UNIVERSITY OF CALIFORNIA,
IRVINE

The use of a Telemedicine Emergency Room Follow-Up Intervention to increase Medication Adherence in Adults with Hypertension

DNP Scholarly Project Paper

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by

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DEDICATION

I dedicate this project to my family. To my parents for always believing in me and supporting me every step of the way. To my mom, who always dedicated her life to making sure her family was taken care of. To my dad, who worked day and night and still made the time to come to all my school events. To my sister, who always believed in me no matter what I set my mind to. To my niece Emily who came into this world to brighten our lives, I want her to know that no dream is unachievable and with hard work and dedication you can achieve anything you set your mind to. Emily, whatever it is that you love to do, do it, with all your heart and soul because we only live once and make the best out of it. Be kind to people, love the people around you, and most importantly love yourself. And to my best friend who always supported me and believed in me I don't know what I would have done all these years without your support.

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VITA

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Doctor of Nursing Practice, Family Nurse Practitioner in Nursing Science

ABSTRACT OF THE DNP SCHOLARLY PROJECT PAPER

The use of a Telemedicine Emergency Room Follow-Up Intervention to increase Medication Adherence in Adults with Hypertension

By

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Doctor of Nursing Practice, Family Nurse Practitioner in Nursing Science

University of California, Irvine, 2022

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Many Emergency Department (ED) visits are related to medication non-adherence and often result in admission to the hospital (Davis et al., 2012). When patients present to the ED for an unrelated event to their chronic condition, little to no attention is paid to managing their chronic disease. Management of chronic conditions is seen as something the ED is not responsible for (Brody et al., 2014). It is estimated that approximately half of patients with chronic diseases do not take their medications as prescribed, leading to increased morbidity and mortality (Bassett et al., 2019). The goal of this Quality Improvement project was to improve medication adherence in patients with a past medical history of hypertension with a 4-week telemedicine intervention at UCI Health's Emergency Department and set out to answer the following; In adults with a past medical history of hypertension who present to the Emergency Department, does a telemedicine follow-up program increase medication compliance with antihypertensive medications? The intervention consisted of increasing participants' knowledge of hypertension and their medications. Weekly interventions assessed the patient's knowledge base and served as medication adherence reminders. A total of 10 participants were included in the intervention. At the end of the 4-week intervention, there was a statistical significance in increased medication adherence.

CHAPTER 1: INTRODUCTION

The use of a Telemedicine Emergency Room Follow-Up Intervention to increase Medication Adherence in Adults with Hypertension

Medication non-adherence can pose serious medical and economic consequences. Poor adherence to medication regimens is associated with worsening disease, death, and increased health care costs (McCarthy et al., 2013). Between 30% and 60% of medication-related hospitalizations in the United States result from poor medication adherence (Heaton et al., 2013). Emergency Departments (ED) serve as the primary care stop for many socioeconomically disadvantaged patients (McCarthy et al., 2013). Unfortunately, vulnerable patients are left with inadequate treatment and exposure to increased risk for the development of potentially avoidable complications (Brody et al., 2014).

Background/Significance

According to the Centers for Disease Control and Prevention (CDC), in the United States, nearly 800,000 people die each year from cardiovascular disease (CDC, 2018). Hypertension is a significant precursor to cardiovascular disease, and out of the estimated 67 million adults in the United States who have hypertension, 36 million of them have uncontrolled hypertension (CDC, 2018*).* Hypertension is a significant cause of premature death worldwide, and an estimated 1.13 billion people worldwide have hypertension (World Health Organization [WHO], 2020).

Hypertension complications can be significantly avoided by managing hypertension with low cost, widely available, safe, and effective medications (Brody et al., 2014). Under or untreated hypertension can pose many dangers to a patient and have severe consequences such as life-threatening cardiovascular and cerebrovascular diseases (Brody et al., 2014). The CDC estimates that in 2018, one in every six deaths from cardiovascular disease was due to stroke and stroke continues to be a leading cause of death in the United States (CDC, 2021). Hypertension has been reported in approximately 64% of patients with stroke and is a prevalent risk factor (Wajngarten & Silva, 2019).

The CDC estimates hospital admission rates increase by 69% due to medication non-adherence for patients with chronic illnesses (CDC, 2018). Progression of disease, disease complications, and repeat

hospital visits are the primary reasons these increased costs with medication non-adherence exist (Farris et al., 2018). Increased health care costs related to medication non-adherence are estimated to be $177 billion annually (Farris et al., 2018). Low adherence to antihypertension medication is associated with preventable hospitalizations due to a four-fold increase in costs compared to patients with high adherence to medications (Shani et al., 2021).

Out of the 100 million U.S. residents living with hypertension, 65% of individuals report difficulties with medication adherence (Sansbury et al., 2014). Patients are most often non-adherent to medications when there are no symptoms. As hypertension is known as the "silent killer," patients often become non-adherent to medication regimens for it as they frequently do not have any unpleasant symptoms (Jimmy & Jose, 2011). The Health Belief Model describes how people's health behaviors are influenced by their perceptions of susceptibility to illness, consequences of illness severity, benefits and barriers of the proposed treatment, and health motivation (McCarthy et al., 2013). If patients do not feel "sick" from their high blood pressure, they will be less likely to adhere to their medication. As measured by prescription claim records, lack of adherence to blood pressure medication is the most crucial cause of inadequate blood pressure control (Bassett et al., 2019).

Studies have demonstrated that 40-60% of patients could not correctly report what their physicians expected of them 10-80 minutes after being provided with the information, and over 60% of patients interviewed immediately after visiting their doctors misunderstood the directions regarding prescribed medications (Jimmy & Jose, 2011). Many factors influence medication non-adherence and can vary from patient to patient. A major reason for non-adherence includes poor follow-up explanation by health care providers of medication (Hacihasanoglu et al., 2011). Additionally, poor provider-patient communication, inadequate knowledge about medicine and its use, not being convinced of the need for treatment, fear of adverse effects of the drug, regimens, schedules, dosing, cost, and access barriers are among the many obstacles to medication adherence (Jimmy & Jose, 2011).

Telemedicine health uses interactive communications between a healthcare provider and patient via telephone-based care or video and digital technologies from remote sites (Carey et al., 2018). Since

the start of the coronavirus pandemic, telemedicine has thrived worldwide as an essential resource to improve the management of various conditions, including hypertension (Omboni et al., 2020). The use of technology can provide a practical and inexpensive way to promote medication adherence, and mobile phones are the most commonly used form of technology worldwide (Park, 2014). Various technology solutions, such as cell phones and smartphones, have improved medication adherence across multiple patient populations (Treskes et al., 2018).

Telemedicine is used to provide effective healthcare services at the convenience of a patient's location and to increase patient access to care (Omboni et al., 2020). The use of telemedicine support provided by nurses contributes to improving patients' health outcomes. Telemedicine interventions have been shown to optimize medication adherence (Khonsari et al., 2014).

Patients face various issues in obtaining appropriate follow-up care after an ED visit, and this problem is exacerbated among the uninsured and those with public insurance (Brody et al., 2014). The only current interventions found to reduce ED visits and increase primary care follow-up are case management and patient navigation; however, these roles do not focus on medication adherence (Carmel et al., 2017). Medication adherence plays an essential role in managing chronic diseases, as adherence to over 80% of prescribed medications has been associated with fewer ED visits, hospitalizations, and outpatient visits among patients with chronic conditions (Shani et al., 2021).

Problem Statement

It has been determined that patients who utilize the ED for primary management of chronic medical conditions such as hypertension have worse blood pressure control than the general population (Brody et al., 2014). With pharmacological interventions, the risk of cardiovascular disease events and all-cause mortality can be reduced by 20 to 40% in adults with hypertension but can only be achieved through treatment adherence (Carey et al., 2018). Emergency providers have determined that a lack of follow-up is a reason not to provide active surveillance of chronic diseases (Brody et al., 2014).

