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Abstract

Pulmonary arterial hypertension (PAH) is a rare, chronic disease with no cure. Patients with this disease have high mortality and morbidity, experience frequent hospitalizations, readmissions, and psychosocial burdens, and require a high degree of self-care management skills (Doyle-Cox et al., 2016; Lattimer et al., 2016; McDevitt & Walter, 2019). More than half of PAH patients are hospitalized within the first year following diagnosis, and about 20% are readmitted to the hospital within thirty days of discharge (Bhattacharya et al., 2019: Tonelli, 2020). These patients also have a high symptom burden, and these symptoms significantly affect their physical and mental quality of life (Matura et al., 2016). As the disease progresses, so do the symptoms, leading to an increased need for symptom monitoring and management by the patient and the healthcare team.

The Pulmonary Arterial Hypertension Center of Comprehensive Care is an accredited facility that serves approximately 400 PAH patients residing in the gulf south region. Evidence supports a multidisciplinary, multi-pronged, comprehensive care model approach to PAH patients' care as they transition through various settings.

This quality improvement project introduces two telehealth interventions to address the critical care needs of this population. The first intervention was a provider-led postdischarge follow-up virtual visit that occurred one week after hospitalization. The second was scheduled nurse-led telephone calls beginning after hospital discharge. These interventions were designed to reduce hospital readmissions for this population, encourage self-care management, and remove barriers to quality healthcare by combining technology with best practice healthcare.

Keywords: pulmonary hypertension, pulmonary arterial hypertension, telemedicine, hospital readmission, virtual visit, chronic disease, self-care management, transitions of care

Implementation of a Postdischarge Virtual Visit and Nurse Follow-up Protocol to Decrease 30-Day Readmission Rates for Patients with Pulmonary Arterial Hypertension

The purpose of this project was to design a DNP quality improvement to decrease 30-day readmission rates of patients with World Health Organization (WHO) 1 Pulmonary Arterial Hypertension (PAH or PH). This paper describes the patient population and their disease-specific treatments and challenges along the health-illness continuum and offers solutions to some of those challenges. One solution was to implement a one-week post-hospital discharge follow-up virtual visit and scheduled nurse-led telephone calls by the pulmonary hypertension nurse coordinator.

The hospital discharge to include the patient's movement from one setting to the next is called a "transition of care." Transitions of care can be a particularly vulnerable time for patients that can increase the chance of adverse events like hospital readmission within 30-days of discharge (AHRQ, 2018). Studies show that a multi-intervention approach to transitions of care for chronic conditions facilitates safe, efficient movement between settings (Albert et al., 2015; Health Quality Ontario, 2017; McDevitt & Walter, 2019). Early post-hospital discharge follow-up and nurse-led telephone follow-up are two such interventions.

Background and Significance

Pulmonary hypertension (PH) is high blood pressure in the vessels and arteries of the lungs. It is a disease that affects both the heart and the lungs and is progressive, chronic, fatal, and with no cure (Lau et al., 2017). The World Health Organization (WHO) developed five groups based on the presentation of the underlying cause of PH, similar clinical presentation, diagnostic testing, and pathophysiology to assist providers in targeted therapy and management (Galiè et al., 2016).

This project's population focus is patients with WHO group 1 pulmonary hypertension, which affects the small arteries explicitly in the lungs and is called Pulmonary Arterial

Hypertension (PAH). The underlying cause for patients classified as WHO group 1 may be idiopathic, hereditary, drug, and toxin-related or associated with other disorders. (Galiè et al., 2016).

Epidemiology

Pulmonary arterial hypertension is a rare disease with fewer than 200,000 identified cases in the United States (Groft et al., (2019). Researchers have conducted several global registries; however, due to PH's etiological variability and the gaps in research for rare diseases, the information is not robust. The most current epidemiological data estimates an incidence of about 2 to 7.6 adult cases per million and a variable prevalence of 11 to 26 million adult cases each year (Thenappan et al., 2018). PAH affects all ages, races, and genders, though there is a female to male ratio of 4:1 (Thenappan et al., 2018). Over the last two decades, the age at diagnosis has increased from approximately 35 years to an average age of 52 years, and 64% of patients diagnosed with PAH were over 65 (Lau et al., 2017).

Pathophysiology of Pulmonary Arterial Hypertension

The causes and patient demographics of PAH may vary, but the disease's symptoms and progression are similar. In PAH, blood flow meets resistance in the narrowed pulmonary arteries causing it to back up into the heart. This results in right heart strain, decreased cardiac output, and heart failure (Lau et al., 2017). Right heart failure is a common cause of death in patients with PAH; however, early diagnosis and advances in therapy increase these patients' life expectancy. Some may succumb to their underlying disease condition rather than PAH. According to Lau et al. (2017), 27-42% of patients with PAH have associated systemic hypertension, 30-38 % suffer from obesity, 14% have type 2 diabetes mellitus, and 10-12% have ischemic heart disease.

Patients with PAH may present with signs and symptoms that are non-specific and may include clinical findings related to a patient's underlying or associated illness. The most common symptoms are dyspnea, fatigue, chest pain, peripheral edema, near syncope, syncope, and

palpitations (Kingman, 2020).

Diagnosis and Treatment of Pulmonary Arterial Hypertension

Diagnosis is a multi-step process that includes patient history, physical exam, diagnostic testing, and lab findings to determine PH classification. Providers classify the disease's severity, patient's prognosis and make treatment and management decisions using the same diagnostic and therapeutic assessment with functional evaluation (Klinger et al., 2019). Since PAH is a progressive disease, early diagnosis and treatment are crucial and, unfortunately, too often delayed in 85% of patients (Maron & Galiè, 2017). This delay occurs because providers attribute the signs and symptoms to comorbid conditions, other diseases, age-related changes, and deconditioning (Ruben & Hopkins, 2019). According to Mandras et al. (2016), a delay in diagnosis also occurs because of a gap in physician education and patients' lack of access to PAH specialty centers.

Treatment goals are to slow the disease progression, improve functional class, reduce hospitalizations, and enhance life quality (Thenappan et al., 2018). Patients with pulmonary arterial hypertension, particularly those with Functional Class III or IV symptoms, may have frequent hospitalizations (Tonelli, 2020). Fifty-three percent of patients with a new PAH diagnosis experienced at least one hospitalization in the first year. About half of the admissions are due to PAH-related congestive heart failure, indwelling line infections from catheters delivering PAH medication, surgical placement or removal of the infusion line, and escalation of therapy (Tonelli, 2020). Treating and managing patients is as complex as the disease itself and requires assessment and reassessment of disease progression and treatment effectiveness. The European Society of Cardiology ([ESC] 2015) recommends that providers assess patients every 3 to 6 months, within one month of the initiation of therapy, and any time the patient reports worsening symptoms. They also recommend that patients be referred to and treated by a multidisciplinary team at a center specializing in pulmonary hypertension (Galiè et al., 2016).

Burden of Disease

There is a significant physical, emotional, psychosocial, and socioeconomic burden for patients with any chronic illness, their families, and their caregivers (FDA, 2014). Patients with PAH may experience the stress of a rare chronic disease with a poor prognosis. Many PAH patients live with undiagnosed symptoms that become progressively worse and affect their quality of life (Lau et al., 2019). Though positive, advancements in treatments have led to an older PAH population who experience more debility and other chronic health conditions (Lau et al., 2019). Medical management and adherence may also be challenging for patients with PAH and requires a high degree of self-care management ability. In 2014 the US Food and Drug Administration (FDA) interviewed patients with PAH and their caregivers as part of their Patient-Focused Drug Development Initiative (FDA, 2014). Patient concerns centered around: fears of symptoms continuing to worsen over time; dramatic life change post-PAH diagnosis; declining health impacting both the patient and the caregiver; difficult medication decisions – benefits versus drug side effects; and necessity of treatments that are "easy and safe" to manage (FDA, 2014).

Because of the disease's complexity and the poor prognosis after hospitalization, PAH patients' burden can be more pronounced as they transfer from one care setting to the next. Housten et al. (2019) and Lattimer et al. (2016) stress the importance of viewing these patients as high risk for readmissions and requiring multidisciplinary, multi-dimensional, expert, supportive care.

Summary and Next Steps

Patients with PAH face considerable hurdles that affect both their prognosis and quality of life. Physical and socioeconomic barriers, complicated treatment regimens, and inadequate patient and provider knowledge often result in missed follow-up appointments and poor illness management, leading to treatment gaps and unnecessary hospitalizations, and reduced overall quality of life.

Expanding medical research and evidence-based practice are ushering in new treatments and management models for chronic illnesses, including PAH. Patients are living longer, and there is a shift in focus to living better. Patients with PAH must have the ability to maintain, monitor, and manage their disease and thus need a high degree of self-care management and self-efficacy to be successful (Kahraman et al., 2016). Providers need to seek out solutions that help remove barriers and enhance self-efficacy. One approach to address these issues is improving the hospital discharge process by leveraging technology for a postdischarge follow-up virtual visit and close monitoring by the PAH nurse. During this visit, the provider and patient can work towards increased patient self-efficacy and better health outcomes. Nurse-led follow-up calls will reinforce strategies to help the patient manage, monitor, and maintain their health.

Problem Statement

The problem statement for this DNP quality improvement project is that patients at this facility with World Health Organization (WHO) Group 1 pulmonary arterial hypertension (PAH) are at risk for readmission within thirty days of discharge and inadequate self-management skills.

The current practice for patients discharging from the hospital involves the inpatient provider and nurse reviewing education, instructions, conducting medication reconciliation, and answering patient questions. See Appendix B for the current process flowchart. The patient ideally returns for a two-week follow-up visit in the clinic, which is the standard timeframe for a hospital follow-up.

The pulmonary hypertension department identified the following issues with the current process. The inpatient team possesses some knowledge of the PAH disease process and medications; however, time constraints and unfamiliarity with the outpatient, self-care, and symptom management process present a potential barrier to a successful transition from hospital to home or another facility. Another problem is the patient's ability to attend the two-week in-clinic follow-up appointment because of time, cost, or transportation issues. An analysis of 106

of the highest acuity PAH patients demonstrated that 79.5% of them lived more than 25 miles from the clinic. These gaps in care have led to medication errors and avoidable readmissions.

Purpose Statement

The purpose statement for this DNP quality improvement project is to implement a hospital discharge follow-up virtual visit and weekly telephone follow-up by the pulmonary hypertension nurse coordinator for patients with World Health Organization (WHO) Group 1, pulmonary arterial hypertension (PAH) at the identified facility. The virtual visit and the nurse follow-up calls will potentially address gaps in the hospital discharge process and improve the patient's ability to monitor, maintain, and manage their symptoms, thereby decreasing readmission rates. It is also projected to improve patient self-care management and patient engagement. During the virtual visit, the provider will review the patient's medication list, discuss the discharge information received and any unanticipated problems since discharge, answer questions and reinforce self-care management, monitoring, and maintenance skills. The nurse follow-up telephone calls beginning at 1-2 days postdischarge and conducted at weekly intervals for three weeks will build on the provider visit's themes and create continuity of care, defined as quality care delivered over time (Lattimer, 2016).

PICOT Question

In patients with WHO Group 1 Pulmonary Arterial Hypertension on therapy (P), how do a post-hospital discharge virtual visit and scheduled telephone follow-up by the pulmonary hypertension nurse coordinator (I) compared to current practice (C) affect readmission rates (O) within 30 days of patient hospital discharge (T)?

Needs Assessment

Objective

The objective of this needs assessment was to identify and prioritize gaps in care for patients with World Health Organization (WHO) Group 1, pulmonary arterial hypertension (PAH) at this Pulmonary Hypertension Center of Comprehensive Care.

Participants

The participants were two doctors, two PAH nurse coordinators, and the senior clinic manager. All the participants are influencers in the care of patients with PAH, the target population. The physicians both manage and treat patients with PAH. One physician is the Pulmonary Hypertension Department Director, and the other is the Section Head for the Advanced Heart Failure and Heart Transplantation Department, which includes the Pulmonary Hypertension Department. The Section Head leads the five physicians, six advanced practice providers, two hospitalists, and four fellows who may also care for PAH patients in the hospital. The Clinic Manager oversees the entire department and is responsible for project approval and allocation of resources.

Purpose of the Needs Assessment

Approximately 400 patients reside in Louisiana, Arkansas, Mississippi, and Texas who receive care through this pulmonary hypertension program. Patients with PAH comprise a population, both individual and unique. The PAH population has complex, chronic medical issues with challenging treatment regimens, sometimes rapid progression, frequent hospitalizations, and a high mortality rate (Lau et al., 2017). Over five years, 82% of PAH patients visited the emergency department, with 58% admitted to the hospital (Stein et al., 2015). Hospitalized PAH patients have a 20% chance of being readmitted within 30 days of discharge (Bhattacharya et al., 2019). Data on readmission rates for PAH patients at this facility is not available. However, by comparison, the all-cause readmission rate in 2019 was 16.9% and 24.4% for heart failure (HF) (This data is collected and stored by the Medical Informatics Department). Both the all-cause and HF readmission rates are higher than the national average, at 15.6% and 21.9%, respectively (AHRQ, 2019). Medical treatment involves various medications and administration routes, often involving two or more different medicines managed by the patient (Maron & Galiè, 2016). Effective disease management requires monitoring by a

multidisciplinary team, ongoing patient and health team communication-patient, and prioritizing patient self-care management skills (Galiè et al., 2016).

This assessment aimed to identify gaps in care and areas of improvement that, if addressed, may improve disease management and health outcomes for this population.

Data Collection

The needs assessment was conducted at the operations meeting for the PAH department on February 10, 2020. In addition to discussing the goals for the coming year and creating a list of items to address ranked by importance, the participants answered questions about improving health outcomes, safety, and quality of care for our target population. They responded to five open-ended questions about the target population, the current process, process weaknesses and strengths, and potential solutions. See Appendix H for the Needs Assessment Survey.

Results

The team identified the following needs for the PAH patients: clinic access, gaps in the hospital discharge process, readmission rates, and provider and patient education.

Five of five participants ultimately decided that the focus should be on the hospital discharge process and care transitions. Also, three of the five participants believed that more robust disease-specific provider education was important. All felt that process, access, and training impacted hospitalizations and readmissions for these patients. To further support the team's answers, two recent incidents involving medication errors on the discharge medication list led to the need for medical interventions and one readmission in the month before this assessment. Based on these incidents, the team determined that the priority gap to address is the discharge process. There is interest in offering one-week, post-hospital discharge virtual visits to address issues like self-care management, medication adherence, and safety to improve overall health outcomes for the PAH patient population.

Aim and Objectives

This project aims to implement a one-week post-hospital discharge telemedicine visit and scheduled telephone follow-up by the PH nurse coordinator to decrease 30-day

readmission rates with World Health Organization (WHO) Group 1, pulmonary arterial hypertension (PAH) at this facility by March 2021. See Appendix A for the Global Aims Assignment. The primary objectives are:

1. Reduce readmission rates below 20% for study participants
2. Achieve 95% participation in Nurse telephone follow-up call at 1-2 days postdischarge
3. Achieve 95% participation in a scheduled one-week postdischarge virtual visit.
4. Achieve 95% participation in 3 of 3 weekly telephone follow-up calls.
5. Achieve 85% management of fluid status by study participants
6. Achieve 95% adherence to medication regimen by study participants
7. Achieve 0% signs and symptoms of infection or admissions for indwelling central line or subcutaneous site infections

Review of Literature

A review of the literature was completed to determine telemedicine's impact on readmission rates and PAH patients' self-efficacy. A research librarian assisted the initial search. A search of relevant articles between 2015 and 2020 was performed using CINAHL, MEDLINE, Ovid, Science Direct, and Google Scholar. The investigation was limited to articles published in the English Language unless a translation was available. Search terms included telemedicine or telehealth, pulmonary arterial hypertension, heart failure, chronic illness, virtual visit, video conferencing, readmissions, self-efficacy, self-care, and self-care management. There were more than 15,000 results for telemedicine and telehealth alone in the initial search. Combining terms such as telemedicine and pulmonary arterial hypertension yielded less than ten results. However, expanding to include heart failure or chronic illness increased that number to greater than 200. Search criteria utilizing virtual visits or video conferencing with telemedicine and telehealth and readmissions resulted in approximately 50 articles. Using the same rules with heart failure and virtual visits or video conferencing returned fewer than 15 results. Combinations of telehealth

and telemedicine with self-care and self-management yielded about 1500 articles. Approximately 1000 titles resulted when searching for self-care and self-management, and chronic illness. That number decreased to around 900 when the term heart failure replaced chronic disease and became two articles using pulmonary arterial hypertension as a modifier.

The author reviewed titles and abstracts of about 85 publications. Those articles were excluded from this review if the subjects were 18 years of age. The author analyzed 40 reports for salient content related to the project theme, objectives, and solutions.

Pulmonary Arterial Hypertension and Heart Failure

Pulmonary arterial hypertension is a chronic, progressive disease of the small pulmonary arteries that leads to increased vascular resistance, which ultimately progresses to heart failure and death (Yacoub & McCleod, 2018). One retrospective cohort study determined that 64% of PAH patients died of heart failure (Tejwani et al., 2018). Admission for heart failure is a primary reason for hospitalization, extended length of stay, and an indicator of poor prognosis in PAH patients (Chaturvedi et al. (2020), Tejwani et al., 2018. According to Thenappan et al. (2018), hospitalizations have decreased, but the cost and length of stay for a PAH admission have increased.

Both HF and PAH are characterized by clinical deterioration over time, mixed with acute episodes that sometimes result in hospitalization. The relationship between these two diseases, the similarities in progression and symptoms, provides an opportunity to translate evidence from one illness to another.

Heart failure (HF) is also a chronic, progressive disease characterized by the heart's inability to pump blood, but it is vastly more prevalent than PAH. In the U.S., the number has increased from 5.7 million to 6.2 million adults over 20 years of age (CDC, 2020b). The total cost of treating and managing HF patients is approximately 30 billion dollars (CDC, 2020b).

Hospital Discharges and Readmissions

There are 35 million hospital discharges nationally each year, and these patient transitions of care, when done poorly, have been linked to preventable and costly hospital readmissions (Alper et al., 2020). As defined by Medicare, a "hospital readmission" is an unplanned readmission for any cause to any hospital that occurs within 30-days of the initial hospital admission (CMS, 2020).

