the project and did not understand the importance of the project until I had a conversation with them. After this conversation, the nurses had 100% of the eligible patients agreed to participate in the project.

A limitation of this project specifically and with telehealth research in general, is identified by Fatehi et al. (2017), that telehealth projects often need to be conducted over long periods of time. For this project, there was only a small amount of time to conduct

the data collection. The use of 60 days to enroll participants was used because the original 30-day period had a lack of COPD patients admitted to the project agency. Future projects should be conducted over longer periods of time.

Another limitation was the original support for the project by a primary provider who then refused to allow any patient under his care to be ordered the medication rescue pack. When coupled with the provider who refused the rescue pack based on recent development, the efficacy was not adequately tested. The rescue pack hold promises for future advances in home COPD management. The barrier is gaining full support from providers to avoid territorial conflicts regarding patient care. As APRNs, garnering respect and trust is needed to advance nursing practice and evidence-based practice.

Summary

The problem of frequent readmissions of COPD patients within the first 30 days after entering home health care is a concern on many levels. Patient care can suffer as well as advancement of the disease, causing decreasing lung function, stress for patient, family, and the health care system, and financial issues related to penalties and decreased patient satisfaction. Post discharge readmissions are a challenge that transcends health care specialties. Therefore, projects that use technology in innovative ways to reduce readmissions is a focus of increasing study. Telehealth technology is one area where the potential is starting to be realized.

Using telehealth for COPD patients is not a new idea, but there has been differing opinions as to the effectiveness. Some literature focus on cost of equipment compared to savings, and when the balance sheets show little net savings for facilities, telehealth is

labeled as a poor option compared to traditional care. Other literature focus on use of telehealth as a replacement for in-office doctor visits with fairly good results. Remote monitoring with telehealth has been tried with varying degrees of success, but there is little documentation of using this technology combined with patient self-assessments and medication rescue packs to prevent readmissions.

This project utilized technology and coupled with participant actions to increase the home health nurse presence in monitoring COPD and daily conditions. Traditionally, the home health nurse sees a patient about once a week, but with telehealth, the nurse can have a daily snapshot of the patient's condition. This daily contact allows the practitioner to view the vital signs and participants perception of their condition regularly and changes are recognized early, and actions set in motion to prevent declines that result in readmission. This project used the Genesis series of telehealth equipment by Honeywell International and the project was designed around the equipment due to the project agency having a supply on hand. Participants were enrolled, trained on equipment during the admission process to the project agency and the intervention would be in place for the next day. When a value exceeded the predetermined parameters, the nurse verified the deviation and if conditions indicated, started the rescue pack where ordered. The telehealth did identify three patients with early declines, one was readmitted, one was started on the rescue pack, and one was referred to their primary provider who ordered the same medications as the rescue pack. The project positively demonstrated that the telehealth monitoring was successful in identifying declines and reducing readmissions when compared to the same timeframe before the project was implemented.

There were limitations noted with this project. The small participant pool, and the size of the project agency were two that had an impact on the project. The duration of the project is seen as a limitation because of the enrollment period being only 60 days. If the project were extended to cover six or eight months, the population would have been significantly larger. Traditionally, COPD admissions are slightly higher during the colder months, so timing during the year may have also aided the sample size. It is important to remember that the project was geared to reduce only 30-day readmissions, so every participant was followed for 30 days. The limitation comes from the project running being implemented for two 30-day segments.

The project was a success in reducing the readmissions to the hospital after discharge. The use of the medication rescue pack is an area for future study. The idea is promising but needs more application and support to be effective. Telehealth has the potential to change health care delivery in the United States. It depends on the willingness of the health care community to accept change and embrace telehealth technology. The result will be better quality of patient care, reduction of health care disparities, and higher satisfaction of patients and practitioners.

Section 5: Dissemination Plan

Dissemination

In any project or study, the results should be disseminated to ensure the continuing acceptance of innovative methods and change. Only through dissemination of project findings via multiple methods, be it in print, posters, or presentations, can clinical providers and patients be educated and effect social change. In this project, social change resulted by reducing the disparity of care often seen in rural areas where physical and social isolation can interfere with communication with home health personnel.

