

A COLLABORATIVE HYPERTENSION CLINIC PILOT PROGRAM IN A RURAL
PRIMARY CARE

A Dissertation
Submitted to the Graduate Faculty
of the
North Dakota State University
of Agriculture and Applied Science

By

Nicole Catherine Pink

In Partial Fulfillment of the Requirements
for the Degree of
DOCTOR OF NURSING PRACTICE

Major Program:
Nursing

April 2020

Fargo, North Dakota

North Dakota State University
Graduate School

Title

A COLLABORATIVE HYPERTENSION CLINIC PILOT PROGRAM IN
RURAL PRIMARY CARE

By

Nicole Catherine Pink

The Supervisory Committee certifies that this *disquisition* complies with North Dakota State University's regulations and meets the accepted standards for the degree of

DOCTOR OF NURSING PRACTICE

SUPERVISORY COMMITTEE:

Heidi Saarinen DNP, CNP-C

Chair

Tina Lundeen DNP, CNP-C

Adam Hohman DNP, CNP-C

Lisa Montplaisir Ph.D.

Approved:

April 14, 2020

Date

Carla Gross Ph.D., RN

Department Chair

ABSTRACT

In 2019, there were about seventy-million Americans with uncontrolled high blood pressure (BP) or hypertension (HTN) (Kitt, Fox, Tucker & McManus, 2019). Hypertension is the leading cause of preventable deaths worldwide (Stephen, Halcomb, McInnes, Batterham & Zwar, 2019). Uncontrolled HTN contributes to stroke, myocardial infarction, and renal failure, and is the most modifiable risk factor for heart disease and death (American Academy of Family Physicians [AAFP], 2019; Oparil & Schmider, 2015). Patients living in rural America have an increased prevalence of HTN and their access to preventative health services is lower (Buford, 2016; Caldwell, Ford, Wallace, Wang & Takahashi, 2016). The increased prevalence of HTN in rural communities does not positively correlate with optimized blood pressure control, which poses a gap in care (Buford, 2016). A multidisciplinary collaboration between registered nurses (RNs) and providers may improve patient outcomes (Ford et al., 2018). The implementation of a collaborative HTN Clinic in a rural setting had the potential to improve BP outcomes by increasing access to services.

The practice improvement project established a HTN Clinic as a collaborative effort between RNs and providers in a rural community. Providers and RNs were educated via modules regarding the protocol and participants took surveys before and after implementation to determine effectiveness and if the HTN Clinic should continue after conclusion of the practice improvement project. The HTN Clinic intervention implemented education for hypertensive patients with an emphasis on medication compliance and lifestyle modifications, as well as medication adjustments through nurse-led protocols.

Despite a short duration of implementation and evaluation, positive results were observed. All HTN Clinic patients had improvement in BP measures and were controlled by the

end of the four-week implementation period. Overall, patient access, wait times for appointments, and BP measures for all hypertensive patients improved after implementation. The providers' and nurses' knowledge increased through completion of a detailed curriculum. The provider and RN surveys indicated support for continuing the HTN Clinic to improve HTN management and clinic providers felt that the HTN Clinic helped improve their time with patients and quality metrics.

TABLE OF CONTENTS

ABSTRACT	iii
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1. INTRODUCTION	1
Background and Significance	1
Problem Statement	4
Purpose.....	5
Project Objectives	6
CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK.....	8
Literature Review and Synthesis	8
Hypertension Prevalence and Risk Factors.....	9
Barriers.....	10
Consequences of Uncontrolled High BP	12
Treatment Barriers	13
Diagnosis.....	15
Treatment Recommendations	15
Quality Measures	20
Theoretical Framework.....	20
Quality Improvement Method.....	24
CHAPTER 3. PROJECT DESIGN.....	27
Congruence to the Organizational Goals	27
Project Design.....	27
Plan	27
Do.....	29

Study	33
Act.....	33
Financial Impact.....	34
Timeline of Project.....	34
Resources	35
Protection of Human Subjects	35
CHAPTER 4. EVALUATION	37
Objective One	37
Objective Two	38
Objective Three.....	39
Objective Four	39
CHAPTER 5. RESULTS	41
Objective One	41
Referrals.....	41
Hypertensive Patient Visits and Access	42
Wait Times	43
Focus Group Feedback	44
Objective Two.....	45
Objective Three.....	51
Objective Four	53
CHAPTER 6. DISCUSSION AND RECOMMENDATIONS	55
Interpretation of Results.....	55
Objective One	55
Objective Two.....	57
Objective Three.....	58

