Increasing Medication Adherence in a Primary Care Practice

Tracey Carson-Johnson

College of Nursing, East Carolina University

Doctor of Nursing Practice

Dr. Dianne Marshburn

July 22, 2021

Acknowledgements

I would like to express my deepest gratitude to the following people for their support during my Doctor of Nursing Practice project: Dr. Khanh Vu for welcoming, supporting, and teaching me; Tanya Darrow for her acceptance, guidance, openness, and camaraderie; and Dr. Dianne Marshburn for her support, advice, and attempts to reign in my verbosity. I am forever thankful for your collaboration and encouragement.

I dedicate this project to my beloved family, including my husband and love of my life, Willie Johnson III; my three wonderful children, Jeremie Johnson, Rhyan Johnson, and Aaria Johnson; my mother, Kate Booth; and my friend and colleague Alyssa Long. Your help, support, patience, and love through this long process made the road bearable. I would not be who I am without your love and support.

Abstract

The focus of this Doctor of Nursing Practice project was to target medication adherence in a private, rural primary care office, designated as a Rural Health Clinic, in a Tier 1 county in central North Carolina. The project site identified that not enough patients with Medicare were demonstrating medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists to achieve a 5-star rating for quality metrics. The purpose of the project was to develop and implement a standardized process to increase medication adherence for patients with Medicare and increase star ratings in a rural primary care office. The project included a four-part intervention to assess for medication adherence and address barriers, to use patient-friendly prescription practices, to increase scheduled follow-up visits, and to recapture patients who were identified as nonadherent. Findings from the project revealed a significant increase in the star rating for oral antidiabetics, the star rating remained stable for the renin-angiotensin system antagonists, and there was a slight decrease in the star rating for statins. There were positive results for four process measures, including improvement in prescribing prescriptions for 90 days or more, scheduling follow-up visits, including diagnosis or procedural codes in the chart, and sending prescriptions to a mail-order pharmacy. However, the trend decreased for the number of DOSE-Nonadherence measure forms completed during the project period. This project contributed to the creation of a quality committee and increased focus on quality measures, laid a foundation for improved medication adherence, and demonstrated the importance of nursing leadership in improving patient outcomes.

Keywords: medication adherence, star ratings, DNP project, primary care, 90-day prescriptions

Table of Contents

Section I. Introduction

Background

Chronic conditions account for two out of three deaths in the United States (Raghupathi & Raghupathi, 2018). Almost 50% of adults have at least one chronic condition, 25% of adults have two or more, and almost 50% of older adults have three or more coexisting chronic diseases (McPhail, 2016). Prescription medications are a standard treatment for chronic diseases and the prevention of their related sequelae; however, medication adherence is suboptimal. Up to 30% of new prescriptions are never filled, 50% are not taken as prescribed, and when medications are started, adherence rates decline over time (Derenthal et al., 2018; Kleinsinger, 2018). Every year, up to 50% of treatment failures, 25% of hospitalizations, and 40% of nursing home admissions are related to medication nonadherence (Braithwaite et al., 2013; Kim et al., 2018). Medication nonadherence causes up to 125,000 premature and preventable deaths and costs up to $300 billion annually (Derenthal et al., 2018; Kleinsinger, 2018). For every $1 spent on improving medication adherence, there is an estimated $7 savings in disease treatment costs (National Council Medical Director Institute, 2018; Pfizer, 2018). Many insurance companies and accountable care organizations tie reimbursement and shared-savings program benefits for primary care practices to patients' medication adherence rates (Centers for Medicare and Medicaid Services [CMS], 2021; Independence Blue Cross 2017).

Organizational Needs Statement

The project site for the Doctor of Nursing Practice (DNP) project was a rural, private family practice office. Their practice goals were improving healthcare quality, promoting value-based care, and focusing on preventive care and chronic disease management (site champion, personal communication, September 16, 2020). Medication adherence plays a significant role in

chronic disease management because it improves clinical outcomes, reduces undesirable sequelae, reduces hospitalizations, enhances the quality of life, reduces premature deaths, and decreases total healthcare costs (Kim et al., 2018). Because medication adherence is an essential element of chronic disease management, it is a significant factor in healthcare quality metrics and practice reimbursement. The practice site earned star ratings on quality metrics for medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists from Blue Cross Blue Shield (BCBS, site champion, personal communication, 2020). The project site's organizational need was to improve medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists for patients with Medicare and increase their star ratings.

Star Ratings

The Five-Star Quality Rating System was created by CMS to improve Medicare Advantage plan members' quality of care (CMS, 2021). They identified quality measures to improve patient care quality and then rate healthcare providers' performance in meeting them. BCBS adopted the Five-Star Quality Rating System and set goals for primary care provider practices to strive to achieve (Independence Blue Cross, 2017). Star rating scores range from 1-5 stars, from lowest to highest (Bajner et al., 2018). Implementing the star rating system encouraged organizations to improve their quality of care and offered financial reimbursement and rewards to incentivize organizations to improve their star rating (CMS, 2021). Primary care offices are reimbursed at a base rate regardless of the star rating; however, an average star rating bonus is payable when the average star rating increases above a predefined threshold.

BCBS calculated star ratings for the quality measures for the project site (site champion, personal communication, November 6, 2020). The project site needed to meet or exceed 4 stars

from BCBS to qualify for the average star rating bonus at the end of each year (Blue Cross Blue Shield of North Carolina [BCBSNC], 2018). The average star rating determined the annual bonus amount, which increased with every quarter of a point, with a score of 4.75 stars and above earning the maximum bonus amount.

The average star rating comprised 10 individual quality measures that each earned star ratings. The individual star ratings were weighted by importance as either single- or triple-weighted. Triple-weighted measures contributed three times their rating toward the average star rating (BCBSNC, 2018). The project site desired to achieve a 5-star rating for all 10 quality measures to earn an overall 5-star rating. However, this project focused on the three quality measures that pertained to medication adherence.

Medication Adherence

Medication adherence is considered critical to improving patient outcomes and quality. Therefore, the medication adherence quality measures for statins, oral antidiabetics, and renin-angiotensin system antagonists included in the average star rating were triple-weighted by BCBS (BCBSNC, 2018). The three medication adherence quality measures accounted for 45% of the project site's average star rating from BCBS (site champion, personal communication, October 13, 2020). The star ratings the project site earned for medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists were, in order, 3, 2, and 3 in December 2020 for BCBS (site champion, personal communication, February 9, 2021).

Medication adherence is the degree to which an individual follows the interval and dosing instructions and correctly takes their prescribed medication (Pfizer, 2018). A patient's medication adherence percentage is determined by pharmacy claims data (Farley et al., 2019). To be adherent, a patient must fill their prescription(s) at least as frequently as enough to have the

medication on hand for a minimum of 80% of the time they should be taking it, called the proportion of days covered (CMS, 2021). BCBS set the benchmarks for the percentage of patients qualifying for medication adherence to earn star ratings. The thresholds progressively increased to earn higher star ratings.

Healthy People 2030

With the focus on medication adherence, this project aligned with the goals of Healthy People 2030. They provide guidance for the nation concerning health promotion and disease prevention (National Center for Health Statistics, 2020). The new initiatives, published in 2020, focused on the causes of health outcomes, upstream measures, matters of national importance, high priority public health issues, and select social determinants of health (Healthy People 2030, n.d.). Healthy People 2030's health indicators address medication adherence directly and indirectly (National Academies of Sciences, Engineering, and Medicine, 2020). Directly, medication adherence is addressed in two objectives included in the topic of Access to Health Services. First, they advocate reducing the number of persons who cannot obtain or delay in obtaining medical care. Secondly, they seek to reduce the number of persons who cannot obtain or delay in obtaining their prescribed medications. Indirectly, many indicators are influenced by improving chronic disease management.

Healthy North Carolina 2030

By focusing on medication adherence, this project indirectly aligned with Healthy North Carolina 2030. The Healthy North Carolina 2030 publication serves as North Carolina's population health improvement plan (North Carolina Institute of Medicine, 2020). This project is related most closely to the 21st health indicator: Life Expectancy. Life expectancy is a good measure of the cumulative outcomes of the health of a population. Therefore, anything that

impacts life expectancy, such as chronic disease management, applies to this indicator. The life expectancy among the counties of North Carolina ranged from 73.1 to 82.1 years. The project site's county had an average lifespan of only 73.1 to 75.9 years, which is the lowest category in North Carolina.

Triple Aim

The project's focus on medication adherence aligned with the Institute for Healthcare Improvement's Triple Aim (IHI, n.d.-b). The Triple Aim focuses on healthcare improvement and optimizing health system performance by reducing healthcare costs, improving population health, and delivering high quality care. This project's focus on medication adherence proposed meeting these objectives through quality chronic disease management to reduce morbidity and mortality and decrease avoidable sequelae. In addition, focusing on medication adherence at the project site aims to reduce the costs associated with uncontrolled disease states, improve their population's health, and provide high quality care to patients.

Problem Statement

Medication nonadherence contributes to morbidity and mortality, causing poorer outcomes and increasing healthcare costs. As a result, insurance organizations are linking reimbursement and incentives to medication adherence performance. The individual star ratings for the three quality metrics related to medication adherence accounted for almost half of the average star rating (site champion, personal communication, February 9, 2021). BCBS set benchmarks for the project site to achieve a specified percentage of their patients who met the target for medication adherence for individuals on Medicare. The problem was that not enough patients with Medicare demonstrated medication adherence for the project site to achieve a 5-star

rating for medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists from BCBS as their star ratings ranged from 2-3 stars in December 2020.

Purpose Statement

The purpose of this DNP project was to develop and implement a standardized process to address medication adherence in patients with Medicare in a rural primary care office. The project sought to improve the quality of care for patients, increase the percentage of persons with Medicare who met the benchmarks set by BCBS, and increase the project site's star ratings for the quality metrics of medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists.

Section II. Evidence

Factors Affecting Medication Adherence

There are many barriers to medication adherence and factors in nonadherence. The World Health Organization (WHO) developed a framework to understand the factors that influence nonadherence (Alvi et al., 2019; Centers for Disease Control and Prevention [CDC], 2017). They described and categorized the factors into five dimensions, and researchers continue to define them using the WHO's framework (Devine et al., 2018; Gast & Mathes, 2019). The framework comprises five dimensions of factors in nonadherence, including those related to the individual; the prescribed therapy; the disease or condition; the healthcare team, system, and processes; and social, economic, and political conditions and policies (Alvi et al., 2019; CDC, 2017).

Patient-related factors are the first dimension affecting adherence. These factors are affected by the individual patients, and incorporate their knowledge, attitude, motivation, beliefs, values, and expectations (CDC, 2017). Factors under this domain include mistrust of or dissatisfaction with doctors and medicine, views about medications and chronic illnesses, and concerns about the possible side effects of taking pills or drugs (Devine et al., 2018; Yap et al., 2016). Cognitive factors such as mental and physical comorbidities, depression, alcohol abuse, substance abuse, and advancing age also affect medication adherence (Devine et al., 2018; Gast & Mathes, 2019). Feeling well during the early stages of chronic illnesses or the lack of symptoms may adversely contribute to the perception of an illness's risks or a medication's benefits (Devine et al., 2018; Yap et al., 2016). Finally, forgetfulness is a significant obstacle to medication adherence, resulting from a lack of a routine, education, or time, and is the most commonly reported factor (Chan et al., 2020; Devine et al., 2018; Yap et al., 2016).

Therapy-related factors are the second domain affecting adherence. These factors are related to the medical regimen and include complexity, duration, prior failures, frequent changes, and adverse reactions (CDC, 2017). Barriers related to therapy include the need to change preexisting routines, conduct regular disease monitoring, and manage difficult and or painful monitoring requirements such as frequent blood glucose testing (Chan et al., 2020; Devine et al., 2018). Complex medication regimens such as a high daily pill burden, frequent dosing, an increased number of medications, and a necessity for routine drug calculations, all contribute to the difficulty of adhering to provider recommendations (Chan et al., 2020; Gast & Mathes, 2019). Therapy-related factors include complicated and hard-to-open drug packaging, generic and trade naming convention, and formulation challenges such as large pills or needing to cut pills in half (Chan et al., 2020; Yap et al., 2016).

Disease-related factors are the third domain affecting adherence. These factors are related to the demands of the illness. These can include the severity, level of disability, expected or actual progression, and possible treatments for the disease (CDC, 2017). Barriers in this domain are also concerned with the condition's duration and the expected length of treatment needed (Gast & Mathes, 2019). Other disease-specific factors include a lack of an immediate improvement in the perceptions of symptoms or overall health and the destructive interplay between comorbid conditions, which exacerbate each other (Chan et al., 2020). Coexisting and multiple conditions require sustained, intensive, and long-term treatments and usually have an unfavorable course if not managed well. Other disease factors include the risks for and effects of hospitalization, the compounding effects of sequelae resulting from uncontrolled disease states, interruptions to drug regimens, the necessity for frequent medication changes, inefficient or absent medication reviews, and induction of polypharmacy (Yap et al., 2016).

Healthcare system-factors are the fourth domain affecting adherence. These factors are related to the healthcare team, systems, and processes (CDC, 2017). These can be related to a lack of access and quality of healthcare services, lack of or poor communication, lack of provider training, unsatisfactory patient involvement, and a lack of adequate patient education. Low health literacy is another factor associated with a lack of knowledge about the disease state, expected outcomes, and medication instructions, such as the intended schedule, dose, interval, timing, and indication (Devine et al., 2018). Health insurance plan coverage, copayments, cost-sharing, drug formularies, and medication costs are system-level factors that present significant barriers for some patients (Gast & Mathes, 2019). Lack of available healthcare due to the timing of office hours, location of facilities, distance to care, lack of transportation, and insurance requirements such as payer networks can negatively affect access and potentially prohibit adequate follow-up (CDC, 2017). The lack of time spent with patients, the complexity of treatment plans, and provider-patient relationships are also factors.

Social and economic factors are the fifth domain affecting adherence. These factors are concerned with social, economic, and political conditions and policies (CDC, 2017). The number of factors in this domain is vast. These include factors related to age, race and ethnicity, socioeconomic status, educational attainment, unemployment levels, social support networks, and living conditions. The WHO emphasizes the socioeconomic and political context people live in as these factors interact with and contribute to the social determinants of health (White-Williams et al., 2020). These influence individuals through governmental, economic, social, and public policies and cultural and societal values. Social factors include an array of influencing elements, including religious and cultural beliefs and practices, sex and gender inequalities, societal expectations, and stigmas associated with some diseases and medication classes (Chan et

al., 2020; Devine et al., 2018). Adherence is affected by marital and family statuses, lack of social support or network, the presence of or lack of a caregiver, and family dysfunction (Devine et al., 2018). Economic barriers in this domain include a lack of money and resources, unemployment or underemployment, high medication costs, travel expenses, lost work time, and insurance deductibles and coinsurance requirements. Financial status, occupation, income levels, and competing financial obligations can all affect adherence (White-Williams et al., 2020). Other social and political conditions include national and state policies, voluntary and forced migration, undocumented status, and even the effects of war (Shahin et al., 2020; White-Williams et al., 2020).

Barriers to medication adherence and factors in nonadherence are extensive and too numerous to list comprehensively. Individuals may experience one or multiple barriers simultaneously. One systematic review by Devine et al. (2018) posited that all factors could stem from or be related to systems-level factors. For example, they reframed patient-related factors and suggested the factors were a really a result of providers' inadequate effort to address patients' comorbidities and substance abuse or consider their values, beliefs, and cultural practices when prescribing care plans. They further suggested that this lack of concordance between the patient's expectations for, knowledge about, and understanding of the provider's orders causes patients to be nonadherent (Devine et al., 2018).

Literature Review

The project lead conducted a literature review of medication adherence. The PICOT (Population, Intervention, Comparison, Outcome, Time) method was used to identify the search question and discovered three concepts for integration in the literature search. The concepts were medication adherence, chronic disease, and family practice. Subject terms were identified by

searching the database language with keywords for each database and new keywords prompted amended searches for subject terms in the other databases for continuity. The subject terms were recorded in a concept table. Medication adherence was the first concept and included the following search terms: medication adherence, medication compliance, patient compliance, and noncompliance. Chronic disease was the second concept and included the search terms: chronic disease and chronic illness. The third concept, primary care, included the search terms: primary health care; physicians, primary care; physicians, family; and practitioner's office.

The project lead conducted literature searches in five databases, including Ovid, the Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, ProQuest, and Google Scholar. The Ovid, CINAHL, PubMed, and ProQuest searches were performed using the identified database's search terms. The Google Scholar search included the keywords used to find the subject terms from the Ovid, CINAHL, PubMed, and ProQuest database searches. The search stream entered into the search bar on Google Scholar was: "medication adherence" or "medication compliance" or "patient compliance" and "chronic disease" or "chronic illness" or "chronic condition" and "primary care" or "family practice" or "practitioner."

Before applying search limits, there were 81 results from CINAHL, 91 from Ovid, 71 from PubMed, 30 from ProQuest, and 29 from Google Scholar, for a total of 302 total search results (see Appendix A). Search limits were applied, including a publication date between 2015 and 2020 and an English language restriction. The applied limits reduced the number of articles returned to 35 from CINAHL, 41 from Ovid, 46 from PubMed, 25 from ProQuest, and 29 from Google Scholar, for 179 remaining articles.

Then, an initial review of the 179 articles' titles and abstracts was conducted to identify those warranting a full article review. An article was selected for full review if the title or

abstract mentioned an intervention related to medication adherence. Of these, 65 articles remained. For the article to be retained during the full review, the article had to detail an intervention for medication adherence. The full review resulted in the retention of 40 articles, and all others were excluded as not related to the project. Data from the 40 articles were entered into a literature matrix for categorization and synthesis (see Appendix B).

The Levels of Evidence designed by Melnyk and Fineout-Overholt (2015) were used to evaluate the 40 retained articles per their Levels of Evidence I through VII. The design and sample data were used in determining the article's Level of Evidence. The literature review results included an array of articles with evidence from nearly all the Levels of Evidence. Of the articles, two were Level I, three were Level II, eight were Level III, seven were Level IV, none were Level V, 12 were Level VI, and eight were Level VII. The literature review identified two significant themes: identifying medication adherence and treating medication adherence. Eleven of the articles focused on screening for medication adherence and identifying barriers. The other 29 articles recommended a specific action(s) for medication adherence.

Current State of Knowledge

Medication adherence has been a frequent topic in the literature since the first study was published in 1968 (Costa et al., 2015). Now, 50 years later, after many studies and attempted interventions, we have fallen short with an abundance of literature but little success in effectively changing medication adherence rates (Costa et al., 2015; Kleinsinger, 2018). Unfortunately, despite small statistically significant results, nearly all studies show minimal to no practical change in medication adherence rates (Costa et al., 2015). Medication adherence rates continue to hover around 50% and have not changed appreciably.

Current Approaches to Measuring Medication Adherence

Medication adherence includes the initiation, implementation, and discontinuation of pharmacotherapeutic treatment (Lam & Fresco, 2015). Primary nonadherence occurs when an individual does not fill their prescription. Secondary nonadherence occurs when the medication is not taken as prescribed. Attempts have been made to measure medication nonadherence using either subjective or objective measures. Subjective measures include the patient's estimation of medication adherence or the provider's evaluation of their behavior, which both tend to overestimate adherence. Objective measures include techniques such as counting pills, employing electronic monitoring, performing secondary database analyses such as pharmacy records and insurance claims, and obtaining biochemical measurements in body fluids.

Adherence measures are further categorized as direct and indirect measures. Direct measures include testing for the presence of metabolites or biomarkers in body fluids or direct observation of medication administration (Lam & Fresco, 2015). Direct measures do not reveal medication adherence patterns over time, are costly, and are invasive, limiting their usefulness. Indirect measures include performing secondary database analyses of electronic prescription and insurance records to calculate medication-taking behavior. Refill adherence assumes that the refills reflect the medication behavior and that the medications are taken as prescribed. Two common measures using electronic databases include the medication possession ratio and the proportion of days covered. The medication possession ratio measures the number of days' supply of the medication the patient has. The proportion of days covered measures the frequency of refills and is commonly used to determine medication adherence. The benefits of using electronic prescription records are that it allows for assessing large populations and multidrug adherence.