Readmission rates for hospitals and the quality of patient care have been inextricably linked since the passage of the Affordable Care Act (ACA) in 2010. The ACA was a call to action to healthcare providers and organizations to prioritize the quality of patient care and patient safety, improve health outcomes, lower healthcare costs, and reduce hospital readmissions (Gai & Pachamanova, 2019). In 2012, the CMS rolled out the Hospital Readmissions Reduction Program (HRRP) to improve care delivery quality by enhancing communication and increasing patient and family engagement, particularly in the discharge planning process. As additional motivation for implementing this program, the CMS tied financial risk to the outcomes such that hospitals that fail to reduce readmission rates are penalized (CMS, 2020c). Although reduction of all-cause readmissions remains the goal, CMS designated six conditions to measure for this program: heart failure, chronic obstructive pulmonary disease, pneumonia, acute myocardial infarction, coronary artery bypass graft surgery, and elective primary total hip and or knee arthroplasty. Since the implementation of the HRRP, there has been some reduction in readmission rates, but still, in the fiscal year 2019, 82% of hospitals were penalized for readmissions (Wadhera et al., 2020). The focus, therefore, remains on strategies to prevent hospital readmissions.

Hospitalizations and preventable readmissions drive healthcare costs. The Agency for Healthcare Research and Quality (2019) found this to be true in 2016 when readmission costs outpaced the index hospitalization for two-thirds of the admitting diagnoses. Researchers analyzed the data from 119 VA acute care hospitals and determined that the expected average

savings for avoiding hospital readmissions was $2140 (Carey & Stefos, 2016). They also noted that high-risk illnesses such as acute myocardial infarction, heart failure, and pneumonia carried significantly high readmission costs.

Pulmonary Arterial Hypertension is a rare disease but still contributes to costly admissions and readmissions. According to Bhattacharya et al. (2019), the mean charge for a primary PAH admission was $75,980, and the readmission average was $85,842. A study conducted by Chatterjee et al. (2017) found that the median length of stay (LOS) was five days for the index hospitalization and seven days for the readmission. The average charge for the index admission was $70,083 and $67,917 for the readmission.

But what is preventable readmission versus unavoidable readmission? There are several factors identified as contributory to readmissions, which make defining preventable readmission more difficult. Some readmissions are not avoidable due to the disease's progression, readmissions for comorbid conditions, or other issues unrelated to the index hospitalization. According to Uitvlugt et al. (2020), there is an average of 8.7 factors that affect preventable readmissions, mainly related to care coordination and follow-up. Alper et al. (2020) lists early discharge, insufficient follow-up, medication errors, inadequate discharge education, inadequate support, failed handoffs, post-procedure complications, and nosocomial infections as driving forces for readmissions. Uitvlugt et al. (2020) expanded on medication-related factors by conducting a study on patients' perceptions versus providers on readmission reasons. They concluded that patients identify medication-related factors as the cause of readmission (21% of readmissions and 58% preventable) more than providers (15% readmissions and 23% preventable. According to Albert et al. (2015), contributing to readmissions are "patient characteristics and unmet needs." Patients have psychosocial, sociocultural, and physiological traits that may present challenges to a successful transition from hospital to home or other settings. These characteristics are frequently found in patients with heart failure and chronic

disease, a group of patients that have statistically, had the highest rate of hospital readmissions (Albert et al., 2015; Goldgrab et al., 2019; Jayakody et al., 2020).

Interventions

In 2018, Kash and colleagues conducted a systematic review of interventions and a comparative study that ranked readmission reduction strategies. They selected twelve interventions from ninety articles and assigned a percentage based on the impact on hospital readmissions. The list included collaboration, home visits, telephone follow-up, education, medication reconciliation, discharge planning, follow-up appointment, telemonitoring, rehabilitation, guideline implementation, medical device, and an inpatient hospital management unit. Based on their research, home visits, patient education, telephone follow-up, and discharge planning significantly reduced hospital readmissions (Kash et al., 2020). They also confirmed that collaboration and emphasis on patient accountability factored into lower readmission rates.

Albert et al. (2015) reviewed the literature on postdischarge programs and intervention outcomes for heart failure. They found the most common interventions were patient education, early postdischarge follow-up, self-management, telephone follow-up, weight monitoring, sodium restriction or dietary advice, recommended exercise, medication review, and social and psychological support. All of the programs reviewed used combinations of interventions to optimize discharge transitions and decrease adverse events and preventable readmissions. The research outcomes included readmissions, postdischarge emergency department visits, adherence to follow-up visits, medication adherence, patient satisfaction, self-management skills, patient quality of life, and health perceptions (Albert et al., 2015). The authors' research analysis indicated that case management program models centered around early postdischarge interventions and monitoring decreased early and late hospital readmissions. Programs that used specialty nurses demonstrated better outcomes for heart failure patients.

In recent years, telehealth interventions have enhanced overall patient care and played a significant role in the management of chronic disease management, demonstrating improvement

in mortality, quality of life, patient satisfaction, reducing hospitalizations and readmissions, increasing care access, and decreasing healthcare cost (Almathami et al., 2020; Knox et al., 2017; Totten et al., 2020; Ware et al., 2020).

Telemedicine and Telehealth Overview

Telemedicine and telehealth are often used interchangeably (Tuckson, 2017). Generally, telehealth is an umbrella term for utilizing telecommunication and electronic data exchange systems to deliver healthcare between patients in one location to a healthcare team member in another site (CMS, 2020d). Delivery services include video conferencing, patient portals, telephones, and remote monitoring equipment that store data for later retrieval or transmit patient data in real-time to the healthcare team (CMS, 2020d). Telehealth encompasses a broad category of services that can be performed by any health team member regardless of certification or degree. On the other hand, telemedicine is more narrowly the practice of medicine between a licensed provider and patient over distance (American Academy of Family Physicians (AAFP), 2020).

Based on a survey conducted by the American Hospital Association (AHA), 76% of hospitals utilize some modality of telemedicine, and 62% are using remote patient monitoring (AHA, 2019). According to the American Medical Association (2018), 15% of physicians used telemedicine for diagnosis and treatment, follow-up visits, and chronic illnesses management. Video conferencing, also known as a virtual visit, was the most often used telemedicine modality.

In 2016, the Agency for Healthcare Research and Quality (AHRQ) published the results of an extensive exploration of a collection of systematic reviews to provide a selection of evidence-based research to illuminate the potential impact of a telemedicine healthcare delivery system. They researched over one thousand studies from 2005 through 2015 and evaluated the evidence from 58 systematic reviews that met the inclusion criteria (Totten et al., 2016). The authors sorted the data by clinical focus, disease state, telehealth modality, and function. The

evidence review showed that communication, counseling via telemedicine, and remote patient monitoring consistently demonstrated potential benefits to health quality of life, clinical outcomes, and decreasing hospital admissions (Totten et al., 2016).

Telemedicine, in the four years since the AHRQ review, has continued to expand but slowly. Many agencies, associations, and organizations agree that it can increase access to care, particularly for the most vulnerable, reduce healthcare costs, and improve health outcomes. Tuckson et al. (2017) state that telemedicine may optimize healthcare delivery by positively impacting the "quadruple aim of healthcare," which focuses on improving the health of the population and the patient experience, reducing costs, and increasing provider satisfaction.

The benefits of telemedicine interventions are balanced out by barriers to implementation, like ensuring information security and privacy, insurance coverage, reimbursement, regulations, and licensing (CDC, 2019). There are also patient-specific barriers to consider, such as having access to the internet and technology, the ability to use the technology, and overall willingness to accept telemedicine into their healthcare plan (Tuckson et al., 2017). These barriers and the fact that more research is needed have slowed the pace of widespread adoption of telemedicine (Tuckson et al., 2017). The pace has picked up significantly since the beginning of 2020, however.

Telemedicine in a Pandemic

COVID-19, caused by SARS-CoV-2, became a global and national health crisis in early 2020 and catapulted telemedicine to the frontlines of healthcare delivery. This highly contagious virus necessitates extreme measures to decrease the risk of exposure among the high-risk population, the vulnerable healthcare workers, and the entire healthcare system (CDC, 2020). Currently, there is no cure or vaccine. The best way to avoid contracting the virus is through preventative measures such as wearing a mask, social distancing, frequent hand-washing, cleaning and disinfecting surfaces, and monitoring symptoms (CDC, 2020). Federal and state governments have imposed stay-at-home orders of varying degrees and recommended that all

who can stay home do stay home. Healthcare institutions operating in crisis mode have to help those hospitalized with the virus and those hospitalized with other illnesses while maintaining their health and trying to keep at-risk patients with chronic diseases out of the hospital.

This shift requires a multi-faceted approach to include innovations and accelerating the broadening of existing programs. One of those programs is telemedicine as an alternative to in-person care (Gorodeski et al., 2020).

Federal, State, and Private Insurer Response to the Pandemic

The government has expanded telehealth services to meet the need during the pandemic. They actively encourage healthcare facilities and providers to use telehealth to safely care for patients by encouraging social distancing (CDC, 2020). Per the CDC, changes to the healthcare delivery system are necessary to limit health care staff exposure to the virus, reduce the risk of shortages of personal protective equipment and mitigate the impact of too many patients straining the system. The benefits of using telemedicine presented by the CDC (2020) are listed in Table 1.

Table 1

Centers for Disease Control and Prevention Telehealth Benefits

Benefits
Screen patients for COVID-19 and refer
Provide low-risk urgent care
Access primary care providers and specialists, including mental and behavioral health, for chronic health conditions and medication management
Provide coaching and support for patients managing chronic health conditions,
Participate in outpatient rehabilitation
Monitor clinical signs of certain chronic medical conditions (e.g., blood pressure, blood glucose, other remote assessments)
Utilize case management for patients who have difficulty accessing care
Follow up with patients after hospitalization
Deliver advance care planning and counseling to patients and caregivers to document preferences
Provide non-emergent care to residents in long-term care facilities
Provide education and training for health care providers that are not locally available, particularly in rural areas

Note: This table lists the benefits of telehealth. From "Benefits and Potential Uses of Telehealth" by the Centers for Disease Control and Prevention," 2020, (https://www.cdc.gov/coronavirus/2019-ncov/hcp/telehealth.html)

The Department of Health and Human (HHS) and CMS are instituting regulations and policies to facilitate care delivery through telehealth (HHS, 2020). All health care providers covered by HIPAA may use remote communication technology to deliver services to patients in various settings and domains. These services include ambulatory and ER visits, consults, wellness visits, follow-up visits, home health, and therapy (HHS, 2020). Likewise, patients have greater access to these services, and CMS has relaxed enrollment restrictions for Medicare, Medicaid, and CHIP programs (CMS, 2020d). HHS (2020) also allows providers to reduce the fee for telehealth services and, in some cases, waive this fee altogether.

Each state governs its telehealth policy for Medicaid and many of the private insurers. They make decisions about provider licensing, reimbursement, patient consent, and online prescribing. During the pandemic, most states have eased licensing for providers to deliver healthcare services across state lines (Weigel et al., 2020). Also, some states have relaxed the rules governing prescriptions and in-person visits so that providers may prescribe to patients based on a virtual visit (Weigel et al., 2020). Additionally, states have temporarily changed the rule requiring written patient consent to verbal patient consent to treat. For private insurers, more states than before the pandemic offer reimbursement for a virtual visit equal to an in-person visit (Weigel et al., 2020).

Several medical organizations, including the American Association of Nurse Practitioners® (AANP), the American Medical Association (AMA), and the American Hospital Association (AHA) (AANP, 2020, AMA, 2020, AHA, 2020), endorsed the federal response to expanding telehealth services. Recently, the Heart Failure Society of America published a report on benefits and barriers to the implementation of virtual visits during the COVID-19 pandemic. They noted that the virtual visit platform had increased access to care for patients, provided more opportunities for the caregiver to be involved, and added a potential layer of privacy. Patients in the comfort of their own homes may be more inclined to open up to providers about their health (Gorodeski et al., 2020). For providers, the virtual visit offered a method for safely managing

their patient's complex health conditions during a pandemic and, in some cases, strengthen the trust bond between patient and provider (Gorodeski et al., 2020). Additionally, the HFSA states that virtual visits allow for the reallocation of services in the time of COVID-19, continuity of care, continued service reimbursement contributing to the financial health of the hospitals and national healthcare system, and provide a platform for expanded telemedicine research (Gorodeski et al., 2020).

However, with a critical need and widespread support, it is prudent to remember that these changes are temporary, and telemedicine may look different post-pandemic. Bashshur et al. (2020) believe it is imperative to demonstrate that safe, quality care can be delivered via telemedicine at the same level as in-person care and is sustainable in a post-pandemic world.

Virtual Visits and Chronic Illness

According to the CDC, six in ten adults have a chronic illness, and four in ten have two or more chronic conditions (2020). Six chronic diseases: heart disease, stroke, chronic lower respiratory diseases, cancer, Alzheimer's, and diabetes made the top ten leading causes of death in 2017 in the US (CDC, 2017). Overall, chronic conditions make up the bulk of healthcare costs in the United States, accounting for 90% of the 3.5 trillion dollars in US healthcare costs annually (CDC, 2020e). Pulmonary arterial hypertension is one of those chronic diseases with an average estimated price of $53,000-$76,000 for the index admission and $62,000 - $85,000 for 30-day readmissions (Bhattacharya et al., 2019).

Telemedicine interventions can positively influence chronic disease management for both the patient and the healthcare provider (Bashshur et al., 2014; Emerson et al., 2016; Gorodeski et al., 2020; Noel et al., 2018; Ware et al., 2020). The US Government Accountability Office (GAO) surveyed several patient and provider associations and found that patients believe telemedicine would improve or maintain their current quality of care, particularly for those with chronic conditions. Providers felt that different telemedicine components could improve clinical outcomes and support treatments for chronic illnesses by utilizing virtual visits and remote

monitoring equipment (GAO, 2017). The Community Preventative Services Task Force (CPSTF) found that the effect of telemedicine interventions on several chronic illnesses was better medication adherence, improved clinical outcomes, and better dietary choices (CDC, 2020). Totten et al. (2016) found that people with chronic diseases benefitted the most from telehealth services. From the same study of the services offered, the most common telemedicine modality is video-conferencing or the virtual visit, and the most common setting was at home.

Telephone Follow-up

Telephone follow-up is used as a singular intervention but most often is mixed with other interventions. Telephone follow-up is also not a novel healthcare tool. It has been used by various healthcare team members to provide patient support and education, teaches and reinforces self-care management skills, and assists clinicians in recognizing changes in medical status (Albert et al., 2015). A prospective study conducted by Greysen et al. (2017) showed that, often, patients who had high levels of perceived engagement and satisfaction at discharge still encountered unanticipated problems for which they needed assistance to correct. According to AHRQ (2020), the phone call facilitates identifying patient questions or misunderstandings concerning postdischarge care and addresses new problems or unanticipated health events. AHRQ incorporates telephone follow-up in their discharge toolkit (ReEngineered Discharge Toolkit (RED) designed to reduce hospital readmissions, provide continuity of care, and improve patient and family satisfaction (AHRQ, 2020). Kash et al. (2018) determined that telephone follow-up was a top-five strategy used by programs that successfully reduced readmission rates. In a systematic review of care transitions and interventions, the most successful heart failure discharge programs used mixed interventions that included a telephone follow-up component (Albert et al., 2015). Odeh et al. (2019) implemented a postdischarge pharmacist-led telephone follow-up single intervention study at a small hospital in Ireland. Results indicated a significant reduction in 30 and 90-day readmission rates for the group who received the telephone intervention.

Lattimer et al. (2016) formed a workgroup that studied care transitions specifically for PAH patients. This population described in this paper has unique challenges requiring significant patient education and support for self-care management, particularly when transitioning from one setting to the next. They face barriers at the care delivery level, provider level, and patient level. Lattimer and colleagues recommend interventions that enhance transition and continuity of care, such as a PAH nurse coordinator contacting patients within the first few days of discharge and ongoing reinforcement of the plan of care, medication review, and symptom management.

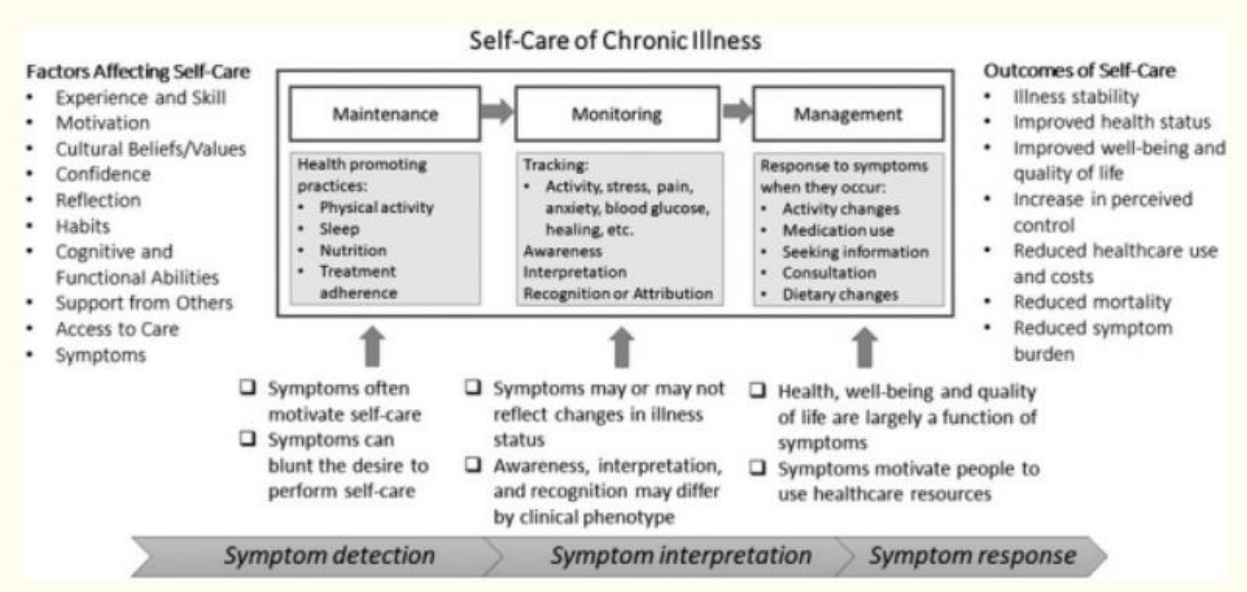
Theoretical Framework

The key to a successful evidence-based project is selecting a theoretical framework that provides the most appropriate lens to view one's topic systematically and thoroughly. Theories are ordered based on their level of ideas and purpose, and there are four identified levels: metatheory, grand theory, middle-range theory, and micro theory. The level of theory for this project is the middle-range theory. Middle-range theories balance abstract and concrete concepts, making them more generalizable and easily tested (Moran et al., 2017). The nursing profession has utilized these theories to guide both evidence-based practice and research (Liehr & Smith, 2016).