ED providers can drastically improve patients’ lives by helping to manage medication adherence to chronic uncontrolled conditions in the ED. Providing clear medication-related information is essential

in improving medication adherence (Jimmy & Jose, 2011). Using technology, such as phones, may provide a practical means to promote medication adherence for patients (Park et al., 2014). Practical and simple telemedicine interventions have shown to be the most effective in optimizing patients' medication adherence (Khonsari, 2014). With the implementation of a telephone, intervention providers can manage patients' chronic conditions and allow for an individualized, personal interaction at a minimal cost (Carey et al., 2018). Most importantly, patients will be allowed a personal interaction at minimal cost without the time and transportation barriers that frequently make follow-up difficult for patients (Carey et al., 2018).

How can the emergency department serve as the bridge between primary care management of the chronic disease known as hypertension? A follow-up telemedicine intervention that provides precise medication and disease-related information to patients, education on common side effects of medications, and medication administration reminders can optimize patient adherence. An intervention delivered in patients' homes, such as by telephone contact, effectively changes multiple patient behaviors (Carey et al., 2018). Using smartphones or cell phones can prove beneficial due to their ease of use and relatively low cost (Treskes et al., 2018).

Many telehealth modalities have been introduced in healthcare to increase medication adherence with hypertension medications. One such modality is the use of a smartphone application. Although smartphone applications have the potential to address nonadherence, not all patients' have smartphones or know how to use applications, making it difficult to truly ascertain the effectiveness of an intervention delivered via an application (Carey et al., 2018). Web-based interventions can also be an effective way to help patients achieve medication adherence. However, not all patients have access to a computer or the internet. For vulnerable populations with low socioeconomic status, financial and social barriers may be more significant causes of the low adherence rates, and evaluation of web-based technologies is still warranted (Treskes et al., 2018; Carey et al., 2018). Personal interactions over the phone allow interventions to be adapted and tailored to patients' concerns and health goals (Carey et al., 2018).

PICO

In adults with a past medical history of hypertension who present to the Emergency Department, does a telemedicine follow-up program increase medication compliance with antihypertensive medications?

CHAPTER 2: BODY OF EVIDENCE

Review of the Literature

Search Process

Literature search was conducted on Science Direct, PUBMED, and CINAHL databases. Key words used included: hypertension, medication adherence, emergency department, telemedicine and telehealth. A total of 111 records were identified through database searching and 10 were removed as duplicates. 12 full articles were retrieved from Science Direct, 1 from PUBMED, and 3 from CINAHL. A total of 11 full-text studies were included in the appraisal and synthesis of supporting literature.

Appraisal of Evidence

Refer to the Table of Evidence in Appendix D

Comprehensive Synthesis of Evidence

Many studies have set out to implement interventions for improvements in medication adherence in various healthcare settings. A level II Randomized Control study by Hacihasanoglu et al., 2011 set out to determine the effect of antihypertensive patient-oriented education and in-home monitoring on medication adherence and management of hypertension. This study included 120 subjects from a public primary health care facility in Turkey and was equally divided into three groups, group A, group B, and the control group. Group A and B subjects received six monthly medication adherence education sessions during the clinic and home visits while the control group was routinely monitored. This study concluded that participants from groups A and B showed improvement in self-efficacy of medication adherence compared to the control group. Additionally, the intervention groups showed a significant decrease in systolic and diastolic blood pressures compared to the control group. This study demonstrates the

significance of patient-oriented education for hypertension medication adherence and can further implicate the need for follow-up with patients to maintain adherence.

A level I Systematic Review of literature by Wilder et al., 2021, assessed how social determinants of health impact medication adherence. A meta-analysis of databases was completed and included PubMed, Scopus, and Cochrane Clinical Trials. This meta-analysis revealed a significant relationship between food insecurity and housing instability most consistently impacted medication adherence (Wilder et al., 2021). This study leads the way for future studies to include social determinants of health when studying medication adherence and the inclusion of these factors in interventions.

A level II Randomized Control Trial by Hedegaard et al., 2015, investigated the effectiveness of a multifaceted pharmacist intervention in a hospital setting to improve medication adherence in hypertensive patients. Patients were randomly assigned to the control group or the intervention group, consisting of a 6-month pharmacist intervention comprising collaborative care, medication review, and tailored adherence counseling, including motivational interviewing and telephone follow-ups (Hedegaard et al., 2015). At the end of this study, it was evident that the intervention group had better adherence rates to medication and concluded that a multifaceted pharmacist intervention in a hospital setting led to sustained improvement in medication adherence for patients with hypertension (Hedegaard et al., 2015). This study demonstrates the significance of interventions that include telephone follow-ups in improving medication adherence for hypertensive patients. Additionally, this study demonstrates how a multidisciplinary team approach may prove valuable when implementing interventions to improve medication adherence.

A level II Randomized Control Trial by Calvert et al., 2012, randomized hospitalized patients with coronary artery disease discharged with medications to usual care or an intervention group to evaluate the effect on medication adherence of linking hospital and community pharmacists. The intervention group received enhanced in-hospital counseling, attention to adherence barriers, communication of discharge medications to community pharmacists and physicians, and ongoing assessment of adherence by community pharmacists (Calvert et al., 2012). The control group received usual hospital discharge

counseling. This study concluded that the intervention group had statistically significantly better adherence to antihypertensive versus the control group. This study additionally demonstrates the significance of assessment of adherence barriers and the use of an interdisciplinary team.

A review of randomized controlled trials discussed telemedicine interventions, such as telephone calls, that have been investigated in an experimental design to improve medication adherence in patients with cardiovascular disease (Treskes et al., 2018). Of the 74 studies included, 47 included telephone calls as the basis of the intervention for medication adherence. In the included studies, patients were randomized between a telephone-based intervention or control. The interventions consisted of nurse-made phone calls that included coaching or educating patients on taking medications according to prescription and education about the condition they were given medication for and the importance of taking the medication correctly (Treskes et al., 2018). In these telephone-based intervention trials, the intervention groups increased medication adherence compared to the control group (Treskes et al., 2018).

Additionally, motivational interviewing techniques improved medication adherence in different patient populations (Treskes et al., 2018). Phone call follow-ups can be an effective way to improve medication adherence by providing patients the interaction with a healthcare professional. Studies that included automated phone-call interventions initiated by a computer system were also reviewed and human-interaction in telephone interventions may be more effective as the studies included found no difference in adherence from the automated phone calls, but found a significant positive difference in the in-person phone calls group (Treskes et al., 2018).

A study conducted in a tertiary teaching hospital in Kuala Lumpur, Malaysia conducted an interventional study where a total of 62 patients with the acute coronary syndrome (ACS) were equally randomized to receive an automated SMS-based reminder text for reminders of cardiac medications versus usual care that does not include the text reminders. The study found a higher medication adherence level in the intervention group rather than in the usual care group and found a meaningful difference in heart functional status between the two study groups with better results among patients in the intervention group (Khonsari, 2014). This study demonstrated how an automated text message reminder system could

increase medication adherence in patients and further supports the use of telemedicine interventions to increase medication adherence and improve patient outcomes.

A quantitative systematic review without meta-analysis published in the Journal of Advanced Nursing was conducted to evaluate the efficacy of mobile phone interventions used to improve medication adherence, specifically text messaging, in a variety of conditions such as asthma, diabetes, HIV/AIDS, and hypertension (Park et al., 2014). This review also set out to explore participants' acceptability and satisfaction with mobile phone interventions. The review found that 18 out of 29 of the studies improved were successful in improving patients' medication adherence rates, while 11 studies reported no difference (Park et al., 2014). This review found that among the studies that were not found to improve patient's adherence rate, the text messages tended to have more basic and repetitious content, whereas the studies that did demonstrate an improvement in adherence delivered text messages with a variety of educational and motivational content (Park et al., 2014). Additionally, the studies that offered "tailored" or "personalized" messages all had positive effects on medication adherence (Park et al., 2014). This study demonstrates that patients are more receptive to personalized interventions, proving that telephone calls tailored to each specific patient and their specific medication can improve medication adherence.