Other indirect methods to calculate adherence include electronic medication packaging, conducting pill counts, clinician judgement, and patient self-reports (Lam & Fresco, 2015). Electronic medication packaging incorporated devices that measure when the container has been accessed by recording each event's date and time. Pill counts are conducted by counting the number of pills remaining between two consecutive visits relative to the number prescribed. Clinician assessments and patient self-reports include several subjective measures that are the least reliable but are the simplest and fastest to use. Available methods include using a patient-kept diary, patient interviews, and questionnaires and scales.

More than 40 self-report scales are used for medication adherence, and currently there is no gold-standard (Lam & Fresco, 2015). Some of the most common tools include the Brief Medication Questionnaire, the Hill-Bone Compliance Scale, the 8-item and 4-item Morisky Medication Adherence Scales, the Medication Adherence Questionnaire, the Medication Adherence Report Scale, and the Domains of Subjective Extent of Nonadherence (DOSE-Nonadherence) measure (Lam & Fresco, 2015; University of Wisconsin, 2019). While most of the tools measured some combination of behaviors, barriers, or beliefs about medication adherence, each had some significant limitations (Lam & Fresco, 2015). For example, the Brief Medication Questionnaire is time-consuming to administer. The Hill-Bone tool has limited generalizability. The Morisky Medication Adherence Scales and the Medication Adherence Questionnaire instruments are expensive to implement. The Medication Adherence Report Scale has limited generalizability. However, the DOSE-Nonadherence measure tool is unique because it has been validated in the presence of many chronic diseases and is free for use under a signed license agreement (University of Wisconsin, 2019).

Current Approaches to Solving Medication Nonadherence

Attempts to solve medication nonadherence have revolved around individual interventions to impact the WHO's five domains of adherence. These interventions have been classified as behavioral, educational, self-management, risk communication, packaging and daily reminder aids, and integrated care interventions (Costa et al., 2015). Behavioral interventions focus on changing a single, specific individual's behavior, often using cognitive-behavioral techniques to promote medication adherence. Personalized behavioral interventions have targeted actions via intensive medication education and counseling (Mantri, 2015; Yoon et al., 2020), barrier identification (Kvarnström et al., 2018), and motivational interviewing (do Valle Nascimento et al., 2017; Ruiz Moral et al., 2015). Using values clarification, conducting a medication adherence assessment, and tailoring medication therapy to the patient's goals for a personalized treatment plan can increase medication adherence (Holmes et al., 2016).

Educational approaches have emphasized patient education, communication, and the patient-provider relationship (Costa et al., 2015). It is recommended that primary care providers give the reason for medication selection, rationale, dosing schedule, and possible side effects in a way the patient understands and can follow for medication adherence to be viable (Fernandez-Lazaro et al., 2019). Techniques to improve the patient-provider relationship and appropriately place the individual as the focus of their treatment plan include a person-centered approach, motivational interviewing, and shared decision-making (Bosworth et al., 2016; Voshaar et al., 2015). These strategies ascribe a stronger emphasis on the provider's responsibility to focus on the patient and make the patient the center of the treatment plan while assessing ways to improve medication adherence. Gogovor et al. (2019) recognize that educational and knowledge-based

interventions alone have had limited effectiveness and wrote that 90% of individuals in their study reported that they understood the directions for taking their medications.

Risk communication interventions are intended to address intentional nonadherence due to poor risk perception (Costa et al., 2015). The patient and the provider often view the risk associated with chronic conditions quite differently; thus, strategies that bolster this aspect of medication adherence may be effective. A written treatment plan is one intervention that may improve medication adherence in chronic conditions (Hale et al., 2018; Holdsworth et al., 2019). For example, asthma action plans are used frequently. However, these have mixed results regarding whether they improve medication adherence (Kelso, 2016), but they may be an asset when working with some patients. Printed materials such as brochures, pamphlets, and online health information may be used to increase disease awareness, progression, and the dangers of undertreatment or nontreatment (Huang et al., 2019; Park et al., 2020; Voshaar et al., 2015). To make informed decisions, patients must have adequate information and understanding of the disease process and potential sequelae.

Self-management has a significant role in medication adherence in the literature (Kvarnström et al., 2018; Voshaar et al., 2015). Interventions that target self-management range from topics devoted to self-efficacy, self-care, and health literacy to self-monitoring via technology-based programs, phone applications, wearable devices, and telehealth visits (Costa et al., 2015). Self-management interventions that have been explored include the presence of family and friend support (Huang et al., 2019), degree of health literacy (Klinovszky et al., 2019; Voshaar et al., 2015), group self-management courses (S. Cutler et al., 2018), and locus of control (Klinovszky et al., 2019). One study successfully improved A1c and blood pressure levels using a medication self-management program (Kim et al., 2020). An exploding area of

research in medication adherence is the role of technology and how it applies to self-management, including smartphone apps (Armitage et al., 2020), text messaging (Khan et al., 2017), telehealth visits (Wu et al., 2019), and digital health technologies and wearable devices (Khan et al., 2017). As more products become available and individuals choose to incorporate their health and wellness with technology, more research will need to be completed to determine whether these changes will increase medication adherence. Also, consideration will need to be given to how these will affect individuals in rural areas with limited access to smart devices and internet access.

Using aids such as special packaging and daily reminders is a practical approach to unintentional nonadherence by reminding individuals when it is time to take their medication, attend appointments with providers, or reorder prescriptions (Costa et al., 2015). One method that showed a significant increase in medication adherence had a nurse call to check on patients with hypertension twice a month to monitor and promote chronic disease control. Another intervention used prescheduled follow-up visits and placed phone calls to patients if they missed their appointment and to those who needed to schedule a visit (Ballo et al., 2018). Another approach, trialed by the U.S. Department of Veterans Affairs, was to have daily monitoring of patients with heart failure via the use of a home telehealth program (Guzman-Clark et al., 2020). Other reminder aids include devices like alarms, wearable devices, pill organizers, and electronic devices such as pillboxes (Choi, 2019). Some electronic devices will upload data directly into electronic health records for medical providers to review (Dinh-Le et al., 2019). Convenience packaging from the pharmacy, in which the medications are prepackaged in blister packs and sorted by time of day, has been an effective intervention, though it can be costly (Conn et al., 2015).

Integrated care interventions are the last classification of interventions, and these interventions show the most promise for increasing medication adherence rates. Integrated care, also known as care management, is a care delivery model in which an entire health system, managed between many different disciplines, provides care for the whole person (WHO, 2016). This approach incorporates multidisciplinary teams from many sectors affiliated with health care to solve complex problems. One integrated care intervention was conducted at the Veteran's Health Administration to calculate the impact on medication adherence by forming a program for primary intensive care management (Yoon et al., 2020). Unfortunately, they did not see changes in medication adherence except in one class of antidiabetic.

Medical homes are another way to provide comprehensive care while utilizing a team approach. One example is the medical home program created by North Carolina for individuals covered by Medicaid (Beadles et al., 2015). One study compared the effects of medical home enrollment with medication adherence and found that those enrolled had better rates by 3-6% than those who were not enrolled. Another study reported on medication adherence rates in a medical home and noted increased medication adherence rates at one year in patients who were enrolled (Lauffenburger et al., 2017). Kim et al. (2020) conducted an interprofessional multifactorial intervention that targeted medication self-management. Though they did not measure medication adherence directly, they demonstrated improved blood pressures and A1c measurements, which they reported were due to better medication management (Kim et al., 2020).

The final example of integrated care interventions was published by Kaiser Permanente, an extensive health system in the United States (Schmittdiel et al., 2015). This organization desired to address the core measures related to the star quality-rating system from CMS and

designed system-level interventions to improve the medication adherence rate to 80% in all their locations. They found a longer prescription duration of greater than or equal to 90 days per prescription to be the largest predictor for medication adherence. Other successful strategies were using mail-order pharmacies, keeping copays less than or equal to $10, and annual out-of-pocket costs less than or equal to $2,000 annually. More patient-friendly prescription services are recommended as an effective systems-level way to improve medication. Effective prescription interventions included greater pharmacist participation (Beadles et al., 2015), longer duration of prescription for 90 days or more (King et al., 2018), using a single pharmacy (Pagès-Puigdemont et al., 2019), and utilizing mail delivery (Yoon et al., 2020).

In the end, despite a vast amount of research on medication adherence, it is a multifaceted and multifactorial challenge facing healthcare, and no simple interventions have been found. The varied and individualized factors demonstrate that targeting medication adherence will need to include systems-level changes, patient-centered care, and an individualized plan of care that addresses the patient's factors and their barriers to medication adherence

Evidence to Support the Intervention

Due to the overwhelming complexity and interplay between contributing factors, no single intervention has dramatically improved medication adherence rates. Consequently, a multidimensional, multifactorial approach is needed to improve medication adherence significantly. Success has been demonstrated by Kaiser Permanente (2016), as they reported improved medication adherence rates to achieve star ratings of 4 and 5 for all their facilities after implementing a health-system-level initiative. They achieved improved medication adherence for all three of their facilities and provided strong evidence that their initiatives worked and are worth replicating. Thus, the project site desires to implement a similar systems-level intervention

that addresses medication adherence with the successful interventions used by Kaiser Permanente while customizing them to the local population's needs.

The best approach for a systems-level intervention, advocated by Kaiser Permanente, was to focus on modifiable barriers at the health system level while assisting individuals at the same time. They recommend including five specific interventions: changing prescription-writing practices, decreasing copays and out-of-pocket costs, offering online refill requests, using automated phone reminders, and utilizing mail order pharmacy (Kaiser Permanente, 2016). Changing prescription practices alone almost doubled the likelihood that the patient would meet the 80% PDC requirement (Schmittdiel et al., 2015). The prescription practices that made the most significant difference were to write prescriptions for 90 days or more, write for generics that cost $10 or less, use a mail-order pharmacy, and keep total expenses per year under $2,000. The project site intends to implement these interventions except for the automated phone reminders. The project site has used automated phone reminders in the past and did not find it useful. Also, the site does not have broad access to pharmacy refill information, and many pharmacies provide this service to their customers (medical director, personal communication, October 7, 2020).

Screening for medication adherence allows for assessment of the factors and barriers each individual faces in their health context. Understanding what influences medication nonadherence is essential because it facilitates shared decision-making and effective patient-centered interventions (Pagès-Puigdemont et al., 2019). The project site will incorporate the DOSE-Nonadherence measure to screen patients for medication nonadherence (site champion, personal communication, November 11, 2020). This tool demonstrated validity across multiple disease

conditions, intended to screen for medication nonadherence, and was low cost to utilize for the project site.

Evidence-Based Practice Framework

The Health Belief Model

The underlying theory used for this project is the Health Belief Model. This model was derived from the social cognitive branch of psychology and was initially developed in the 1950s to explain why people would not engage in health behaviors that could prevent disease even when they were relatively low cost or even free (Rosenstock, 1974). It was later applied to sick-role behavior, health decisions made after a diagnosis of a disease has been established (Becker, 1974). The Health Belief Model has been applied to actions such as screenings, risk behaviors, vaccinations, contraceptive use, diet and exercise, dental behaviors, well-child visits, physician visits, and chronic disease management, particularly related to treatment adherence for hypertension, diabetes, renal disease, obesity, asthma, and psychiatric disorders (Abraham & Sheeran, 2015).

The Health Belief Model was expanded to include three domains that affect each other, and include modifying factors, individual beliefs, and actions (Champion & Skinner, 2008). The modifying factors influence the individual's beliefs, which, in turn, influence the individual's actions (Champion & Skinner, 2008). Modifying factors is the first domain and includes demographic variables such as age, gender, race and ethnicity, socioeconomic status, education, and psychological factors such as personality, peer pressure, and locus of control (Abraham & Sheeran, 2015). Individual beliefs is the second domain and encompasses perceptions of the threat of illness, including perceived susceptibility and severity, general health motivation, and an evaluation of behaviors that counteract the threat, including the perceived benefits and

barriers. Actions is the third domain, and it is influenced by cues to action and an individual's self-efficacy.

In a review of studies using this model, results showed that the most reliable predictor of behavior in chronic diseases, known as sick role behavior, was the existence of barriers, followed by disease severity, benefits third, and then susceptibility. This project sought to find ways to influence individuals to embrace health behaviors that would increase medication adherence and decrease chronic conditions' sequelae. The Health Belief Model suggested that focusing on barriers, severity, benefits, and susceptibility should be considered along with health motivation; thus, it was a useful framework to guide the project.

The IHI Model for Improvement

The Institute for Healthcare Improvement's (IHI) Model for Improvement was used as the operational framework. The IHI's Model for Improvement uses three questions and the plan-do-study-act (PDSA) cycle (IHI, n.d.-a). The first question identifies the intended goal by asking what the desired outcome is. The second question seeks to identify what data will need to be collected by asking how the change will be identified. The third question seeks to determine what changes could be tested by asking what solutions might improve the process. The PDSA cycle is used to evaluate the changes (IHI, n.d.-a). Each cycle ends by determining whether the change should be adapted, adopted, or abandoned, and subsequent cycles are repeated. The results are used to determine the next testing cycle.

The Model for Improvement was used to focus on systems-level changes and optimize health system performance and aligned with the Triple Aim's goals to reduce healthcare costs, improve population health, and ensure patient satisfaction (IHI, n.d.-b). This framework guided the project, by focusing on making changes that could be implemented to solve deficiencies in

healthcare practices and improve the quality of care delivered to patients. Using the Health Belief Model and the IHI Model for Improvement together aimed to produce both patient-centered and systems-level changes to improve medication adherence at the project site.

Ethical Consideration & Protection of Human Subjects

Ethical considerations and protection of human subjects include consideration of patient harm, safety, equality, equity, and the use of protected health information. Ethical principles in research and quality improvement included respect for persons, beneficence, and justice (Adashi et al., 2018). Respect for persons is paramount and encompasses a wide array of principles such as informed consent, autonomy, and personal dignity, all of which should be protected and ensured (Dearman et al., 2020). Beneficence is benefitting the individual while reducing harm to the extent possible. An assessment or risks and benefits weighs the potential benefits with all potential harms when making decisions. Justice is the process of equal and equitable treatment for all individuals. These three principles guided the Doctor of Nursing Practice (DNP) project development. The project provided education to the physicians and advanced practice providers to improve medication adherence in patients and entailed implementing patient-centered interventions that pursued concordance with patients' expectations. This project aimed to respect all persons by providing patient dignity and autonomy through participation in shared decision-making. It is beneficent by providing benefits to the patient in meaningful ways without causing any undue harm. Finally, it exercised justice by designing an appropriate, inclusive, and equitable project.

As patients were the ultimate beneficiaries of this DNP project, all recommended and required ethical processes, protocols, and guidelines were followed. First, an Academic Integrity Pledge was signed by the project lead to ensure academic integrity and uphold the university's

standards. Second, organizational approval to partner with the practice and conduct the DNP project at the project site was obtained. Third, ethical education was attained by the project lead before the initiation of the project. Successful completion of the Collaborative Institutional Training Initiative (CITI) program for research, ethics, and compliance training was required by the university. The CITI Program (2016) provides educational courses and materials designed to provide ethical education to investigators, staff, and students. The courses provided education concerning ethical guidelines and principles for protecting human subjects, vulnerable populations, legal considerations, and institutional review board processes. The content of these modules contributed to the project lead's ethical foundation.

Lastly, this DNP project was reviewed for compliance with institutional review board standards. Reviews are intended as an independent appraisal of the project's impact to ensure that human subjects are protected (CITI Program, 2016). The project site itself did not require IRB approval or have an informal project approval process. The university required completion of a Quality IRB Self-Certification Review to determine whether an institutional review board required a formal review. Upon faculty approval, the review included a brief description of the project and a declaration of the project's intent and was submitted via Qualtrics to the university's IRB. After the review process, it was determined that the project did not meet the requirements for human subject research and required no further review by the institutional review board.

Section III. Project Design

Project Site and Population

The project site was a family practice office located in a rural county of central North Carolina. It was a Rural Health Clinic, designated by the Centers for Medicare and Medicaid Services (CMS) to improve healthcare access (Medicare Learning Network, 2019). Rural Health Clinic status was granted due to their location in a rural, underserved area with a health-professional shortage. As required by the designation, the practice used team-based care with at least 50% of provider staffing time consisting of nonphysician providers, including nurse practitioners, physician assistants, certified nurse-midwives, clinical psychologists, or clinical social workers. The project site met these qualifications with three physicians and 16 advanced practice providers.

Description of the Setting

The project site setting was a large private, for-profit primary care office. According to the organization's website, their mission was medical excellence, their values included service, compassion, knowledge, and safety, and their vision was to help their patients and their community achieve their health goals ([Clinic Site], n.d.). The office location was in a rural central North Carolina county, and served three additional surrounding counties. The office served approximately 25,000 active patients and was the most extensive private practice in the area. The practice had a diverse payor mix and accepted nearly all insurance plans, including private insurance and Medicare and Medicaid. Their patients ranged from newborn through the end of life, and they provided a full range of family medicine services, including primary care, pediatrics, obstetrics and gynecology, chronic disease management, geriatrics, and long-term care.

The project site was embedded within an economically distressed county with a Tier 1 ranking in North Carolina (North Carolina Department of Commerce, 2019). Tier 1 is the lowest rating, indicating it was one of the most disadvantaged counties based on the unemployment rate, household income, property tax per capita, and population growth. According to the North Carolina Institute of Medicine (2019), the project site's county was home to around 40,000 individuals. Of these, 16% were uninsured adults, 24% were living in poverty, 42% were enrolled in Medicaid or the Children's Health Insurance Program, and 18% were enrolled in Medicare. Additionally, 13% did not have access to a vehicle, and 21% were current smokers (North Carolina Institute of Medicine, 2019).

Description of the Population

The project population comprised three physicians, one family nurse practitioner, 15 physician assistants, and many assistive personnel, including licensed practical nurses, certified nursing assistants, medical techs, and several front office personnel. The physicians specialized in family medicine and were board-certified through the American Board of Family Medicine. All physicians had more than 10 years of experience, with one having more than 30 years. The advanced practice providers ranged from newly graduated to more than 30 years of experience.

Project Team

The project team was comprised of four individuals with direct input on the project. The group consisted of the project lead, the site champion, the medical director, and the university clinical faculty advisor. The project lead was a baccalaureate-prepared registered nurse with seven years of experience with concentrations in women and infants' health and emergency medicine. She was responsible for planning, implementing, evaluating, and disseminating the Doctor of Nursing Practice project.

The second member of the project team was the site champion. She was a physician assistant with more than 10 years of experience. She was the only staff member in the office whose time was dedicated to quality metrics. Her contributions to the project included serving as an intermediary between the project lead and the project site, project facilitation, advice, and direction. The third member of the project team was the medical director. He was a family practice physician with more than 30 years of experience and the project's sponsor. His responsibilities included approving the project, facilitating implementation, scheduling staff meetings, office management, and serving as the medical, organizational, and financial decision-maker. The fourth team member was the project lead's clinical faculty member from the university. She was a PhD and registered nurse at a major medical center for more than 30 years, had a Nurse Executive Board Certification, and had many publications to her credit. Her responsibility in the project was to offer guidance, support, and leadership to the project lead.

Project Goals and Outcome Measures

The project's primary goal was to increase medication adherence in patients with Medicare taking statins, oral antidiabetics, and renin-angiotensin system antagonists in Medicare patients at the project site by April 2021. The secondary goal was to improve the project site's individual star ratings for the three quality measures related to medication adherence from Blue Cross Blue Shield (BCBS). This project evaluated both outcome and process measures. The individual star ratings for medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists from BCBS were the outcome measures for the project. The process measures were related to the project's interventions which included assessing patients' medication adherence, changing prescription practices, educating patients about regular follow-up, and recapturing patients identified as nonadherent.

Description of the Methods and Measurements

The project desired to impact the project site's average star rating through the individual medication adherence quality measures. Outcome measures directly impact the goal, relate to an individual's health status, and are considered the primary drivers (Agency for Healthcare Research and Quality [AHRQ], 2015). Therefore, the individual star ratings were the primary drivers and the outcome measures used to evaluate the project's impact (see Appendix C). The outcome measures included the three individual star ratings for medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists for BCBS. The required levels to reach a 5-star rating for BCBS were 86.5% for statins, 84.5% for oral antidiabetics, and 87.5% for renin-angiotensin system antagonists (site champion, personal communication, October 12, 2020).