The Middle-Range Theory of Self Care of Chronic Illness integrated with Symptom Theory is the framework for this improvement project. Self-care is a process of maintaining one's health along the life span by engaging in health maintenance and health management behaviors during wellness or illness (Riegel et al., 2019). Chronic illness or disease is defined as a condition that lasts longer than one year, is often activity limiting, and requires ongoing care (Centers for Disease Control and Prevention [CDC], 2019). In chronic illness, self-care is about managing one's condition daily to control symptoms and improve survival and quality of life. Compared to patients with poor self-care skills, those with better self-care management experience lower mortality rates, fewer hospitalizations, and improved quality of life (Riegel et al., 2019).

The concepts contained within the middle-range theory combined with self-care are self-care maintenance, monitoring, and management. Maintenance is engaging in behaviors to help maintain health; monitoring is noting and recognizing signs and symptoms; management is the person's response to those signs and symptoms (Riegel et al., 2019). Symptoms affect behavior, precisely self-care behavior. They are subjective perceptions of physical and mental changes that occur to the individual; therefore, the interpretation of what is happening resides wholly with the patient (Riegel et al., 2019). Patients with a chronic disease engaging in self-care react to symptoms based on their self-knowledge, previous experiences, and what they have been taught and understand. Symptoms theories explain how the individual identifies and responds to the symptoms of their disease. Riegel et al. (2019) determined that the overlap amongst self-care, chronic illness, and symptom management is significant enough to integrate the concepts into one theory. Symptoms influence self-care in a feedback loop process of positive and negative forces that may or may not motivate them to change their behavior, as shown in Figure 1. See Figure 1

Self-Care of Chronic Illness



Note: From "Integrating Symptoms Into the Middle-Range Theory of Self-Care of Chronic Illness" by Barbra Riegel, Tiny Jaarsma, Christopher Lee and Anna Stromberg, 2019, *Advances in Nursing Science 42* (3), p. 212 (doi: 10.1097/ANS.0000000000000237). Copyright 2019 by The Authors.

Putting Theory In Practice

For the PAH population living with a chronic illness, healthcare professionals and patients often describe the type of self-care they need as the "new normal" (Bowling & Miklois, 2015). The "new normal" includes frequent medical appointments, tests, new medications, diet and exercise adjustments, activity regulation, mental health maintenance, and symptom management. Symptoms of PAH may manifest as part of the progression of the disease, medication side effects, disruptions in medication regimen, and a lack of lifestyle modifications. Patients may also experience hospitalizations, both planned and unplanned, becoming part of the self-care and symptom management cycle (Tonelli, 2020).

As an example, the PAH patient monitors their weight daily and notices a three-pound weight gain overnight. The provider has instructed the patient to take an extra diuretic the day this occurs and call the office if they do not shed the weight or continue to gain. However, the patient is traveling to a family crawfish boil and does not want to spend the whole day in the bathroom, so they decide not to take the extra diuretic. The next day they are up an additional three pounds and are short of breath. The patient now takes an additional diuretic due to experiencing symptoms, but two days later, the patient has a ten-pound weight gain, shortness of breath, and increased oxygen needs. The provider admits them to the hospital for IV diuresis, which is successful, and the patient discharges home two days later.

This scenario offers an opportunity to integrate the self-care theory of illness and symptom theory by making adjustments that treat the patient holistically. Riegel et al. (2019) describe this as acknowledging the impact of symptoms on self-care and self-care on the individual's symptoms. Based on the information gleaned from the patient, they need more education on self-care management, such as taking medication as directed and recognizing and acting to minimize dietary salt and fluid intake to decrease fluid retention. The provider may also need to adjust the patient's medicines if fluid retention is frequently occurring. Upon discharge, the provider may increase the patient's home dose of diuretics, discuss the importance of

medication adherence, and give a booklet on managing sodium and fluid intake. These actions reflect the provider's recognition of the impact the patient's behavior has on their symptoms and the symptoms have on the patient's behavior (Riegel et al., 2017). See Appendix D for the DNP Project Concept Map that integrates the Middle-Range Theory of Self Care of Chronic Illness and Symptom Theory.

Summary

The integrated theory presented here applies to the PAH population, which requires a high degree of self-care, self-efficacy, and symptom management skills to navigate the course of chronic illness. The provider and healthcare team can use this framework at all patient touchpoints, including early post-hospital discharge virtual visits and telephone follow-ups. During the virtual visit, the patient and provider will discuss the changes made at discharge, make additional adjustments as needed, reinforce patient education, answer patient questions, and promote self-efficacy and self-care management. 'The visit allows the patient and provider to continue a collaborative interaction focused on supporting the patient with their mental and physical self-care, which will improve self-care management and clinical outcomes (AHRQ), 2016). The subsequent telephone follow-up will continue the two-way communication, provide opportunities to reinforce self-care management skills and symptom monitoring.

Methodology

Project Description

The PAH telehealth quality improvement project was developed to reduce preventable readmissions, medication errors and promote self-care management by combining early discharge follow-up via one-week postdischarge virtual visits and weekly follow-up telephone calls to deliver best practice healthcare.

This health facility is in a unique position to implement this project. The PH department is a designated Pulmonary Hypertension Comprehensive Care Center. The designation means the department has expertise in pulmonary hypertension and has a better opportunity to deliver

positive health outcomes for PAH patients (Pulmonary Hypertension Association, 2020). This project also aligns with the health systems mission to "Serve, Heal, Lead, Educate and Innovate" in healthcare delivery.

Additionally, a commitment to technology and innovation has resulted in an infrastructure to deliver care virtually in all modalities. At the end of 2019, this health System had completed more than 2,100 virtual visits for urgent care and behavioral health services and enrolled 11,500 patients in these programs. More than 9,000 patients were enrolled in the Digital Medicine program for hypertension and diabetes, helping patients manage their chronic conditions from home while staying connected to their healthcare team.

Project Design

Quality improvement projects prioritize interventions and practice improvement to drive change (Moran, Burson & Conrad, 2017). The "Model For Improvement" and "PDSA" cycle offer a framework and a method for planning and testing this change (Institute for Healthcare Improvement, 2020). The Model For Improvement" is designed to accelerate change. The key questions to be answered are: What are we trying to accomplish? How will we know if a change is an improvement? What change can we make that will result in improvement? The answers to these questions are found in the project aim, measures, and interventions.

The Plan Do Study Act (PDSA) cycle was employed to test the interventions and monitor progress. PDSA stands for Plan, Do, Study, Act and "consists of planning the change (Plan), carrying out the change (Do), observing and analyzing the results of the change (Study) and then deciding what additional changes should be made (Act)" (US Department of Veterans Affairs, 2017). The PDSA Cycle methodology guided planning, implementation, and evaluation of the implementation of telehealth supported delivery system.

This project's primary goal is to reduce 30-day readmission rates for patients with PAH by enhancing inpatient to home transitions with a one-week, postdischarge virtual visit and scheduled nurse follow-up telephone calls. The secondary objectives are to achieve a high

percentage of completed virtual follow-up appointments and improve patients' ability to manage their disease by adherence to prescribed medication regimen, recognizing signs and symptoms of disease exacerbations, controlling fluid status, and eliminating line or site infection. The Principal Investigator (PI) collected data on each participant through the electronic medical record and patient interviews. The PDSA cycles tested the implementation of the two primary interventions; the virtual visit and the nurse follow-up phone calls. Data on participant outcomes, such as 30-day readmissions, medication adherence, and fluid management, were collected into a secure database and visually displayed for future statistical research.

The research interventions did not have a detrimental effect on patient care. The patients had more contact with the provider and healthcare team than the currently used standard of care.

Setting

This program will be implemented in the Pulmonary Hypertension Department within a large nonprofit, academic healthcare system in Louisiana. The department is located at the main facility in New Orleans, Louisiana, a Magnet-recognized, 767-bed acute care hospital. The multidisciplinary healthcare team provides services for hospitalized patients and follows up in our outpatient pulmonary hypertension clinic.

Study Population

This study's population was adult patients diagnosed with WHO Group 1 PAH and managed by the multidisciplinary team at the pulmonary hypertension comprehensive care center. The estimated enrollment was ten patients for the study period.

Inclusion criteria included patients hospitalized during the study period, who had been diagnosed with PAH, and those newly diagnosed. Study members were required to have an active patient portal and an iOS® or Android™ device with a MyChart application and a stable internet or data connection. Recruitment was not limited geographically, but the location does determine which provider conducts the visit since medical licensure is state-dependent. Disabled patients that required a home caregiver were not excluded from this study since the designated

caregiver may be present with the patient during the virtual visit and scheduled phone calls with proper consent.

To qualify as a hospital readmission, the participant had to meet CMS criteria, described as unplanned readmission within 30 days of discharge from the initial admission. Unplanned readmissions include readmission to the same hospital or another applicable acute care hospital for any reason (CMS, 2020c). Participants admitted to the hospital but then returned for a planned admission were not counted as a readmission.

Exclusion criteria included patients who declined to participate in the virtual visit, did not have the technology to connect, were discharged to a facility other than home, transitioned to home hospice, or died during hospitalization. Patients discharged home but opting out of the virtual visit were scheduled for the standard in-clinic visit within two weeks of discharge and followed by the PAH nurse coordinator at variable intervals.

Subject Recruitment

The PI used purposive sampling to intentionally select patients who fit the study. The Pulmonary Hypertension (PH) nurse coordinator was notified when a PAH patient was hospitalized. Notification of admission happened via EMR, provider-to-provider communication, or patient or family report. Once a patient was hospitalized, the PI followed the patient's progress via communication with the inpatient team, attending multidisciplinary rounds, and chart review. These methods were used to determine the patient's appropriateness, the timing of the patient's introduction to the improvement project, and discharge planning. The severity and progression of illness and disposition at discharge were factors in recruitment. Participants also needed access to an iOS® or Android™ device with cellular service or Wifi connection to participate in the virtual visit intervention arm.

Consent Procedures

The PH coordinator will inform the patient of the option for a one-week virtual visit and scheduled nurse follow-up phone calls following hospital discharge and explain the patient's role

in the process. If the patient verbally agreed to the postdischarge follow-up and all technical requirements are met, the patient was asked to sign a consent form to participate in the study. See Appendix J for the Study Consent Form. There was also a separate consent form for the virtual visit. This form was automatically sent to the patient when scheduled for an appointment. See Appendix K for the Virtual Visit Consent Forms.

Study Measures

Conceptual Definitions. *Telemedicine* is the practice of medicine between a licensed provider and patient over distance (American Academy of Family Physicians (AAFP), 2020). *Telehealth* is an umbrella term for utilizing telecommunication and electronic data exchange systems to deliver healthcare between patients in one location to a healthcare team member in another site (CMS, 2020d). A *virtual visit* is a secure audio and or video appointment between the patient and provider via a smartphone or tablet per project facility. *Telephone follow-up* is a call placed from PH nurse to PH patient following hospital discharge at scheduled intervals.

Operational Definitions. The operational definition of "hospital readmission" is defined as unplanned readmission to the same hospital as the initial admission that occurs within 30-days of discharge (CMS, 2020c). This facility describes a *virtual visit* as a secure two-way audio and video appointment between a provider and patient. The provider uses a device with the EMR application access, and the patient uses a personal smartphone or tablet.

Outcome Measures. There were seven expected and measurable outcomes for this program; reduce readmission rates below 20% for PAH patients; Achieve 95% participation in PH Nurse telephone follow-up call at 1-2 days postdischarge; 95% of PAH patients complete their scheduled one-week postdischarge virtual visit; 95% completion of 3/3 weekly telephone follow-up calls; 85% of PAH patients manage fluid status; 95% adherence to medication regimen; and achieve 0% signs and symptoms, or 0% admissions for indwelling line infections for 30-days. Evaluation and collection tools included data collection through the Electronic Medical Record (EMR) and patient interviews conducted by the PH Nurse

Coordinator. The existing EMR has data storage and retrieval mechanisms, including report generation capabilities, though somewhat limited for this population. A spreadsheet was used to track any information not covered by the EMR reports. Readmission rates were assessed bi-weekly. The participant interview data from the telephone follow-ups were documented in the EMR using the telephone nurse script and evaluated weekly. See Appendix K for the Nurse Telephone Script.

Process Measures: Process is one of the tools for evaluating healthcare, according to Donebedian, and reflects the therapeutic relationship between patient and provider (Hickey & Brosnan, 2017). Process measures use patient-provider interactions to determine healthcare quality. For this project, selected criteria included the percentage of providers who conducted postdischarge virtual visits and the number of patients moving through the protocol's steps. The specific measurements that determined an effective process are that 80% of providers agreed to implement the virtual visit intervention, and 85% of eligible patients participated in the new protocol. The process measure for the scheduled nurse telephone follow-up was that 95% of study participants completed the initial phone call and 95% completion of subsequent phone calls. The PI observed and monitored the process measures weekly using PDSA cycles.

Balancing Measures. Balancing measures are in place to ensure that this project does not create gaps or issues where there are none and recognizes the unintended positive impact of the project. Safety is measured by documenting any increase in the number of readmissions during the study above 20%. A record was also kept on provider availability and patient access to an appointment within one week of discharge. The number of "no shows" was observed during the study period as well.

Benefits and Risks

Benefits to the one-week postdischarge virtual visit included the opportunity for early assessment of the patient's self-care management skills, medication regimen, disease-state knowledge, and mental health since hospital discharge. Post-hospitalization, this earlier

touchpoint between provider and patient allows for education reinforcement, additional learning, and encouragement that may increase the patient's self-efficacy and self-care and moderate preventable factors related to illness exacerbation and readmissions.

Another benefit was maintaining continuity of care by reducing barriers such as access, time, and cost. The virtual visit also offered a safe option to patients during the pandemic. This country is currently experiencing a pandemic, and a mitigating strategy is to maintain physical distance to decrease the risk of exposure and spread (CDC, 2020). Remote access to healthcare helps to overcome this barrier. Though it was not encountered during this study period, there is a significant risk of environment-related disasters in this area. Louisiana is one of the most flood-prone states in the country (Louisiana's Strategic Adaptations for Future Environments (LaSAFE), 2019). According to LaSAFE (2019), sixty-four parishes have experienced a major disaster over the last fifteen years due to a named tropical storm. The entire state is at an increased risk for flooding from heavy rain, ocean surge, and river breach.

Risks for the virtual visit provider may include technical difficulties, inability to complete some physical exam components, and feeling disconnected from the patient. There may also be licensing and regulatory barriers (CDC, 2020). The patient may experience technical issues, have difficulty understanding (hearing, seeing), may not feel comfortable with the "virtual" environment, may become frustrated with the process, or have privacy issues if they do not have space to be alone (CDC, 2020).

Subject Costs and Compensation

The only cost to the patient was for the virtual visit. At this time, the charge for an uninsured established patient is $65.60. If the patient is insured, the insurance provider will be billed, and the cost of the visit will depend on their coverage. The patient will receive no compensation for participating in this project. Providers code the virtual visit as if they are face-to-face with the patient; however, the service will change based on the physical exam level completed remotely.

Resources and Economic Consideration

There was no cost to the facility for the implementation of this DNP project. This facility and clinic are currently utilizing virtual visits in the outpatient setting for this population. The cost for an uninsured established patient virtual visit is an estimated $65.60. The cost for an insured patient is insurance dependent and determined at the time of the visit. All devices, functionality, and environmental space exist and operate in the same manner as described in this project. Since this is an enhancement to usual care for this patient population, the staff is in place, and there is no need for additional resources. Also, the PI has access to database software and computers at no cost.

Implementation

Study Interventions

The primary intervention included a one-week postdischarge virtual visit for patients that the provider conducted. The technology, protocol, policy, coding, billing, documentation, and consents were already in place for this visit. The virtual visit was completed one week after discharge.

The secondary intervention was a postdischarge telephone follow-up call made by the Pulmonary Hypertension Nurse Coordinator. The calls began 1-2 days postdischarge and then occurred one week after the initial virtual visit for three consecutive weeks. The nurse documented these calls in the EMR using the PAH Nurse Coordinator Weekly Telephone Follow-up Script. See Appendix K for the PAH Nurse Coordinator Weekly Telephone Follow-up Script.

Pre-Implementation Phase

During this phase, meetings were held with all stakeholders to review the project goals, outcomes, measures, and timeline. The PI completed the database template used to collect results and informed the providers and medical assistants of the new option for a one-week postdischarge virtual visit. See Appendix G for the Data Collection Sheets. Because of the time

between the approval process and implementation and personnel changes within the department, additional meetings were held after approval to review the study protocol. These meetings included a new interim PH director, provider, clinic lead, and medical assistant who were educated on the study. Baseline demographics, diagnoses, and treatment plans for patients currently followed at the PAH comprehensive center are housed in the EMR.

There is no PAH patient admission data for comparison at this facility, but there are plans to collect this data in the future.

Implementation Phase

As the implementation unfolded, the first patient was enrolled in the study on February 1, 2021. Implementation involved providers, nurses, medical assistants, schedulers, and social workers as part of the multidisciplinary team that works with this population. The first participant passed through all phases of the protocol but was the only patient enrolled during the study period. There were two other potential participants, but they did not meet the criteria for this study. The following sections highlight timeline challenges, process deviations, adjustments, and team dynamics.

Participant Identification.

During this phase, the PI was alerted to a patient admission through direct provider communication. The enrolled participant had a recent diagnosis of WHO Group 1 Pulmonary Arterial Hypertension but had not started medical therapy. Once the patient had been identified as meeting criteria on the index admission, the PI monitored the patient's progress while hospitalized by daily chart reviews, communicating with the inpatient team, and attending daily multidisciplinary discharge rounds. The PI recognized that the patient was too ill upon admission to introduce the study. Once the patient was stable, the PI met with the patient and their spouse (patient consented to have spouse present) to discuss the study protocol, and they were receptive. It was determined through the PDSA cycle that waiting until the patient was more physically stable offered a better opportunity for improved communication and education.

Two participants were identified as potential PAH patients but were excluded. One participant was transitioned to hospice during the study period, and another was referred for advanced heart-lung transplant options.

Education and Consent.