A mixed-method systematic review aimed to evaluate the efficacy of telehealth and mobile health interventions and explore the benefits and challenges of the interventions in patients with Irritable Bowel Disease (IBD). Out of the 18 studies included, 16 were quantitative, and two were qualitative studies. Four of the studies that were reviewed evaluated the efficacy of telehealth and mobile health interventions on medication adherence in participants with IBD. Three of the studies were randomized control trials that used the Morisky Scale to assess medication adherence and found that medication adherence significantly improved in two of the reviewed studies after implementing telehealth and mobile health interventions (Davis et al., 2020). Of the two qualitative studies included, both explored the benefits and challenges of telehealth and mobile health interventions in adults with IBD and found that participants of both studies reported: "four common themes: increased knowledge about their condition and symptoms,

improved two-way communication between patients and provides, a sense of reassurance, and better appointment options" (Davis et al., 2020). This study demonstrates that providing education to patients via telemedicine avenues such as by phone can improve medication adherence, improve disease outcomes, increase patients' knowledge, and increase patients' confidence in managing their chronic conditions (Davis et al., 2020).

A cohort study in Israel set out to determine the associations of adherence levels to chronic disease medications with ED visits and hospitalizations and included individuals aged 50-74 years with a diagnosis of diabetes mellitus or hypertension, treated with at least one hypertension or diabetes medication. What was found was that of 268,792 patients in the study 81.1% of patients had hypertension and 59.5% had diabetes with a total of 40.6% of the patients having both conditions and found that patients who were nonadherent to medications had more hospital visits in one year (Shani et al., 2021). This study concluded that increased adherence to medications was associated with a decreased probability of ED visits and inpatient hospitalizations and a negative association between medication adherence and hospitalizations (Shani et al., 2021). Furthermore, this study demonstrates how increasing medication adherence for patients with hypertension can decrease the number of ED visits and decrease healthcare costs associated with hospitalizations.

A level II Randomized Control trial by McCarthy et al., 2013 set out to determine whether prescription information or services improve medication adherence of ED patients in three separate EDs. Subjects were randomly assigned to one of three intervention groups or the usual discharge care. This study concluded that medication adherence among patients discharged from the ED did not improve by only providing prescription information. This study helps us determine that providing patients with self-educational material might not be enough to improve medication adherence, and patient involvement and follow-up can prove beneficial.

In 2018, Farris et al., completed a retrospective, observational analysis of patients discharged from the ED to assess barriers and clinical implications of patient nonadherence to filling discharge medication prescriptions. This study's primary outcome was the frequency of nonadherence to filling discharge

medications prescribed during the ED visit at the ED outpatient pharmacy (Farris et al., 2018). The secondary outcomes included identifying barriers to medication adherence, the rate of return ED visits within 30 days of ED discharge, and the rate of 30-day hospital admissions (Farris et al., 2018). Patients were contacted via telephone by an ED pharmacist. This study determined that a large portion of nonadherent patients revisited the ED within 30 days of ED discharge. This study demonstrates how medication nonadherence can increase ED revisits and ultimately increase healthcare costs.

Collectively, all of these studies demonstrate the significance of patient-centered interventions to improve medication adherence. Various factors influence a patient's difficulty with medication adherence. Patient-centered interventions that include a multidisciplinary team approach and follow-up telemedicine calls can improve health outcomes for patients with hypertension who face barriers to medication adherence. Further assessment of the management of chronic conditions for patients who present to the ED can prove beneficial in improving patient outcomes.

Clinical Practice Guideline Appraisal

The American College of Cardiology Guidelines for High Blood Pressure in Adults 2017, indicate that every adult with hypertension should have a timely follow-up with the healthcare team, and integration of telehealth interventions and counseling is recommended (Whelton et al., 2018). In addition to these telehealth recommendations, the ACC also recommends motivational strategies to promote lifestyle modification in patients with hypertension and notes that outcomes may be improved with quality improvement strategies at the health system, patient, and provider level (Whelton et al., 2018). The ACC guideline meets all criteria on the Appraisal of Guidelines for Research and Evaluation II (AGREE II; Appendix E) instrument (Brouwers et al., 2010)

Evidence-Based Recommendation for the Project

The studies reviewed demonstrate that telemedicine interventions can increase and improve medication adherence amongst patients with hypertension in various settings. A registered nurse-led telemedicine follow-up intervention in the ED can prove beneficial for medication adherence. Using

telephone-based interventions for medication adherence can increase cost-effectiveness due to the low intervention costs and decreased hospital visit rates (Carey et al., 2018).

CHAPTER 3: PROJECT FRAMEWORK

Conceptual Framework

The framework guiding this project is derived from the Transitional Care Model (TCM), a nurse-led intervention targeting older adults at risk for poor outcomes as they move across healthcare settings and between healthcare providers. The TCM focuses on improving patient care and outcomes and reducing healthcare costs among vulnerable, chronically ill, older adults. The TCM is an evidence-based practice approach model delivered and coordinated by an advanced practice registered nurse (APRN) in collaboration with patients, their families, and other health care providers. It has been demonstrated to improve acutely ill older adults' experiences with care and the health and quality of life outcomes.

The TCM is composed of nine core components: screening, staffing, maintaining relationships, engaging patients and caregivers, assessing/managing risks and symptoms, education/promoting self-management, collaborating, promoting continuity, and fostering coordination (Hirschman et al., 2015). The TCM model was used for this project because it incorporates chronic disease management, patient education regarding hypertension, medication adherence, diet, exercise, and is nurse-driven and led.

Logic Model

Logic model inputs included are as follows: Registered Nurse (RN) Doctorate of Nursing Practice (DNP) Student, Nurse Practitioner (NP) Lead, ED Pharmacy resource, and ED manager. The RN will screen potential participants with a validated scale for medication adherence. Once participants consent to participate, they will be provided with verbal education and printed educational materials on hypertension from the American Heart Association (AHA). Weekly telephone follow-ups for a total of 4 weeks will be provided for each patient. Telephone calls will consist of a reminder of medication adherence, knowledge about the disease, and the importance of taking medication correctly using teach-back methods for 5-15 minutes per telephone call. A validated scale on medication adherence will be administered pre-and-post

intervention. The end goal of this study is to have 50% of the participants increase their medication compliance scale score.

CHAPTER 4: METHODS

Project Goals

The purpose of this project was to increase medication adherence in patients with a history of hypertension who presented to the ED and were screened as nonadherent. Short term goals were at each weekly intervention patients would be able to teach-back the education provided to them on hypertension and their medications. The short-term goals were:

At the first phone call intervention: Participants would be able to verbalize the name and dose of their medication and verbalize what normal blood pressure is.

At the second phone call intervention: Participants would be able to verbalize the name and dose of their medication and list one common side effect and verbalize what normal blood pressure is.

At the third phone call intervention: Participants would be able to verbalize the name and dose of their medication, list one common side effect, verbalize what normal blood pressure is and describe how the medication works.

At the fourth phone call intervention: Participants would be able to verbalize the name and dose of their medication, list one common side effect and describe how the medication works. Patients would be able to verbalize what normal blood pressure is, and two ways to remember to take their medications (taking medication at the same time each day, taking it when they brush their teeth, setting phone reminders, etc.). Also, participants would be able to verbalize two reasons blood pressure control is important (decreased risk of cardiovascular disease, risk of stroke, vision, kidney failure).

The long-term goal of this project was that at the end of the 4-week intervention 50% of the participants would increase their medication adherence from a score of low adherence to high adherence.

Project Description

Project Type/Design

This Quality Improvement Project aimed to improve medication adherence in patients with a past medical history of hypertension who present to the ED. The project design was a non-experimental project in a one-group pretest-posttest to determine the effect of an intervention on a given sample. Participants were assessed with a validated medication adherence tool before and after the 4-week intervention.

Project Setting/Population

This project took place at UCI Health's Emergency Department. The participants were patients who present to the ED for any condition/complaint and were seen by the ED NP in the fast-track area or admitted to the NP-led Observation Department. Participants were recruited in person in the ED prior to discharge by the DNP student. Patients were only approached after the primary provider had assessed them and the patient was pending discharge. The participants were predetermined before approaching them for consent and discussed with the site mentor. Site approval and support was obtained prior to initiating project from ED manager and ED educator.

Participants and Recruitment

The aim of this project was to recruit 10 participants and 10 participants were recruited. Inclusion criteria included adult ages 18 and up, past medical history of hypertension, prescribed hypertension medications, access to medication, screened low medication adherence on validated tool, access to telephone/cell phone, seen by ED NP discharged same day or placed in NP-led observation department. All 10 participants recruited met the inclusion criteria. Participants' ages ranged from 52-71 years old. Participants primary languages included English and Spanish. Participant ethnicities included Hispanic and Caucasian.