There were six process measures used to evaluate the project's impact on standardizing the process for medication adherence. Process measures are indirectly related to the goal, related to healthcare delivery, and associated with the secondary drivers (AHRQ, 2015). There were four secondary drivers, including assessing patients for medication nonadherence, improving prescription-writing practices, identifying patients with low health literacy, and recapturing at-risk patients. The first driver was patient assessment. There were two process measures related to this driver. Identifying patients who were nonadherent was to allow providers the opportunity to intervene while the patient was present in the office. The providers were encouraged to chart a Current Procedural Terminology (CPT) code or a code for the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) for medication nonadherence if applicable. Also, the number of Domains of Subjective Extent of Nonadherence (DOSE-Nonadherence) measures in eligible patient charts each week was tracked. This scale

measured nonadherence by asking three questions about the frequency of missed medication doses and then asked the patient to rate the reasons for the missed doses. Therefore, the two process measures related to assessment were the number and percent of visit notes with the presence of a procedure or diagnosis code and the number and percent of charts with the presence of a DOSE-Nonadherence form.

The second secondary driver was prescription writing practices. Kaiser Permanente (2016) reported doubling the likelihood of medication adherence in patients by changing prescription practices that are more patient friendly. These included writing prescriptions for 90 days or more whenever possible, sending them to a mail-order pharmacy, and prescribing medications that cost less than $10. Thus, two of these were selected as process measures to determine changes in prescription writing habits. The number and percent of prescriptions written for 90 days or more and the number and percent of prescriptions sent to mail-order pharmacies was tracked.

The third secondary driver was the patient's lack of understanding or education about the need for regular follow-up visits for medication adherence. The process measure for patients' awareness of the need to obtain regular follow-up was measured by the number and percent of patients who scheduled a follow-up appointment during their visit. This process measure reflects the patients' understanding of the importance of regular follow-up and when they need to return.

The fourth secondary driver was recapturing individuals who were already nonadherent to their medication. The nonadherent patients were identified and an alert was placed into their chart so providers would be able to assess the patient when they came in to be seen. Additionally, if patients had not been seen in the last three months, they were called to return to the clinic for a medication adherence evaluation. The two process measures included the number

of patients needing to be recaptured and the number and percentage of how many did not have a scheduled follow-up appointment. These process measures were chosen as the number of individuals flagged every month were expected to decrease over time if the issue was addressed through interventions to reduce individuals' barriers.

A Plan-Do-Study-Act (PDSA) tool was employed to evaluate the project's progress. A PDSA form (see Appendix D) was adapted from the Institute of Healthcare Improvement's Model for Improvement and the PDSA Worksheet for Testing Change from the Minnesota Stroke Program (Langley et al., 2009; McQuillan et al., 2016; Minnesota Stroke Program, 2017). The form was utilized to document and monitor changes, identify areas of concern, guide the process steps, and document progress with implementation. The review was completed monthly. Results guided modifications and changes to implementation as needed to improve the new process. Feedback and updates were presented by the project lead monthly at the staff meetings.

Lastly, a run chart was employed to display the data results. Run charts are beneficial for assessing effectiveness over time (IHI, n.d.-c). They have three benefits when displaying data: demonstrating whether a process is working well or not, determining if a change has occurred, and displaying the change's value. The run chart was useful for evaluating whether improvement had occurred as it demonstrated patterns over time.

Data Collection Process

The project lead collected data on an Excel spreadsheet from three sources: the electronic health record, a progress report from BCBS, and an online app from an affordable care organization that partners with the project site. These sources were used to obtain demographic data and data for the outcome and process measures. All reports and data were saved to a shared folder stored on the project site's secured server and could only be accessed through a designated

login created for the project lead. A virtual private network was installed on the project lead's computer for access to the server, which was protected by a secure login and password that only the project lead and the office manager knew. No information could be accessed, copied, saved, or printed outside the project site's server.

The progress report from BCBS provided the star ratings for medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists. The star ratings data were entered into a Star Rating Data Tool (see Appendix E). The online app provided a list of patients who were nonadherent to their medications from participating insurers. The nonadherent patients' data were collected on a Recaptured Report Data Tool (see Appendix F).

The electronic health record was used to gather data pertaining to the patients' visits. The site champion ran three reports from the electronic health record, one each for the weekly visits for patients taking statins, oral antidiabetics, and renin-angiotensin system antagonists. Chart reviews were conducted, and the data were entered into a Data Collection Tool (see Appendix G). The three electronic health record reports were limited to adult patients who were seen the week prior for patients taking statins, oral antidiabetics, and renin-angiotensin system antagonists.

Data collected included demographic data, prescriber-related data, and patient-recapture data. Demographic data included information related to the patient's race and ethnicity, sex, age, and insurance type. The race and ethnicity category consisted of the number and frequency of individuals who were Black, White, Hispanic, or other. The sex category included the number and frequency of individuals who were male or female. The age ranges consisted of the number and frequency of individuals who reported their age between 18-44 years, 45-64 years, or 65 years and older. The insurance type included the number and frequency of individuals who

reported their health insurance company as BCBS, Medicare, Medicaid, UnitedHealthcare, or other.

Prescriber-related information included the data related to the medication adherence assessment and billing codes present, prescriber prescription practices, pharmacy usage, and follow-up scheduling. Medication adherence assessment consisted of the number and frequency of uses of the DOSE-Nonadherence measure and the presence of diagnosis or procedure codes in the chart. Prescription practices include the number and frequency of prescriptions written for 90 days or more. Pharmacy usage included the number and frequency of prescriptions sent to mail-order pharmacies. Follow-up scheduling included the number and frequency of patients who scheduled a follow-up visit within six months at the time of their office visit.

Patient recapture data was related to the patients reported as nonadherent by the accountable care organization. The data included the total number of patients who are nonadherent and the percent who had a follow up visit scheduled within six months. No protected health information was collected.

Descriptive statistics were used to describe the data from the project results. Descriptive statistics allowed the data to be condensed and simplified into a summary and presented in a meaningful form (Kaur et al., 2018). Descriptive statistics formed the basis for comparing and displaying data to effectively measure the outcomes. They were used for analysis and reporting the results, which were presented to make it easier to see how the data reflected the quality improvement initiative (Mason, 2019). The descriptive statistics included the total number, frequencies, and percentages.

Implementation Plan

Implementation occurred in three parts. The first part included education for providers and nursing and office staff on the new process. The provider education consisted of five handouts targeting medication adherence supplied by the accountable care organization and a 15-minute PowerPoint presentation outlining the four needed actions by the providers: assessment for medication adherence, improved prescription practices, increased education about follow-up, and patient recapturing.

The first action was assessment for medication adherence, which was conducted along with the use of the DOSE-Nonadherence measure. The tool was distributed with the demographic forms at check-in to patients with Medicare. It was stressed that if a provider identified medication nonadherence during the screening, an effort should be made to identify and overcome the patients' barriers. To encourage medication adherence screenings, educational posters were hung in all exam rooms that targeted medication adherence for patients, staff, and providers. Second, providers were encouraged to write prescriptions for 90 days or longer when possible, to send prescriptions to a mail-order pharmacy, and to prescribe medications with low copays. Third, providers were asked to increase education to patients, reminding them of the need for close follow-up, and request their patients make a follow-up appointment during the visit. Fourth, to recapture nonadherent patients, alerts were placed on the identified patients' charts and those who did not have a scheduled follow-up appointment were called to schedule one if possible. The alert was intended to inform the provider of the patients' nonadherent status, remind the providers to assess for medication adherence, and encourage them to identify and treat contributing barriers. Nursing staff education reinforced existing rooming procedures, including completing the medication review thoroughly during the intake process with the

history collection. Instructions were provided to the staff and patients to keep the DOSE-Nonadherence form in the room to discuss with the provider.

Following the education, the second part was implemented as the providers began to use the new process to address medication adherence with patients. The providers were encouraged to address medication adherence in all patients and use barrier reduction strategies. Together, the provider and patient were to review the assessment form and develop a plan to achieve medication adherence. The provider's recommended treatment was encouraged to be acceptable to the patient and within their ability (Bosworth et al., 2016; Voshaar et al., 2015). If the provider assessed medication adherence, they were encouraged to enter a procedure or diagnosis code into the chart, if applicable.

The third part included using the app provided by the accountable care organization. This app functioned as a database of patients who were nonadherent and needed intervention. A reminder was placed on the electronic health record for all patients flagged as nonadherent. A provider reviewed each patient on the list to determine if they need to be called or have a visit scheduled. If the patient needed a follow-up visit, a member of the office staff contacted the patient to request they schedule an office visit. The providers were responsible for assessing and treating the patients at their next office visit.

The project lead monitored the implementation of the new process. Monthly reviews were conducted using a PDSA worksheet to identify areas for improvement. The project lead and site champion gave small PowerPoint presentations with status updates at staff meetings monthly. Staff and providers were encouraged to report successes, barriers, and concerns to the project lead for attention and resolution.

Timeline

A timeline was developed for the project outlining the beginning and end dates and other important dates and events to organize and manage the project (see Appendix H). The project lead obtained organizational approval for the project, and a site champion was identified. A literature review of best practices was conducted. Meetings between the project lead and site champion began biweekly and transitioned to weekly as the project developed and was implemented. Educational sessions for providers and nursing staff occurred at a staff meeting on January 6, 2021. Data collection began on January 12, 2021. Thereafter, weekly reports were collected each Tuesday during the weekly meetings. Data collection continued until Week 16 on April 27, 2021. Weekdays for the project lead to be onsite were Tuesdays. Data analysis occurred in May 2021. Dissemination of the findings were completed at the project site and university in July 2021.

Section IV. Results and Findings

Results from this project included demographic, quantitative, and qualitative findings. Demographic and quantitative results were derived from three key areas: star ratings, recapture patients, and office visits. Star ratings and the data on recapture patients was collected monthly for four months in 2021, from January through April. The data collected from chart reviews on office visits occurred during 16 consecutive weeks in 2021, from January through April, and included patients with Medicare who were taking statins, antidiabetics, and renin-angiotensin system antagonists. Qualitative results were derived from the plan-do-study-act (PDSA) cycle reviews used to evaluate project progress. These reviews were completed at monthly intervals in February, March, and April.

Results

Star Ratings

For the project site, the star ratings decreased for statins, improved for oral antidiabetics, and were unchanged for the renin-angiotensin system antagonists. The project site's ratings from Blue Cross Blue Shield (BCBS) for statins was 3 stars in December and remained stable before decreasing in March with 3, 3, 2, and 2 stars for January, February, March, and April, respectively. The ratings showed a marked improvement for oral antidiabetics, which were at 2 stars in December before increasing to 4, 4, 5, and 5 stars for January through April. Ratings for renin-angiotensin antagonists were 3 stars in December and remained stable in January before decreasing and then recovering with ratings of 3, 2, 3, and 3 stars for January through April.

Recapture Patients

During the project period, there were 517 patients who were identified as nonadherent to one or more medications and needed to be recaptured. Of these patients, 44% (245) were 65

years and older, 44% (232) were 45-64 years, and 7% (39) were 18-44 years. A majority of the patients were female at 53% (273) compared with 47% (244) males. Of the 517 patients, 47% (243) were Black, 45% (232) were White, 5% (24) noted other, and 4% (18) were Hispanic. Health insurers for the recaptured patient data include 84% (434) for BCBS, 12% (62) for UnitedHealthcare, 3% (14) for Medicare, and 1% (7) for other private insurers.

In total, there were 613 prescriptions that were past due to be filled among the 517 patients, averaging 1.19 prescriptions per patient. Of these prescriptions, 36% (222) were renin-angiotensin system antagonists, 34% (204) were statins, and 31% (187) were non-insulin antidiabetics. Of the total nonadherent patients, 69% (346) did not have a follow-up visit scheduled. Outreach was completed for 50% (269) of the patients while the other 50% (248) were unable to be contacted.

Patient Visits

During the project period, there were 2624 patients' charts reviewed from patient visits. Demographic analysis (see Appendix I) showed most patients were female, at 64% (1696) compared with just 36% (928) male (see Figure I1). Of the patients, 71% (1870) were 65 years of age and older, 26% (656) were 45-64 years, and 4% (96) were 18-44 years (see Figure I2). Further, a significant majority were Black, at 57% (1493), while 40% (1039) were White, 4% (92) noted other, and 2% (42) were Hispanic (see Figure I3). For the patient visits, 53% (1343) had Medicare alone, while 47% (1269) had additional coverage with 17% (449) with BCBS, 15% (405) with UnitedHealthcare, and 15% (415) with other private insurers (see Figure I4).

Process measure analysis (see Appendix J) showed, of the 2624 total patients' charts reviewed, only 6% (167) had a DOSE-Nonadherence form completed, and 3% had a diagnosis or procedure code documented that related to medication adherence. There were 622 total

prescriptions written for statins, antidiabetics, and hypertensives. Of the prescriptions, 85% (526) were written for 90 days or more, and 12% (73) were sent to a mail-order pharmacy. On average, 62% (1639) of patients scheduled a follow-up visit prior to leaving the office.

Further review was conducted to evaluate for statins, non-insulin antidiabetics, and renin-angiotensin system antagonists individually. Of the 2624 patients, 43% (1133) were on statins, 32% (828) were on antidiabetics, and 656 (25%) were on antihypertensives. Of the 1133 patients on statins, 6% (74) had a DOSE-Nonadherence form completed, 3% (34) had an ICD-10 or CPT code documented, 92% (240) had prescriptions written for 90 days or greater, 11% (29) of the prescriptions were sent to a mail-order pharmacy, and 59% (660) had a scheduled follow-up visit. Of the 828 patients on antidiabetics, 5% (46) had a DOSE-Nonadherence form completed, 4% (34) had an ICD-10 or CPT code documented, 75% (139) had prescriptions written for 90 days or greater, 11% (22) of prescriptions were sent to a mail-order pharmacy, and 64% (533) had a scheduled follow-up visit. Of the 656 patients on antihypertensives, 6% (45) had a DOSE-Nonadherence form completed, 4% (23) had an ICD-10 or CPT code documented, 86% (151) of prescriptions were written for 90 days or greater, 11% (19) of prescriptions were sent to a mail-order pharmacy, and 62% (405) had a scheduled follow-up visit.

PDSA Cycle Review

In total, there were four cycle reviews completed at monthly intervals. Five themes were identified relating to the project processes: difficulty running reports, challenges with the DOSE-Nonadherence form distribution, provider acceptance of assessment for medication adherence, placing alerts on patients' charts, and follow-up visits. It was quickly identified that the planned reports from patient visits did not target the intended patients and required chart reviews to find those who had been prescribed a prescription for a statin, a non-insulin antidiabetic, or a renin-

angiotensin system antagonist. Secondly, difficulties in instituting the DOSE-Nonadherence form into the workflow were noted. In all four reviews, the struggle with distribution and the eventual staff abandonment of the process were identified. However, there were also positive results related to the nonadherence forms. For example, some providers annotated on the forms and in the patients' charts, which showed that the forms were being used to assess medication adherence.

Another result was the documentation of providers' assessment for medication nonadherence with patients. Evidence of assessment occurred even when the nonadherence forms, meant to trigger the conversation, were not present during the visit. Many providers accepted and embraced the need for initiation of conversations about medication adherence with patients. Another significant result was the receptiveness to alerts related to medication nonadherence on patients' charts. Some providers wrote notes in the alert to communicate with the project lead, though some alerts were deleted without annotating barrier identification or interventions. Lastly, patients who needed to be recaptured were contacted by office staff to schedule an appointment to assess medication nonadherence if they did not have one scheduled within three months.

Committee for Quality Metrics and Incentives

An essential result of the impact of this project at the project site was the creation of the Committee for Quality Metrics and Incentives (CQMI) by the site champion. The project lead was, in part, a catalyst for the creation of the committee. Due to the initiation of the project and the project site's desire for improved quality metrics, star ratings, and transition to value-based care, the medical director allocated more resources to these goals. Prior to inception of this project, the only time devoted to quality improvement was four hours a week from the site

champion. After concluding the project, the committee had expanded to two providers who were dedicating time during the week, two full-time support staff members, and the project lead.

Discussion of Major Findings

Star Ratings

The star ratings from BCBS were variable throughout the project for statins, antidiabetics, and antihypertensives. The individual medication adherence scores were calculated over a rolling 12-month calendar and were based on claims data, which can take months to clear, so it was difficult to know if the scores were truly reflective of the project's efforts, which spanned the first 16 weeks of the year. The star ratings may need a longer duration to show the effects accurately. The results from the process measures of the project demonstrated that the project was successful: principally, the increase in 90-day prescription writing. Therefore, the project lead anticipated this would translate into improved star ratings in the future months. This prediction is based on the research from Kaiser Permanente that reported writing 90-day prescriptions increased the likelihood almost two-fold of achieving higher star ratings (Schmittdiel et al., 2015).

Recapture Patients

Monitoring patients through the accountable care organization's online app allowed for easy identification and targeted interventions to individuals who were already nonadherent to at least one medication. However, collecting this data every month was possibly too frequent since patients refill their prescriptions approximately every three months if 90-day supplies are used, as recommended. Depending on the percentage of their medication refills (goal is 80%), the patient may need to refill medications one or more times to become adherent. The patient remains on the list until they fill their prescriptions enough to catch up. Therefore, depending on

the number of medications and fill percentage the patient is at, they may stay on the list for months. The alerts placed on the accounts of the nonadherent individuals in the electronic health record worked well to signal the patients' nonadherence status to providers and included the medication(s) that were delinquent.

Patient Visits

Demographic data from the patient visits were remarkable. During the project, the majority of patients with Medicare that were prescribed a statin, non-insulin antidiabetic, or renin-angiotensin system antagonist at the project site were Black (57%) versus White (40%). The census data from 2019 shows the state averages in North Carolina are 22% African Americans and 71% White, whereas the project site's county is 51% African American and 39% White (North Carolina Institute of Medicine [NCIOM], 2019). Additionally, there were twice as many females, which accounted for 64% of the patients. Predictably, older adults were the majority of the patients with Medicare, as 71% were 65 years or older, however, that left 29%, or almost three in every ten, Medicare patients younger than 65 years old. Also, approximately 53% of all the patients had only regular Medicare, without an Advantage plan or other co-insurance. These demographics are essential to understanding the individual, social, cultural, and economic contexts of the patients touched by this project, and further points to the need for system-level changes along with targeted interventions. In the past, medication adherence has been viewed as the patient's responsibility. However, evidence overwhelmingly suggests the need for engaging healthcare team members to embrace provider changes along with patient-centered, effective interventions to improve clinical outcomes while reducing costs (Kim et al., 2018; Neiman et al., 2017).

Evidence from the review demonstrated the providers were beginning to incorporate assessment for medication adherence into their patient visits, even when the defined process was not followed. For example, the project lead found notes written on completed nonadherence forms, written in the alerts placed on the charts, and annotated in the history of present illness and assessment and plan portions of the providers' notes. The evidence promoted providers' responsibility to assess medication adherence and create patient-centered interventions that address individual's barriers to increase medication adherence (Costa et al., 2015). The providers' noticeable efforts demonstrated engagement and will likely improve medication adherence of their patients.

When evaluating the data, the first four weeks were used as the baseline to evaluate for improvement and were the basis for calculating the trend's direction (see Appendix J). Three of the process measures showed increased percentages with an overall increasing trend for the total of all patient visits. The percentage of 90-day prescriptions increased from about 80% to 85% (see Figure J1). The percentage of scheduled follow-up visits increased from about 58% to 62% (see Figure J2). The diagnosis and procedure code use in the chart increased from 0% to 3% (see Figure J3). The literature indicated writing 90-day prescriptions instead of 30-day prescriptions almost doubles the likelihood of the patient being adherent and is the single most significant predictor of adherence (Schmittdiel et al., 2015). Therefore, this process measure was considered the most crucial piece of the project. The only process measure that did not trend as an improvement by the end of the 16-week implementation period was for the Domains of Subjective Extent of Nonadherence (DOSE-Nonadherence) form, which likely resulted from a lack of distribution (see Figure J4). Despite the distribution issues, the process of assessment was considered a success. Additionally, when the graphs are compared together, the use of the codes

increased when forms were distributed, likely demonstrating the value of using a formal assessment tool.