The PI educated the patient and spouse on the protocol, reviewed the consent form, and obtained a signature to proceed. The PI reinforced that the patient could select a follow-up appointment in the clinic instead of the virtual visit at any time. The PI ensured the patient was activated in the patient portal and the application was installed on their device. A virtual visit one week from the date of discharge was scheduled. The virtual visit consent form and instructions were automatically sent to the patient when the appointment was scheduled. The patient tested their technology before the visit and completed consent forms. The participant did not complete the optional survey associated with the virtual visit.

Scheduled Nurse Follow-up Call at 1-2 Days.

On day two postdischarge, the PH Nurse Coordinator contacted the patient for follow-up. During the telehealth phone call, the nurse obtained vital signs (BP, HR, Weight, O2 Saturation), reviewed the patient's medications, completed a symptom and functional assessment, discussed goals, reviewed the treatment plan, answered all questions, and confirmed upcoming appointments. While reviewing the medication list, the PH nurse coordinator noted that the patient had not been prescribed potassium at discharge but was on a moderate dose of diuretic. Not prescribing potassium represented a potential safety concern for the patient since diuretic use may precipitate a hypokalemic state (Mount, 2021). The coordinator contacted the provider, who called in a prescription for potassium. Information was documented in the electronic medical record. See Figure 4 for the nurse follow-up workflow. As displayed, the process begins when the patient is discharged from the hospital and the first call is scheduled. The follow-up process repeats itself. Each call is conducted at scheduled intervals and documented in the EMR.

Virtual Visit.

On the day of the virtual visit, the patient failed to check in at the appointment time. Because of good team communication and dynamics, the provider and medical assistant made minor adjustments to see other patients while the PH nurse contacted the patient. The patient was unsure of how to sign on through the portal since they relied on their spouse, who was not home. Their adult son was there to help with pre-check, however. The provider and the PI/PH nurse coordinator conducted the virtual visit. The provider confirmed the patient's current dose of her infusing medication, and the patient showed the pump to the provider. The provider also visualized the patient's catheter site to confirm no outward signs of infection at the catheter insertion site. It was noted that the dressing was clean, dry, and intact. There were no connection errors during the visit. After the visit, the provider followed the standard of care to conclude an appointment, drop charges, and document the visit.

Upon reviewing the process, PI discovered that the medical assistants do not always call patients before their virtual visit to assist with logging onto the system. For future iterations of this protocol, the PI will reinforce instructions for virtual visit check-in and offer to call the patient 15 minutes before the appointment.

Scheduled Nurse Follow-up Calls.

After the one-week virtual visit, the coordinator called the participant weekly for three weeks and followed the same telephone script. During the first weekly call, they complained of pain and tingling to their feet, a common adverse event associated with the prostacyclin infusion. The provider was notified and adjusted the participant's pain medication. The participant denied weight gain greater than three pounds in 24 hours and five pounds in one week and infection symptoms. The following week, during the coordinator follow-up call, the participant endorsed some swelling to both lower extremities and feeling fatigued. They did not meet the criteria for an overnight gain of three pounds or five pounds in one week. However, the provider adjusted the participant's diuretics for symptom management. These phone calls were documented in the

EMR.

A review of the documentation process illuminated the need for modification to the phone call documentation. The PH nurse coordinator should use the original nurse script for the follow-up call at 1-2 days, but a more succinct interview and documentation will be more efficient for the subsequent phone calls.

Post-Implementation Phase

An Excel spreadsheet was used to track information not covered by the EMR reports. Data collected in the EMR was transferred into the Excel database after de-identification, as shown in Appendix G. The PI was challenged by only one enrolled participant during the implementation period instead of the expected ten or more participants. Because of patient hospitalization variability, patient course of illness, patient disposition at discharge, and discharge date, it was challenging to capture a more robust sample during the shortened implementation period. One participant does not allow for statistical meaningfulness, and the choice was made to focus on the process and its feasibility for this population. This information was shared with all stakeholders, the DNP preceptor, and the DNP committee chairs.

Process Comparison

A comparison between the pre-intervention postdischarge process to the post-intervention process was completed. The current workflow has “unknowns” related to patient education and medication reconciliation: The provider and inpatient nurse *may* have educated the patient. The patient may have understood their disease, and the patient *may* have been discharged with an accurate medication list. Before implementing the new process, the patient was solely responsible for reaching out to the healthcare team with any questions or concerns if they thought of them before their in-clinic appointment at around two weeks. After implementation, the nurse was tasked with scheduled calls to contact the patient for follow-up on education, self-care management, and any medication questions. The provider and patient could also speak directly through the virtual visit a week sooner than the usual standard of care. Implementation

of the new protocol for just one participant resulted in finding a medication error, providing symptom relief, and reinforcing disease and medication education.

Figure 2 shows the existing hospital discharge process and clinic follow-up, and Figures 3 and 4 display the new process with the virtual visit option and the nurse follow-up call workflow. The nurse follow-up process begins when the patient is discharged from the hospital, and the first call is scheduled. The process repeats itself. Each call is conducted at scheduled intervals and documented in the EMR. The Process Charts are also shown in Appendix B.

Figure 2

Existing Hospital Discharge and Clinic Follow-up

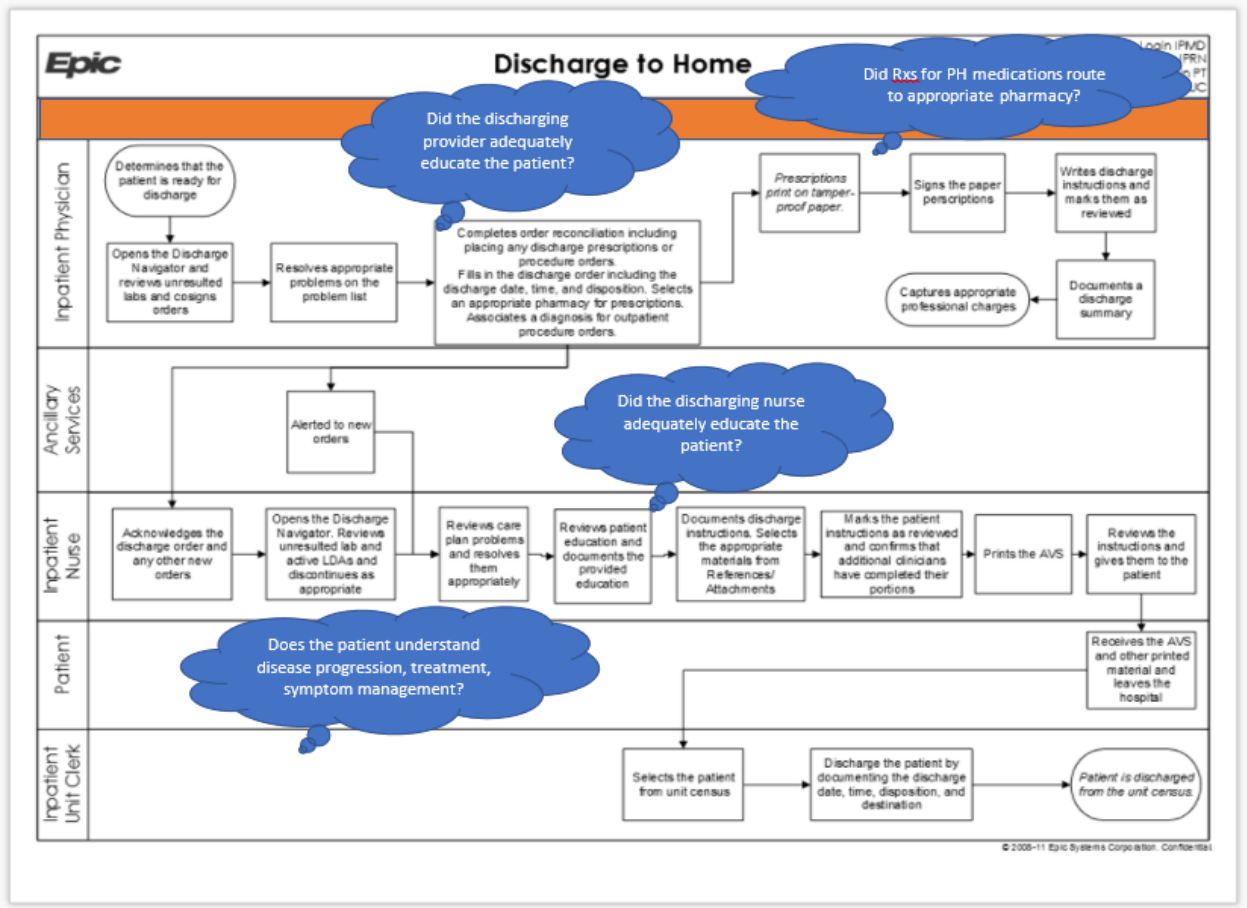


Figure 3

New Virtual Visit Process Flowchart

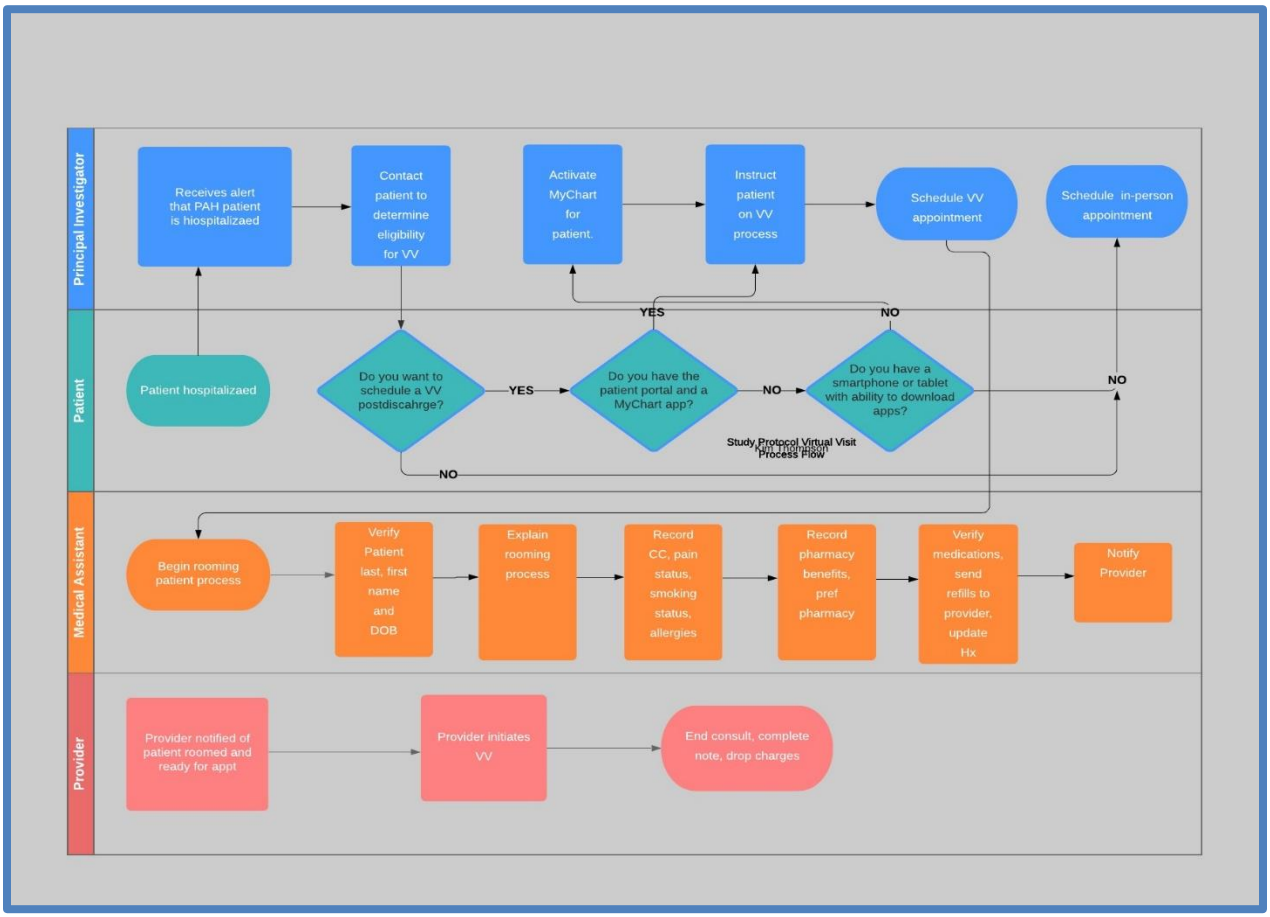
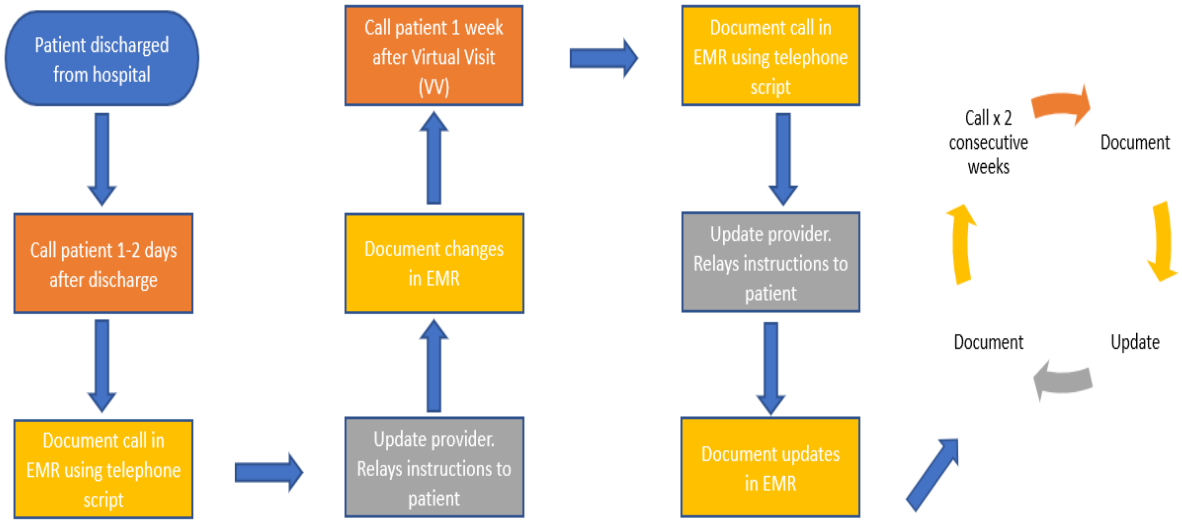


Figure 4

New Scheduled Nurse Follow-Up Phone Call Process Flowchart



Project Timeline

The DNP project took place between October 2020 through March 31, 2021. Preparation began in October 2020, and project implementation started in February 2021. The original date for implementation was scheduled to begin November 1, 2020. However, there was a significant delay in obtaining approval from both the university and the facility. The end date was set for March 31, 2021. On February 1, 2021, all patients meeting study criteria who consented to participate in the study were scheduled for the postdischarge virtual visit and the four nurse follow-up phone calls. April 1, 2021, marked the beginning of the post-implementation phase. Data will be analyzed and disseminated to the Pulmonary Hypertension Department and the doctoral committee representing the University of Arkansas Eleanor Mann School of Nursing. See Appendix E for the Gantt chart depicting the original DNP project timeline and the actual timeline.

Evaluation Plan

Data Maintenance and Security

The principal investigator used the secure hospital electronic medical record (EMR) and an excel spreadsheet to collect data for this project. During the Pre-Implementation phase, a patient list, which identifies those with WHO Group 1, PAH, currently treated by this PH center, was created in the EMR. Within this list, columns displayed automatically retrieved data that includes patient name, portal status, admission date, 30-day readmission, chief complaint, and length of stay. The data in the list was refreshed every five minutes and manually refreshed, if necessary. The PI exported the list from the EMR to an excel spreadsheet and added columns that capture the project's objectives, as shown in Appendix G.

The Pulmonary Hypertension Nurse Coordinator collected data during each phone interview on medication adherence, fluid management, and infection signs and symptoms. Additional demographic information was collected on each patient admitted to the hospital during the study period and recorded in the excel database.

The PI attended multidisciplinary discharge rounds to discuss hospitalized study participants. It was essential to attend rounds and communicate with the inpatient team to know when patients would be discharged and discuss any social service needs. Chart reviews were conducted weekly to track the number of patients meeting criteria or readmitted during the 30-day readmission window. The PI also observed the virtual visit check-in process for the patients 100% of the time and participated in every nurse follow-up call.

Once all data was collected in the EMR, identifying information was removed, transferred, and incorporated into the excel spreadsheet. All data was stored on the principal investigator's (PI) secure workstation at the facility and the PI's password-protected laptop.

All data collected during the patient-provider virtual visit was covered within the virtual visit's privacy and security rules and was entered into the secure EMR. Due to the COVID-19 emergency, the current HIPAA rules, set forth by the Office of Civil Rights (OCR) and amended by the Health Information Technology for Economic and Clinic Health (HITECH) Act, allow providers to use non-public facing audiovisual, remote device to communicate with patients (HHS, 2020). Providers may use a personal device such as a phone and applications like an EMR designed for operating systems and smart devices.

According to the Department of Health and Human Services (HHS), providers can use applications such as "Apple FaceTime, Facebook Messenger video chat, Google Hangouts video, Zoom, or Skype" to provide telehealth services to their patients (HHS, 2020). At this facility, providers may use either an iPad® or iPhone® with the EMR application. All virtual visits are completed within the EMR, and patient consent is embedded in the workflow. If the patient can only conduct an audio visit, the consent form must be read aloud before completing the visit and documentation.

Data Analysis

The primary outcome measured was the effect of a one-week postdischarge virtual visit and weekly telephone follow-up on readmission rates. In the first week of implementation, the PI

was able to enroll one participant, and that participant was able to complete all phases of the quality improvement project. Unfortunately, subject recruitment was limited by participant characteristics and time. The project aims to capture patients transitioning from the hospital to home and reducing 30-say readmission rates. Therefore, recruitment relies on the patient being hospitalized and discharged, then followed for 30 days postdischarge. The final project timeline spanned approximately two months. The project should run for a minimum of six months with an ideal time of one year to increase sample size and provide usable quantitative data.

Because of the shortened implementation timeframe and lack of participants, data was not collected on ten patients as initially planned in this proposal. Statistical analysis was not possible for a sample size of one. However, process feasibility was studied. One participant completed each step of the process and was not admitted to the hospital within 30-days of discharge. It was determined that it is possible to implement a protocol that follows PAH patients after discharge in a systematic fashion and yield positive results.