The plan for dissemination of the results of this project includes presentation at the project agency. Staff nurses and administrators will be invited as well as the local health care lobbyist who has become more interested in the telehealth sector and is active in the legislature in Illinois. I will also invite the providers who had patients with COPD admitted to the project agency. A printed flyer of the results will be presented by the agency and used to educate new staff and physicians who enter into agreements with the agency. My employer is also involved with telehealth and supports furthering the education of the advanced practice nurses in their employ. My employer encourages Doctor of Nursing Practice graduates to participate in a poster session at the annual national summit for the nurse practitioners in the company, a conference exceeding 2400 attendees including physicians and top administrators. Every fall, the Florida Telehealth Conference is held by the Global Partnership for Telehealth (GPT) and the Southeast Regional Telehealth Center. This platform would expose the project to professionals, providers, and people interested in expanding technology to improve health care. With

the vast numbers of elderly with COPD living in Florida, this population could benefit from this project. Last, publication of the project in a peer-reviewed journal, such as *The Journal of Nurse Practitioners* is a path I may explore. The project design and execution could be beneficial for someone looking to expand on the knowledge provided.

Analysis of Self

As an advanced practice nurse, I realize that I am better prepared to apply evidence-based research geared towards improving the quality of patient care regardless of the nursing care area. I am better prepared to identify areas of need, design, initiate, and facilitate future projects in my organization or community because of the knowledge gained from this experience. This process has demonstrated how important reviewing data is to identify areas where patient care can be improved. I understand how research is the foundation of what becomes evidence-based practice nursing. I will be a leader and an advocate for other health care providers promoting the use of research to improve patient outcomes in all areas of practice.

The immersive learning experience I have had at Walden University has increased my clinical knowledge in multiple ways. I am better prepared to apply knowledge gained at Walden to my professional practice and community. I believe that my preparation will make me a leader who will be approached by others in my practice for participation in future projects. A result of developing this project is that I have learned to correctly analyze data to promote the best practice in the clinical environment.

Summary

COPD is a devastating disease that requires cooperative management when the patient is first admitted to home health care. The use of telehealth is being realized as a viable method to help patients manage chronic diseases at home, and home health should recognize the benefits of using remote home monitoring of COPD patients to reduce 30-day hospital readmissions. Further study is needed to contribute to the collective knowledge of telehealth.

As the baby boom population ages, there are going to be increasing numbers of geriatric patients with COPD. As physicians acknowledge the benefits of home health care and telehealth technology, there will be increased demand for evidence-based practice to assist in determining ways to better manage chronic diseases. As the drive to reduce 30-day readmissions continues to gain traction, clinicians will use the EBP documentation to work to better the patient care experience. The combination of telehealth remote monitoring with a medication rescue pack that is directed by physician-approved criteria will permit good stewardship of antibiotics while making them available to the patient when needed. Advance practice RNs with knowledge of and experience with telehealth are poised to create a new model of care where patients and health care providers are cooperatively working towards better management and control of chronic diseases like COPD.

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Appendix A: Self-Assessment Questions