When the data for statins, antidiabetics, and antihypertensives were considered independently, there were mixed reviews. Of the prescriptions written, statins that were written for 90 days or more increased from 89% to 92% and antidiabetics increased from 66% to 75%, both revealing a net trend toward improvement. However, the antihypertensives' trend decreased over the 16 weeks, with the percentage of 90-day prescriptions declining from 89% to 86%. There were eight weeks above the median line and seven weeks below it. Also, there were two low values at weeks 9 and 13, but both weeks had a small number of prescriptions written (nine and four, respectively) which may have skewed the data toward a downward trend.

Committee for Quality Metrics and Incentives

The Committee for Quality Metrics and Incentives (CQMI) was developed, in part, because of the project's influence and the project's site's commitment to improving the quality of care. The committee was created to focus more efforts on quality initiatives at the project site, and, though the project lead was not an employee, she was included as a member. Due to the success of the project, which was the first they had participated in, the medical director stated he desired to host more projects at the site. Therefore, the project site and the site champion agreed to welcome a second Doctor of Nursing Practice student project and was planning to host additional projects in the future.

Section V. Interpretation and Implications

Costs and Resource Management

This project sought to decrease healthcare costs and resources while producing tangible benefits for patients, providers, and the project site while improving population health. Therefore, both the costs and benefits were evaluated. The costs related to this project included both direct and indirect costs. The direct costs were related to financial resources, such as money, provider and support staff time and labor, and supplies needed. The costs were itemized in a project budget (see Appendix K). The project's indirect costs included what was not done when the resources were directed to medication adherence. These costs included time away from other tasks, obligations, or projects, seeing a reduced number of patients, and the loss of provider productivity, ultimately affecting the number of patients seen and provider reimbursement for the practice. The project implementation cost was estimated at $2354.60. However, the printing costs were approximately $424.80, which could be eliminated simply by using an electronic version which would bring the total cost to less than $2000.

The benefits of this project were also direct and indirect. The direct benefits included those which affected the patient. Since medication adherence enhances health outcomes, patients are likely to experience reduced sequelae, a decrease in morbidity and mortality, and a reduction in hospital admissions and readmissions because of improved quality of care and reduction in medication nonadherence. Further, patients are likely to experience a higher quality of life with better disease control. Medication nonadherence costs billions of dollars, increases hospitalizations and medical visits, and contributes to the deaths of more than 100,000 patients annually (R. Cutler et al., 2018). Additionally, medication nonadherence adds treatment costs, some of which are passed on to the patients. For example, medication nonadherence in

cardiovascular disease, including hyperlipidemia and hypertension, adds adjusted economic costs of between $3347 and $19,472 per patient, per year. Diabetes adds between $2741 to $9819 annually. Therefore, the financial and health benefits to patients are significant if even one patient was impacted. If the estimate of a $7 savings for every $1 spent on medication adherence is accurate (National Council Medical Director Institute, 2018), then the cost of this project would return about $17,500 in savings alone.

Indirect benefits include those that affect the primary care office, healthcare organizations, and society. Due to the focus on medication adherence and its role in reimbursement, there were financial incentives for improvement. For example, the primary care office could increase their reimbursement through higher star ratings as higher star ratings earn higher reimbursement and bonuses. There were other financial incentives also, such as shared savings programs available through accountable care organizations and increased reimbursement for improved quality metrics from insurance companies. With higher star ratings and quality care, the primary care office can negotiate better contracts and higher reimbursement with other organizations and insurance companies in the future. Lastly, higher star ratings would improve the reputation of the project site within the community and with other healthcare partners. Ultimately, improved population health and reduced costs benefit healthcare organizations and society in a myriad of ways.

Implications of the Findings

This project demonstrated important implications that are pertinent to patients, nursing practice, and healthcare systems. The project demonstrated there is value in targeting medication adherence with patients. Improved awareness of assessing for medication adherence improved the provider-patient interaction. It further showed that initiating quality improvement projects,

even if the results are not immediately seen, is an essential part of patient care and an excellent avenue for nurses to demonstrate leadership. This project showed the benefit of using systems-level changes while incorporating patient-centered interventions. The project can provide a foundation for the importance of medication adherence quality improvement in policy and practice decisions.

Implications for Patients

The implications for patients were related to the increase in quality of care, an improved patient experience, and improved population health. This project demonstrated that increasing the quality of care through assessment, treatment, and follow-up can influence patient outcomes. Increasing patient and provider awareness of medication adherence with improved medication management, prescription writing, barrier identification, and treatment plans should improve patients' outcomes. For example, by writing prescriptions for 90 days or more, there are many benefits to the patients, including decreasing the number of trips to the pharmacy every year to four rather than twelve, no longer holding patients' hostage to office visits to obtain needed medications timely, and ending penalties for follow-up visits. Due to the scope of factors that affect medication adherence, using a barrier identification strategy including assessment and treatment along with shared decision-making offers the patient-centered care that patients deserve while acknowledging that patients have unique health contexts. Lastly, due to the length of time needed to change medication adherence rates, interventions should be purposeful, continuous, and tailored to the patient.

Implications for Nursing Practice

This project demonstrated implications for nursing practice through four domains: nursing leadership, advocacy, collaboration, and accountability. Nursing shares a position of

leadership in healthcare. This project demonstrated that nursing has an essential voice in improving the quality of care with quality improvement initiatives. Nursing has a responsibility to initiate and influence conversations in transforming healthcare related to medication adherence. Advanced practice nurses can use the recommended practices in this project such as prescribing medications for 90 days or more, utilizing a mail-order pharmacy, writing for low-cost medications, and increasing follow-up visits for patients with chronic diseases.

Further, this project demonstrated that nursing is an integral partner in transitioning to value-based care, improving population health, and improving patient care. Advocacy is a basic tenet of nursing, and this project demonstrated that nurses can advocate for improved quality of care. Further, this project demonstrated the value of collaboration among interprofessional and interdisciplinary teams and showed that nursing is a valuable healthcare team member. Lastly, this project demonstrated nursing accountability by meeting the Essentials of Doctoral Education for Advanced Nursing Practice (American Association of Colleges of Nursing, 2006).

Impact for Healthcare System(s)

This project demonstrated an impact on healthcare systems through various areas, including costs and reimbursement, quality improvement and quality metrics, improved population health, and culture shifts. The costs associated with healthcare are a national concern. This project showed the value of investing in interventions toward healthcare quality metrics through quality improvement initiatives related to medication adherence in a rural primary care office. There were many financial benefits to the healthcare system, and this project demonstrated that even small changes could reap significant rewards. By focusing on quality improvement and quality metrics, this project showed that the quality of care is enhanced, thereby improving the healthcare system. Patients are more than a number, and this project

demonstrated that systems-level interventions could be combined with patient-centered interventions to provide excellent care to patients.

This project revealed culture shifts might be challenging but are necessary to transform care in the transition to value-based care. The change from problem-oriented visits to preventive care is a significant change for healthcare. By focusing on medication adherence and improving the quality of care, this project provided opportunities to change provider practices and priorities through evidence-based interventions. It demonstrated that change is possible when disciplines work together toward improving complex healthcare issues, such as with medication adherence. Further, it demonstrated the power of interdisciplinary teams in organizing and orchestrating changes to improve the health of a population.

Sustainability

One objective of this project was the ability to continue it in the future after its formal conclusion. Because of the project site's continued focus on medication adherence, transition to value-based care, and desire to earn higher star ratings, medication adherence remains a priority for the project site. Due to the project's success, its low cost to continue, and the potential for increased reimbursement, the project site intends to continue the project implementation with two changes. First, the DOSE-Nonadherence form license expires with the conclusion of the project. The project demonstrated the need for assessment, but there were many difficulties with the form and distribution never achieved desired levels. For these reasons, the project site intends to pursue a shortened assessment tool that can be incorporated into the electronic health record. A shortened form to assess medication nonadherence is available from one of the accountable care organizations with whom they partner. An electronic version will negate the need for the paper form entirely, provide an assessment tool for providers available at the time of the visit

with the patient, and will be automatically attached to the patient's visit. Secondly, the number of chart reviews will be significantly decreased. The project site intends to request a reporting function from the electronic health record administrators so that reports can be generated by specific medication classes. Improved reports are expected to narrow the pool and decrease the number of chart reviews necessary to track the outcomes. Other than these two changes, the project site plans to continue to use the interventions from the project to focus on medication adherence and increasing star ratings. Additionally, the project site will continue the Committee for Quality Metrics and Improvement and plan and continue working on quality metrics to improve the quality of care.

Dissemination Plan

Dissemination of the project included two presentations and submission of the project paper to the university's online scholarly repository. The first presentation was at the project site and occurred on July 7, 2021. This presentation presented the findings and results to the providers and office staff at the project site, provided closure for the project, and transitioned the continued presence of the project elements. Second, a poster presentation with question-and-answer session occurred at the project lead's university on July 13, 2021. The presentation summarized the entire project for faculty, staff, and fellow students. Lastly, the project paper was submitted online to the digital scholarship repository through the project lead's university on July 22, 2021.

Section VI. Conclusion

Limitations and Facilitators

Limitations

Several limitations were identified during the project implementation related to project site challenges, staffing, nonadherence form distribution, data collection, and reimbursement. Site challenges were related to the COVID pandemic that occurred concurrently with the project development and implementation. At the time of implementation, the project site became the only private practice in the area to begin distributing the COVID vaccine, which necessitated a considerable shift in resources and caused a significant need for rapid staff expansion, training, and rotation. Staffing changes were a substantial factor in the failure to facilitate Domains of Subjective Extent of Nonadherence (DOSE-Nonadherence) measure form distribution. However, there were other challenges with the form which affected the project. The original form did not include an area for the patient to write identifying data such as name and birthdate, so some forms could not be identified. Also, the forms were lengthy and double-sided, which took up a significant amount of time to complete. Some forms were not left in the room for the provider, so they were not available at the time of the visit. Other forms were returned partially completed, and some were completed incorrectly. Lastly, the project site is paperless and discourages paper use to conserve resources.

Data collection was another significant challenge. Several changes occurred during the implementation phase affecting the data for the recapture patients. There was a planned consolidation of patients from several insurance companies into the accountable care organization’s app. However, the planned merger was not completed as initially scheduled, nor was it completed during the project, skewing the patients to a vast majority of Blue Cross Blue

Shield patients while neglecting patients with other insurance companies. It was quickly identified that the reports used for chart reviews were not specific enough to pull patients who had been prescribed medications from the specified drug classes only during the past week. Instead, they pulled visits for all the patients seen during the past week who had ever received a prescription for the specified drug classes. This necessitated a significant number of chart reviews, more than 200 charts weekly, to identify the charts with new and refilled prescription medications for the specified drug classes. The number of chart reviews took a significant amount of time, delaying timely adjustments, frequently by one to two weeks. During the fifth week, the reports were generated incorrectly, including only patients with regular Medicare, possibly skewing the data results. Lastly, the plan-do-study-act (PDSA) cycle reviews were conducted monthly, which was too infrequent in the beginning to correct the course and address the challenges encountered.

Challenges regarding reimbursement were related to the star ratings, providers' transition to value-based care, quality metrics changes, and a lack of reimbursement for coding for medication adherence. Due to the calculation process for the star ratings, a change may not be noted for a significant amount of time as the data still includes performance from last year. Despite the significant impact medication adherence has on star ratings, there is no reimbursement available for coding for it in the chart. Lastly, at the project site, there was a prevalent belief that providers do not influence medication adherence rates because the data is obtained from claims data. These contributed to the challenge in transitioning to value-based care by the providers and may have contributed to providers viewing medication adherence as a low priority during the visit and contributed to a lack of charted codes.

Facilitators

Many facilitators contributed to the success of the project implementation and were related to project site, provider and staffing support, and research and data availability. Site facilitators included the concurrent roll-out of the COVID vaccines and the novelty of addressing medication adherence. While the vaccine roll-out created challenges related to staffing, it also provided an opportunity to increase visits for Medicare patients due to vaccine initiation, which began with the older adult population. The project site's interest in addressing medication adherence was triggered by the project site's desire to improve quality metrics and star ratings, particularly related to medication adherence. This mutual focus on quality metrics and star ratings drove stakeholder support for the project's interventions and were without opposition, which encouraged providers at the project site to actively participate in the project. The chart reviews often showed that the providers were assessing for medication adherence even when there were no DOSE-Nonadherence forms or codes noted in the chart.

Provider and staffing support was an invaluable contribution. The medical director was supportive, facilitated a partnership between the project lead and the site champion, and allocated space at the project site for the project lead to work. Additionally, the other providers and staff at the project site integrated the project lead into the organization and offered comments, feedback, and suggestions for the project. The project site's investment of additional staff and resources into quality improvement, specifically through the Committee for Quality Metrics and Incentives (CQMI), provided staff and resources for the project's tasks when needed. The project lead was considered a committee member and invited to attend all meetings and discuss project progress.

The research related to medication adherence was plentiful, offering the project lead a wealth of evidence-based information on the subject. The project was supported by evidence-

based research and was reasonable, feasible, and relevant to the project site and its population. Data was plentiful and made available through the site champion. Lastly, the PDSA cycle reviews were an asset in evaluating the project's processes, with the format lending itself well for communication with the project site at the staff meetings. The providers offered feedback that the updates helped them remember the project and keep the recommendations in mind.

Recommendations for Others

The recommendations that resulted from this project pertain to three areas: replication, value-based care, and quality improvement initiatives. For replication, the project lead recommends using an electronic medical record-based assessment tool that is immediately available to providers and is automatically included in the patient's chart. Also, it is recommended to find an improved method for identifying charts with prescriptions written during the visit, not just patients with the specified medication classes. This will reduce the number of chart reviews needed to track progress. It is further recommended to invest in value-based care and address medication adherence in a population. This project serves as a foundation for addressing medication adherence, but there is still work to be done to create sustainable change. The project lead recommends starting conversations about medication adherence, using a few simple questions, and then targeting nonadherence through barrier reduction interventions. For quality improvement projects, it is recommended to use collaboration and interdisciplinary teams to find ways to improve the quality of care for populations. Specifically, primary care offices could consider appointing a site champion and investing in projects to facilitate improved quality of care, further the reach of evidence-based research, and inspire and intensify stakeholder support.

Recommendations for Further Study

Recommendations for further study include the areas related to pharmacy, population health, increasing target populations, and research. Improving data exchange between pharmacies and primary care offices is an area needing further study. Aside from the data available from the accountable care organization, which only pertained to specific patient populations for the project site, there was no way to evaluate patients' prescription fill history. Additionally, when prescription data was available, it did not address all the critical information needed to evaluate prescription fill habits. Another area that needs further study is to apply these lessons to managing medication adherence in younger patient populations. This project focused on Medicare patients, with the majority older than 65 years old at the project site. While medication adherence is undoubtedly recommended for these patients, initiating a medication adherence program that targets younger patients will likely yield better results over the lifespan.

Final Thoughts

This project sought to improve the quality of care in a rural primary care office. Due to the weight of medication adherence on quality metrics and the effects on reimbursement, medication adherence to statins, oral antidiabetics, and renin-angiotensin system antagonists were selected for the project. A literature review was conducted to improve medication adherence. The Health Belief Model and Institute for Healthcare Improvement's Model for Improvement were used to incorporate systems-level changes with patient-centered interventions.

The project targeted medication adherence through assessment, treatment, follow-up, and recapturing patients who demonstrated nonadherence. The three outcome measures, the star ratings for medication adherence, were split, demonstrating a small decrease in statins, a

significant increase in oral antidiabetics, and remaining steady in antihypertensives. The first process measure, the DOSE-Nonadherence form, did not demonstrate increased use; however, the assessment aspect of the project was considered successful due to evidence of assessment for medication adherence. The other four process measures showed improvement with an increase in writing prescriptions for 90 days or more, increased mail-order pharmacy use, inclusion of diagnosis and procedure codes in patient charts, and increased follow-up visits. The increased assessment and treatment of medication adherence at the project site, along with the more patient-friendly prescription writing practices and increased follow-up visits are key findings that demonstrate the effectiveness of the project. Therefore, the project lead anticipates an increase in star ratings. This project provided a foundation for improved medication adherence in patients with Medicare and demonstrated the role of nursing leadership in improving population health.

References

Abraham, C., & Sheeran, P. (2015). The health belief model. In M. Conner & P. Norman (Eds.), *Predicting and changing health behavior: Research and practice with social cognition models* (3rd ed., pp. 30-69). Open University Press.

Adashi, E. Y., Walters, L. B., & Menikoff, J. A. (2018). The Belmont Report at 40: Reckoning with time. *American Journal of Public Health*, *108*(10), 1345–1348. https://doi.org/10.2105/AJPH.2018.304580

Agency for Healthcare Research and Quality. (2015). *Types of health care quality measures*. U.S. Department of Health & Human Services. https://www.ahrq.gov/talkingquality/measures/types.html

Alvi, Y., Khalique, N., Ahmad, A., Khan, H. S., & Faizi, N. (2019). World Health Organization dimensions of adherence to antiretroviral therapy: A study at antiretroviral therapy centre, Aligarh. *Indian Journal of Community Medicine*, *44*(2), 118-124. https://pubmed.ncbi.nlm.nih.gov/31333288/

Armitage, L. C., Kassavou, A., & Sutton, S. (2020). Do mobile device apps designed to support medication adherence demonstrate efficacy? A systematic review of randomized controlled trials, with meta-analysis. *BMJ Open*, *10*, Article e032045. https://bmjopen.bmj.com/content/10/1/e032045

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced practice nursing.* https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf

Bajner, R., Meinkow, E., Munroe, J., Smith, J. R., & McHugh, J. (2018). *Impact of star ratings on Medicare advantage plan success*. Becker's Hospital CFO Report.

https://www.beckershospitalreview.com/finance/impact-of-star-ratings-on-medicare-advantage-plan-success.html

Ballo, P., Profili, F., Policardo, L., Roti, L., Francesconi, P., & Zuppiroli, A. (2018). Opposite trends in hospitalization and mortality after implementation of a chronic care model-based regional program for the management of patients with heart failure in primary care. *BMC Health Services Research, 18*(388), 1-8. https://doi.org/10.1186/s12913-018-3164-0

Beadles, C. A., Farley, J. F., Ellis, A. R., Lichstein, J. C., Morrissey, J. P., DuBard, C. A., & Domino, M. E. (2015). Do medical homes increase medication adherence for persons with multiple chronic conditions? *Medical Care, 53*(2), 168-176. https://doi.org/10.1097/MLR.0000000000000292

Becker, M. H. (1974). The Health Belief Model and sick role behavior. *Health Education Monographs, 2*(4), 409-419. https://doi.org/10.1177/109019817400200407

Blue Cross Blue Shield of North Carolina. (2018). *Provider quality report: Frequently asked questions*. https://www.bluecrossnc.com/sites/default/files/document/attachment/providers/public/pdfs/Frequently_Asked_Questions_10192017.pdf

Bosworth, H. B., Fortmann, S. P., Kuntz, J., Zullig, L. L., Mendys, P., Safford, M., Phansalkar, S., Wang, T., & Rumptz, M. H. (2016). Recommendations for providers on person-centered approaches to assess and improve medication adherence. *Journal of General Internal Medicine, 32*(1), 93-100. https://doi.org/10.1007/s11606-016-3851-7

Braithwaite, S., Shirkhorshidian, I., Jones, K., & Johnsrud, M. (2013). *The role of medication adherence in the U.S. healthcare system*. Avalere Health. https://avalere.com/research/docs/20130612_NACDS_Medication_Adherence.pdf

Centers for Disease Control and Prevention. (2017). *Strategies and emerging interventions for improving medication adherence.* https://www.cdc.gov/dhdsp/pubs/docs/SIB_feature_Aug2017.pdf

Centers for Medicare and Medicaid Services. (2021). *2021 Medicare-Medicaid plan performance data technical notes*. https://www.cms.gov/files/document/mmpperformancedatatechnotes.pdf

Champion, V. L., & Skinner, C. S. (2008). The Health Belief Model. In. K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp 45-65). Jossey-Bass.