Outcome Measures

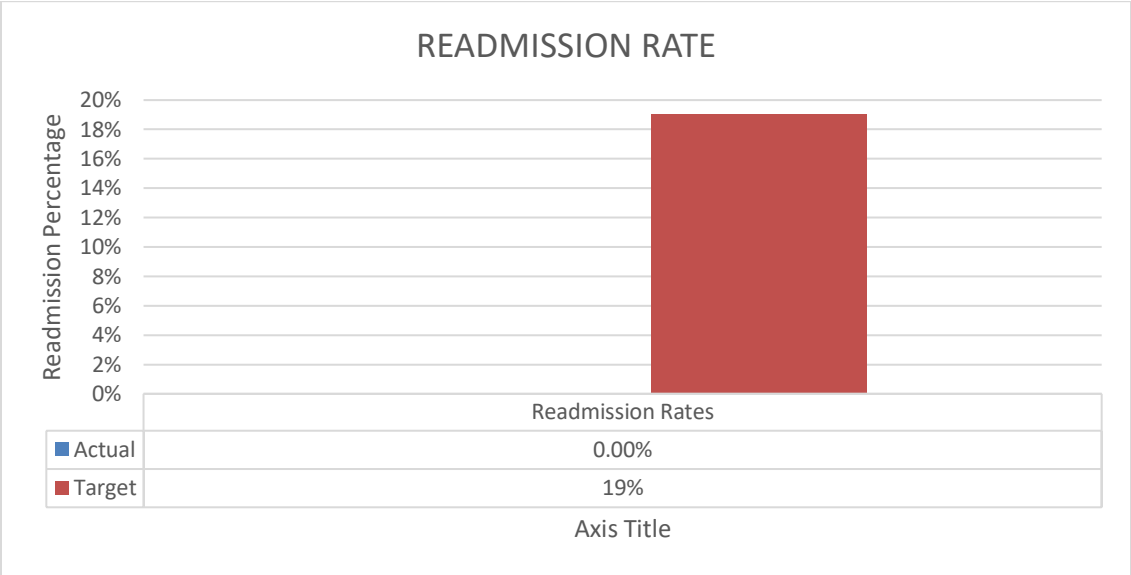
There were five expected and measurable outcomes for this protocol.

Outcome #1: Reduce readmission rates below 20% for study participants

Nationally, hospitalized PAH patients have a 20% chance of being readmitted to the hospital within 30-days of discharge (Bhattacharya et al., 2019). Data is not available for this population at this time; however, the rate for system-wide, all-cause hospital readmissions in 2019 was 16.9%, and specifically for heart failure, it was 24.4%. This outcome was measured using the EMR and patient or provider reports. See Figure 1 for a visual representation of the readmission rate for the participant enrolled in this study.

Figure 5

Readmission Rate



The final three outcomes were assessed during the nurse telephone calls.

Outcome #2: Achieve 85% Management of Fluid Status by Study Participants

Fluid status is recorded by nurse interview and patient report of weight during each call. Weight gain of 3lb overnight or 5lb weight gain in one week indicates that the patient may be "volume up" and need medication adjustments or hospitalization if other criteria are met, such as shortness of breath and increased oxygen needs. The participant reported some swelling and fluctuations in weight, but they did not meet the criteria. Reported weights were 177 => 181 => 175 => 179 => 183. The provider made medication adjustments for symptom relief, and the patient did not have to be admitted to the hospital.

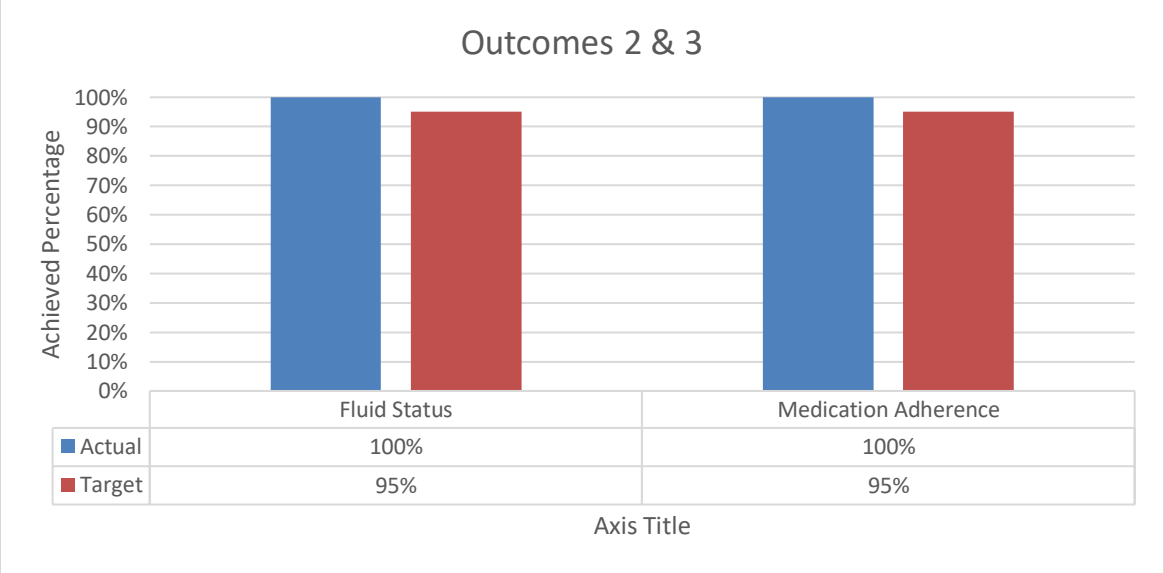
Outcome #3: Achieve 95% Adherence to Medication Regimen by Study Participants

Adherence to medication regimen was measured by nurse interview and patient report. The patient reported taking their medication as directed. Of note, the patient has a continuous infusion that is self-managed and titrated as tolerated. The medication comes

with specialty pharmacy support and education, including a home visit and telephone calls, but this is only in the initial stages of beginning the medication.

Figure 6

Outcomes 2 & 3



Outcome #4: Achieve 0% Signs and Symptoms of Infection or Admissions for Indwelling Central Line or Subcutaneous Site Infections

This outcome is measured by nurse interviews, patient reports, and images uploaded by the patient if available. Not all PAH patients will have a central line or subcutaneous administration site. However, the enrolled participant did have a central line and site, and the dressing remained clean, dry, and intact. The patient did not report any signs and symptoms of infections such as fever, redness, warmth, drainage, or pain at the site.

Process Measures

Process measures help determine the effectiveness and efficacy of an improvement project. PDSA cycles were used to observe and monitor the implementation process to facilitate the project, note any barriers, and make adjustments. See Appendix F for the PDSA Cycles. Other selected process criteria included the percentage of providers who conducted postdischarge virtual visits and the number of patients moving through

the protocol's steps. The specific measurements that determined an effective process are that 80% of providers agreed to implement the virtual visit intervention, and 85% of eligible patients participated in the new protocol. The process measure for the scheduled nurse telephone follow-up was that 95% of study participants completed the initial phone call and 95% completion of subsequent phone calls. Only one patient enrolled during this study period, but they did complete all phases of the protocol. One provider was scheduled to see this patient for the one-week virtual visit, and that visit was completed. The chart in Figure 7 shows the process measures with target and actual percentages. Should this QI project be restarted, this chart will be used.

Process Measure #1: Achieve 95% Participation in PH Nurse Telephone Follow-Up Call At 1-2 Days Postdischarge

This outcome was measured by the nurse interview and documented in the EMR. The one participant was called on the second day postdischarge and completed the telephone interview. As stated in the implementation section, a medication error was discovered based on the call's information. According to Housten et al. (2019), structured patient follow-up by the nurse is a "simple, cost-effective method of assessing patient status and wellbeing, reviewing key discharge education and instructions, and identifying issues that may lead to poor outcomes."

Process Measure #2: Achieve 95% Participation in a Scheduled One-Week Postdischarge Virtual Visit

The participant completed the virtual visit with the provider at the one-week postdischarge mark. This outcome was measured using data from the clinic schedule within the EMR. Early clinic follow-up offers an opportunity to review discharge instructions, reinforce education, and address any unexpected problems faced by the patient in the outpatient setting (Housten et al., (2019), Lattimer et al. (2016)).

Process Measure #3: Achieve 95% Participation in 3 Of 3 Weekly Telephone

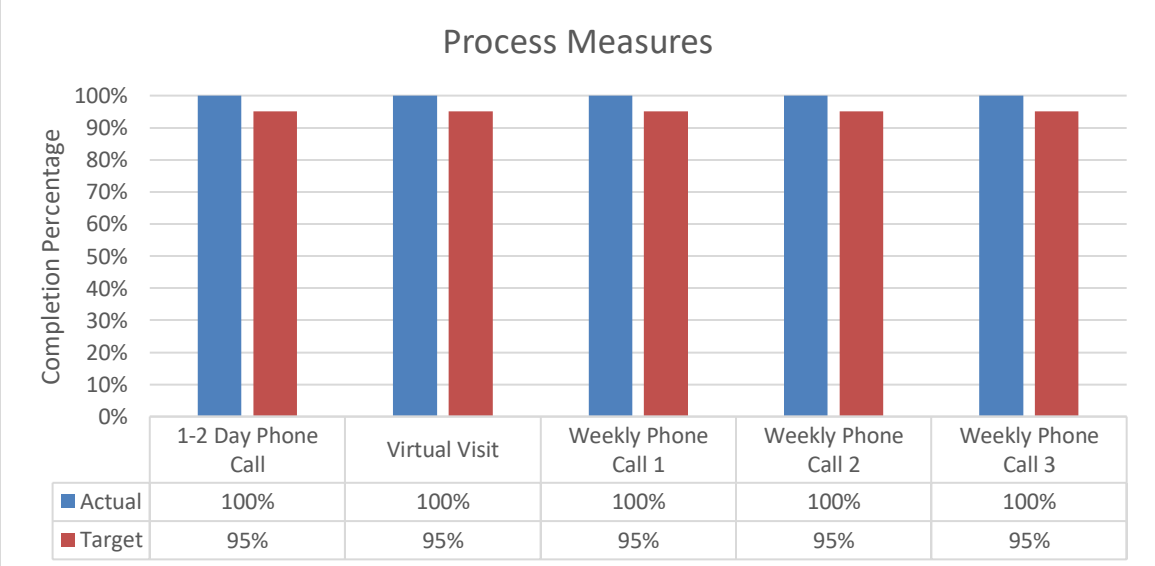
Follow-Up Calls

The nurse completed 3 of 3 weekly telephone calls to the participant. The length of the call varied depending upon their input. Some of the data was not always available because the participant did not consistently measure their vitals. During these calls, the nurse discovered that the ordered physical and occupational therapy had not been started on this patient, resulting in a call to the home health agency to begin services. Also, the provider adjusted the patient's fluid medications and PH infusion based on another call.

Additionally, the nurse reinforced the need for the patient to take their vitals once a day and weigh themselves daily. By week three, the participant had created a daily diary that contained their vital signs and weight. The goal is to add a symptoms diary as well.

Figure 7

Process Measures



Balancing Measures

Balancing measures are in place to ensure that this project does not create gaps or issues where there are none and recognizes the unintended positive impact of the project. Safety is measured by documenting any increase in the number of readmissions during the study above 20%. A record was also kept on provider availability and patient access to an appointment

within one week of discharge. Of note, the provider pool decreased from 6 providers to four during this study period. The number of "no shows" was observed during the study period, and there were none. The patient experience is vital to any patient-centered intervention. The participant had the opportunity to fill out a survey regarding the virtual visit embedded in the workflow.

Discussion

Healthcare Quality and Safety

Implementing a virtual visit during the pandemic is tied directly to safety as it reduces the risk of exposure to the patient and healthcare workers (HHS, 2020). Beyond the pandemic environment, the patient and provider's ability to connect one week after discharge instead of 2 weeks or more can affect patient safety by providing an early opportunity for education and reinforcement of self-care management skills. Additionally, telephone follow-ups completed by PAH Nurse Coordinators improved patient clinical outcomes and self-care management skills. Though there was only one patient enrolled in this protocol, they completed all phases and avoided rehospitalization within the 30-day window. The nurse's first call to the patient resulted in the discovery of a medication error. The subsequent three calls resulted in medication adjustments by the provider, order clarification, and patient symptom management education. Chronically ill patients benefit from effectively managing their disease, positively impacting their quality of life (Riegel et al., 2019). The patient with a better comprehension of their health will reduce the risk of adverse health events such as medication errors and improve patient safety (AHRQ, 2019). With this knowledge, the healthcare team can work with the patient to build upon the existing information to increase self-care management, self-efficacy, and health autonomy. (Stewart, 2020).

The findings mirror those of an extensive systematic review published by AHRQ. The results from 58 systematic reviews demonstrated that patient quality of life and clinical outcomes were improved by communication between the healthcare team and the patient, counseling via

telemedicine, and remote patient monitoring. These interventions also decreased hospital admissions (Totten et al., 2016). Jayokody et al. (2018) researched the effect of 48-hour telephone follow-up on 18,659 chronically ill participants. They determined that a reduction in emergency department visits and at least one adverse event in 28 days was associated with implementing the telephone protocol.

Economic and Cost Benefits

This quality improvement project did not yield enough subjects to adequately assess the health care system's impact by reducing hospital readmissions for PH patients and the overall hospitalized population. The lone participant did remain out of the hospital for greater than 30 days. Hospitalization for PAH patients can be an economic burden for all involved. On average, their hospitalization costs more than that of a heart failure patient (Highland et al., 2019). The PAH population is almost exclusively admitted to telemetry beds and often ICU beds, with an average daily cost of $2,700 at this facility. In a retrospective study, Bhattacharya et al. (2019) found that the mean cost for admission was $75,980, and the mean for readmission was $85,842. The virtual visit and the nurse coordinator follow-up calls may have been a factor in the participant not being rehospitalized since the provider made adjustments that relieved symptoms, and the nurse reinforced patient self-care management. The promotion of self-care management skills, particularly for patients with chronic illness, has been shown to reduce overall hospitalizations, whether implemented as a singular intervention or in conjunction with other interventions (Horwitz & Krumnholtz, 2020). The virtual visit may also decrease access barriers such as transportation and cost for the patient and result in fewer "no shows" or rescheduled appointments. The participant and their caregiver avoided a 2.5-hour drive back to the clinic using the virtual visit option. The participant's caregiver stated that it was a hardship to make the drive because of money and time, and they appreciated the chance to speak with the provider so soon after discharge.

Limitations

Factors that have affected the project's results included time, sample size, participant characteristics, the lack of comparative statistics, and personnel. This study's original timeline was for a minimum of three months, but the actual timeline was one month. The implementation timeframe severely limited participant enrollment and the protocol's implementation since it spans the 30-day period following hospital discharge. Participants had to be admitted during the study period and meet the criteria to be selected for this protocol. Therefore the PI was not able to recruit patients or rely on a selected sample population. Also, the course of illness for each patient is different and affects how long they are in the hospital and disposition at discharge. For the future, this study's ideal timeframe would be six months to a year, which should increase the sample size. Also, participants will have more time to begin the 30 days and complete the protocol.

Another limitation was the lack of comparative statistics for the PAH population at this facility. To address this limitation, the PI used National statistics for readmission rates for PAH patients and included the facility all-cause admission rates and the heart failure admission rates.

Additionally, key stakeholders and resources left the organization during the life of this study. Fortunately, the new interim PAH department directed was familiar with the project and stepped into the role quickly. The other loss was one of two PAH Nurse Coordinators. The PI designed the project so that one nurse could do the bulk of it, and they were able to handle the work due to the small sample size. There will need to be adequate staffing to execute the nurse-led follow-up phone calls going forward.

Sustainability

This facility continues to use and invest in telemedicine and telehealth, so the virtual visit should remain as part of the clinic operations. Since March of 2020, the facility has conducted over 100,000 virtual visits to date (Ochsner Health System, 2021). The interim PAH department director is interested in continuing this protocol for this population. All data collected

and the final DNP project will be kept within the PH department and accessible for reference.

Recommendations

Practice Implications

The one-week postdischarge virtual visit can be used with any group of patients discharged from the hospital. The provider can also use the virtual visit for outpatient follow-up not associated with a hospital discharge. Telephone follow-up is usual care for this department, but there is no standard timeframe for follow-up or a written script or documentation template. There is an opportunity to create these tools and protocols.

Policy Implications

This project will add to the growing body of knowledge supporting sustaining and expanding upon the relaxation of telehealth policies and regulations for federal, state, and private insurers. Before the 2020 global pandemic, telemedicine varied by state and by the insurance provider, and the insured's usage was low. In 2019, forty-two states had enacted some form of telemedicine parity law for private insurers (Laktman et al., 2019). Providing coverage for telehealth, however, did not correspond to usage by employees or enrollees. In 2019, 82% of companies with 5,000 or more employees offered telehealth benefits, but only 2.4% of the enrollees used them (Rae et al., 2020).

According to Weigel et al. (2020), to continue the momentum post-pandemic, health insurers should treat telehealth services the same as in-person health services, ensure that patients can access telehealth from their homes, allow audio-only provider-patient videos, and commit to investing in technological infrastructure for rural areas.

At the department level, this project may lead to a change in postdischarge follow-up protocol for the PAH population to include an earlier visit and weekly telephone calls. They may also opt to update the standard timeframe for follow-up in the other sections.

Dissemination

Brownson et al. (2018) believe that the passage of health knowledge to the public and

eventually to policy is negatively impacted by ineffective dissemination. Translational research, moving it from the scientific domain to the public domain, is the "art" that pairs with implementation science. According to White and Zaccagnini (2017), there are two dissemination purposes; sharing with stakeholders and academia and sharing with a broader professional audience.

Pulmonary Arterial Hypertension is a rare disease, and as such, it is even more imperative to share data, both qualitative and quantitative. Advances in diagnoses and treatments of diseases that are novel, affect a small population and have few subject matter experts benefit from translational research and dissemination (Courbier et al., 2017).

Site and DNP Committee Reporting

The PI will share findings with the Pulmonary Hypertension multidisciplinary team and stakeholders via presentation. Since the postdischarge protocol can be applied to various patient populations, it will also be shared with the other sections in this department, such as "Heart Failure." The project will be shared with the Pulmonary Hypertension Professional Network through publication and presentation at the symposium. The PI will also present via audio/visual modality and submit the project in its entirety to the University of Arkansas, Eleanor Mann School of Nursing doctoral committee. Additionally, the project will be shared with the Evidence-Based Nursing Research Department at this facility and presented, if accepted, as an abstract at the facility EBP conference.