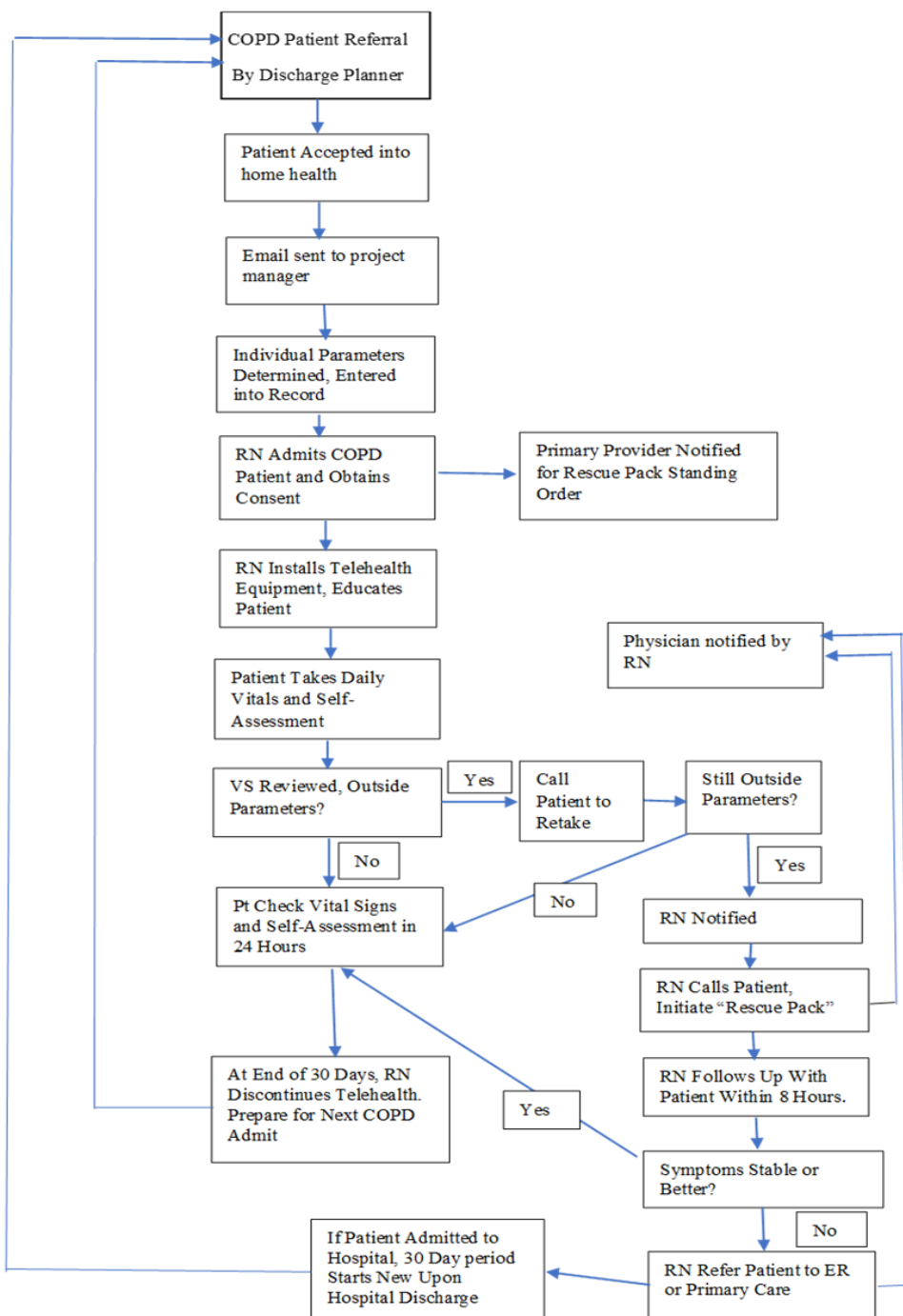
These questions will be answered by participants daily when completing vital sign collection. These questions are programmed into the telehealth monitor and require a yes or no answer.

Are you experiencing more difficulty breathing today compared to a normal day?

Do you have increased sputum, mucus or phlegm?

Do you feel more anxious or upset today?

Appendix B: Project Flow



Appendix C: Project Responsibilities

Task	Responsible Party	Time Frame
Refer COPD Patient to Home Health	Hospital Discharge Planner	Within 24 Hours
Patient Accepted into Home Health	Clinical Assistant	Within 48 Hours
Notify Project Manager of Patient	Clinical Assistant	Within 24 hours after acceptance
Individual Vital Sign Parameters Determined	Project Manager	Within 24 hours after notification
Patient Admitted, Consent for Project Signed	RN	Within 48 Hours after Hospital Discharge
Fax orders for rescue pack to primary provider	RN	Within 48 hours
Telehealth Equipment Installed	RN	Upon Admit and Consent
Patient Educated on Equipment Use	RN	Upon Admit and Consent
Daily Vital Signs and Self-Assessment	Patient	Every Morning
Review Vital Signs and Self-Assessment	Clinical Assistant or On-Call RN	Every Morning
Call Patient to Retake Vitals if Outside Parameters	Clinical Assistant or On-Call RN	Every Morning (If Needed)
Notify RN if Continued Outside Parameters	Clinical Assistant or On-Call RN	If Needed
Call Patient to Start Rescue Pack	RN	If Needed
Notify Physician about change in condition	RN	As Soon As Possible
Check Back with Patient	RN	Within 8 hours
Refer Patient to ED/Primary Care	RN	Upon Check in
Notify physician	RN	As Soon As Possible
Discharge Telehealth Equipment	RN	After 30 Days after Admit to Home Health