Chan, A. H. Y., Cooper, V., Lycett, H., & Horne, R. (2020). Practical barriers to medication adherence: What do current self- or observer-reported instruments assess? *Frontiers in Pharmacology*, *11*(572), 1-11. https://doi.org/10.3389/fphar.2020.00572

Choi, E. P. H. (2019). A pilot study to evaluate the acceptability of using a smart pillbox to enhance medication adherence among primary care patients. *International Journal of Environmental Research and Public Health*, *16*(20), 3964. https://doi.org/10.3390/ijerph16203964

CITI Program. (2016). *Mission and History*. https://about.citiprogram.org/en/mission-and-history/

Conn, V. S., Ruppar, T. M., Chan, K. C., Dunbar-Jacob, J., Pepper, G. A., & De Geest, S. (2015). Packaging interventions to increase medication adherence: Systematic review and meta-analysis. *Current Medical Research and Opinion*, *31*(1), 145-160. https://doi.org/10.1185/03007995.2014.978939

Costa, E., Giardini, A., Savin, M., Menditto, E., Lehane, E., Laosa, O., Pecorelli, S., Monaco, A., & Marengoni, A. (2015). Interventional tools to improve medication adherence: A review of the literature. *Patient Preference and Adherence*, *9*, 1303-1314. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4576894/pdf/ppa-9-1303.pdf

Cutler, R. L., Fernandez-Llimos, F., Fromer, M., Benrimoj, C., & Garcia-Cardenas, V. (2018). Economic impact of medication non-adherence by disease groups: A systematic review. *BMJ Open*, *8*, e016982. https://doi.org/10.1136/bmjopen-2017-016982

Cutler, S., Crawford, P., & Engleking, R. (2018). Effectiveness of group self-management interventions for persons with chronic conditions: A systematic review. *Medsurg Nursing*, *27*(6), 359-367. https://search.proquest.com/docview/2159927766/fulltextPDF/7F9ECC7D8C3D47F8PQ/1?accountid=10639

Dearman, C., Roberts, D., & Chappel-Aiken, L. (2020). The Institutional Review Board process. In J. L. Harris, L. Roussel, C. Dearman, & P. L. Thomas (Eds.), P*roject planning and management* (3rd ed., pp. 85-101). Jones & Bartlett Learning.

Derenthal, C., Jardine, J., Boekweg, C., & Coffin, J. (2018). Patient medication adherence: Guidelines to improve quality of care. *The Journal of Medical Practice Management*, *34*(1), 33-35. https://search.proquest.com/docview/2099886835?accountid=10639

Devine, F., Edwards, T., & Feldman, S. R. (2018). Barriers to treatment: Describing them from a different perspective. *Patient Preference and Adherence*, *12*, 129-133. https://doi.org/10.2147/PPA.S147420

Dinh-Le, C., Chuang, R., Chokshi, S., & Mann, D. (2019). Wearable health technology and electronic health record integration: Scoping review and future directions. *JMIR mHealth and uHealth*, *7*(9), e12861. https://doi.org/10.2196/12861

do Valle Nascimento, T. M. R., Resnicow, K., Nery, M., Brentani, A., Kaselitz, E., Agrawal, P., Mand, S., & Heisler, M. (2017). A pilot study of a community health agent-led type 2 diabetes self-management program using motivational interviewing-based approaches in a public primary care center in São Paulo, Brazil. *BMC Health Services Research*, *17*(32), 1-10. https://doi.org/10.1186/s12913-016-1968-3

Farley, J. F., Kumar, A., & Urick, B. Y. (2019). Measuring adherence: A proof of concept study for multiple medications for chronic conditions in alternative payment models. *Pharmacy*, *7*(3), 81. https://doi.org/10.3390/pharmacy7030081

Fernandez-Lazaro, C. I., García-González, J. M., Adams, D. P., Fernandez-Lazaro, D., Mielgo-Ayuso, J., Caballero-Garcia, A., Moreno Racionero, F., Córdova, A., & Miron-Canelo, J. (2019). Adherence to treatment and related factors among patients with chronic conditions in primary care: A cross-sectional study. *BMC Family Practice*, *20*(132), 1-12. https://doi.org/10.1186/s12875-019-1019-3

Gast, A., & Mathes, T. (2019). Medication adherence influencing factors—an (updated) overview of systematic reviews. *Systematic Reviews*, *8*(112), 1-17. https://doi.org/10.1186/s13643-019-1014-8

Gogovor, A., Nemis-White, J., Torr, E., MacPherson, N., Martin, L., Aylen, J., Manness, L.-J., & Montague, T. (2019). Nonadherence to prescribed therapies: Pharmacare's existential challenge. *Healthcare Quarterly*, *22*(2), 21-26. https://doi.org/10.12927/hcq.2019.25909

Guzman-Clark, J., Yefimova, M., Farmer, M. M., Wakefield, B. J., Viernes, B., Lee, M. L., & Hahn, T. J. (2020). Home telehealth technologies for heart failure: An examination of adherence among veterans. *Journal of Gerontological Nursing*, *46*(7), 26-34. https://doi.org/10.3928/00989134-20200605-05

Hale, G. M., Joseph, T., Moreau, C., Prados, Y., Gernant, S., Schneller, M., Jones, R., Seamon, M., & Rodriguez, H. (2018). Establishment of outpatient rounds by an interprofessional chronic care management team. *American Journal of Health-System Pharmacy*, *75*(10), 598-601. https://doi.org/10.2146/ajhp170106

Healthy People 2030. (n.d.). *Leading health indicators*. U. S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. https://health.gov/healthypeople/objectives-and-data/leading-health-indicators

Holdsworth, S., Corscadden, L., Levesque, J.-F., & Russell, G. (2019). Factors associated with successful chronic disease treatment plans for older Australians: Implications for rural and Indigenous Australians. *Australian Journal of Rural Health*, *27*(4), 290-297. https://doi.org/10.1111/ajr.12461

Holmes, E. A. F., Morrison, V. L., & Hughes, D. A. (2016). What influences persistence with medicines? A multinational discrete choice experiment of 2549 patients. *British Journal of Clinical Pharmacology*, *82*(2), 522-531. https://doi.org/10.1111/bcp.12971

Huang, J., Jiang, Z., Zhang, T., Wang, L., Chu, Y., Shen, M., Liang, H., Liu, S., Zhang, Y., & Liu, C. (2019). Which matters more for medication adherence among disabled people in Shanghai, China: Family support or primary health care? *Journal of Health Care Organization, Provision, and Financing*, *56*, 1-10. https://doi.org/10.1177/0046958019883175

Independence Blue Cross. (2017). *CMS star rating program and our network providers*. https://www.ibx.com/documents/35221/56671/cms-star-rating-provider-guide.pdf

Institute for Healthcare Improvement. (n.d.-a). *How to improve. Science of improvement: How to Improve.* http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementHowtoImprove.aspx

Institute for Healthcare Improvement. (n.d.-b). *Initiatives. The IHI Triple Aim*. http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Institute for Healthcare Improvement (n.d.-c). *Tools*. *Run chart tool*. http://www.ihi.org/resources/Pages/Tools/RunChart.aspx

Kaiser Permanente. (2016). Exactly as prescribed: Kaiser Permanente researchers shed light on poor medication adherence. *Kaiser Permanente Policy Stories, 4*(6), 1-7. https://www.kpihp.org/wp-content/uploads/2019/03/KP-Story-4.6_Medication-Adherence.pdf

Kaur, P., Stoltzfus, J., & Yellapu, V. (2018). Descriptive statistics. *International Journal of Academic Medicine, 4*(1), 60-63. http://www.ijam-web.org/text.asp?2018/4/1/60/230853

Kelso, J. M. (2016). Do written asthma action plans improve outcomes? *Pediatric Allergy, Immunology, and Pulmonology, 29*(1), 2-5. https://doi.org/10.1089/ped.2016.0634

Khan, N., Marvel, F. A., Wang, J., & Martin, S. S. (2017). Digital health technologies to promote lifestyle change and adherence. *Current Treatment Options in Cardiovascular Medicine, 19*(60), 1-12. https://doi.org/10.1007/s11936-017-0560-4

Kim, J., Combs, K., Downs, J., & Tillman, F., III. (2018). Medication adherence: The elephant in the room. *U.S. Pharmacist*, *43*(1), 30-34. https://www.uspharmacist.com/article/medication-adherence-the-elephant-in-the-room

Kim, J., Powers, S., Rice, C., & Cawley, P. (2020). Interprofessional medication self-management program for older underserved adults. *Patient Preference and Adherence*, *14*, 839-845. https://doi.org/10.2147/PPA.S225163

King, S., Miani, C., Exley, J., Larkin, J., Kirtley, A., & Payne, R. A. (2018). Impact of issuing longer-versus shorter-duration prescriptions: A systematic review. *British Journal of General Practice*, *68*(669), e286-e292. https://doi.org/10.3399/bjgp18X695501

Kleinsinger, F. (2018). The unmet challenge of medication nonadherence. *The Permanente Journal*, *22*(3), Article 18-033. https://doi.org/10.7812/TPP/18-033

Klinovszky, A., Kiss, I. M., Papp-Zipernovszky, O., Lengyel, C., & Buzás, N. (2019). Associations of different adherences in patients with type 2 diabetes mellitus. *Patient Preference and Adherence*, *13*, 395-407. https://doi.org/10.2147/PPA.S187080

Kvarnström, K., Airaksinen, M., & Liira, H. (2018). Barriers and facilitators to medication adherence: A qualitative study with general practitioners. *BMJ Open*, *8*(1), Article e015332. http://dx.doi.org/10.1136/bmjopen-2016-015332

Lam, W. Y., & Fresco, P. (2015). Medication adherence measures: An overview. *BioMed Research International*, *2015*, Article 217047. https://doi.org/10.1155/2015/217047

Lauffenburger, J. C., Shrank, W. H., Bitton, A., Franklin, J. M., Glynn, R. J., Krumme, A. A., Matlin, O. S., Pezalla, E. J., Spettell, C. M., Brill, G., & Choudhry, N. K. (2017). Association between patient-centered medical homes and adherence to chronic disease

medications: A cohort study. *Annals of Internal Medicine*, *166*(2), 81-88. https://doi.org/10.7326/M15-2659

Langley, G. J., Moen, R. D., Nolan, K. M., Nolan, T. W., Norman, C. L., Provost, L. P. (2009). *The improvement guide* (2nd ed.). Jossey-Bass.

Mantri, P. (2015). Medication adherence in adults with epilepsy. *Practice Nursing*, *26*(4), 179-184. https://doi.org/10.12968/pnur.2015.26.4.179

Mason, B. (2019). *Why scientists need to be better at data visualization*. Knowable Magazine. https://doi.org/10.1146/knowable-110919-1

McPhail, S. (2016). Multimorbidity in chronic disease: Impact on health care resources and costs. *Risk Management and Healthcare Policy*, *9*, 143-156. https://doi.org/10.2147/RMHP.S97248

McQuillan, R. F., Silver, S. A., Harel, Z., Weizman, A., Thomas, A., Bell, C., Chertow, G. M., Chan, C. T., & Nesrallah, G. (2016). How to measure and interpret quality improvement data. *Clinical Journal of American Society of Nephrology*, *11*(5), 908-914. https://doi.org/10.2215/CJN.11511015

Medicare Learning Network. (2019). *MLN fact sheet. Knowledge. Resources. Training. Rural health clinic.* U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services. https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/RuralHlthClinfctsht.pdf

Melnyk, B. M., & Fineout-Overholt, E. (2015). Chapter 1: Making the case for evidence-based practice and cultivating a spirit of inquiry. In B. M. Melnyk & E. Fineout-Overholt (Eds.), *Evidence-based practice in nursing & healthcare: A guide to best practice* (3rd ed., pp. 3-23). Wolters Kluwer Health.

Minnesota Stroke Program. (2017). *PDSA worksheet for testing change – Example*. https://www.health.state.mn.us/diseases/cardiovascular/documents/examplepdsa.pdf

National Academies of Sciences, Engineering, and Medicine. (2020). *Leading Health Indicators 2030: Advancing health, equity, and well-being.* The National Academies Press. https://doi.org/10.17226/25682

National Center for Health Statistics. (2020). *NCHS fact sheet. August 2020. Healthy People 2030*. https://www.cdc.gov/nchs/data/factsheets/Factsheet-HealthyPeople2030-H.pdf

National Council Medical Director Institute. (2018). *Medication matters. Causes and solutions to medication nonadherence.* National Council for Behavioral Health. https://www.nationalcouncildocs.net/wp-content/uploads/2018/09/medication-non-adherence-082918.pdf

Neiman, A. B., Ruppar, T., Ho, M., Garber, L., Weidle, P. J., Hong, Y., George, M. G., & Thorpe, P. G. (2017). CDC grand rounds: Improving medication adherence for chronic disease management — Innovations and opportunities. *Morbidity and Mortality Weekly Report*, *66*(45). http://dx.doi.org/10.15585/mmwr.mm6645a2

North Carolina Department of Commerce. (2019). *County distress rankings (tiers)*. https://www.nccommerce.com/grants-incentives/county-distress-rankings-tiers

North Carolina Institute of Medicine. (2019). *NC county health data.* https://nciom.org/map/

North Carolina Institute of Medicine. (2020). *January 2020. Healthy North Carolina 2030: A path toward health*. http://nciom.org/wp-content/uploads/2020/01/HNC-REPORT-FINAL-Spread2.pdf

Pagès-Puigdemont, N., Tuneu, L., Masip, M., Valls, P., Puig, T., Mangues, M. A. (2019). Determinants of medication adherence among chronic patients from an urban area: A

cross-sectional study. *European Journal of Public Health, 29*(3), 419–424. https://doi.org/10.1093/eurpub/cky259

Park, L. G., Ng, F., Shim, J. K. Elnaggar, A., & Villero, O. (2020). Perceptions and experiences of using mobile technology for medication adherence among older adults with coronary heart disease: A qualitative study. *Digital Health, 6*, 1-12. https://doi.org/10.1177/2055207620926844

Pfizer. (2018). *The value of drug adherence*. https://www.pfizer.com/news/featured_stories/featured_stories_detail/the_value_of_drug_adherence

Raghupathi, W., & Raghupathi, V. (2018). An empirical study of chronic disease in the United States: A visual analytics approach to public health. *International Journal of Environmental Research and Public Health, 15*(3), 431. https://doi.org/10.3390/ijerph15030431

Rosenstock, I. M. (1974). Historical origins of the Health Belief Model. *Health Education Monographs, 2*(4), 328-335. https://doi.org/10.1177/109019817400200403

Ruiz Moral, R., Pérula de Torres, L. A., Pulido Ortega, L., Criado Larumbe, M., Roldán Villalobos, A., Fernández García, J. A., Parras Rejano, J. M., & Collaborative Group ATEM-AP Study. (2015). Effectiveness of motivational interviewing to improve therapeutic adherence in patients over 65 years old with chronic diseases: A cluster randomized clinical trial in primary care. *Patient Education and Counseling, 98*(8), 977-983. https://doi.org/10.1016/j.pec.2015.03.008

Schmittdiel, J. A., Nichols, G. A., Dyer, W., Steiner, J. F., Darter, A. J., & Raebel, M. A. (2015). Health care system-level factors associated with performance on Medicare STAR

adherence metrics in a large, integrated delivery system. *Medical Care*, *53*(4), 332-337. https://doi.org/10.1097/MLR.0000000000000328

Shahin, W., Kennedy, G. A., Cockshaw, W., & Stupans, I. (2020). The role of refugee and migrant migration status on medication adherence: Mediation through illness perceptions. *PloS One*, *15*(1), Article e0227326. https://doi.org/10.1371/journal.pone.0227326

University of Wisconsin Department of Surgery. (2019). *Self-reported medication nonadherence measurement*. https://www.surgery.wisc.edu/research/researchers-labs/corrine-voils-phd/self-reported-medication-nonadherence-measurement/

[Clinic Site]. (n.d.). *[Clinic Site]: Healthcare for your lifetime*. http://www.[Clinic Site].com/[Clinic County]

Voshaar, M. J. H., Nota, I., van de Laar, M. A. F. J., & van den Bemt, B. J. F. (2015). Patient-centered care in established rheumatoid arthritis. *Best Practice & Research Clinical Rheumatology*, *29*(4-5), 643-663. http://doi.org/10.1016/j.berh.2015.09.007

White-Williams, C., Rossi, L. P., Bittner, V. A., Driscoll, A., Durant, R. W., Granger, B. B., Graven, L. J., Kitko, L., Newlin, K., & Shirey, M., and on behalf of the American Heart Association Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; and Council on Epidemiology and Prevention. (2020). Addressing social determinants of health in the care of patients with heart failure: A scientific statement from the American Heart Association. *Circulation*, *141*(22), e841-e863. https://doi.org/10.1161/CIR.0000000000000767

World Health Organization. (2016). *Integrated care models: An overview*. https://www.euro.who.int/__data/assets/pdf_file/0005/322475/Integrated-care-models-overview.pdf

Wu, A. C., Rehman, N., & Portnoy, J. (2019). The good, the bad, and the unknown of telemedicine in asthma and allergy practice. *Journal of Allergy and Clinical Immunology: In Practice*, *7*(8), 2580-2582. https://doi.org/10.1016/j.jaip.2019.08.017

Yap, A. F., Thirumoorthy, T., & Kwan, Y. H. (2016). Systematic review of the barriers affecting medication adherence in older adults. *Geriatrics Gerontology International*, *16*(10), 1093-1101. https://doi.org/10.1111/ggi.12616

Yoon, J., Wu, F., & Chang, E. (2020). Impact of primary care intensive management on medication adherence and adjustments. *The American Journal of Managed Care*, *26*(8), e239-e245. https://doi.org/10.37765/ajmc.2020.44073

Appendix A

Search Log

DNP Project Literature Search Log				
Student: Tracey Carson-Johnson			**Date of Submission:** September 24, 2020	
Project Title: Increasing Medication Adherence in a Primary Care Office				
Date of Search	**Database**	**Key Word Searches**	**Limits**	**# of Citations Found / Kept**
9/23/2020	OVID	Patient Compliance/ or Medication Adherence/ AND Chronic Disease/ AND Primary Health Care/	2015-2020	91 total found 41 found written from 2015 to 2020 in English 23 for full article review 12 retained
9/23/2020	CINAHL	(MH "Medication Compliance") OR "medication adherence" AND (MH "Chronic Disease") AND (MH "Primary Health Care") OR (MH "Physicians, Family") OR (MH "Practitioner's Office")	2015-2020 English language	81 total found 35 found written from 2015 to 2020 in English 16 for full article review 11 retained
9/23/2020	PubMed	"Medication Adherence"[Mesh] AND "Chronic Disease"[Mesh] AND ("Primary Health Care"[Mesh] OR "Physicians, Primary Care"[Mesh])	2015-2020 English language	71 total found 46 found written from 2015 to 2020 in English 13 for full article review 8 retained
9/23/2020	ProQuest	MAINSUBJECT.EXACT("Noncompliance") OR MAINSUBJECT.EXACT("Patient compliance") AND MAINSUBJECT.EXACT("Chronic illnesses") AND MAINSUBJECT.EXACT("Primary care")	2015-2020 English language	30 total found 25 found written from 2015 to 2020 in English 13 for full article review 9 retained
9/24/2020	Google Scholar	"medication adherence" or "medication compliance" or "patient compliance" and "chronic disease" or "chronic illness" or "chronic condition" and "primary care" or "family practice" or "practitioner."	2015-2020 English language	29 total found 10 found written from 2015 to 2020 in English 0 for full article review 0 retained