Professional Reporting

The PI may share the quality improvement project with the Pulmonary Hypertension Professional Network (PHPN) and present it at the bi-annual PHPN conference scheduled for Sept. 30-Oct. 2, 2021. The PHPN conference hosts nurse practitioners, nurses, pharmacists, physicians, physician assistants, social workers, and other allied health professionals. It provides an opportunity to share and discuss the latest advances in the field of pulmonary hypertension.

Conclusion

There is little argument that America has a chronic disease "problem." According to the Centers for Disease Control (CDC), in 2012, half of all adults in the United States had one or more chronic health conditions (2017). It is also clear that the healthcare landscape is changing rapidly and advancing technology in all life areas.

Pulmonary hypertension is a chronic illness and a rare disease that makes patients vulnerable in all aspects of care. It is one of those illnesses that necessitate empowering the patient with self-care management skills and removing barriers to quality health care. The time following hospital discharge is a particularly high-risk period for patients with PH and requires a multidisciplinary approach delivered by a healthcare team of experts in PH (Housten et al., 2019). If efforts are unsuccessful, the result may lead to readmissions, adverse events, medication complications, and inadequate self-care management skills (Housten et al., 2019; Moreo et al., 2017).

Questions surrounding how providers deliver quality care, attain access to care equity, and the costs to all, monetarily, physically, and mentally, for any patient drive the need for a better health care delivery system. As has been shown, chronic illness requires ongoing collaboration between the patient and healthcare team to promote self-care management skills (AHRQ, 2016).

One answer to these questions is to combine existing technology with quality health care delivery to connect the patient and healthcare team. Though this QI project was limited by sample size and time, the single participant completed the protocol, including the visit and four nurse follow-up phone calls. During the follow-up, patient safety was addressed by finding a medication error; access was increased, costs were mitigated, patient education was enhanced, and the patient avoiding being readmitted to the hospital within 30 days of discharge. Additionally, it was demonstrated that the protocol is feasible to implement.

There is a place for telemedicine interventions to reduce hospital readmissions and

enhance chronic disease management skills. Continuing implementation of this protocol would improve our ability to deliver safe, effective, efficient, timely, patient-centered care to improve patient outcomes for the PAH population and other chronically ill populations.

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Appendix A: Global Aims Assignment

Write a Theme for Improvement: _Transitions of Care_____

Global Aim Statement

Create an aim statement that will help keep your focus clear and your work productive:

We aim to improve: **transitions of care for patients with World Health Organization (WHO) Group 1, pulmonary arterial hypertension (PAH) at this facility**
(Name the process)
In: **the Pulmonary Hypertension Comprehensive Care Center**
(Clinical location in which process is embedded)
The process begins with: **identifying gaps in the current process.**
(Name where the process begins)
The process ends with **implementing a provider-led post-discharge follow-up virtual visit and nurse-led telephone follow-up call process in the thirty days after hospital discharge for patients with World Health Organization (WHO) Group 1, pulmonary arterial hypertension (PAH) at this facility.**
(Name the ending point of the process)

By working on the process, we expect: **Reduce readmission rates below 20% for study participants; achieve 95% participation in scheduled one-week postdischarge virtual visit; achieve 85% management of fluid status by study participants; achieve 95% adherence to medication regimen by study participants; 0% signs and symptoms or admissions for indwelling central line or subcutaneous site infections.**
(List benefits)
It is essential to work on this **because improving the process will reduce readmission rates and improve symptom and self-care management.**
(List imperatives)

Create Flowchart

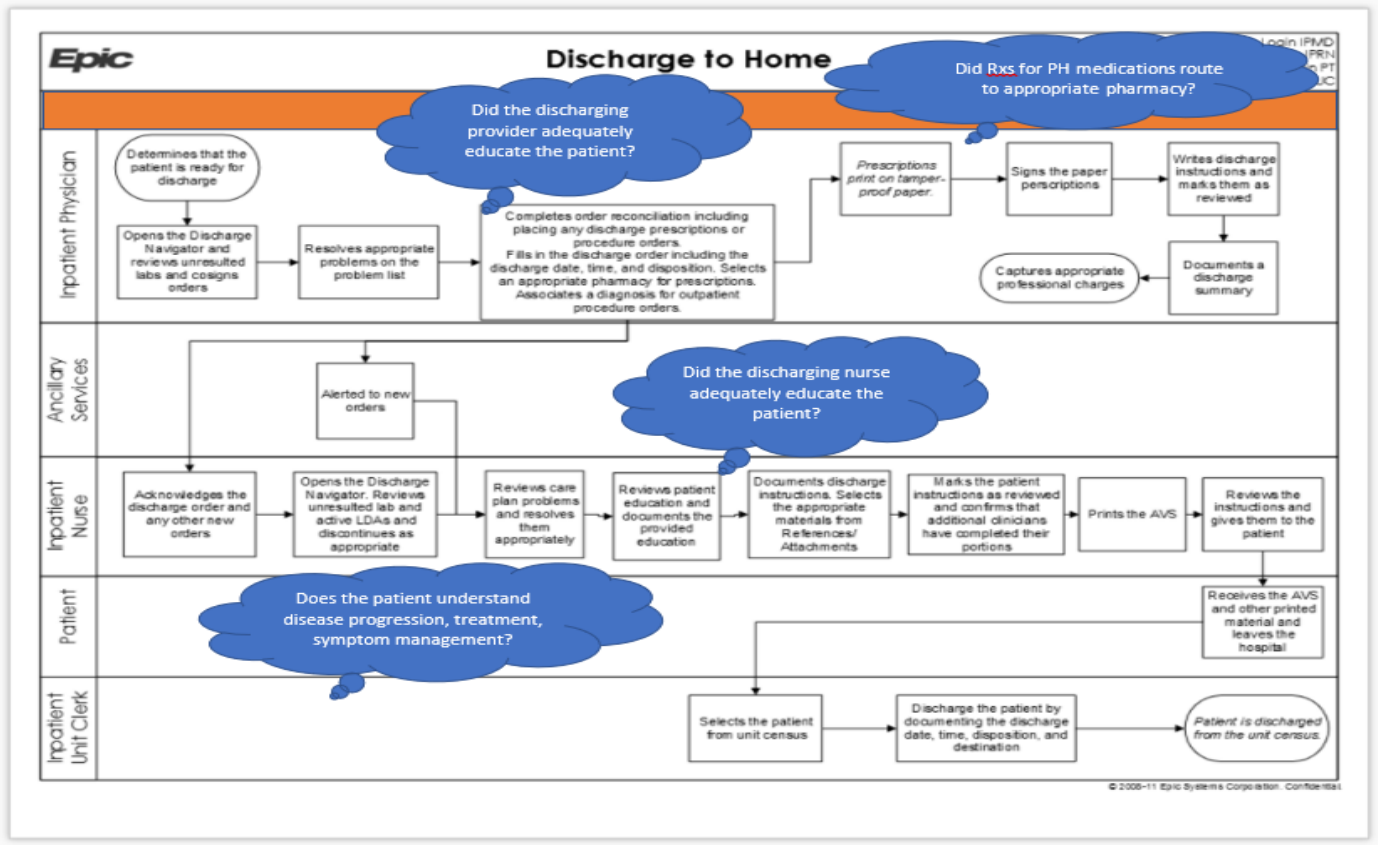
Specific Aim Statement

We will: ☐ improve ☐ increase ☐ **decrease**

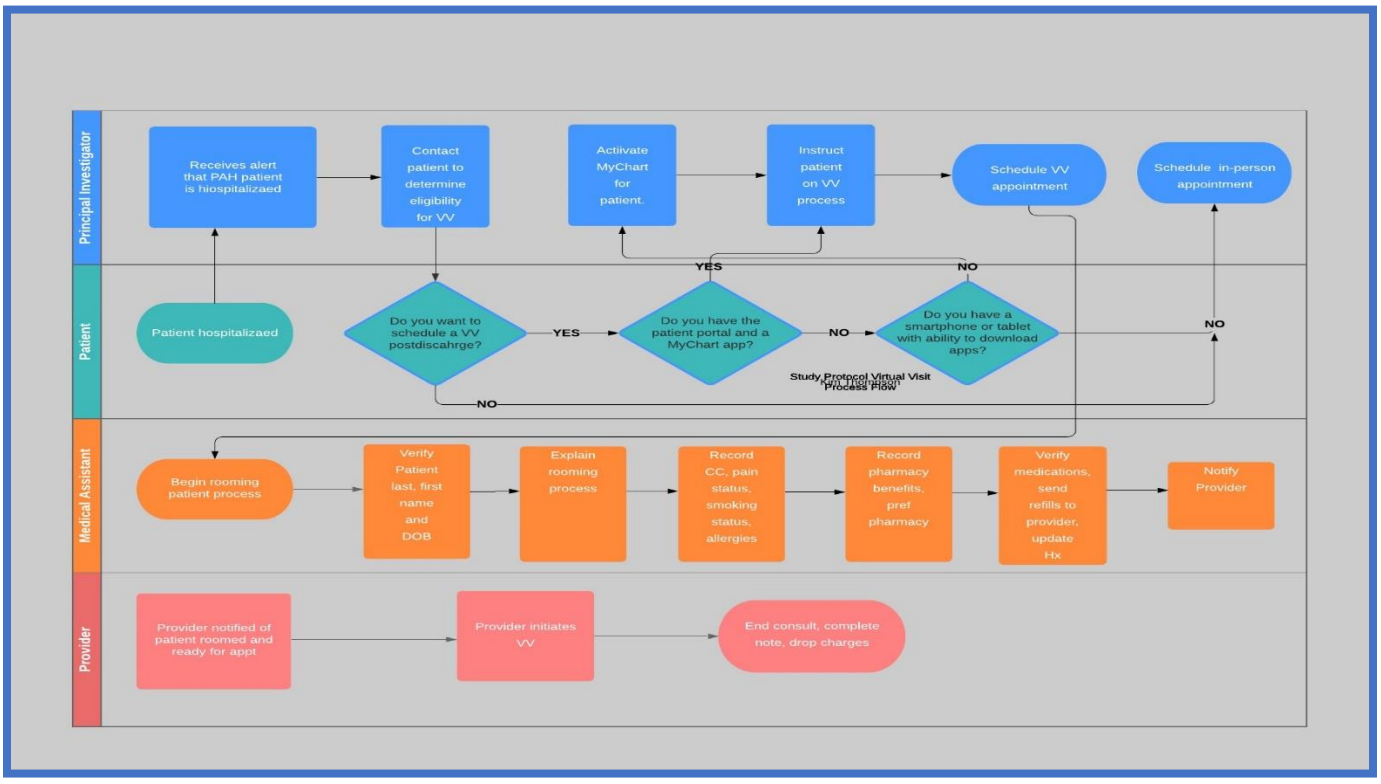
The: ☐ quality of ☐ **number/amount of** ☐ **30-day rehospitalization rates_____**
(process)
To:_____**less than 20%**_____
(percentage)
To/By: **offering a 1-week post-discharge virtual visit and nurse-led telephone follow-up call process in the thirty days after hospital discharge** _____
(describe the change in the quality or state the number/amount/percentage)
By: **March 2021**

Appendix B. Process Charts

Existing Hospital Discharge and Clinic Follow-up

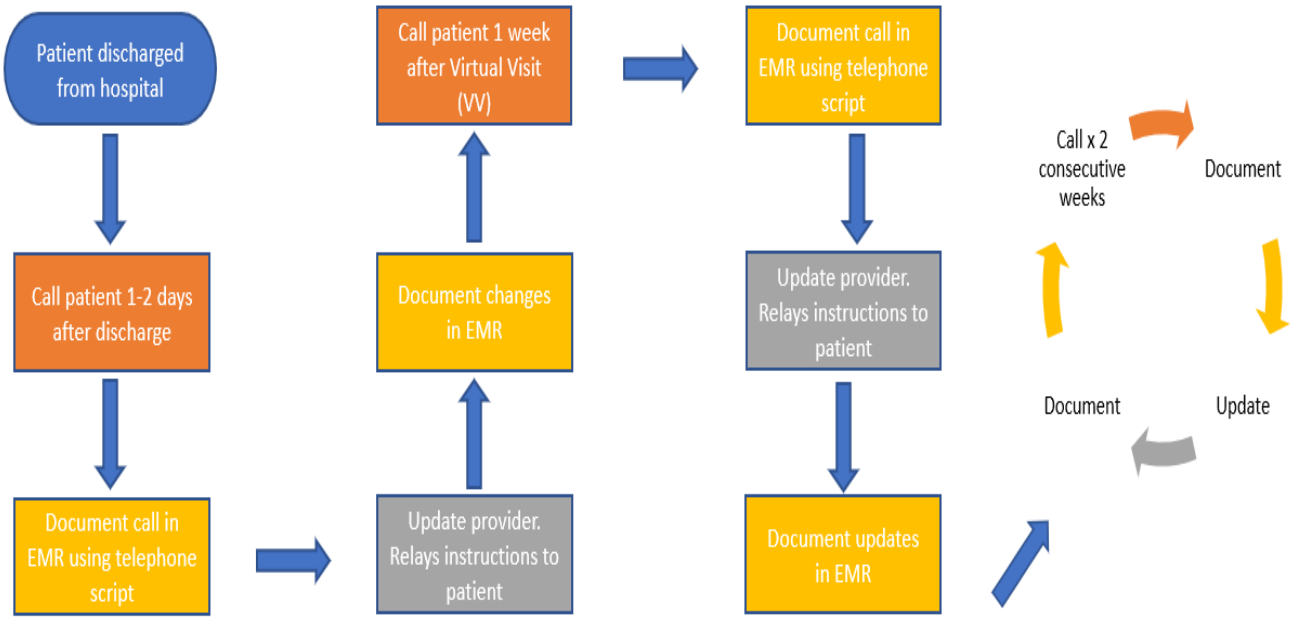


New Virtual Visit Process Flowchart



Appendix B. Process Charts

New Scheduled Nurse Follow-Up Phone Call Process Flowchart



Appendix C: Evidence Table

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
Gai, Y.& Pachamanova, D	2019	USA	N/A	The Hospital Readmissions Reduction Program	Readmisstion rates for three targeted conditions (acute myocardial infarction, heart failure, and pneumonia) among four types of vulnerable populations, including low-income patients, patients served by hospitals that serve a high percentage of low-income or Medicaid patients, and high-risk patients	Quasi-experimental design to compare the pre-HRRP (i.e., 2010–2011) differences in readmission rates between treatment and control groups with their post-HRRP (i.e., 2012–2014) differences	n = 34 million hospitalizations	Nationwide Readmission Database (NRD), which contained all discharges from community hospitals in 27 states during 2010–2014	Found evidence that there has been a decline in readmissions across the board, and sometimes more substantial changes for vulnerable populations The HRRP does work.	Level III

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
Chatterjee, K., Goyal, A., Boye, B., & Ranagswami, J.	2017	USA	N/A	Patients hospitalized for PAH with primary ICD-9-CM diagnosis code 416.0	30-day Readmission rates,	Retrospective Study	n = 776	Nationwide Readmission Database analysis. Sampling weights were used to create national-level estimates	Studied the predictors of 30-day readmission rates and cost analysis for PAH patients. Risk factors for readmission were presence of COPD, AKI, and cardiogenic shock. No impact of age or gender on risk of readmissions. The median time to readmission being 17 days. The median LOS was higher for readmissions than index hospitalizations (7 vs 5 days, p = 0.04). The mean charges	Level II

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
									for index admissions and readmissions were $70083 and $6791 . About 15% of patients with PAH-related hospitalizations are readmitted within thirty days. Readmissions contribute to significant healthcare utilization and cost among patients with PAH.	
Emerson, J. F., Welch, M., Rossman, W. E., Carek, S., Ludden, T., Templin, M., Moore,	2016	USA	N/A	3-month multidisciplinary intervention using health coached (telephone and virtual visits) and cloud-based glucose monitoring plus	Feasibility of intervention – ability to connect with patient and manage DM through virtual visit	Randomized Clinical Trial	127 patients randomized n = 10, 8 completed the study. Diabetic w/poorly controlled diabetes,	Surveys and glucometer/ EMR data percent of successful virtual visits (defined by ability to	Address health disparities using multi-disciplinary intervention & advanced communication to improve	Level II Weak – small sample size

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
C. G., Tapp, H., Dulin, M., & McWilliams, A.				usual care.	(# of visits) Patient use of cloud-based glucometers Patient satisfaction *Secondary* – HA1C control Psychosocial assessment		English speaking, uninsured, between ages 18-75, from four regions in NC	coordinate a tablet-based virtual visit with a health coach in the patient home), participant utilization of cloud-based glucometers and participant satisfaction based on post-participation surveys	access and chronic disease management. Successful incorporation of telemedicine and health coaches in a vulnerable patient population. Virtual access extends of care team. Patients felt that interventions were beneficial	
Gu, S., Hu, H., & Dong, H.	2016	China	N/A	Evaluate current evidence on economic burden and cost effectiveness of treatments associated with PAH, based on a country- or institution-specific population	Cost burden and cost effectiveness for patients, clinicians, and decision makers.	Systematic Review	n = 19 studies PAH treatments 8 studies examined populations from the USA and Germany	Search terms: 'pulmonary arterial hypertension', 'pulmonary hypertension', 'pulmonary artery hypertension' and 'PAH' were used in	Review cost of PAH on patients and health care systems and cost of treatments for PAH.	Level I Small sample

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
							6 studies focused on disease burden for privately insured patients All studies had estimates of annual or monthly direct health care costs per patient, but none evaluated indirect costs	combination with each of the terms 'economic', 'cost', 'economics', 'health expenditures', 'burden of illness', 'cost of illness', 'health care cost', 'direct costs' and 'indirect costs' data extraction form to record the characteristics of each included study		
Knox, L., Rahman, R. J., & Beedie, C.	2017	England	N/A	Published RCT's, peer reviewed, reporting Quality of Life (QOL) measure. Comparing delivery of any	Health Related Quality of Life	Meta-analysis of RCTs	n = 26 studies, 7,066 participants with heart failure receiving	Checked title and abstract of each identified study. SPSS (v21)	Telemedicine significantly increased overall quality of life for patients vs	Meta-Analysis Level I