Description of Intervention

The 4-week intervention consisted of weekly follow-up phone calls with the participants and were tailored to each participant. The phone calls were based on motivational interviewing techniques

such as engaging and focusing on the participant while building a partnership. Counseling was provided on blood pressure, normal blood pressure, how to reduce blood pressure using non-pharmacological means such as diet and exercise, and why taking medication for hypertension is essential. Additionally, participants were provided with reminders for medication adherence at each weekly follow up.

Measures/Instruments

The Morisky Scale is a four-item self-reported adherence validated tool that has been widely used in Randomized Controlled Trials of medication adherence interventions (Moon et al., 2018). The MMAS-4 has an alpha reliability of 0.68, sensitivity of 0.88, and specificity of 0.52, and is available in English and Spanish (Morisky et al., 1986). Demographic data on age, sex, and ethnicity were collected from the participants.

Data Collection Procedures

Data was collected directly from participants with their verbal consent before and after the intervention. Data collection took a total of 6 weeks. Initially, participants were screened with the Morisky medication adherence tool, and data was collected. At the end of the 4-week intervention, participants were given the Morisky scale again to assess adherence level.

Data Analysis

Data collected was used to measure the outcome of medication adherence. Data analysis assessed if patients' adherence levels increased after the intervention. A paired sample T-test was used to compare the same participants' pre and post-test results. The Statistical Package for the Social Sciences (SPSS) was used for data analysis. The P-value of a two-sided paired t-test was <.001, which indicates statistical significance.

Ethical Considerations

The official UCI Institutional Review Board (IRB) form, Request for -Determination-Non-Human-Subjects was completed and approved by UCI Health. All participants were protected by the Health Insurance Portability and Accountability Act of 1996 (HIPAA)which, among other guarantees, protects the privacy of patients' health information (Modifications to the HIPAA Privacy, Security,

Enforcement, and Breach Notification Rules, 2013). All information collected as part of evaluating the impact of this project was aggregated data from the project participants and did not include any potential patient identifiers. The risk to participants who participated in this project was explained. Participant confidentiality was assured by coding the participants using individual identification numbers. The list of participants and their identifying numbers were kept locked in a place, only accessible to the DNP student. All electronic files containing identifiable information is password protected to prevent access by unauthorized users and only the DNP student had access to the password.

Stakeholders/Barriers

Stakeholders consisted of participants of the project, UCI Health ED, UCI ED manager, UCI ED educator, and the UCI site mentor. Constraints included the recruitment of participants. The recruitment process required an extension from 4 to 6 weeks as the aim of 10 participants was not achieved in 4 weeks. A barrier that influenced the implementation of my DNP project included the completion of the telemedicine interventions. Phone calls were not scheduled, and participants would be called weekly. Unscheduled phone calls were implemented to allow participants flexibility. However, allowing flexibility in the schedule prolonged the evaluation phase of the project. Extending the implementation process timeline allowed for adequate data collection.

Formative Process Evaluation

Throughout the intervention, participants were asked to identify the name and dose of their medication, list one common side effect, and describe how the medication works. Patients verbalized what normal blood pressure is. Participants verbalized two ways to remember to take their medications (taking medicines simultaneously each day, taking them when they brush their teeth, setting phone reminders, etc.). Participants verbalized two reasons blood pressure control is important (decreasing risk of cardiovascular disease, risk of stroke, vision, kidney failure). Using teach-back techniques, patients verbalized their knowledge of hypertension and their medications at the end of each telemedicine phone call. Additionally, participants verbalized two ways to remember to take their medications (taking

medicines at the same time each day, taking them when they brush their teeth, setting phone reminders, etc.) at the end of each telemedicine follow-up.

CHAPTER 5: RESULTS AND CONCLUSIONS

Results

Using a paired t-test statistical analysis the project resulted to be statistically significant. The two-sided p value result was <.001. This signifies that overall, the intervention increased participants medication compliance. Using the Morisky medication adherence scale participants were screened before the intervention and screened at the end of the 4-week telemedicine intervention. The pre-scores and post-scores were then analyzed via SPSS through a paired t-test as the scores were for the same participants and compared pre- and post-intervention compliance scores.

	Before	After
1	.00	4.00
2	.00	3.00
3	2.00	4.00
4	2.00	4.00
5	.00	3.00
6	2.00	4.00
7	2.00	4.00
8	2.00	4.00
9	1.00	4.00
10	.00	3.00

Figure 1: Data Set

T-Test

[DataSet1]

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before	1.1000	10	.99443	.31447
	After	3.7000	10	.48305	.15275

Paired Samples Correlations

		N	Correlation	Significance One-Sided p	Significance Two-Sided p
Pair 1	Before & After	10	.763	.005	.010

Paired Samples Test

		Paired Differences					t	df	Significance One-Sided p	Significance Two-Sided p
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper				
Pair 1	Before - After	-2.60000	.69921	.22111	-3.10018	-2.09982	-11.759	9	<.001	<.001

Paired Samples Effect Sizes

			Standardizer[a]	Point Estimate	95% Confidence Interval Lower	95% Confidence Interval Upper
Pair 1	Before - After	Cohen's d	.69921	-3.719	-5.506	-1.912
		Hedges' correction	.76510	-3.398	-5.031	-1.748

a. The denominator used in estimating the effect sizes.
Cohen's d uses the sample standard deviation of the mean difference.
Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

Figure 2: SPSS Paired T-Test results

Discussion

Implications of this project determined that telemedicine interventions can benefit patients with chronic conditions from the ED. This project also determined common themes in why patients have difficulty maintaining medication adherence. One theme that emerged from data collection was the lack of knowledge patients had on why blood pressure control is essential and the impact that medication non-adherence can have on their health. Many patients with chronic diseases do not take their prescribed medications which are directly associated with a worsening disease, death, and increased health care costs. (Basset, 2019; McCarthy, 2013). Another theme that emerged was the participant's inability to name their medication or dosage.

An additional theme that emerged was the misinterpretation of the instructions on taking their medication. Many patients had additional comorbidities and had other prescribed medications besides their hypertension medication to take. Many participants reported that they would not take their

hypertension medication at times due to fear that their prescriptions would interfere with each other. The most common and recurrent theme that emerged from data collection was that all 10 participants had questions regarding their ED admission and ED test results. It was evident that all of the participants had remaining questions after their ED discharge, which leads us to determine a need and a gap in post-ED discharge education that can prove beneficial for patients. The growing body of evidence indicates that telehealth can provide patients with timely and efficient health care.

A significant limitation of this project was that participants could not be given information on their ED visit results or discharge information. Another limitation of this project included the recruitment of participants. As participants were recruited in person by one DNP student, time constraints almost caused the inability to reach the goal of 10 participants. The recruitment timeline had to be extended to allow the goal of 10 participants to be reached. Another limitation was the number of participants recruited. Although the goal was to recruit 10 participants, recruitment of additional participants would have been preferred to obtain a larger sample.

By designing, implementing, and evaluating this project, an advanced practice registered nurse-led intervention demonstrates how patient care can be optimized via interventions based on nursing science.

Conclusion

The "silent killer" known as hypertension can pose many healthcare risks to patients and, most commonly, to vulnerable populations. Patients often become non-adherent to medication regimens for hypertension as they frequently do not have any unpleasant symptoms (Jimmy & Jose, 2011). The CDC estimates that of the 67 million adults in the United States who have hypertension, 36 million have uncontrolled hypertension (CDC, 2018*).* Low adherence to hypertension medication is associated with preventable hospitalizations and increased healthcare costs (Shani et al., 2021). Medication non-adherence is directly related to the progression of chronic disease, disease complications, and repeat hospital visits which ultimately decrease a patient's quality of life (Farris et al., 2018).

The Department of Health and Human Services defines telehealth as "the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration" (O'Connor et al., 2016). Since the beginning of the Covid-19 pandemic, telehealth services have soared worldwide and will only continue to expand. Management of chronic conditions in an emergency setting can significantly influence patient outcomes for vulnerable populations as EDs are the most commonly used health care facilities globally and serve as the primary care stop for many socioeconomically disadvantaged patients (McCarthy et al., 2013).