Appendix B

Literature Matrix

Search/ Location	Authors	Year Pub	Article Title	Theory	Journal	Design/Analysis/Level of Evidence	IV DV or Themes concepts and categories	Instr. Used	Sample Size	Sample method	Subject Charac.	DOI
C01 United States	Yoon, J., Wu, F. & Chang, E.	2020	Impact of Primary Care Intensive Management on Medication Adherence and Adjustments.	n/a	*Journal of Managed Care, 26(8), e239-e245*	Pilot study at 5 sites **Level 2**	Primary Care Intensive group (PIM) vs usual primary care	Adherence in PDC by difference in difference	1527 in MA cohort and 1719 in medication adjustment cohort.	Randomized sample of vets in the top 10% risk for hospitalization into two arms: MA and medication adjustment cohort.	x̄=62-64 years, 50% White, mostly male, x̄ CCI score= 1.4	https://doi.org/10.37765/ajmc.2020.44073
C02 United States	Schreiner, N., DiGennaro, S., Harwell, C., Burant, C., Daly, B., & Douglas, S.	2020	Treatment burden as a predictor of self-management adherence within the primary care population.	cumulative complexity model	*Applied Nursing Research, 54, 151301, 1-6.*	prospective, descriptive, cross-sectional study **Level 6**	Measured demographics, treatment burden, adherence in chronic disease, and exercise and diet adherence	Cumulative and task-specific treatment burden, adherence in chronic disease scale (ASCD-8).	149	convenience sampling	male and female in a single primary care clinic associated within a tertiary hospital setting.	10.1016/j.apnr.2020.151301
C06 Australia	Holdsworth, S., Corscadden, L., Levesque, J.-F., & Russell, G.	2019	Factors associated with successful chronic disease treatment plans for older Australians: Implications for rural and Indigenous Australians.	n/a	*Australian Journal of Rural Health, 27, 290-297*	Observational study via secondary analysis **Level 6**	treatment plan	questionnaire	3310 people 55+ years old	cross-sectional survey in 11 countries	aged 55+, Australian	doi.org/10.1111/ajr.12461

C07	Pagès-Puigdemont, N., Tuneu, L., Masip, M., Valls, P., Puig, T., Mangues, M. A.	2019	Determinants of medication adherence among chronic patients from an urban area: a cross-sectional study.		*European Journal of Public Health, 29(3), 419–424.*	cross-sectional, observational study **Level 6**		questionnaire	577	Random sample recruited by healthcare professionals including pharmacists and general practitioner	had at least one chronic disease and under pharmacologic treatment.	doi.org/10.1093/eurpub/cky259
C10 United States and Canada	Cutler, S., Crawford, P., & Engleking	2018	Effectiveness of Group Self-Management Interventions for Persons with Chronic Conditions: A Systematic Review.	n/a	*Medsurg Nursing, 27(6), 359-367.*	Systematic review **Level 1**	Group Self-Management Interventions	Multiple	19	Literature review	Group self-management programs	http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=91&sid=55fab421-55de-4ac5-b481-665439a282e3%40sessionmgr103
C12 United States	Hale, G. M., Joseph, T., Moreau, C., Prados, Y., Gernant, S., Schneller, M., Jones, R., Seamon, M., & Rodriguez, H.	2018	Establishment of outpatient rounds by an interprofessional chronic care management team.	n/a	*American Journal of Health-System Pharmacy, 75(10), 598-601.*	Quality improvement project **Level 7**	Outpatient rounds	No measurement provided	n/a	n/a	n/a	DOI: 10.2146/ajhp170106
C13 United States	King, S., Miani, C., Exley, J., Larkin, J., Kirtley, A., Payne, R. A.	2018	Impact of issuing longer- versus shorter-duration prescriptions: a systematic review.	n/a	*British Journal of General Practice, 68(669), e286-e292*	Systematic review of 9 retrospective cohorts, 3 cross-sectional analyses, and 1 retrospective before-and-after study **Level 1**	Prescription length	Health outcomes, MA, AE, medication waste, pharmacy time/cost, patient experience/ costs	13 Studies	Literature review	measured length of prescription use with some outcome data.	10.3399/bjgp18X695501

C16 United States	Lauffenburger, J. C., Shrank, W. H., Bitton, A., Franklin, J. M., Glynn, R. J., Krumme, A. A., Matlin, O. S., Pezalla, E. J., Spettell, C. M., Brill, G., & Choudhry, N. K.	2017	Association Between Patient-Centered Medical Homes and Adherence to Chronic Disease Medications: A Cohort Study.	n/a	*Annals of Internal Medicine, 166(2), 81-88.*	Retrospective cohort study **Level 4**	MA in medical homes		313,765 patients with 18,611 in medical homes	4,660 matched control and medical home practices	Aetna members on OADs, RASAs, statins	10.7326/M15-2659
C22 Austria, Belgium England Germany Greece, Hungary, Netherlands, Poland, Wales.	Holmes, E. A. F., Morrison, V. L., & Hughes, D. A.	2016	What influences persistence with medicines? A multinational discrete choice experiment of 2,549 patients.	n/a	*British Journal of Clinical Pharmacology, 82, 522-531.*	Discrete choice experiment (DCEs) **Level 3**	survey of psychosocial and sociocognitive determinants of MA	Brief Illness Perception Questionnaire (B-IPQ)	2,549 patients	Multinational web-based survey of adults with HTN	18+, HTN >3 mos., currently on an anti-HTN and responsible for taking their own medication	10.1002/jppr.1301
C25	Geraldo Pierin, A. M., Eleuterio da Silva, S. S. B., Cortez Colosimo, F., de Andrade Toma, G., deSouza Serafim, T., & Meneghin, P.	2016	Chronic and asymptomatic diseases influence the control of hypertension treatment in primary care.		*Revista da Escola de Enfermagem da USP (Journal of School of Nursing USP), 50(5), 763-770.*	Cross-sectional exploratory study **Level 6**	Instrument to measure MA	Morisky medication adherence scale related to BP control	290	Met inclusion criteria within one community	≥ 18y, f/u of at least 6 months, Dx HTN, in primary care	DOI: http://dx.doi.org/10.1590
C34	Mantri, P.	2015	Medication adherence in adults with epilepsy.	n/a	*Practice Nursing, 26(4), 179-184.*	Educational article **Level 7**		n/a	n/a	n/a	n/a	doi: 10.12968/pnur.2015.26.4.179

OV03 Spain	Fernandez-Lazaro, C. I., García-González, J. M., Adams, D. P., Fernandez-Lazaro, D., Mielgo-Ayuso, J., Caballero-Garcia, A., Moreno Racionero, F., Córdova, A., & Miron-Canelo, J.	2019	Adherence to treatment and related factors among patients with chronic conditions in primary care: a cross-sectional study.	WHO conceptional framework to evaluate adherence and related factors among chronic-disease patients in primary care.	*BMC Family Practice, 20(132), 1-12.*	Cross-sectional study **Level 4**	ID factors associated with adherence	Questionnaire and face-to-face interviews 1. Morisky-Green-Levine questionnaire 2. Adjusted morbidity group (AMG)	299	randomly approached patients presenting for follow up appointments for chronic diseases.	Adult with ≥ 1 chronic condition	doi: 10.1186/s12875-019-1019-3
OV05 Chinese	Choi, E. P. H.	2019	A Pilot Study to Evaluate the Acceptability of Using a Smart Pillbox to Enhance Medication Adherence Among Primary Care Patients.	n/a	*International Journal of Environmental Research and Public Health, 16, 3964.*	Pilot study **Level 3**	Free smart pillboxes	Asked 4 questions about MA	344	all patients who agreed to participate from a government-funded primary care clinic	primary care patients 40+ years old	DOI 10.3390/ijerph16203964
OV11 India	Jindal, D., Gupta, P., Jha, D., Ajay, V. S., Goenka, S., Jacob, P., Mehrotra, K., Perel, P., Nyong, J., Roy, A., Tandon, N., Prabhakaran, D., & Patel, V.	2018	Development of mWellcare: an mHealth intervention for integrated management of hypertension and diabetes in low-resource settings.	Framework for development of complex interventions by the Medical Research Council (UK).	*Global Health Action, 11, 1517930*	Descriptive study of pilot program **Level 6**	mWellcare intervention	Describes results of implementation of the intervention of using new EHR protocol.	5 nurses, 5 physicians	the providers at 5 community health centers	providers in 5 centers in India	DOI 10.1080/16549716.2018.1517930

OV12 Italy	Ballo, P., Profili, F., Policardo, L., Roti, L., Francesconi, P., & Zuppiroli, A.	2018	Opposite trends in hospitalization and mortality after implementation of a chronic care model-based regional program for the management of patients with heart failure in primary care.	Chronic Care Model (CCM)	*BMC Health Services Research, 18(388), 1-8.*	retrospective matched cohort study **Level 4**	Chronic care model-based project	HF hospitalization rate and mortality	1,761 patient intervention group and 3,522 usual care control group	all patients with a diagnosis of HF in primary care for a regional healthcare system	HF patients in primary care	doi: 10.1186/s12913-018-3164-0
OV13 Germany	Muth, C., Uhlmann, L., Haefeli, W. E., Rochon, J., van den Akker, M., Perera, R., Güthlin, C., Beyer, M., Oswald, F., Maria Valderas, J., Knottnerus, J. A., Gerlach, F. M., Harder, S.	2018	Effectiveness of a complex intervention on Prioritizing Multimedication in Multimorbidity (PRIMUM) in primary care: results of a pragmatic cluster randomized controlled trial.	n/a	*BMJ Open, 8, e017740, 1-16.*	Cluster RCT **Level 2**	Prioritizing Multimedication in Multimorbidity (PRIMUM).	Medication appropriateness index (MAI).	465 patients and 71 practices	randomized by the practice	cognitively intact, ≥ 60y, ≥ 3 chronic conditions, ≥ 5 long-term drug Rx	doi: 10.1136/bmjopen-2017-017740
OV18	do Valle Nascimento, T. M. R., Resnicow, K., Nery, M., Brentani, A., Kaselitz, E., Agrawal, P., Mand, S., & Heisler, M.	2017	A pilot study of a Community Health Agent-led type 2 diabetes self-management program using Motivational Interviewing-based approaches in a public primary care center in Sao Paulo, Brazil.	n/a	*BMC Health Services Research, 17(1), 32*	Pilot study **Level 3**	Community health agent-led type 2 diabetes self-management program using motivational interviewing	Self-reported outcome measures Patient assessment for chronic illness care (PACIC).	19 female CHAs 52 patients	all CHAs willing to participate all patients meeting criteria	DM2, A1c C6 months, ≤ 75 years, nonpregnant, nonterminal dx	doi: 10.1186/s12913-016-1968-3

OV22	Bosworth, H. B., Fortmann, S. P., Kuntz, J., Zullig, L. L., Mendys, P., Safford, M., Phansalkar, S., Wang, T., & Rumptz, M. H.	2016	Recommendations for Providers on Person-Centered Approaches to Assess and Improve Medication Adherence.	n/a	*Journal of General Internal Medicine, 32(1), 93-100*	Expert Recommendation **Level 7**	Recommendations include 5 A's: Assess, advise, agree, assist, arrange, Motivational interviewing, Shared decision-making	Clinical scenarios	n/a	n/a	n/a	doi: 10.1007/s11606-016-3851-7
OV25 Spain	Pages-Puigdemont, N., Mangues, M. A., Masip, M., Gabriele, G., Fernandez-Maldonado, L., & Blancafort, S.	2016	Patients' Perspective of Medication Adherence in Chronic Conditions: A Qualitative Study.	n/a	*Advances in Therapy, 33, 1740-1754.*	Qualitative study **Level 6**	8 semi-structured interviews	Morisky Medication Adherence Scale	36	focus groups	Adult, ≥ 1 chronic condition on medications.	DOI 10.1007/s12325-016-0394-6
OV27 Australia	Randall, S., & Neubuck, L.	2016	What's in a name? Concordance is better than adherence for promoting partnership and self-management of chronic disease.	n/a	*Australian Journal of Primary Health, 22, 181-184.*	Expert Recommendation **Level 7**	n/a	n/a	n/a	n/a	n/a	DOI:10.1071/PY15140
OV34 New York	De Leon, S. F., Pauls, L., Arya, V., Shih, S. C., Singer, J., & Wang, J. J.	2015	Effect of Physician Participation in a Multi-element Health Information and Data Exchange Program on Chronic Illness Medication Adherence.	n/a	*Journal of the American Family Board of Medicine, 28(6), 742-749.*	Retrospective cohort study **Level 4**	Primary Care Information Project (PCIP)	Medication possession ratio ≥ 80% PCIP vs non-PCIP	PCIP 4,477 non-PCIP 15,608	Prescription claims data from NY city members working in building services from 2008 and 2011	Adult, union members,	DOI: https://doi.org/10.3122/jabfm.2015.06.150010

OV38 Spain	Ruiz Moral, R., Pérula de Torres, L. A., Pulido Ortega, L., Criado Larumbe, M., Roldán Villalobos, A., Fernández García, J. A., Parras Rejano, J. M., & Collaborative Group ATEM-AP Study.	2015	Effectiveness of motivational interviewing to improve therapeutic adherence in patients over 65 years old with chronic diseases: A cluster randomized clinical trial in primary care.	n/a	*Patient Education and Counseling, 98(8), 977-983*	Cluster RCT **Level 2**	Motivational interviewing	Haynes-Sackett survey Morisky-Green test	154 patients and 27 healthcare providers	16 primary care centers Physicians volunteered Patients selected by providers	65+ years, had a chronic disease, polypharmacy (5+ meds) or 12+ daily doses/week ≥ 6 months	
OV39 UK	Kenning, C., Coventry, P. A., Gibbons, C., Bee, P., Fisher, L., & Bower, P.	2015	Does patient experience of multimorbidity predict self-management and health outcomes in a prospective study in primary care?		*Family Practice, 32(3), 311-316.*	Prospective study **Level 6**	Questionnaires Independent: 1. (B-IPQ) 2. (MULTIPleS) 3. (PACIC) 4. Hassles scale 5. (HADS). Dependent 1. (heiQ) 2. Self-monitoring and Insight scale 3. Modified Morisky scale	factors affecting MA	410	convenience sampling responded to a mailing.	Adult, access to mail	doi:10.1093/fampra/cmv002
PM02 Finland	Kvarnström, K., Airaksinen, M., & Liira, H.	2018	Barriers and facilitators to medication adherence: a qualitative study with general practitioners	n/a	*BMJ Open, 8(1), e015332*	Qualitative study **Level 6**	GP's insights into nonadherence	medication management challenges	16	focus groups	Work in a regional healthcare system	doi: 10.1136/bmjopen-2016-015332

PM14 Canada	Gogovor, A., Nemis-White, J., Torr, E., MacPherson, N., Martin, L., Aylen, J., Manness, L.-J., & Montague, T.	2019	Non-Adherence to Prescribed Therapies: Pharmacare's Existential Challenge	n/a	*Healthcare Quarterly, 22(2), 21-26.*	Expert Recommendation **Level 7**	Contributions needed by pharmacy		n/a	n/a	n/a	DOI: 10.12927/hcq.2019.25909
PM20	Beadles, C. A., Farley, J. F., Ellis, A. R., Lichstein, J. C., Morrissey, J. P., DuBard, A., & Domino, M. E.	2015	Do medical homes increase medication adherence for persons with multiple chronic conditions?	n/a	*Medical Care, 53(2), 168-176*	Retrospective cohort study **Level 4**	Medical homes	PDC >0.80	4 cohorts: Depression 9,303; HTN 12,595; DM 6,409; and HLD 9,263	Claims data from NC Integrated Data for Researchers (NCIDR)	NC Medicaid enrollees with multiple chronic conditions including major depressive disorder, hypertension, diabetes mellitus, and hyperlipidemia.	doi: 10.1097/MLR.0000000000000292.
PM26	Fredericksen, R. J., Gibbons, L., Brown, S., Edwards, T. C., Yang, F. M., Fitzsimmons, E., Alperovitz-Bichell, K., Godfrey, M., Wang, A., Church, A., Gutierrez, C., Paez, E., Dant, L., Loo, S., Walcott, M., Mugavero, M. J., Mayer, K., Mathews, W. C., Patrick, D. L., ... Crane, H. M.	2018	Medication understanding among patients living with multiple chronic conditions: Implications for patient-reported measures of adherence	n/a	*Research in Social and Administrative Pharmacy, 14(6), 540-544.*	Qualitative study **Level 6**	Name medications, explain purpose, and be able to distinguish between them in interviews	Demonstrate health literacy.	57	convenience sample	English or Spanish speaking, taking 3+ medications	DOI: 10.1016/j.sapharm.2017.06.009

PM32 South Florida	Palacio, A., Keller, V. F., Chen, J., Tamariz, L., Carrasquillo, O., Tanio, C.	2016	Can Physicians Deliver Chronic Medications at the Point of Care?	RE-AIM CFIR	*American Journal of Medical Quality, 31(3), 256-264.*	Mixed-methods study: qualitative and cross-sectional survey **Level 6**	Point-of-care medication delivery system (POCMDS)	Patient surveys	426	Survey of capitated members in a clinical practice	Had diabetes	DOI: 10.1177/1062860614568646
PM36	Virgolesi, M., Pucciarelli, G., Colantoni, A. M., D'Andrea, F., Di Donato, B., Giorgi, F., Landi, L., Salustri, E., Turci, C., & Proietti, M. G.	2017	The effectiveness of a nursing discharge programme to improve medication adherence and patient satisfaction in the psychiatric intensive care unit	Self-efficacy model to medication adherence (SEMMA).	*Journal of Clinical Nursing, 26, 4456-4466.*	prospective correlational design **Level 3**	Nursing discharge program with follow-up phone call 7-10 post d/c	MMAS-4 scale	135	survey of patients admitted to Psychiatric Diagnosis and Treatment Services (PDTSs) at three hospitals in Rome	Hospitalized 3+ days, d/c with long-term medications, no dual dx of drug, alcohol abuse, no other physical illnesses, speak Italian or English, was not d/c or transferred to another hospital	doi.org/10.1111/jocn.13776
PM40	Voshaar, M. J. H., van de Laar, M. A. F. J., & van den Bemt, B. J. F.	2015	Patient-centred care in established rheumatoid arthritis.	Patient-centered care	*Best Practice & Research Clinical Rheumatology, 29, 643-663.*	Evidence review of 5 patient-centered care activities **Level 7**	Patient-centered care	n/a	n/a	n/a	n/a	doi: 10.1016/j.berh.2015.09.007
PM45	Brey, Z., Mash, R., Goliath, C., & Roman, D.	2020	Home delivery of medication during Coronavirus disease 2019, Cape Town, South Africa: Short report	SWOT analysis	*African Journal of Primary Health Care & Family Medicine, 12(1), a2449, 1-4.*	Expert Recommendation **Level 7**	Home delivery of medication for up to 200,000 people	n/a	n/a	n/a	n/a	DOI: 10.4102/phcfm.v12i1.2449