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
				kind of telemedicine w/usual care to HF patients vs usual care			usual care + telemedicine	to store & categorize variables. Applied guidelines from Scottish Intercollegiate Guidelines Network-50 (SIGN50)20 to gauge quality of the study; Used mediated for disagreements	standard care in the management of heart failure. They also determined that Telemedicine equaled standard care in maintenance of physical and mental QOL	
Milani, Lavie, Bober, Milani, & Ventura,	2017	USA	N/A	Patient education, drug management, and lifestyle recommendations as per hypertension guidelines Using Remote, home-based telemonitoring program	Blood pressure control and patient engagement	Adult patients with the diagnosis of hypertension at one hospital location who had elevated blood pressure (systolic pressure > 140 mm Hg or diastolic	digital-medicine group (n = 156) and usual-care groups (n = 400)	Clinical data from EMR collected from patient home BP cuff /smartphone app PAM questionnaire	Digital-med patients completed questionnaires online, submitted at least 1 bp reading/week, and received medication management and lifestyle recommendations via a	Level III Single-center study, not randomized

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
						pressure > 90 mm Hg) at each of the 3 most recent physician visits within the previous 18 months.			clinical pharmacist and a health coach. Found that .it is feasible to significantly improve hypertension control as well as enhance patient activation using a digital health monitoring and intervention program. 71% over 90 days with digital health intervention to 31% usual care Reduced poor patient activation by 60%	
Bhattachary a, P. T.,	2019	USA	N/A	Patients with pulmonary	Readmission	Experimental	Sampling weights used	2014 Healthcare	20% readmission	

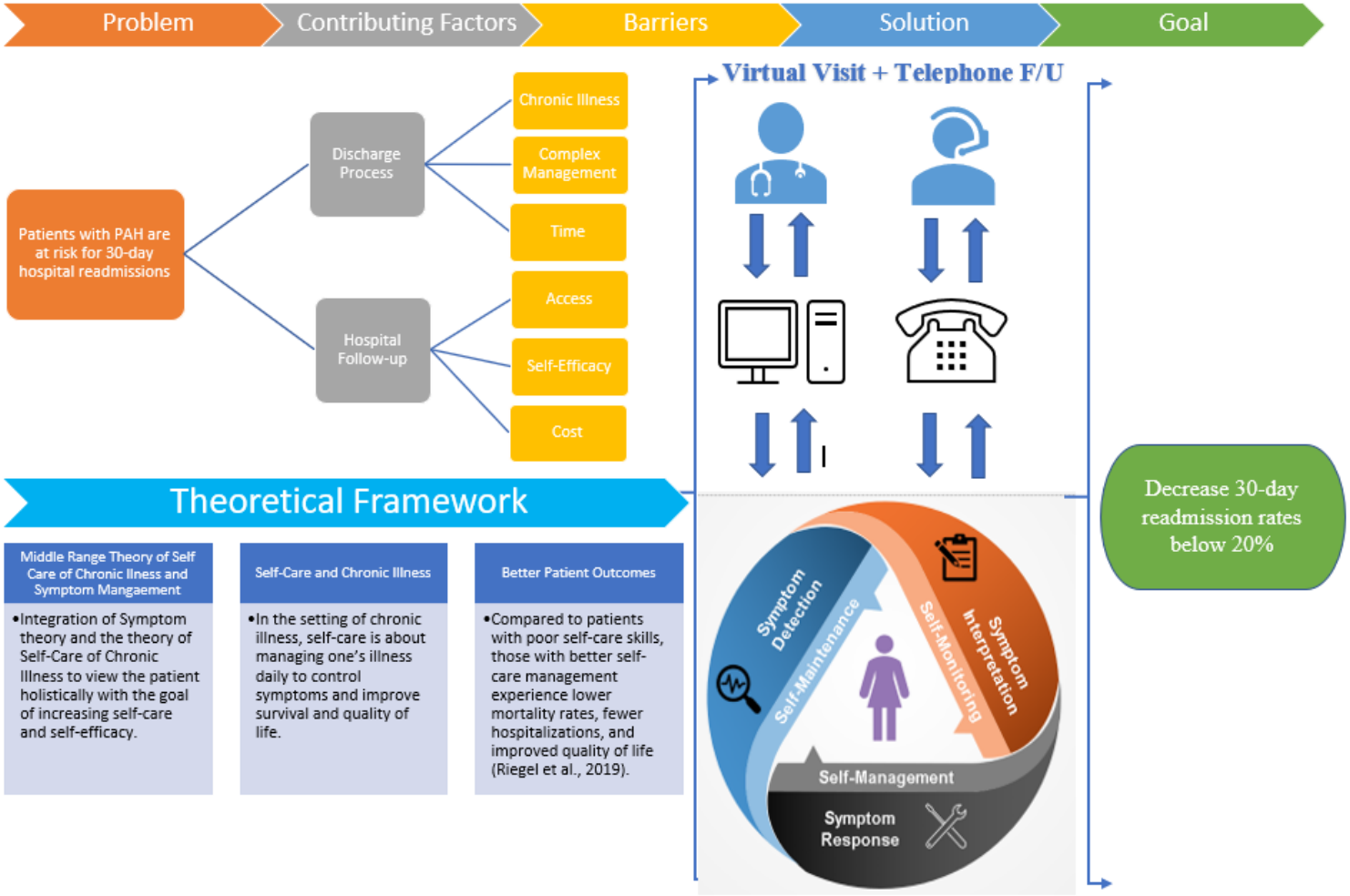
Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
Hameed, A. A., Bhattacharya, S. T., Chirinos, J. A., Chatterjee, S., Giri, J. S., . . . Mazurek, J. A.				hypertension (primary and secondary)	rates		to compare to national stats. n = 2338	Cost and Utilization Project Nationwide Readmission Database (NRD) and the diagnosis codes of 416.0 and 416.8 and an index admission and readmission within 30 days	rates for all PAH 90% of 30-day readmissions were SPH and 10% were PPH. The mean charges for PPH admissions and readmissions were $75,980 and $85,842, with SPH totaling $53,084 and $62,585, respectively.	
Tejwani, V., Patel, D. C., Zein, J., Guzman, J. A., Diaz-Guzman, E., Mireles-Cabodevila,	2018	USA	N/A	PH patients admitted to the MICU between January 2009 and June 2011	post-MICU discharge mortality rate	Retrospective cohort study at 6, 12, 24 months	n = 63 with matched PH cohort (n = 58). adult groups of patients with PH enrolled in the Clinic	PH Registry for the clinic	The most common reason for admission was RHF and 64% died of RHF in the hospital and	Level V

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
E., . . . Heresi, G. A.							PH registry		85% died of RHF post-discharge	
Stein, P. D., Matta, F., & Hughes, P. G.	2015	USA	N/A	Adults with Group 1 PAH (ICD 9 – 416.0)	Hospitalizations, deaths	Retrospective study	n= 64,451 20% stratified sample on hospital characteristics of US hospital-based Eds.	Nationwide Emergency Department Sample, 2007-2011	From 2007-2011 the rate of ED visits, hospitalizations, and deaths in patients with Group 1 PAH decreased	Level V
Levine, D. M., Dixon, R. F., & Linder, J. A.	2018	USA	N/A	Virtual visit vs usual care	BP control, primary care office visits, specialist office visits, ED visits, and inpatient admissions in the 180 days before and 180 days after the inperson visit	Retrospective cohort study with adjustment by difference-in-differences	n = 1051 VV and n = 24,848in person visits	EHR	BP control was equivalent between the groups and decreased use of primary care	Level V
Slightam, C., Gregory, A. J., Hu, J., Jacobs, J., Gurmessa,	2020	USA	N/A	Video visits	Patient satisfaction/ preferences	Survey	n = 764 respondents who completed baseline and	Baseline survey then post visit survey sent 3-6 mos	Significant patient satisfaction with video visit or	VI

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
T., Kimerling, R., . . . Zulman, D. M					identify primary health care access barriers (2) examine patient experiences with tablets and any changes in perceived access to care, and (3) investigate the patient characteristics associated with preferences for video visits vs in-person care.		follow-up survey n= 530 baseline only	later	equivalent to in person visit. Identified patient characteristic that influence preference for video visits. Patients less likely to report preference for video visits if they had more chronic conditions. Qualitative analyses identified 4 themes related to preferences for video-based care: perceived improvements in access to care, perceived differential quality of care, feasibility of obtaining	

Authors	Year	Country	Theory guiding study & ID of Variables	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Design type	Sample (n =) Method	Data Collection tools	Brief Summary of Results	Strength of evidence
									necessary care, and technology-related challenges	
Almathami, H. K. Y., Win, K. T., & Vlahu-Gjorgievska, E.	2020	Australia and Saudi Arabia	N/A			Systematic Review	n = 45	Database search - Scopus, Association for Computing Machinery, PubMed, and Web of Science. Yielded 2518 articles.	Identified barriers and facilitators to telemedicine. They found some benefit to telemedicine services although barriers still exist for some patients.	
2015 ESC/ERS Guidelines for the diagnosis and treatment of pulmonary hypertension – Evaluation and summary of all evidence on pulmonary arterial hypertension; management, treatments, outcomes, recommendations for practice.										

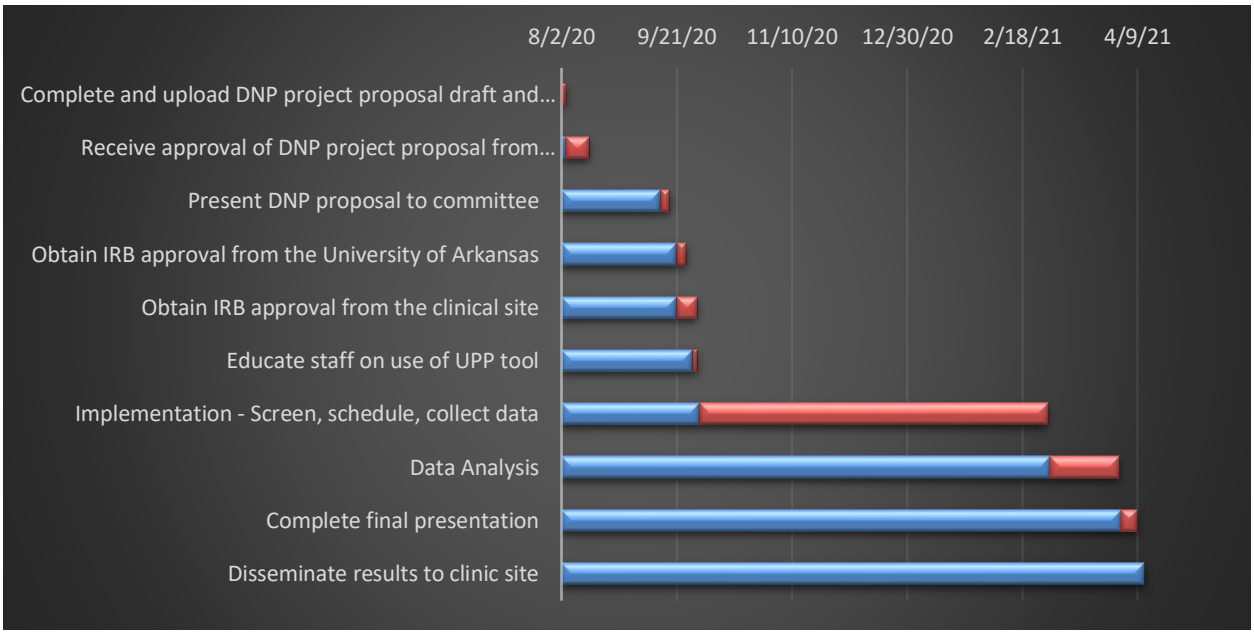
Appendix D: Concept Map



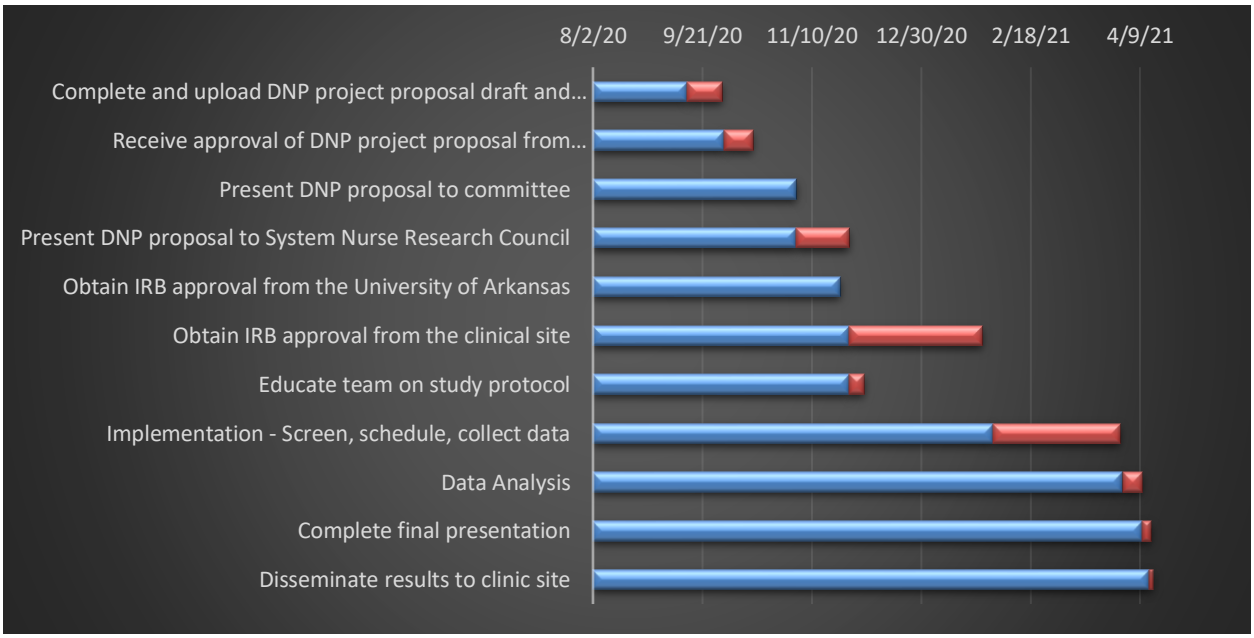
Concept Map: Post-Discharge Virtual Visit & Nurse Follow-up Protocol

Appendix E: Gantt Chart

Initial Timeline



Revised Timeline



Appendix F: PDSA Cycles

PDSA - Patient Enrollment		
OBJECTIVE: Implement protocol		
Change Idea: Enroll participants in study		
	Person Responsible	Due Date
Plan: Monitor EMR for pulmonary hypertension patient admissions. Enroll participants in the study	PRINCIPAL INVESTIGATOR	2/1/2021-Ongoing
Do: Followed up with admitted patient. Educated and consented patient for study. Patient had activated patient portal. Attended multi-disciplinary discharge rounds and communicated with team to remain aware of discharge date. Patient discharged to home on 2/17. Scheduled virtual follow-up for 2/26. Contacted patient at day 2 post-discharge. Used nurse script to guide interaction.	PRINICIPAL INVESTIGATOR	2/8/21-2/19/21
Study: Challenges to this study are the lack of control over admission dates and discharge dates but only in the context of a set project timeline. Once the process is approved and added to the guidelines, the admission and discharge dates will not be a factor. Another issue is that a patient or provider may not be available for an appointment at exactly one-week postdischarge. There will need to be some flexibility in the virtual visit date.	PRINCIPAL INVESTIGATOR	2/1/2021 - life of the study
Act: Will note exactly how many days postdischarge the appointment is scheduled to illuminate any potential issues. Will create a qualitative question about the patient's experience to add to the interventions. This will be provided to the University and Facility team for review and approval. Adding this question does not trigger a re-submission to IRB.	PRINCIPAL INVESTIGATOR; Chair and head of Facility Nurse Research dept.	2/18/2021 - 2/26/2021

PDSA Process Cycle - Provider		
OBJECTIVE: Monitor Provider Participation		
Change Idea: Observe and calculate a percentage of providers who conducted postdischarge virtual visits		
	Person Responsible	Due Date
Plan: Schedule study participants with different providers for virtual visit.	PRINCIPAL INVESTIGATOR	2/1/2021-Ongoing
Do: Followed up with admitted patient. Educated and consented patient for study. Patient had activated patient portal. Attended multi-disciplinary discharge rounds and communicated with team to remain aware of discharge date. Patient discharged to home on 2/17. Scheduled virtual visit for 2/26.	PRINICIPAL INVESTIGATOR	2/8/21-2/19/21
Study: Challenges to this study are the lack of control over admission dates and discharge dates but only in the context of a set project timeline. Once the process is approved and added to the guidelines, the admission and discharge dates will not be a factor. Another issue is that a provider may not be available for an appointment at exactly	PRINCIPAL INVESTIGATOR, Providers, PH Nurse Coordinator	2/1/2021 - life of the study

one-week postdischarge. There will need to be some flexibility in the virtual visit date.		
Act: Noted that PI was able to schedule patient for the following week as planned, however the date was not exactly one week. Providers rotate through clinic and see outpatients regularly. Also, provider options decreased from 6 to 4 during this study period. There has to be a slot available for the postdischarge patient or the visit may be pushed to later than one week.	PRINCIPAL INVESTIGATOR, Providers,	2/18/2021 - 2/26/2021

PDSA Process Cycle - Patient		
OBJECTIVE: Monitor Patient Participation		
Change Idea: Observe and calculate a percentage of patients who complete the visit and phone calls.		
	Person Responsible	Due Date
Plan: Schedule study participants with different providers for virtual visit.	PRINCIPAL INVESTIGATOR	2/1/2021-Ongoing
Do: Followed up with admitted patient. Educated and consented patient for study. Patient had activated patient portal. Attended multi-disciplinary discharge rounds and communicated with team to remain aware of discharge date. Patient discharged to home on 2/17. Scheduled virtual visit for 2/26. Additionally, patient availability when they are home is variable. The nurse may need to make more than one attempt to contact patient.	PRINCIPAL INVESTIGATOR, Providers, PH Nurse Coordinator	2/8/21-2/19/21
Study: Challenges to this study are the lack of control over admission dates and discharge dates but only in the context of a set project timeline. Once the process is approved and added to the guidelines, the admission and discharge dates will not be a factor. Another issue is that a patient may not be available for an appointment at exactly one-week postdischarge. There will need to be some flexibility in the virtual visit date and the phone calls. Also, the patient may contact the nurse at any time during the weeks following discharge. The nurse should document those calls as part of standard of care but still complete a planned call that follows the nurse script. Of note, the PH Nurse Coordinator team decreased from 2 nurses to 1, so resources became a challenge.	PRINCIPAL INVESTIGATOR, PH Nurse Coordinator	2/1/2021 - life of the study
Act: Noted that PI was able to schedule patient for the following week as planned, however the date was not exactly one week due to provider availability. There was not a set appointment time for the follow up call so the PH nurse coordinator had to call and leave a message on at least one occasion (the call was still completed). Department is searching for a new nurse to fill the vacant position.	PRINCIPAL INVESTIGATOR, PH Nurse Coordinator, Facility Managers	2/18/2021 - 2/26/2021

Appendix G: Data Collection Charts

Project ID		Active Portal	Type of Device	Admission Date	Reason for Admission	Discharge Date	Length of Stay (LOS)	Readmission Date	Reason for Readmission
A		YES	CADD Pump	2/1/2021	Overload/New Diagnosis PH	2/17/2021	16	0	0
Date	**Completed Visit**	**PH Medication 1**	**PH Medication 2**	**PH Medication 3**	**Missed doses of medications**	**Reported Weights**	**Weight Gain 3# overnight**	**Weight Gain 5# in 1 week**	**S&S of Infection**
1-2 day Call	Yes	IV Remodulin	Adcirca	None	No Rx	177	0		0
Virtual Visit	Yes	IV Remodulin	Adcirca	None	None	181	0	4	0
Week 1	Yes	IV Remodulin	Adcirca	None	None	175	0	-6	0
Week 2	Yes	IV Remodulin	Adcirca	None	None	179	0	4	0
Week	Yes	IV Remodulin	Adcirca	None	None	183	0	4	0

Appendix H: Needs Assessment Questionnaire

Needs Assessment Questionnaire

The purpose of this questionnaire is to gather information about the care of our pulmonary hypertension population. The information obtained will be used to improve processes and health outcomes for this patient population. Information collected from interviews will be confidential. The interview should take approximately 15 minutes to complete.