Objective Four	60
Recommendations.....	60
Strengths	62
Project Limitations.....	62
Application to the Doctor of Nursing Practice Roles	64
Dissemination Plan	64
REFERENCES	66
APPENDIX A. IRB APPROVAL LETTER	79
APPENDIX B. POST-IMPLEMENTATION NURSING HYPERTENSION (HTN) CLINIC SURVEY.....	80
APPENDIX C. PROVIDERS PRE- AND POST- IMPLEMENATATION SURVEY.....	82
APPENDIX D. PERMISSION TO USE HEALTH PROMOTION MODEL.....	83
APPENDIX E. PERMISSION TO USE RURAL HEALTH INFORMATION	84
APPENDIX F. HYPERTENSION PROTOCOL.....	85
APPENDIX G. HYPERTENSION POWERPOINT PRESENTATION	91
APPENDIX H. FOCUS GROUP QUESTIONS	92
APPENDIX I. ESSENTIA HEALTH GRAND RAPIDS IRB APPROVAL.....	93
APPENDIX J. IN-SERVICE POST-TEST	95
APPENDIX K. PROVIDER POST-INSERVICE SURVEY	97

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Evaluation of Total Hypertensive Patient Visits for any Patient with HTN at EHGR	42
2. Median Wait Times (MWT) for Episodic (30 minute) Appointment in the EHGR Clinic.....	44
3. Episodic (30-minute) Appointment Requests for All Patients in the EHGR Clinic	44
4. Post-Implementation Nursing HTN Clinic Survey Results Questions 1-10 (N=2).....	46
5. Breakdown of Providers Ratings to Questions 1-5.....	46
6. Provider’s Qualitative Feedback Pre- and Post-Implementation.....	50
7. Hypertension (HTN) Clinic Blood Pressure (BP) Results.....	52
8. Providers Post-Survey Results Following Presentation for Questions 1-5.....	53

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Nola Pender’s Health Promotion Model.....	21
2. PDSA for Hypertension Services Project at Essentia Health, Grand Rapids, MN.....	25

CHAPTER 1. INTRODUCTION

Background and Significance

The worldwide epidemic of hypertension (HTN) is largely uncontrolled, and HTN remains the leading cause of non-communicable disease-related deaths globally (Burnier, 2019). In the United States (US), over 70 million people have HTN, and, of those, approximately 50% are controlled (Center for Disease Control and Prevention [CDC], 2018; Kitt, Fox, Tucker & McManus, 2019). The rural Midwest has a higher incidence of individuals older than 60 years of age (Kit et al., 2019). Researchers have found that approximately 65% of the US adult population have HTN and are greater than 60 years of age, resulting in a higher correlation of patients requiring treatment in rural areas (Buford, 2016).

High blood pressure (BP) is often asymptomatic and is considered a “silent killer”. Hypertension, or high BP, is the leading cause of preventable cardiac death globally (Stephen, Halcomb, McInnes, Batterham & Zwar, 2019). Hypertension contributes to disease and death in the US leading to stroke, myocardial infarction, and renal failure if left untreated (American Academy of Family Physicians [AAFP], 2019). Improving BP control for patients of all ages is essential, given the strong correlation between uncontrolled HTN and morbidity and mortality (Rosemberg, 2017). When coupling HTN with tobacco abuse, obesity, poor nutrition, and alcohol excess, the risk of cardiovascular disease increases exponentially (Stephan et al., 2019).

Adequate treatment intensity by primary care providers and patient compliance with treatment recommendations is considered when choosing and implementing hypertension protocols or guidelines for healthcare workers. Another important component of HTN management is lifestyle modification, including weight loss and dietary changes, as well as medication titration to achieve desired BP goals (Hacihasanoglu & Gozum, 2011). The practice

improvement project implemented a HTN Clinic to help reduce the negative consequences of uncontrolled HTN. The HTN Clinic utilized treatment protocols to care for adult patients with uncontrolled HTN in a rural, primary care clinic through the use of collaborative efforts between nurses and primary care providers, including physicians and advanced practice registered nurses (APRNs). This collaborative approach served as a conduit to provide better education, improve access to care, BP monitoring and titration, and support for those with uncontrolled HTN in the designated rural community.

There is evidence to support optimizing BP goals to be less than or equal to (\leq) to 120/80 according to the SPRINT Trial of 2017 (The Sprint Research Group, 2017). This study included adults age 50 years or older with a diagnosis of HTN and at least one other cardiovascular disease risk factor. Twenty-five percent of the population studied were 75 years and older and 28% of the population had chronic kidney disease. The study compared systolic BP targets of \leq 140 mmHg with intensive BP targets of systolic BP \leq 120 mmHg, resulting in a 1.6% reduction of composite cardiovascular events and all-cause mortality when compared with the standard systolic BP control of \leq 140 mmHg (Hassid, Lash & Jackevicius, 2017). However, increased adverse events such as hypotension, acute kidney injury, and syncope occurred in the intensive systolic BP group showing a statistical significance to abandon the intensive systolic target values (Mezue et al., 2018).