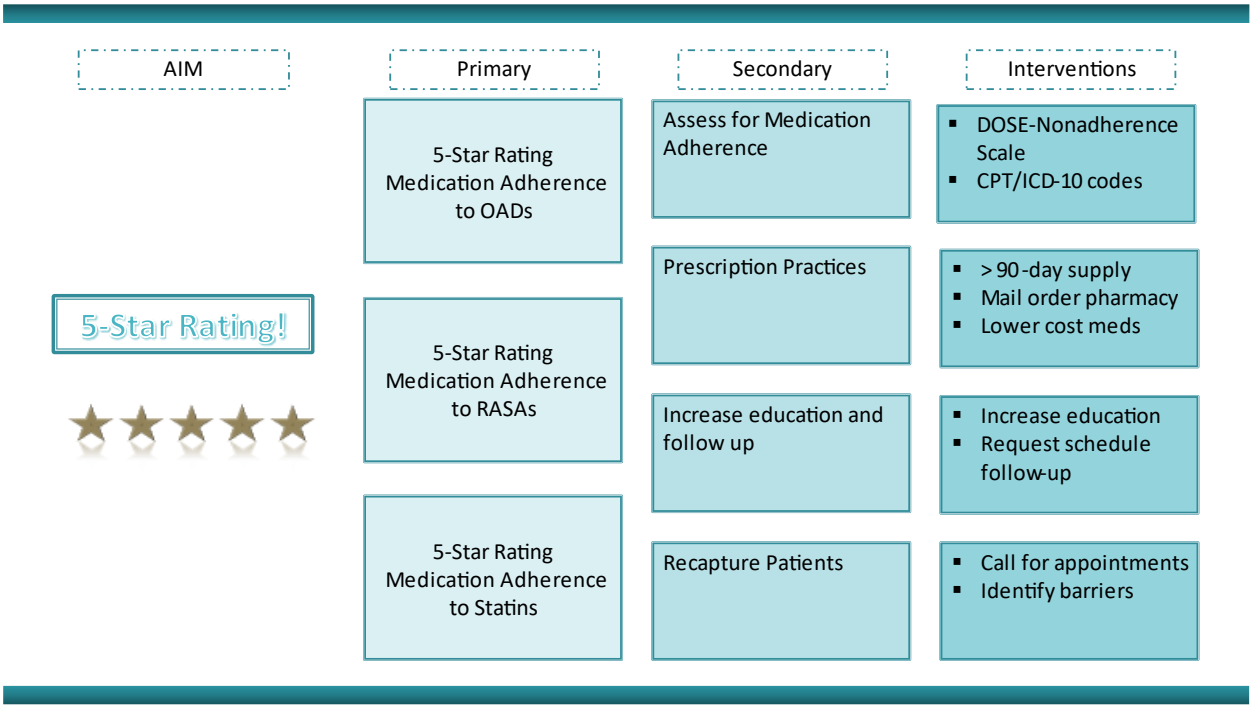
PQ01	Kim, J., Powers, S., Rice, C., & Cawley, P	2020	Interprofessional Medication Self-Management Program for Older Underserved Adults	n/a	Patient Preference and Adherence, 14, 839-845	Quasi-experimental, pre-post study **Level 3**	Medication self-management program	A1c level SBP measurement	50	all patients meeting the criteria were selected in an internal medicine primary care residency clinic	60+ years, SBP> 140 mmHg and A1c > 7.5	DOI:10.2147/PPA.S225163
PQ03 China	Huang, J., Jiang, Z., Zhang, T., Wang, L., Chu, Y., Shen, M., Liang, H., Liu, S., Zhang, Y., & Liu, C.	2019	Which Matters More for Medication Adherence Among Disabled People in Shanghai, China: Family Support or Primary Health Care?	n/a	*Journal of Health Care Organization, Provision, and Financing*, *56*, 1-10	Questionnaire survey **Level 6**	Pharmaceutical Service Demand Questionnaire for People with Disabilities survey tool administered by trained investigator	predictors of MA for disabled individuals	226	random	≥ 18 years and in the Disabled People Information System without severe mental illness	DOI:10.1177/0046958019883175
PQ04 United States	Guzman-Clark, J., Yefimova, M., Farmer, M. M., Wakefield, B. J., Viernes, B., Lee, M. L., & Hahn, T. J.	2020	Home Telehealth Technologies for Heart Failure: An Examination of Adherence Among Veterans	n/a	*Journal of Gerontological Nursing, 46(7), 26-34.*	Retrospective cohort study **Level 4**	Home telehealth program	MA adherence at 1, 3, 6, 12 months via days per weekly	3,449 from 141 VA facilities	All patients which met inclusion criteria and were not enrolled in another program	HF patients in VA	DOI:10.3928/00989134-20200605-05
PQ07	Hooper, L. M., Huffman, L. E., Higginbotham, J. C., Mugoya, G. C. T., Smith, A. K., & Dumas, T. N.	2018	Associations Among Depressive Symptoms, Wellness, Patient Involvement, Provider Cultural Competency, and Treatment Nonadherence: A Pilot Study Among Community Patients Seen at a University Medical Center	n/a	*Community Mental Health Journal, 54, 138-148.*	Pilot study cross-sectional **Level 3**	Adherence starts with knowledge (ASK-20) adherence barrier survey	factors affecting MA	88	from a large university medical center in Southern US.	Black and White Americans	DOI:10.1007/s10597-017-0133-8

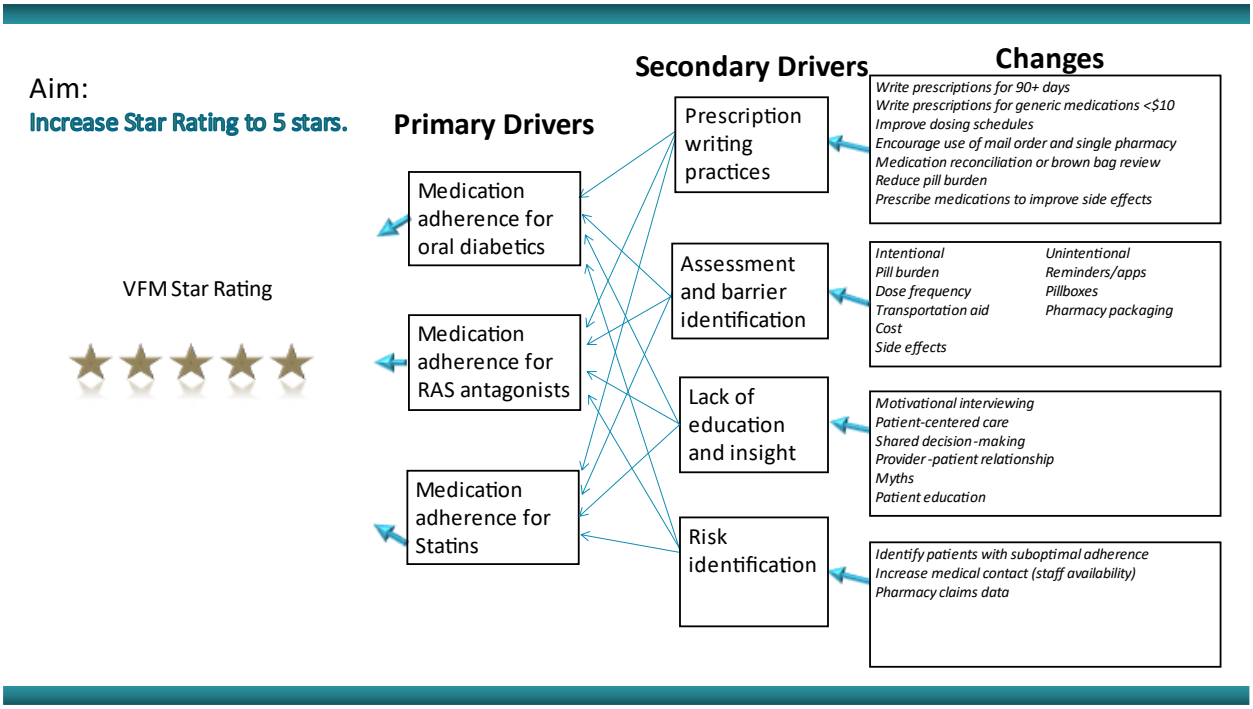
PQ10	Fort, M., Steiner, J. F., Santos, C., Moore, K. R., de los Angeles Villaverde, M., Nease, D. E., Jr., Ortega, D., & Manson, S. M.	2020	Opportunities, Challenges, and Strategies for Engaging Family in Diabetes and Hypertension Management: A Qualitative Study		*Journal of Health Care for the Poor and Underserved, 31(2), 827-844.*	Qualitative study **Level 6**	semi structured interviews		23 patients 13 family members	hand picked	American Indian or Latino/Spanish speaking 10 of 13 family members lived within the same household as the patient	DOI:10.1353/hpu.2020.0063
PQ18 Singapore	Liau, Y. W., Cheow, C., Leung, K. T. Y., Tan, H., Low, S. F., Cheen, H. H. M., Lim, W. C., Tan, L. L., Tan, J. Z. Y., Lee, E. S., Xu, S. J., Tan, C. Y. K., Phang, J. W., Phang, J. K., Lam, M. H., Blalock, D. V., Voils, C. I., Yap, K. Z., & Kwan, Y. H.	2019	A cultural adaptation and validation study of a self-report measure of the extent of and reasons for medication nonadherence among patients with diabetes in Singapore		*Patient Preference and Adherence, 13, 1241-1252.*	Two phases: 1. cognitive interviews 2. prospective cohort study **Level 4**	Voils medication nonadherence tool		1. 30 2. 393	1. patients with diabetes 2. recruited	1. 48-76 years old 2. 3 languages	DOI:10.2147/PPA.S208736
PQ19	Klinovszky, A., Kiss, I. M., Papp-Zipernovszky, O., Lengyel, C. & Buzás, N.	2019	Associations of different adherences in patients with type 2 diabetes mellitus	n/a	*Patient Preference and Adherence, 13, 395-407.*	cross-sectional study **Level 3**	explore adherence behavior of people with T2DM	Adherence to medications, glucose monitoring, dietary adherence, and physical exercise	113	convenience sampling	T2DM inpatient with average age duration of DM for 13 years	DOI:10.2147/PPA.S187080

PQ23	Durand, H., Hayes, P., Harhen, B., Conneely, A., Finn, D. P., Casey, M., Murphy, A. W., & Molloy, G. J.	2018	Medication adherence for resistant hypertension: Assessing theoretical predictors of adherence using direct and indirect adherence measures		*The British Psychological Society, 23, 949-966.*	Cross-sectional study **Level 3**	medication nonadherence	MMAS and MARS to test for unintentional vs intentional MA	204	completed all data for adherence measures	18-96, on antihypertensive med	DOI:10.1111/bjhp.12332
PQ25	Wu, A. C., Rehman, N., & Portnoy, J.	2019	The Good, the Bad, and the Unknown of Telemedicine in Asthma and Allergy Practice	n/a	*Journal of Allergy and Clinical Immunology in Practice, 7(8), 2580-2582.*	Expert Recommendation **Level 7**	Telemedicine	n/a	n/a	n/a	n/a	DOI:10.1016/j.jaip.2019.08.017

Appendix C

Driver Diagrams





Appendix D

PDSA Worksheet for Testing Change

AIM – What are we trying to accomplish?

Overall goal

MEASURE – How will we know it is improved?

Measurable outcomes

CHANGES – What will result in improvement?

Possible changes

PLAN

Describe test of change

DO

What happened?

STUDY

Describe the measured results and compare to the prediction.

ACT

Adapt, adopt, or abandon? What is next?

Note: Adapted from the Model for Improvement from the Institute for Healthcare Improvement PDSA Worksheet for Testing Change and the Minnesota Stroke Response's PDSA Worksheet for Testing Change (Langley et al., 2009; McQuillan et al., 2016; Minnesota Stroke Program, 2017).

Appendix E

Star Ratings Data Tool

BCBS Star Ratings

	December	January	February	March	April
Oral Antidiabetics	2	4	4	5	5
Renin-Angiotensin System Antagonists	3	3	2	3	3
Statins	3	3	3	2	2

Appendix F

Recapture Report Data Tool

Recaptured Report 2021

	1/4/2021	2/9/2021	3/2/2021	4/6/2021	5/11/2021	Trends	Total	Average
Recapture Patients								
Outreach needed								
No appointment								

Total All Categories																				
	Total Pts	Total Rx	Total S	Total D	Total H	Black	White	Hispanic	Other	Male	Female	18-44	45-64	65+	UHC	BCBS	Medicare	Medicai	Other	Needs Follow Up
January																				
February																				
March																				
April																				
May																				
Total																				

Total All Categories Percentages																				
	Total Pts	Total Rx	Total Rx/Pt	Total S	Total D	Total H	Black	White	Hispani	Other	Male	Female	18-44	45-64	65+	UHC	BCBS	Medicar	Medicai	Other	Needs Follow up
January																					
February																					
March																					
April																					
May																					
Total																					

Appendix G

Data Collection Tool

Total All Categories																						
Week	Total Pts	Male	Female	18-44	45-64	65+	Black	White	Hispanic	Other	UHC	BCBS	Medicare	Medicaid	Other	Follow Up	DOSE form	ICD-10/CPT codes	Total Rx	Mail	Local	<90 days	≥90 days
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							
14																							
15																							
16																							
Total																							

Total All Categories Percentages																						
Week	Total Pts	Male	Female	18-44	45-64	65+	Black	White	Hispanic	Other	UHC	BCBS	Medicare	Medicaid	Other	Follow Up	DOSE form	ICD-10/CPT codes	Total Rx	Mail	Local	<90 days	≥90 days
1																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							
14																							
15																							
16																							
Total																							

Appendix H

Project Timeline

	Date	Activities
Initiation	September 16, 2020	Site Champion identified
	September 23, 2020	Literature review begins
	October 28, 2020	Site meeting with project lead and site champion
	November 11, 2020	Site meeting with project lead and site champion
	November 23 2020	Site meeting with project lead and site champion
	December 1, 2020	Site meeting with project lead and site champion
	December 15, 2020	Site meeting with project lead and site champion
	December 22, 2020	Christmas break
	December 29, 2020	Christmas break
	January 5, 2021	Site meeting with project lead and site champion Staff meeting January 6, 2021 - provider and staff training
Week 1	January 12, 2021	Site meeting with project lead and site champion Baseline data collection
Week 2	January 19, 2020	Site meeting with project lead and site champion Week 1 data collection
Week 3	January 26, 2021	Site meeting with project lead and site champion Week 2 data collection
Week 4	February 2, 2021	ECU Immersion week Week 3 data collection
Week 5	February 9, 2021	Site meeting with project lead and site champion PDSA cycle review 1 Staff meeting February 10, 2021 Week 4 data collection
Week 6	February 16, 2021	Site meeting with project lead and site champion Week 5 data collection
Week 7	February 23, 2021	Site meeting with project lead and site champion Week 6 data collection

		PDSA cycle review 2
Week 8	March 2, 2021	Site meeting with project lead and site champion Week 7 data collection Staff meeting March 3, 2020
Week 9	March 9, 2021	Site meeting with project lead and site champion Week 8 data collection
Week 10	March 16, 2021	Site meeting with project lead and site champion Week 9 data collection
Week 11	March 23, 2021	Site meeting with project lead and site champion Week 10 data collection
Week 12	March 30, 2021	Site meeting with project lead and site champion Week 11 data collection PDSA cycle review 3
Week 13	April 6, 2021	Site meeting with project lead and site champion Week 12 data collection
Week 14	April 13, 2021	Site meeting with project lead and site champion Week 13 data collection Staff Meeting April 13, 2020.
Week 15	April 20, 2021	Site meeting with project lead and site champion Week 14 data collection
Week 16	April 27, 2021	Site meeting with project lead and site champion Week 15 data collection PDSA cycle review 4 Complete data analysis
	May 4, 2021	Staff Meeting
Dissemination	July 7, 2021	PowerPoint presentation at the project site
Dissemination	July 13, 2021	Poster presentation at the College of Nursing
Dissemination	September 23-24, 2021	Proposed presentation at the North Carolina Nurses Association Annual Convention

Appendix I

Demographic Results

Figure I1

Total Sex Distribution

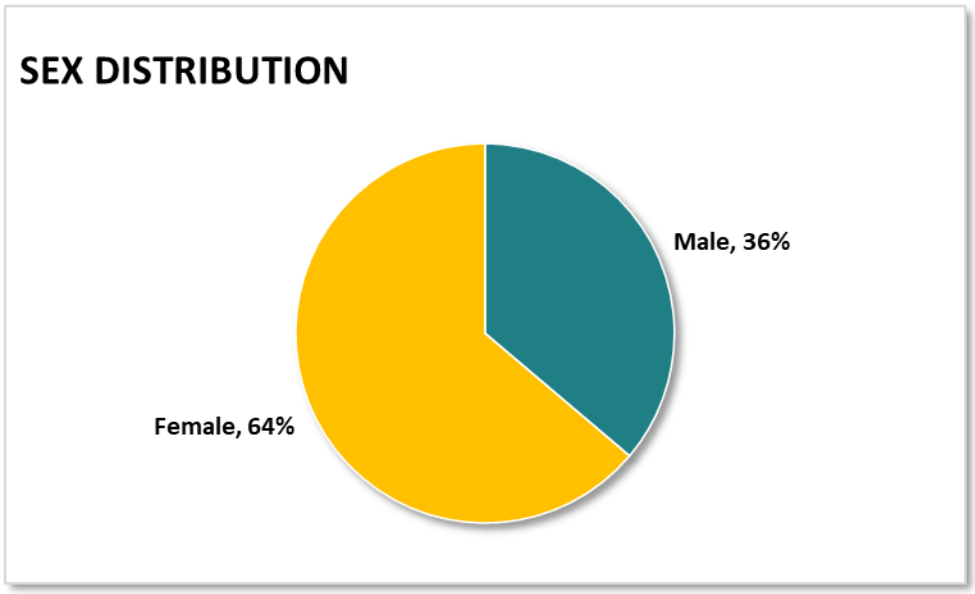


Figure I2

Total Age Distribution

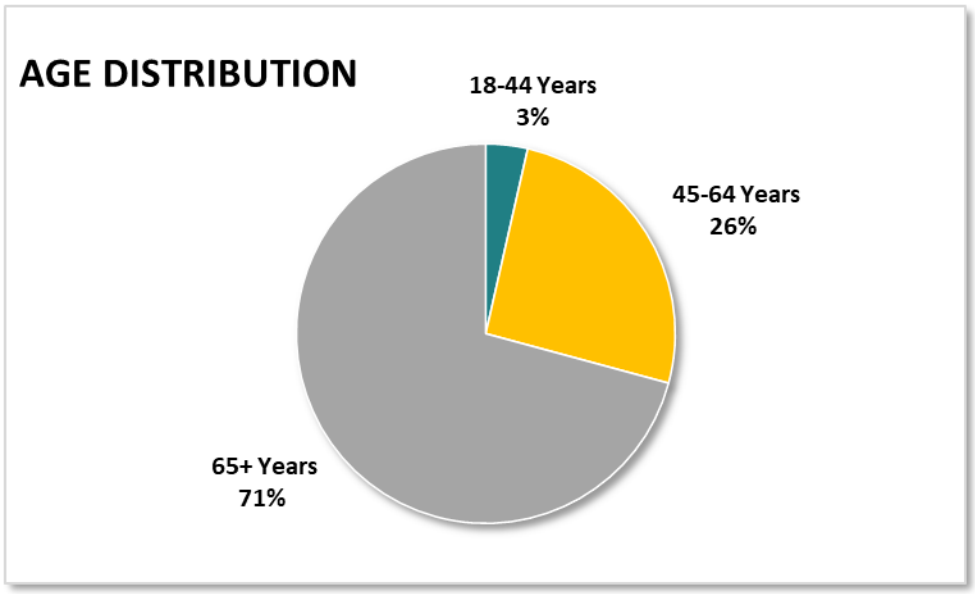


Figure I3

Total Race/Ethnicity Distribution

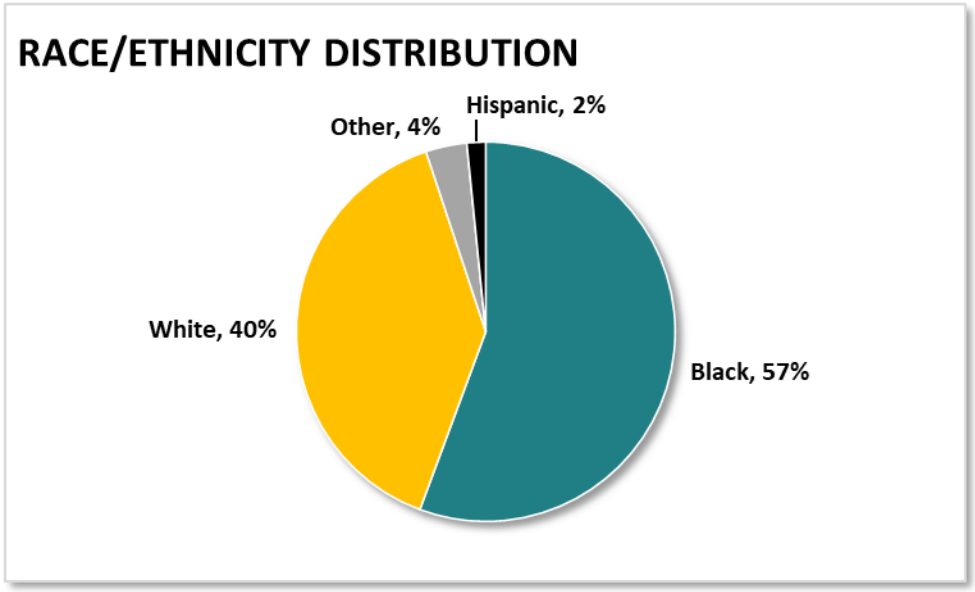
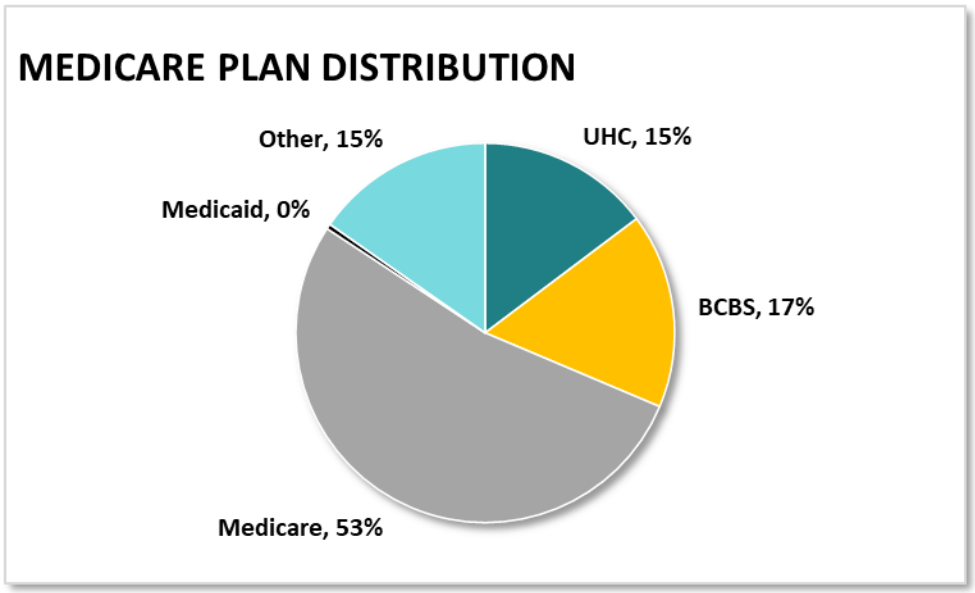