This project led to a statistically significant improvement in medication adherence in patients with hypertension who presented to the ED. Implementing this project has allowed me to achieve DNP Essential III, in clinical scholarship and analytical methods for evidence-based practice, as scholarship and research are the hallmarks of doctoral education. Implementation of this project allowed me to apply the translation of research into practice and disseminate, integrate, and evaluate new knowledge to improve patient outcomes. Implementation of this project allowed me to achieve DNP Essential IV, information systems/technology, and patient care technology to improve and transform health care.

The premise of this project consisted of telemedicine avenues to educate patients on medication adherence and ultimately improve their medication adherence. This quality improvement initiative used technology to support and enhance patient care. Implementation of this project allowed me to achieve DNP essential VI, interprofessional collaboration for improving patient and population outcomes (*Doctor of nursing practice,* 2006). This project allowed me to work collaboratively in an interprofessional team to create change in health care and possess the leadership skills needed to achieve change. Most importantly, the implementation of this project allowed me to achieve DNP essential VIII, advanced nursing practice, by allowing me to design, implement, and evaluate therapeutic interventions based on nursing science.

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Appendix A: Site Approval

UCI University of California, Irvine

Letter of Cooperation with Outside Organization for UCI DNP Project

Date: 11/30/2021

Dear: (name of DNP Student): Brenda Aguilar

This letter confirms that I, as an authorized representative of
allow the above-named Doctor of Nursing Practice student access to conduct a leadership, policy, quality improvement, or evidence-based practice project activities at the listed site(s) as discussed with the DNP student and outlined below. These activities may commence after the DNP student has consulted with UCI IRB about the proposed project.

- **Project site(s):** (list specific site name and address for all sites within which the organization is providing student access to conduct the project)

  UCI Health Emergency Department

- **Project purpose:** (briefly summarize the project purpose, plan and expected outcomes)

  To increase medicaiton adherence in patients with a past medical history of hypertension who present to the Emergency Department by implementing a telemedicine follow up intervention

- **Project activities:** (briefly summarize the activities that will commence at the site, including any baseline data collected, educational interventions, PDSA cycle proposed...)

  Baseline data collected on medication adherence via Morisky Scale during recruitment, educational intervention on hypertension and hypertension medications

- **Target population:** (identify the population upon whom the project will focus)

  Adults with a past medical history of hypertension who present to the Emergency Department and are seen by the ED Nurse Practitioner

- **Site(s) support:** (briefly describe the support the project site(s) agree to provide to support the project, such as space to conduct project activities, data retrieval from electronic records, facilitation of educational activities....)

  Project Mentor Dr. Kathleen Ahn Nurse Practitioner II
  Space to conduct recruitment

Sue & Bill Gross School of Nursing
260 Beckman Hall
Irvine, CA 92697-3959
(949) 824-5540
www.nursing.uci.edu

- **Data management plan:** (briefly describe the plan for management of data such as what data will be collected, whether it will be identified/de-identified, what protections will be in place for data protection...)

  All information collected as part of evaluating the impact of this project will be aggregated data from the project participants and will not include any patient identifiers

- **Other agreements:** (briefly describe any additional agreements that have been made to support the project, if applicable)

  N/A

- **Anticipated end date:** (indicate the anticipated date that the project will be concluded at the site)

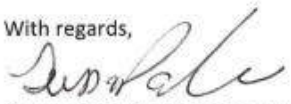
  March 2022

It is understood that all DNP Scholarly Project related activities must cease if directed by UCI IRB. It is also understood that any activities that involve Personal Private Information or Protected Health Information must comply with HIPAA Laws and institutional policy.

Our organization agrees to the terms and conditions stated above. If there are any concerns related to this project, we will contact the DNP student named above and their DNP Scholarly Project Chair. For concerns regarding IRB policy or human subject welfare, we may also contact our own institutional IRB.

UCI IRB: https://www.research.uci.edu/compliance/human-research-protections/researchers/irb-faqs.html

With regards,



ED Nurse Manager

(Signature of Project site-authorized representative) (Job title of authorized representative)

12/8/21

(Date signed)

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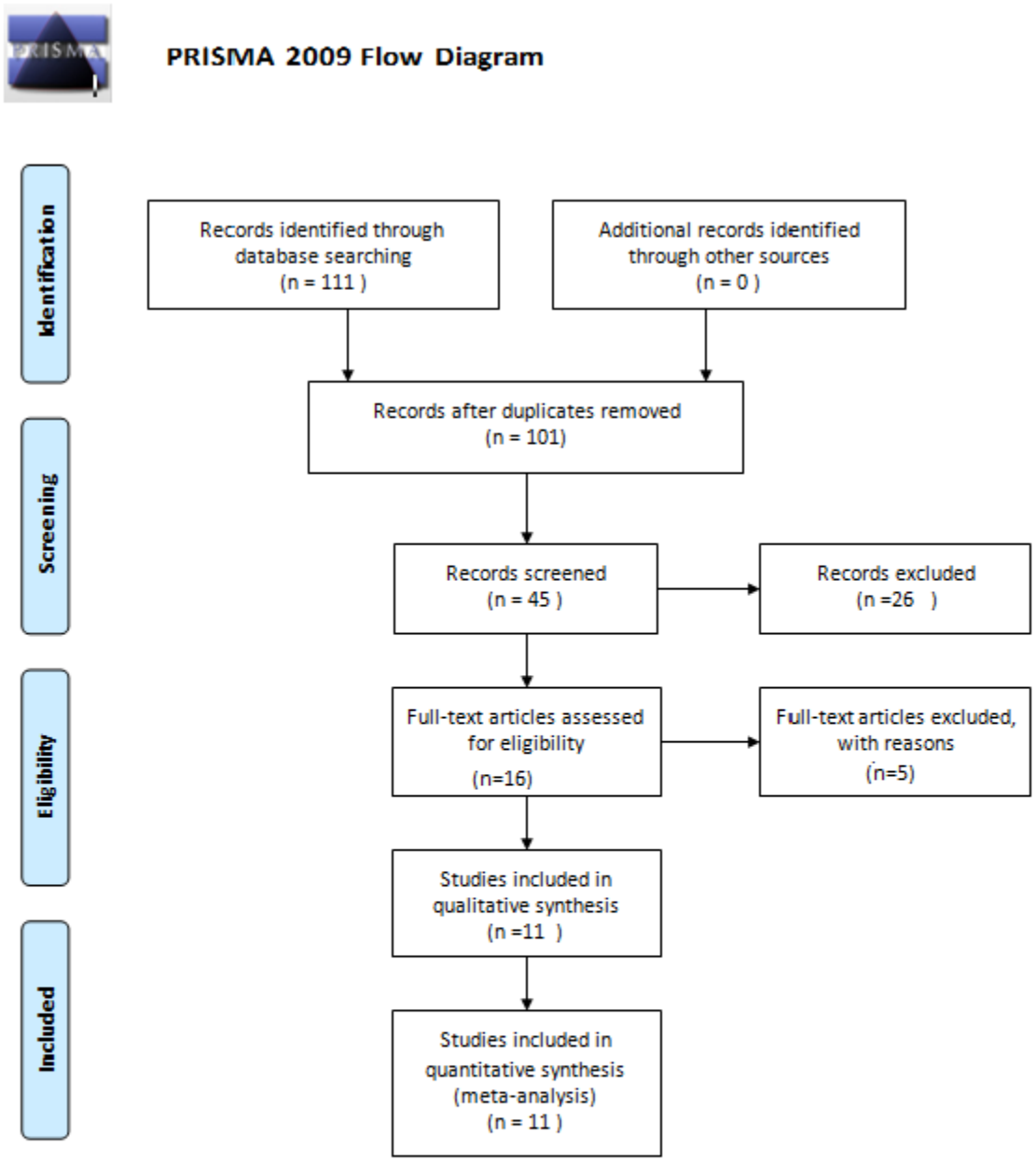
Appendix B: Kuali Approval

Appendix C: PRISMA Chart



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement.* PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix D: Table of Evidence