Role: Administrator (1), Section Head, MD (1), PH Department Director, MD (1), PH Nurse Coordinator (2)
Employment Status: Full time (5)

1. **What is currently in process in our department?**

Answers: REVEAL Calculator; inpatient IV/SC order sets, preparation for PH Director transition; EPIC PH snapshot

2. **Where is there room for improvement in our department?**

Answers: PH patient discharge/transition to home or other setting – med reconciliation, patient discharge education; outpatient clinic access; clinic process and workflow; ability to retrieve data from EPIC for PH patients; staffing needs – nurse coordinator assistance; provider education

2. **What are the top areas to work on to improve the things that are not working well?**

Answers: outpatien**t** clinic access, gaps in the hospital discharge process, and provider and patient education

4. **What are some solutions?**

Answers: Early discharge follow-up for PH patients, clinic access – virtual visits and create a process/workflow and role responsibilities; education materials – meet with patient education coordinator; discharge checklist or education packet; add staffing help to PH department

5. **What resources do we have to assist with these solutions?**

Answers: Nurse Coordinators, Medication manufacturers/specialty pharmacy, patient education coordinator, LPN/MA, Epic Team

Appendix I: Study Consent Form

IMPLEMENTATION OF A POSTDISCHARGE VIRTUAL VISIT AND NURSE FOLLOW-UP PROTOCOL INTERVENTION

PRINCIPAL INVESTIGATOR (PI)
Kimberly C Thompson
University of Arkansas Eleanor Mann School of Nursing
606 N. Razorback Rd.
1-504-842-0948
kcthomp@uark.edu

FACULTY ADVISOR
Dr. Thomas Kippenbrock
University of Arkansas Eleanor Mann School of Nursing
606 N. Razorback Rd.
479-575-4560
tkippen@uark.edu

PURPOSE OF PROJECT

You are being asked to take part in a graduate school project. Before you decide to participate in this project, it is important that you understand why the project is being done and what it will involve. Please read the following information carefully. Please ask the PI if there is anything that is not clear, if you need more information or would like the PI to read it out loud to you.

The PI is working with the University of Arkansas, Ochsner Health System and your Ochsner Pulmonary Hypertension team to study a new hospital follow-up plan. The plan includes a virtual visit with your provider one week after your discharge from the hospital. It also includes a phone call from your nurse coordinator within one to two days after discharge and three weekly calls after your virtual visit. Previously, you would be scheduled for an in clinic visit with your provider one to two weeks after hospital discharge. Also, your nurse coordinator will reach out to you at more frequent intervals following your hospital discharge.

The purpose is to decrease hospital readmissions withing 30 days of discharge, increase access to healthcare by reducing the travel, cost, and time for you. It also provides an earlier chance for you, your provider, and your nurse to review your care instructions, your medications and to discuss any concerns you may have about managing your condition at home.

IMPORTANT DEFINITIONS

- A virtual visit a secure audio and or video appointment between you and the provider.
- The visit is scheduled and completed through your patient portal, using a smartphone or tablet.
- The virtual visit will take the place of the standard one to two week in-clinic visit following your discharge from the hospital.

  - **Note:** You may still request an in-clinic visit with your provider at any time. You will also continue to be scheduled for your regular follow-up appointments.
- The second part of the study is that you will receive a phone call from your PH nurse one to two days after you leave the hospital and then once a week for three weeks after your virtual visit.
  - **Note:** You may still call or email your PH nurse at any time, Monday through Friday, 8-5, with any questions or concerns.
- Telephone follow-up is a call placed from PH nurse to the PH patient following hospital discharge.

PROJECT PROCEDURES

- You will be screened by the PI to determine eligibility for the virtual visit.
- You will be scheduled for the virtual visit.
- The PH coordinator will call you 1-2 days after you are discharged from the hospital
- After you complete your virtual visit, the PH coordinator will call you in 1 week and weekly for 2 more weeks.
- You and your healthcare team will:
  - Discuss your disease process,
  - Review your medications,
  - Discuss signs and symptoms to watch out for and what to report to your team.
  - Discuss when to seek emergency medical care and
  - Confirm follow-up appointments

RISKS

- There are no risks associated with this study.
- Potential loss of patient privacy and confidentiality of data collected during this study can occur. The principal investigator and the facility are committed to handling all patient data in accordance with HIPAA standards.

BENEFITS

- Decreased chance of being hospitalized within 30 days of discharge.
- Early contact with your healthcare team for post-hospitalization assessment.
- Reduced travel and cost associated with travel to your appointment
- Increased self-care management skills

CONFIDENTIALITY

- Any information that has identifying data will be stored in your secure electronic medical record (EMR) as it is now.
- Any data collected outside of the EMR will be “de-identified” which means any identifiers associated with you will not be used. This includes: any part of your name, date of birth, address, or social security number.

CONTACT INFORMATION

- If you have questions at any time about this project, or you experience adverse effects as the result of participating in this project, you may contact the principal investigator, whose information is provided on the first page.
- If you have questions or concerns about your rights as a research participant, you may also contact Ro Windwalker, the University's Human Subjects Compliance Coordinator, at 479-575-2208 or send an email to irb@uark.edu.

INFORMED CONSENT AND VOLUNTARY PARTICIPATION

What is informed consent?

- Informed consent is an agreement to take part in a study.
- It gives you facts about the study so that you can decide if you want to participate or not.
- The form will explain the study and the benefits and risks.
- You can choose whether you want to be in the study or not.
- If you decide not to participate it will not affect your health care.
- You can agree to be in the study and then change your mind later.
- Your PH (pulmonary hypertension) coordinator will help you with the consent form.

CONSENT

I have read, and I understand the information provided. I have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this project.

Participant's signature _____ Date _____

Investigator's signature _____ Date _____

Appendix J: Virtual Visit Consent Form

Informed Consent for Virtual Visit

PURPOSE: The purpose of this form is to obtain your consent to participate in a "virtual visit" telehealth consultation.

DESCRIPTION: What is a virtual visit? To better serve the needs of its patients, [redacted] is offering interactive video communications between some patients and their [redacted] health care providers, when appropriate. This is referred to also as "telehealth." In this way, you may be evaluated and treated by your provider from a distant location.

Since this may be different from the type of visit with which you are familiar, it is important that you understand and agree to the following:

1. My physician will be at a different location than me for the virtual visit.
2. My physician will document the virtual visit in my [redacted] medical record.
3. I will be informed of the relationship between me and my physician or other provider treating me and the role he or she will serve in my care.
4. I will be informed if any health care provider is to be present with me at my location to assist in the visit.
5. There are potential risks to this technology, including:
   - In rare cases, information transmitted may not be sufficient (e.g., poor resolution of images) to allow for appropriate medical decision-making by the physician.
   - Delays in medical evaluation and treatment could occur due to deficiencies or failures of the equipment.
   - In very rare cases, security protocols could fail, causing a breach of privacy of personal health information.

I or my health care provider can discontinue the virtual visit if it is felt that the technical connections are not adequate for the situation or if I have any concerns about confidentiality or the ability of my physician to render proper care to me in this setting.

6. I have been informed how to receive follow-up care and emergency care.
7. I have been informed how to receive care in the event of a technology or equipment failure.
8. All existing laws regarding my access to my medical information and copies of my medical records apply to this virtual visit. I have been informed how to obtain copies of medical records and/or insure transmission, or forwarding, to another medical provider.
9. Video, audio, and/or photo recordings may be taken of me during the procedure.
10. Reasonable and appropriate efforts have been made to eliminate any confidentiality risks associated with the virtual visit, and all existing confidentiality protections under federal and Louisiana state law apply to information disclosed during the virtual visit.
11. I have the option to decline to receive medical services by telehealth and may withdraw from such care at any time without affecting the right to future care or treatment at [redacted].

CONSENT

I have read, understand, and agree to all information set forth in this document and agree that all applicable blanks were filled in prior to my signing. This information, including, but not limited to, the benefits and risks of this care and alternative treatment options to telehealth, was discussed with me, in language that I understand, by my [redacted] health care provider(s). During this discussion, my provider(s) gave me the opportunity to ask any and all questions I had regarding the information set forth in this document and answered any such questions I had to my full satisfaction.

I hereby agree to participate in virtual visit telehealth services, as described above, and authorize my [redacted] physician to utilize telehealth in the course of my diagnosis and treatment. This authorization for and consent to my participation in virtual visit telehealth services are and shall remain valid until revoked by me verbally or in writing.

_____	_____
Signature of Patient	Signature of Patient Representative (where required)
_____	_____
Signature of Witness	Patient Representative Print Name

_____	_____	_____
Date	Time	Relationship to Patient

Appendix K: PAH Nurse Coordinator Weekly Telephone Follow-up Script

Discharge Date:

Primary Discharge Diagnosis:

How is the patient feeling since discharge from the hospital?

Vital Signs (If known)

BP:
HR:
O2%:
Temp:
Current Weight:

Medication Review

Discharge Medication Review:

Medication reconciliation performed? ☐ YES ☐ NO

Did the patient have any difficulty/problems filling prescriptions? ☐ YES ☐ NO

Notes:

PAH Diagnosis Specific Medication Review:

Name	Frequency	Side Effects (If Any)

Does the patient have any questions regarding medications? ☐ YES ☐ NO

Notes:

Oxygen and Order Review

Does the patient use oxygen?

☐ NO

☐ YES LITER FLOW _____
☐ ATC
☐ WITH ACTIVITY
☐ AT NIGHT

Notes:

Was Home Health and any equipment ordered for the patient upon discharge?
☐ YES☐ NO

Home Health	
If yes, has home health contacted patient and/or initiated services?	
Name of Home Health Agency	
Durable Medical Equipment (DME)	
If yes, has the DME provider contacted patient and delivered equipment?	
DME Company	

Pulmonary Hypertension Symptom Checker

☐ DIZZINESS
☐ SHORTNESS OF BREATH
☐ FEELING TIRED
☐ FAINTING
☐ SWOLLEN LEGS, ANKLES
☐ SWOLLEN ABDOMEN, FEELING OF FULLNESS
☐ COUGH
☐ WEIGHT GAIN 3# OVERNIGHT
☐ WEIGHT GAIN 5# IN 1 WEEK
☐ OTHER

Central Line/Site Assessment

PUMP SETTINGS: TYPE _____ DOSE: _____ RATE _____
☐ FEVER
☐ REDNESS
☐ PAIN
☐ WARMTH
☐ DISCHARGE DESCRIBE _____
☐ DRESSING, C/D/I
☐ OTHER

Activity Assessment

☐ NO SYMPTOMS
☐ DO YOU HAVE SYMPTOMS WITH ORDINARY ACTIVITY?
☐ DO YOU HAVE SYMPTOMS WITH MINIMAL ACTIVITY?
☐ DO YOU HAVE SYMPTOMS DURING ACTIVITY OR REST?

Education & Flag Review

Was the patient educated on "red flags" or things to watch for? ☐ YES ☐ NO

If yes:

"Red flags" patient was told to watch for:

- ✓ Struggling to breathe or unrelieved shortness of breath while at rest
- ✓ Experience chest pain or heart palpitations that persist
- ✓ Experience pre-syncope or syncope

Is the patient experiencing any red flags today? ☐ YES ☐ NO

Notes:

Education provided (Pathophysiology, Indications, Treatment, Symptom Management, Medication, Social and Emotional Guidance, Support Resources, Other):

Patient Goals

What activities are you able to do today?

What activities would you like to be able to do?

How do you know when you are having a "good day?"

How many good days have you had in the last week?

Patient Follow Up

Phone number patient will call if having any questions or problems:

Appointment scheduled? ☐ YES ☐ NO DATE: _____

Follow-up/transition of care appointment, including the date/time and location of your appointment:

Diagnostics scheduled? ☐ YES ☐ NO

Notes:

Provided patient with date, time, and location of follow-up appointment if they do not have it:

Notes:

Appendix L: DNP Project Title Form

UNIVERSITY OF ARKANSAS
College of Education and Health Professions
Eleanor Mann School of Nursing

Appendix A: DNP Project Title Form

Name: Kimberly Thompson Student ID #: 000682039

Title of DNP Project to be applied toward the requirements of the degree:

Implementation of a Postdischarge Virtual Visit and Nurse Follow-up Protocol to Decrease 30-Day Readmission Rates for Patients with Pulmonary Arterial Hypertension

Will Research Committee Review be required?

This section must be completed

Approval #			
Biosafety Committee	Yes*_____	No_____	_____
Animal Care and Use Committee	Yes*_____	No_____	_____
Institutional Review Board	Yes*_✓_	No_____	2011300337 STUDY 00001415

Please refer to the Office of Research Compliance website for information about specific research committees
http://vpred.uark.edu/199.php

*NOTE TO STUDENT: If Yes is checked, approval must be on file with the Office of Research Compliance before the degree will be conferred. If No is checked, no data requiring committee approval may be used in the project.

Chair of the DNP Project Committee: [signature] Date: April 21, 2021

Assistant Director Graduate Studies: N/A Date: _____

Department Chair/Head: Susan Patton Date: 4/21/2021

This form is to be submitted to the School of Nursing as soon as the DNP Project topic has been established. Title changes may be submitted by memorandum to the School of Nursing until immediately before graduation.

Appendix M: Statement of Mutual Agreement

UNIVERSITY OF ARKANSAS
College of Education and Health Professions
Fulbright Fulton School of Nursing

Appendix B: Statement of Mutual Agreement for DNP Guidance

DNP Student Name: Kimberly Thompson Clinical Site or Agency: Ochsner Health Center

DNP Committee Chair: Dr Thomas Kippenbrock Site Champion Name & Title: Dr Sapna Desai
Interim Director, Pulmonary Hypertension

DNP Project Title: Implementation of a Postdischarge Virtual Visit and Nurse Follow-up to Decrease 30-day Readmission Rates For Patients with Pulmonary Arterial Hypertension

Expected On-Site Activities:

Clinic scheduling. Providers and nurses will be on-site. All patients will be off-site

Agency Approval for Presentations and Publications

- How agency will be referenced: "facility" or "facility in New Orleans, LA"
- Approval granted to use agency name in presentations publications:
- Approval granted to use agency name in the University of Arkansas
  DNP Project Scholar Works online repository:

DNP Student Signature: K Thompson Date: 10/21/2020

Committee Chair Signature: Thomas Kippenbrock Date: 4/21/2021

Site Champion Signature: Date: 10/21/2020

Preceptor Signature: Date: 4/21/2021

Appendix N: IRB Approval - Facility

Ochsner Clinic Foundation
Institutional Review Board
1514 Jefferson Highway New Orleans, LA 70121
(504) 842-3535 | irb@ochsner.org
DHHS Federal Wide Assurance Identifier: FWA00002050

IRB DETERMINATION – EXEMPT

Implementation of a Postdischarge Virtual Visit and Nurse Follow-up Protocol to Decrease 30-Day Readmission Rates for Patients with Pulmonary Arterial Hypertension	
Determination Date: 1/27/2021	
Investigator:	Kimberly Thompson
IRB ID:	2021.022
Sponsor:	Name: Investigator
Documents Reviewed:	• (FINAL) 2021.022_Consent_2021.01.27.pdf, Category: Ochsner Consent Form (Final); • EBP_Protocol, Category: IRB Protocol; • PAH Nurse_Telephone_Script.pdf, Category: Data Collection;

The IRB determined that the research is Exempt under the following categories:
(2)(ii) Tests, surveys, interviews, or observation (low risk)
(4) Secondary research on data or specimens (no consent required)

For exempt projects: Amendments are required only for substantive changes that impact or alter the criteria used to make the initial exempt determination. For example, a request to change a survey project's protocol from the collection of anonymous data to the collection of sensitive data linked to personal identifiers would require the submission of an amendment for IRB review.

The IRB issued a full waiver of HIPAA authorization for your study. If you are not familiar with the HIPAA rules, review them here: Privacy Rules

INSTITUTIONAL APPROVAL INFORMATION: If your project involves finances, contracts, grants, legal matters and other institutional oversight then it is especially important to have your research cleared by Research Administration. Study teams cannot share data outside the institution without consulting with Ochsner Research Compliance and Ochsner Research Legal Counsel.

Appendix O: IRB Approval - University of Arkansas

UNIVERSITY OF ARKANSAS

To:	Kimberly Carol Thompson
From:	Douglas J Adams, Chair IRB Expedited Review
Date:	01/25/2021
Action:	**Exemption Granted**
Action Date:	01/25/2021
Protocol #:	2011300337
Study Title:	Implementation of a Postdischarge Virtual Visit and Nurse Follow-up Protocol to Decrease 30-Day Readmission Rates for Patients with Pulmonary Arterial Hypertension

The above-referenced protocol has been determined to be exempt.

If you wish to make any modifications in the approved protocol that may affect the level of risk to your participants, you must seek approval prior to implementing those changes. All modifications must provide sufficient detail to assess the impact of the change.

If you have any questions or need any assistance from the IRB, please contact the IRB Coordinator at 109 MLKG Building, 5-2208, or irb@uark.edu.

cc: Thomas A Kippenbrock, Investigator