Figure I4

Total Medicare Plan Type Distribution



Appendix J

Process Measures Results

Figure J1

90-Day Prescriptions

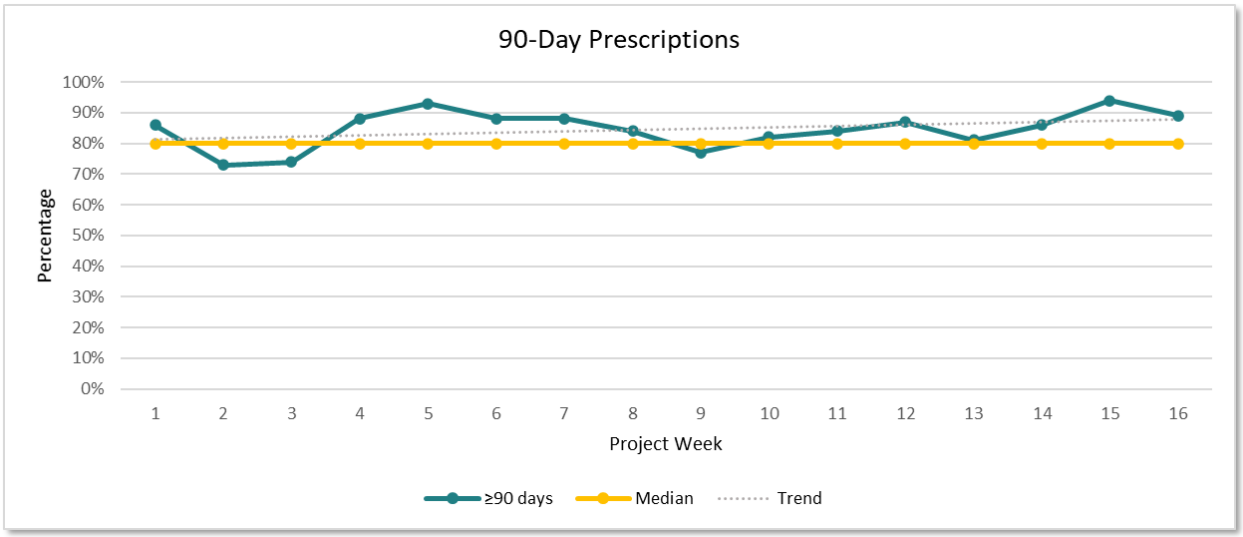


Figure J2

Scheduled Follow-Up Visits

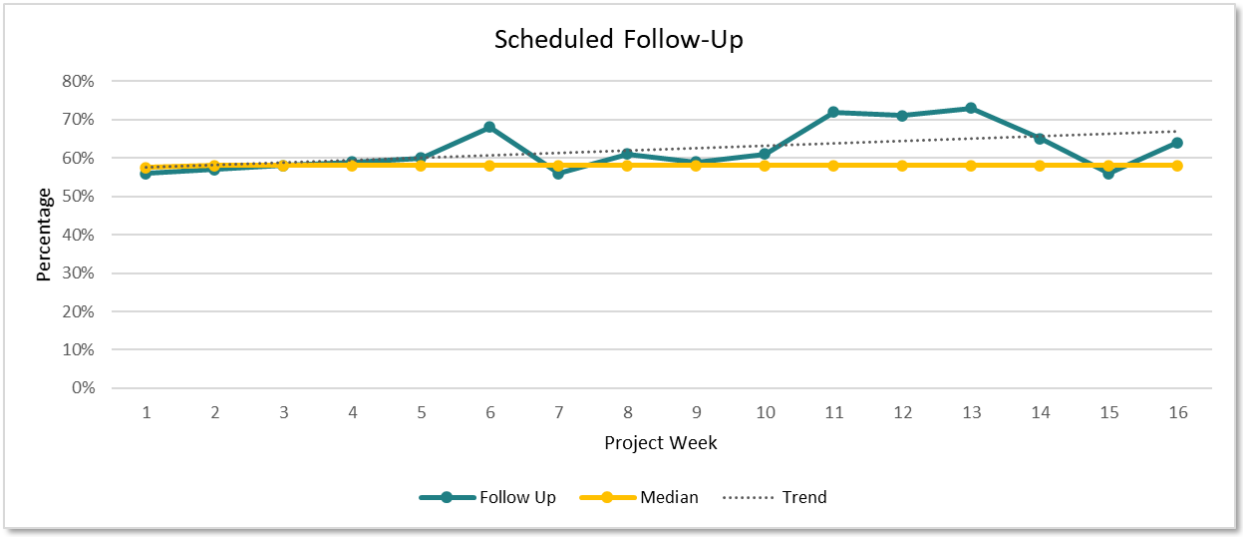


Figure J3

ICD-10/CPT Code Use

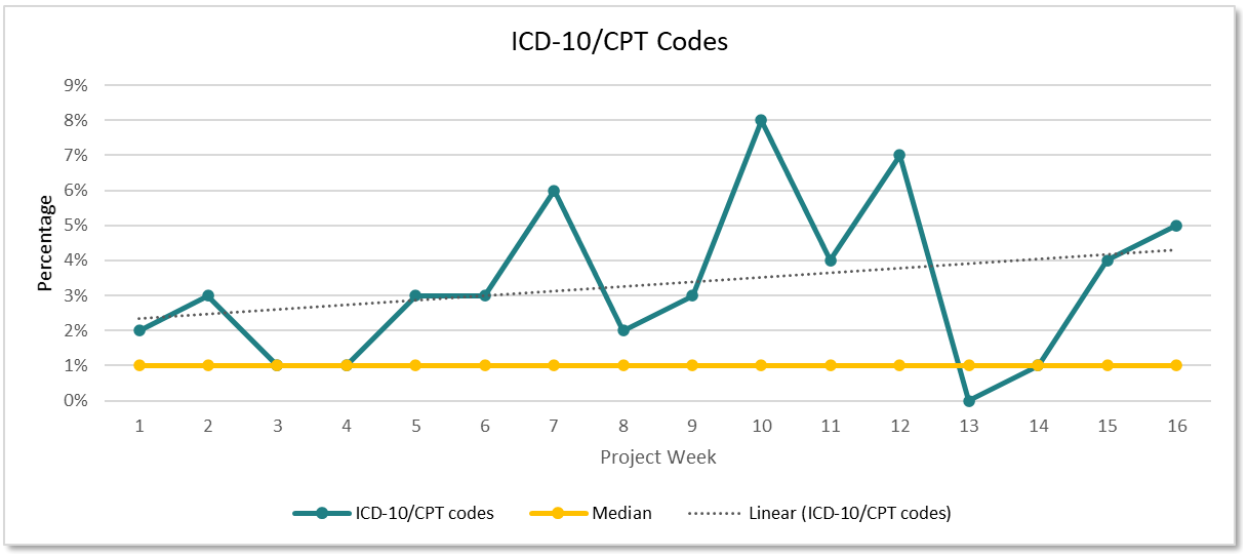
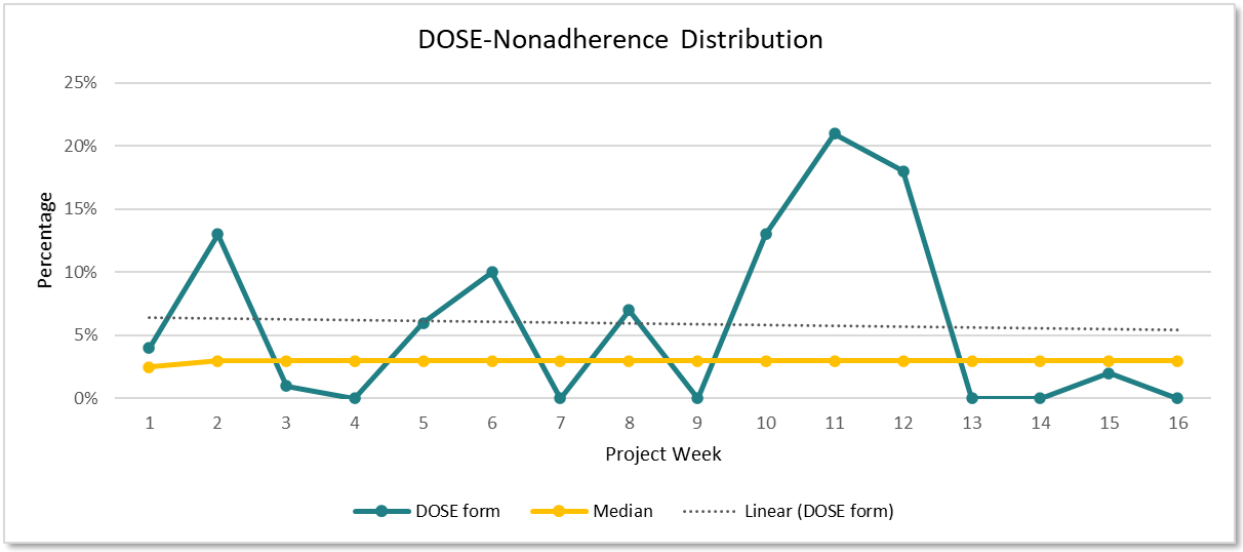


Figure J4

DOSE-Nonadherence Form Distribution



Appendix K

Project Budget

Item	Quantity	Cost	Total
Double-sided black and white copies	1000	$ 0.25	$ 250.00
8.5 x 11, double-sided black and white copies laminated	20	$ 2.74	$ 54.80
8.5 x 11 color single-sided, laminated	40	$ 10.62	$ 424.80
Provider hours monthly	20	$ 50.00	$ 1,250.00
Staff hours monthly	20	$ 15.00	$ 300.00
Staff meeting snacks (donuts and coffee)	1	$ 75.00	$ 75.00
Total			$ 2,354.60

Appendix L

Doctor of Nursing Practice Essentials

	Description	Demonstration of Knowledge
Essential I ***Scientific Underpinning for Practice***	**Competency** – Analyzes and uses information to develop practice **Competency** -Integrates knowledge from humanities and science into context of nursing **Competency** -Translates research to improve practice **Competency** -Integrates research, theory, and practice to develop new approaches toward improved practice and outcomes	➢ Performed a literature review of medication adherence ➢ Analyzed research to develop a plan to address the organizational need ➢ Applied implementation science and social sciences theories by integrating the Institute for Healthcare Improvement's (IHI) Model for Improvement and Health Belief Model as a foundation for the project ➢ Employed PICOT method to define search question ➢ Utilized library science by searching databases using search terms derived from keywords ➢ Applied the Levels of Evidence by Melnyk and Fineout-Overholt (2015) to determine the Levels of Evidence for the articles discovered in the literature search ➢ Analyzed and evaluated evidence-based literature ➢ Developed relevant, feasible, plan based on best available evidence that was acceptable to the project site stakeholders
Essential II ***Organizational & Systems Leadership for Quality Improvement & Systems Thinking***	**Competency** –Develops and evaluates practice based on science and integrates policy and humanities **Competency** –Assumes and ensures accountability for quality care and patient safety **Competency** -Demonstrates critical and reflective thinking **Competency** -Advocates for improved quality, access, and cost of health care; monitors costs and budgets	➢ Used the IHI Model for Improvement to target systems-level interventions and the Health Belief Model to target patient-centered interventions ➢ Interacted with audiovisual materials to develop knowledge ➢ Completed CITI training courses to strengthen ethical foundation ➢ Completed the Quality IRB Self-Certification Review to determine whether the project required a full review by the IRB

	Competency -Develops and implements innovations incorporating principles of change **Competency** - Effectively communicates practice knowledge in writing and orally to improve quality **Competency** - Develops and evaluates strategies to manage ethical dilemmas in patient care and within health care delivery systems	➢ Demonstrated accountability and leadership through academic achievement and deliverables ➢ Attended all meetings for the Committee for Quality Metrics and Incentives ➢ Implemented the DNP project at the project site ➢ Provided leadership and communication through presentations of project findings at staff meetings ➢ Developed a poster for the dissemination presentations ➢ Disseminated the DNP Paper in scholarly repository
Essential III ***Clinical Scholarship & Analytical Methods for Evidence-Based Practice***	**Competency** - Critically analyzes literature to determine best practices **Competency** - Implements evaluation processes to measure process and patient outcomes **Competency** - Designs and implements quality improvement strategies to promote safety, efficiency, and equitable quality care for patients **Competency** - Applies knowledge to develop practice guidelines **Competency** - Uses informatics to identify, analyze, and predict best practice and patient outcomes **Competency** - Collaborate in research and disseminate findings	➢ Accountable for researching, planning, implementing, evaluating, and disseminating the project ➢ Cited all work using APA 7th Edition ➢ Utilized electronic health record to conduct chart reviews ➢ Analyzed project data ➢ Attended Vir-Mersion (both the online synchronous and nonsynchronous meetings) ➢ Collaborated with the site champion, medical director, and university faculty member to design the project ➢ Collaborated with the project site providers, assistive personnel, and office staff ➢ Conducted PDSA cycle reviews to evaluate project processes ➢ Used Excel to tabulate, analyze, create visual displays for, and the dissemination of the data for use in the paper and the poster ➢ Used the three principles of ethics including respect for persons, beneficence, and justice to guide project development ➢ Utilized web-based app ➢ Retrieved electronic health record reports

Essential IV ***Information Systems – Technology & Patient Care Technology for the Improvement & Transformation of Health Care***	**Competency** - Design/select and utilize software to analyze practice and consumer information systems that can improve the delivery & quality of care **Competency** - Analyze and operationalize patient care technologies **Competency** - Evaluate technology regarding ethics, efficiency, and accuracy **Competency** - Evaluates systems of care using health information technologies	➢ Used computer software such as Microsoft Word, Excel, and PowerPoint and Adobe to produce scholarly paper, poster, and the pre-, intra-, and post-implementation reports related to the project ➢ Submitted work through online, web-based programs and plagiarism checkers as required by the university ➢ Use of computer programs such as Microsoft Word, Excel, PowerPoint, and Chrome for project documentation, data collection, analysis, and dissemination ➢ Used a virtual private network (VPN) to access the project site's secure server and maintained all sensitive information on it ➢ Use of online video conferencing programs such as Teams, WebEx, and Zoom ➢ Utilized the health sciences library at the project lead's university, including accessing scholarly databases Ovid, CINAHL, PubMed, ProQuest, and Google Scholar ➢ Utilized teleconferencing and email to collaborate with the project site team members and university faculty member ➢ Printed and laminated patient-facing materials that were provided by the affordable care organization and placed them in the exam rooms to trigger medication adherence conversations ➢ Placed alerts on patient charts so that individual barriers could be assessed for individuals who were nonadherent
	Description	**Demonstration of Knowledge**
Essential V ***Health Care Policy of Advocacy in Health Care***	**Competency**- Analyzes health policy from the perspective of patients, nursing, and other stakeholders	➢ Implemented a tailored plan derived from current literature within the last five years ➢ Provided leadership throughout the project to the project site during staff meetings, through policy changes, and

	Competency – Provides leadership in developing and implementing health policy **Competency** –Influences policymakers, formally and informally, in local and global settings **Competency** – Educates stakeholders regarding policy **Competency** – Advocates for nursing within the policy arena **Competency**- Participates in policy agendas that assist with finance, regulation, and health care delivery **Competency** – Advocates for equitable and ethical health care	conducted education to stakeholders at staff meetings to implement evidence-based care ➢ Demonstrated the value of advanced practice nursing, securing a second DNP project in the fall at the project site and the medical director is planning to take a third project afterwards ➢ Presented the project to the affordable care organization that partners with the project site, who is interested in the results of the project to see if they may like to distribute it to other primary care offices within their network ➢ Worked with the CEO, CNO, Director of Quality, and others at the local hospital for project development (first project) ➢ Created a budget for the project ➢ Performed a cost-benefit analysis to determine whether the project was "worth" the cost of implementation ➢ Demonstrated the value of nursing leadership and impact on quality improvement at project site
Essential VI ***Interprofessional Collaboration for Improving Patient & Population Health Outcomes***	**Competency**- Uses effective collaboration and communication to develop and implement practice, policy, standards of care, and scholarship **Competency** – Provide leadership to interprofessional care teams **Competency** – Consult intraprofessionally and interprofessionally to develop systems of care in complex settings	➢ Performed a peer review for the DNP project paper ➢ Collaborated with graduate students during Immersion ➢ Used library science to develop the research question and concept table to monitor the literature search ➢ Kept a literature search log for replication if needed by another investigator ➢ Obtained letter of support from the medical director ➢ Collaborated with project site leaders such as nursing, billing, etc. ➢ Obtained license for DOSE-Nonadherence scale form from Duke University for project implementation through the project site and authorized by the site champion.

Essential VII ***Clinical Prevention & Population Health for Improving the Nation's Health***	**Competency**- Integrates epidemiology, biostatistics, and data to facilitate individual and population health care delivery **Competency** – Synthesizes information & cultural competency to develop & use health promotion/disease prevention strategies to address gaps in care **Competency** – Evaluates and implements change strategies of models of health care delivery to improve quality and address diversity	➢ Investigated the population health statistics for the Tier 1 county that the project site is embedded in to understand the individual, social, cultural, and economic context for the project impact ➢ Used the Health Belief Model to develop and guide interventions ➢ Used the DOSE-Nonadherence tool ➢ DNP project was a catalyst for creation of the Committee for Quality Measures and Incentives which was developed by the site champion in part due to project initiation ➢ Used evidence-based recommendations for the project interventions to target medication adherence
Essential VIII ***Advanced Nursing Practice***	**Competency**- Melds diversity & cultural sensitivity to conduct systematic assessment of health parameters in varied settings **Competency** – Design, implement & evaluate nursing interventions to promote quality **Competency** – Develop & maintain patient relationships **Competency** –Demonstrate advanced clinical judgment and systematic thoughts to improve patient outcomes **Competency** – Mentor and support fellow nurses **Competency**- Provide support for individuals and systems experiencing change and transitions **Competency** –Use systems analysis to evaluate practice efficiency, care delivery, fiscal responsibility, ethical responsibility, and quality outcomes measures	➢ Project lead recognizes that the project site's patient populations represent several significant at-risk populations which demands culturally competent interventions ➢ Created diver diagrams to guide primary and secondary drivers for star ratings ➢ Evaluated project impact by analyzing the primary (star ratings) and secondary (process measures) drivers ➢ Developed professional relationships with project site personnel ➢ Demonstrated clinical judgement and systematic changes to improve the quality of care and improve patient outcomes ➢ Performed education to providers, assistive personnel, and office staff – interprofessional collaboration ➢ This project led to the opportunity to host other DNP projects for the university's college of nursing ➢ Leveraged stakeholder support