	CONCEPTUAL FRAMEWORK	SAMPLE/SETTING	Major valuables (outcomes) studied(their definitions)	Measurement (Instruments or tools to measure outcomes	Data Analysis Method	Findings	Put the level and quality of the article Worth to use?
Hacihasanoglu, 2011	Randomized Control Study: To determine the effect of anti-hypertensive patient-oriented education and in-home monitoring for medication adherence and management of hypertension in a primary care setting, by providing education on healthy lifestyle behaviours and medication adherence	120 subjects from public primary health care facilities in Turkey (40 Group A, 40 Group B, 40 controls)	Participants in Group A and B received a total of six monthly education sessions, four times during clinic visits and two home visits. Medication adherence education for Groups A and B and education about healthy lifestyle behaviours for Group B were administered in a structured and individualised format. The control group was routinely monitored in health care facilities	Pretest data were collected through the administration of a descriptive questionnaire, medication adherence self-efficacy scale (MASES), health-promoting lifestyle profile (HPLP). Final data were collected through re-administration of the pretest questionnaires and scales, blood pressure mea surements and weight measurement. All data were obtained by face-to-face interview	analysis (ANOVA) were used for the assessment of the experimental groups and the control group; paired t-test was used for intra-group assessment of significance of the difference between the average pretest–posttest scores of MASES, HPLP, BMI and SBP-DBP; variance analysis was used for inter-group assessment of significance of	statistically significant differences between any of the groups (both intervention and control groups). When the effectiveness of interventions in the both control and intervention groups was compared using the SBP, DBP MASES, it was found out that the both interventions were effective, but combined education (Group B) more effective than medication adherence education alone (Group A) on	Level II: Randomized control study. Yes, this study demonstrates how educational interventions in hypertensive patients are efficacious in htn management and can make a major contribution to improvement in the patients' healthy lifestyle behaviours, medication adherence, blood pressure and BMI. This is also the first nursing intervention study to improve both medication adherence and healthy lifestyle behaviours for hypertensive patients in Turkey
Wilder, 2021	A systematic review of literature to assess how social determinants of health impact (SDH) medication adherence	29 articles: using three databases: PubMed, Scopus, and Cochrane Clinical Trials Register in Decem ber of 2018. Included studies were completed in the USA, included adults aged 18 years and older, measured at least one social determinant of health, and medication adherence was the primary outcome measure	Meta-analysis and pooled the odds ratios from the included studies for each social determinant as well as for all SDH factors collectively	Systematic review of literature using a Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) format. Three databases used were PubMed, Scopus, and Cochrane Clinical Trials Register in Decem ber of 2018.	Meta-Analysis: heterogeneity of the studies using Cochran's Q (x 2 test) and I 2 test statistics and we estimated both the unadjusted and adjusted pooled odds ratios using random effects models (R studio version 1.3.959: R package: metafor) because of the methodological differences among the studies	The meta-analysis revealed a signif icant relationship between food insecurity (aOR = 0.56; 95% CI 0.42–0.7), housing instability (aOR = 0.64; 95% CI 0.44–0.93), and social determinants overall (aOR = 0.75; 95% CI 0.65–0.88) and medication adherence	Level I: Systematic Review. Yes, this article demonstrates the significant relationship between SDH and medication adherence which can be taken into account when developing an intervention for medicaiton adherence
Maguire, 2008	To assess the levels of adherence in a sample of hypertensive patients being cared for in primary care in Northern Ireland and to explore the impact of depressive symptoms and medication beliefs on medication adherence	97 community pharmacies, 327 patients receiving antihypertensive medications across Northern Ireland	Assessed for medication adherence, depression, social support, self-efficacy, and beliefs about medicines in patients prescribed antihypertensives	A questionnaire comprising a mix of closed, open-ended and Likert scaled questions and was self-completed by patients in their own homes	Dichotomised self-reported adherence together with logistic regression analyses	3.3% of participants were non-adherent with their antihypertensive medication (self-report adherence scale) and 37.9% had scores indicative of depressive symptoms as determined by the Center for Epidemiological Studies Depression Scale (CES-D). In the univariate analysis, concerns about medications had negative effects on both adherence and depressive symptomatology. However, logistic regression analysis revealed that patients over the age of 50 were more likely to be adherent with their medication than those younger than 50. Depressive symptomatology and medication beliefs (concerns) were not significantly related to adherence in the regression analysis	Level VI: Single qualitative study, no
Goh, 2014	To assess the effectiveness of medication review by pharmacists as an intervention to improve a patient's knowledge and adherence to their chronic medications	195 patients from four polyclinics who were referred by their prescriber	Prospective study: to assess the effectiveness of medication review as an intervention to improve a patient's knowledge and adherence to their chronic medications	A two-part questionnaire, which was applied before intervention and upon follow-up	Student's paired t-test, Chi-square and Pearson's correlation test	Of the 195 patients who completed follow-up, 93.8% demonstrated medication knowledge deficits. Medication review conducted by the polyclinic pharmacists had improved the patients' overall understanding of their medications' dosage, frequency, indication, storage and administration method (p<0.01). Seventy point three percent of study patients had issues with medication adherence. Of these, half reported an improvement after medication review. There was significant correlation between the patients' knowledge and adherence scores (p<0.001).	Level VI: Single qualitative study, no
Sansbury, 2013	To determine if time perspective is associated with medication adherence among people with hypertension and diabetes	178 people in 3 cities near Washington, D.C. Silver Spring, Maryland; Hagerstown, Maryland; and Martinsburg, West Virginia	Using the Health Beliefs Model a path analysis was used to test direct and indirect effects of time perspective and health beliefs on adherence	Participants completed a 6-page written questionnaire on demographic characteristics and three subscales of the Zimbardo Time Perspective Inventory (ZTPI)	Initial regression and analysisof variance tests	good fit (RMSEA = 0.17, 90% CI [0.10, 0.28], p = 0.003; comparative fit index = 0.91). Future time perspective and age showed direct effects on increased medication adherence; an increase by a single unit in future time perspective was associated with a 0.32 standard deviation increase in reported adherence. There were no significant indirect effects of time perspective with reported medication adherence through health beliefs.	Level VI: Single qualitative study, no
Hedegaard, 2015	Randomized Control Trial: To determine the effectiveness of a multifaceted pharmacist intervention in a hospital setting to improve medication adherence in hypertensive patients	532 were recruited from 3 hospital outpatient clinics and randomized to usual care or a 6-month pharmacist intervention comprising collaborative care, medication review, and tailored adherence counseling including motivational interviewing and telephone follow-ups	The primary outcome was overall adherence to antihypertensive and lipid-lowering agents 12 months after inclusion, reported as a continuous, as well as a binary outcome. Adherence was calculated using the medication possession ratio (MPR) measure,23 defined as the amount of drug available from refills during the follow-up period relative to the amount prescribed.Secondary outcomes were compos ite MPR at 3, 6, and 9 months, as well as adherence and persistence to diuretics, calcium antagonists, beta-blockers, renin-angiotensin agents, and lipid-lowering agents, all at 12 months. Nonpersistence was defined by failure to redeem a pre scription within 90 days after the last date covered by the preceding prescription.	Telephone interviews at 1 month and 6 months after the first visit. To ensure standardization and to guide the pharmacist in assessing and addressing the various reasons for nonadherence, we used a medication adherence questionnaire validated in Danish users and filled out before the interview,19 and an adapted version of the DRug Adherence Work-up (DRAW)20 tool	Binary outcomes were compared using Fisher's exact test and given as risk differences. Continuous outcomes were compared using an unpaired t test or the Wilcoxon-Mann Whitney 2-sided test. Median difference estimate was derived from Hodges-Lehmann estimate. MPR over time was compared using a mixed-effect linear regression model with patient and time as random-effect parameters, and an interaction between follow-up time and treatment group was tested. Persistence was illustrated using Kaplan-Meier cumulative failure curves and compared using the Cox proportional hazard model. All P values were 2-tailed, with statistical significance set at .05. All confidence intervals were calculated at the 95% level	At 12 months, 20.3% of the patients in the intervention group (231) were nonadherent (MPR <0.80), compared with 30.2% in the control group (285) (risk difference 9.8; 95% confidence in terval [CI], 17.3, 2.4) and median MPR (interquartile range) was 0.93 (0.82-0.99) and 0.91 (0.76-0.98), respectively, P .02. The combined clinical endpoint was reached by 1.3% in the intervention group and 3.1% in the control group (relative risk 0.41; 95% CI, 0.11-1.50). No significant differences were found for persistence, blood pressure, or hospital admission	Level II: Randomized control trial. Yes, because motivational interviewing was a key element of the intervention which can be used as an example for my DNP project and it is one of the first studies to demonstrate a sustained effect after intervention has stopped

Calvert, 2012	Randomized Control Trial: To evaluate the effect on medication adherence of linking hospital and community pharmacists	143 enrolled hospitalized patients with coronary artery disease discharged on aspirin, β-blocker, and statin who used a participating pharmacy were randomized to usual care or intervention.	The usual care group received discharge counseling and a letter to the community physician; the intervention group received enhanced in-hospital counseling, attention to adherence barriers, communication of discharge medications to community pharmacists and physicians, and ongoing assessment of adherence by community pharmacists	The Beliefs about Medicines Questionnaire (BMQ) was completed to assess potential barriers to adherence those with a high activity level and/or those in which a physician was involved.	haracteristics and outcomes of patients randomized to the intervention and control groups were compared using Pearson χ2 tests for all categorical variables and Wilcoxon rank sum tests for all continuous variables	Of 143 enrolled patients, 108 (76%) completed 6-month follow-up, and 115 (80%) had 6-month refill records. There was no difference between intervention and control groups in self-reported adherence (91% vs 94%, respectively, P = .50). Using the PDC to determine adherence to β-blockers and statins, there was better adherence in the intervention versus control arm, but the difference was not statistically significant (53% vs 38%, respectively, P = .11). Adherence to β-blockers was statistically significantly better in intervention versus control (71% vs 43%, respectively, P = .03). Of 85 patients who self-reported adherence and had refill records, only 42 (49%) were also adherent by PDC.	Level II: Randomized control trial, Yes because this study demonstrates how interventions can improve adherence to medications for patients
Czaja, 2014	Feasibility study of a home telehealth system that monitored blood pressure and bodyweight	A total of 34 participants (10 males and 24 females) met the inclusion criteria and were willing to have the telemedicine system in their homes. Their mean age was 72 years (SD 11) and 94% of them self-identified as Hispanic. The participants had fairly low educational attainment and only 50% had any prior computer experience	Usability and usefullness of the telemedicine system	The telehealth system consisted of three devices: a blood pressure measuring unit, a bodyweight scale and a wireless unit to transmit the data to a server and participants used it for 6 months and feasibility was assessed	follow-up assessment six months after the intervention period, which included six assessment instruments. The System Evaluation Questionnaire, a 13-item instrument, was designed to measure participants' satisfaction with the telemedicine system (Appendix). Lower scores reflected more positive perceptions, with scores in the range 13-65. A trained assessor administered the tests. At the conclusion of the study, a study investigator conducted a telephone survey and interview with the two HCS nurses who were responsible for monitoring remotely the data from the participants. Responses to the survey and	Participants had strong positive perceptions regarding the usability and usefulness of the telemedicine system. Most of them (92%) found the device easy to use and 96% felt that the training they received prepared them to use the device. The providers indicated that use of the system improved their ability to manage their patients	Level VI: Single qualitative study. No, no input on medication adherence
McCarthy, 2013	Randomized Control Trial: Determining whether prescription information or services improve medication adherence of emergency department (ED) patients	3,940 Adult patients in 3 ED's who were prescribed an antibiotic, central nervous system, GI, cardiac, or respiratory drug at discharge	Medication adherence: Eligible subjects were randomly assigned to usual dc care or one of 3 prescriptions information or services intervention groups	Self-reported medication adherence measured by primary adherence (rx filling) and persistence (receiving medication as prescribed) rates, was determined during a telephone interview 1 week post discharge	Self-reported medication adherence, measured by primary adherence (prescription filling) and persistence (receiving medicine as prescribed) rates, was determined during a telephone interview 1 week postdischarge	enrolled and randomly allocated to treatment, 86% (N 3,386) completed the follow up interview. Overall, primary adherence was 88% and persistence was 48%. Across the sites, primary adherence and persistence did not differ significantly between usual care and the prescription information or services groups. However, at site C, subjects who received the practical prescription information or services (odds ratio [OR] 2.4;	Level II:I Randomized Control Trial. Yes, because this study demonstrated that prescription filling and receiving medicaitons as prescribed was not meaningfully improved by offering patients patient-centered prescription information and services and to demonstrate that there may be other ways to improve adherence by involving the patient and providing follow up after an ED discharge
Carmel, 2017	A retrospective review of the impact of an ED-to-rapid-primary-care protocol on avoidance of hospitalizations in a large, urban medical center	162 charts of pts in rapid	To what extent can hospital admissions from the ED be averted with access to rapid (next business day) primary care follow-up?	Physician reviewers were asked to review the patient charts and assess whether the referral represented an "avoided admission"	Analyses were done using chi square, Fisher's exact test, Student's t-test, and Kruskal-Wallis test, as appropriate. All P values are two-tailed, with P<0.05 considered statistically significant.	referrals for rapid primary care follow-up as avoided admissions. Of the 162 patients referred for rapid follow-up, 118 (73%) arrived for their rapid appointment. There were no differences in rates of ED revisits or subsequent hospitalizations between those who attended the rapid follow-up and those who	Level VII: No, this study is regarding primary care follow up after and ED visit to reduce hospital readmission not medication adherence
Farris, 2018	A retrospective , observational analysis of patients discharged from the ED to assess barriers and clinical implications of patient nonadherence to filling discharge medication prescriptions	505 patients' medical records	frequency of nonadherence to filling discharge medications prescribed during the ED visit at the ED outpatient pharmacy. Secondary outcomes included identifying barriers to medica tion adherence, the rate of return ED visits within 30 days of ED	Patient contact was attempted by ED retail pharmacy staff for all 505 nonadherent patients	analysis. Data collected included status of discharge medication retrieval, return ED visit within 30 days of ED discharge, hospital admission within 30 days of	A large proportion of nonadherent patients revisited the ED within 30 days of ED discharge. Multivariate logistic regression found payer class, ethnicity, and sex were independently associated with return ED visits.	Level VI: Single descriptive study. Yes because this study demonstrates the importance of medication adherence to reduce the rate of return to ED
Treskes, 2018	Review of randomized control trials that discuss telemedicine interventions to improve medication adherence in patients with cardiovascular disease	patients with cardiovascular disease who take medication orally for more than 180 days consecutively 74 experimental studies were reviewed. A total of 475 PubMed papers were reviewed, of which 74 were assessed.	Telemedicine solutions that can potentially improve medication adherence in patients with cardiovascular disease	Narrative review on telemedicine strategies to improve medication adherence in patients with CVD	Narrative review	the intervention groups demonstrate and increase in medication adherence compared to the control group. Motivational interviewing was shown to improve medication adherence in different patient	Level V: Narrative review, Yes evidence based
Khonsari, 2015	An interventional study to to investigate the effect of automated SMS-based reminders on medication adherence in patients after hospital discharge following acute coronary syndrome (ACS)	62 patients with ACS were equally randomised to receive either automated SMS reminders before every intake of cardiac medications or only usual care within eight weeks after discharge	the primary outcome was adherence to cardiac medications.Secondary outcomes were the heart functional status, and ACS-related hospital readmission and death rates	computer program Statistical Packages for Social Sciences (SPSS) version 21. The significance level in this study was α=0.05. Patients' characteristics were compared between the study	Interventional Study	adherence level in the intervention group rather than the usual care group, ($\chi2$ (2)=18.614, p<0.001). The risk of being low adherent among the control group was 4.09 times greater than the intervention group (relative risk	Level II: Interventional study, Yes
Park, 2014	A quantitative systematic review without meta-analysis to evaluate the efficacy of mobile phone interventions used to improve medication adherence specifically text messaging in a variety of conditions	29 quantitative research studies related tomobile phones and medication adherence. The studies were conducted forprevention purposes as well as management of acute and chronic illnesses	efficacy of mobile phone interventionsto improve medication adherence. Secondary aims are to explore participants'acceptability and satisfaction with mobile phone interventions and to evaluate theselected studies in terms of study rigour, impact,	A quantitative systematic review without meta-analysis was conducted and the selected studies were critically evaluated to extract and summarize pertinent characteristics and outcomes.	Systematic Review	Eighteen studies found significant improvement in medication adherence	Level I: Systematic review, Yes
Davis, 2020	A mixed-method systematic review aimed to evaluate the efficacy of telehealth and mobile health interventions and explore the benefits and challenges of the interventions in patients with Irritable Bowel Disease (IBD)	Out of the 18 studies included, 16 were quantitative and two were qualitative studies	This systematic review aimed to evaluate the efficacy of telehealth and mHealth interventions and explore the benefits and challenges of these interventions in patients with IBD	This review used a convergent segregated approach to synthesize and integrate research findings, a methodology recommended by the Joanna Briggs Institute for mixed-methods systematic reviews	Systematic Review	The results of quantitative analysis supported the efficacy of telehealth and mHealth interventions to improve patients' quality of life, medication adherence, disease activity, medication monitoring, disease-related knowledge and cost savings.	Level I: Systematic review, Yes
Shani, 2021	determine the associations of adherence levels to chronic disease medications with ED visits and hospitalizations and included individuals aged 50-74 years with a diagnosis of diabetes mellitus or hypertension,	268,792 patients in the study 81.1% of patients had hypertension and 59.5% had diabetes with a total of 40.6% of the patients having both conditions	the mean adherence rates of the medications prescribed to each individual. Adherence rates were stratified into categories. Information about all the ER visits, and hospitalizations in internal medicine and surgical wards during 2016–2018 was	odds ratios for ER visits and hospitalizations in internal and surgical wards, and adjusted the model for age, gender, SES, Charlson score, and family physician visits. ER visits and hospitalizations in internal	Cohort Study	This study concluded that increased adherence with medications was associated with a decreased probability of ED visits and inpatient hospitalizations and a negative asscociation between medication adherence and hospitalizations	Level II: Cohort Study, yes

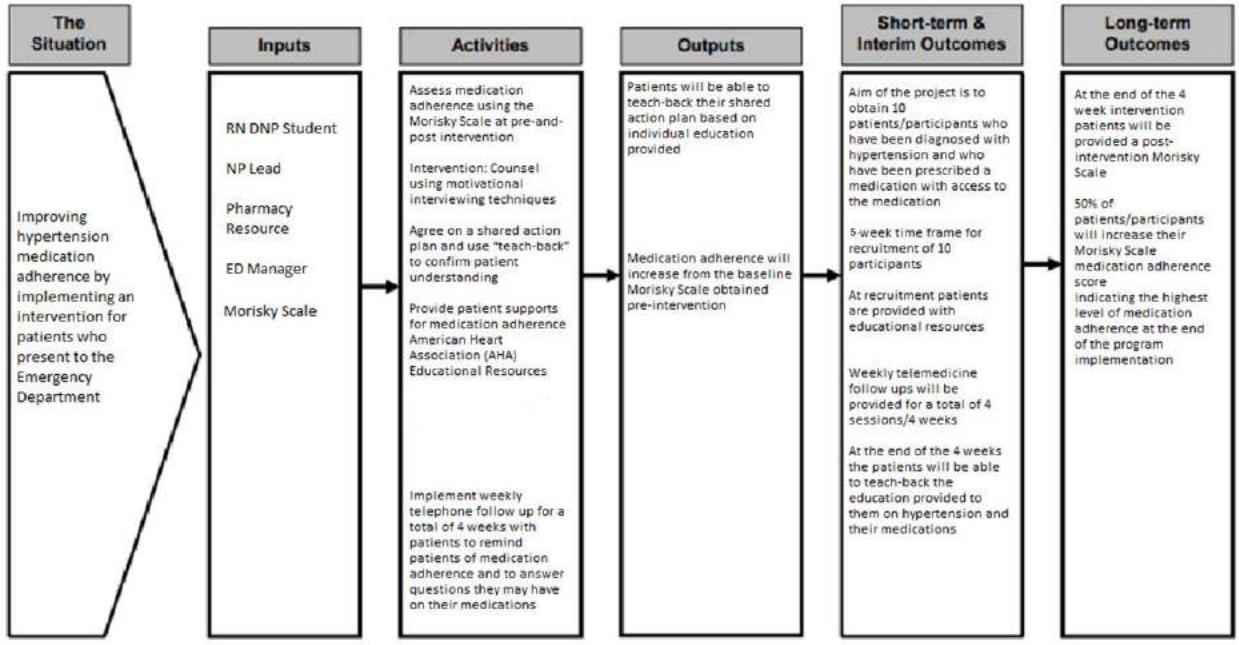
Appendix E: Practice Guideline Appraisal (AGREE TOOL)

Appendix F: Conceptual Framework

Table 1. Transitional Care Model (TCM) Components and Definitions

Component	Definition
Screening	Targets adults transitioning from hospital to home who are at high risk for poor outcomes.
Staffing	Uses APRNs who assume primary responsibility for care management throughout episodes of acute illness.
Maintaining Relationships	Establishes and maintains a trusting relationship with the patient and family caregivers involved in the patients' care.
Engaging Patients and Caregivers	Engages older adults in design and implementation of the plan of care aligned with their preferences, values and goals.
Assessing/ Managing Risks and Symptoms	Identifies and addresses the patient's priority risk factors and symptoms.
Educating/ Promoting Self-Management	Prepares older adults and family caregivers to identify and respond quickly to worsening symptoms.
Collaborating	Promotes consensus on plan of care between older adults and members of the care team.
Promoting Continuity	Prevents breakdowns in care from hospital to home by having same clinician involved across these sites.
Fostering Coordination	Promotes communication and connections between healthcare and community-based practitioners.

Appendix G: Logic Model



Retrieved from https://www.template.net/business/word-templates/logic-model-template/

Appendix H: Data Collection Instruments and Approval

mmar.
MORISKY MEDICATION ADHERENCE RESEARCH, LLC.

(Please check your answer below)		
1. Do you ever forget to take your medicine?	*No*	*Yes*
2. Are you careless at times about taking your medicine?	*No*	*Yes*
3. When you feel better do you sometime stop taking your medicine?	*No*	*Yes*
4. Sometimes if you feel worse when you take the medicine, do you stop taking it?	*No*	*Yes*

Scoring: high-low; yes= 0; no= 1
Range: 0-4
Mean: (weighted): n = 290; x
Cronbach alpha: 0.61

TABLE 1. Self-reported Medication-taking Scale and Item-to-total Correlation Coefficients

	Corrected Item-to-total Correlation
1. Do you ever forget to take your medicine?	0.515
2. Are you careless at times about taking your medicine?	0.479
3. When you feel better do you sometimes stop taking your medicine?	0.527
4. Sometimes if you feel worse when you take the medicine, do you stop taking it?	0.561

Scoring: high–low; yes = 0; no = 1.
Range: 0–4.
Mean (weighted): n = 290; $\bar{x}$ = 2.31.
Cronbach alpha: 0.61

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DEPARTMENT OF COMMUNITY HEALTH SCIENCES
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PO BOX 951772
LOS ANGELES, CA 90095-1772

TO: TO WHOM IT MAY CONCERN

FROM: Donald E. Morisky, ScD. ScM, MSPH

RE: Permission to use the MGL

Date: January 18, 2022

I, Professor Donald E. Morisky, Research Professor Emeritus, UCLA Fielding School of Public Health, hereby give permission to Brenda Aguilar to use the Morisky, Green and Levine, 1986 (MGL) Medication Adherence Questionnaire for her study "**Quality improvement project in the emergency department at UCI Health to increase medication adherence for patients with hypertension.**" She can also make her own translation, if needed. Here is the required reference that needs to be cited in his manuscript.

Morisky DE, Green LW, and Levine DM. Concurrent and Predictive Validity of a Self-Reported Measure of Medication Adherence and Long-Term Predictive Validity of Blood Pressure Control. *Med Care* 1986; 24:67-74.

Sincerely,

Donald E. Morisky

Donald E. Morisky, Sc.D., MSPH, ScM
Research Professor Emeritus
Lifetime Career Award, American Public Health Association
UCLA Fielding School of Public Health
Department of Community Health Sciences

Appendix I: Intervention Material