As a result of this study, the American Academy of Cardiology (ACC) and American Heart Association (AHA) completed a trial comparing the ACC/AHA recommendations with the European Society of Cardiology (ESC) and European Society of Hypertension (ESH) HTN guidelines (Bakris et al., 2019). Both guidelines denoted updates of previous guidelines and supported former concepts of HTN prevention, specifically, low salt intake, physical activity,

weight loss, and minimization of alcohol intake (Bakris, Ali & Parati, 2019). Overall, the two guidelines both concluded that proper BP measurement, home BP monitoring, and lifestyle modifications were effective interventions. The major differences were the level of BP that diagnoses HTN, identification of BP metrics for treatment, and initial treatment with combination therapy. Although initial single-pill combination therapy was strongly recommended in both guidelines, the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH) guidelines recommended single-pill combination therapy as initial therapy in patients with BP at $\geq 140/90$ mmHg.

The ACC/AHA guideline recommends single-pill combination therapy in patients with a blood pressure $\geq 20/10$ mmHg above BP goal (Bakris et al, 2019). Therefore, the only identifiable difference between the two guidelines was that the ACC/AHA sustained that all patients with BP values $\geq 130/80$ mmHg were diagnosed with HTN with subsequent recommendations to optimize BP to $\leq 130/80$ mmHg for all patients. Alternatively, the ESC/ESH guidelines denoted HTN $\geq 140/90$ mmHg with a subsequent goal of $\leq 140/90$ mmHg. The purpose of reviewing these multiple guidelines was to show similarities in treatment goals and guidelines for proper HTN management and to emphasize the process for which the practice improvement project interventions were chosen (Bakris et al., 2019).

The Joint National Committee (JNC-8) guidelines are to initiate treatment for those ≥ 60 years of age for a BP $\geq 150/90$ mmHg and to initiate treatment for adults younger than 60 years of age for a BP of $\geq 140/80$ mmHg (Weber, 2014). For those with diabetes or chronic kidney disease, treatment is recommended for a BP $\geq 140/90$ mmHg regardless of age (Weber, 2014). For the purposes of this project with the partner organization, the JNC-8 guidelines will be used

in accordance with the current policy and protocol developed in this rural clinic and used by the collaborating organization.

The focus of this practice improvement project was to improve BP management at Essentia Health Grand Rapids (EHGR) rural primary care clinic in adult, uncontrolled hypertensive patients through the collaboration of primary care providers implementing nursing BP protocols. Given the respected nurse-patient rapport, registered nurses (RNs) were strategically included to help collaborate with primary care providers to improve BP control at EHGR. Establishment of an HTN Clinic pilot program was to be implemented into primary care that was to include HTN medication adjustment, lab monitoring, and lifestyle management education through protocols by nursing staff utilizing an agreed upon algorithm with provider oversight.

Problem Statement

Hypertension is the most important modifiable risk factor for heart disease and death (Oparil & Schmieder, 2015). Uncontrolled HTN increases the risk of cardiovascular disease and accompanying morbidity and mortality among adults (Stephen, Halcomb, McInnes, Batterham & Zwar, 2019). The World Health Organization (WHO) attests that HTN directly or indirectly causes up to nine million deaths globally every year (Kitt et al., 2019). Hypertension is often the result of insufficient provider treatment, poor patient compliance to medication regimen, and insufficient lifestyle modifications (Rose, Berlowitz, Orner & Kressin, 2007).

Rural status is a disadvantage for access to preventative health care services (Caldwell, Ford, Wallace, Wang & Takahashi, 2016). One specific barrier is access to appointments in primary care (MacQueen et al., 2018). Extensive research exists that supports preventative

measures, such as routine screening, chronic disease measurement, and health checks result in improved patient outcomes (Bakris et al., 2019; Ford et al., 2018).

Demographically, patients that reside in rural areas face additional prohibitive access to healthcare due to provider shortages (Mackinney et al., 2014). One-fifth of the US population reside in rural areas with less than 12% of physicians practicing in rural communities, thus requiring patients to travel greater distances to attain healthcare (MacQueen et al., 2018). As efforts to improve rural health care access have become more important, and as demographic and economic fluctuations are reshaping settlement patterns across the US, policy makers have implemented specific interventions to account for the greater need of rural health care (Mackinney et al., 2014). In MN, there are 87 designated rural health clinics (Minnesota Department of Health [MDH], 2014). The designated community chosen to implement the intervention in this practice improvement project qualifies as “rural.”

Implementing a collaborative BP titration protocol in a rural health primary care clinic could improve patient access to HTN management and possibly improve HTN management outcomes in rural, adult hypertensive patients. A partnership between providers, nurses, and patients can enhance and improve HTN outcomes (Patel et al., 2017). These interventions were to include standardized treatment protocols, patient empowerment, and team-based care. This practice improvement project was developed to provide the foundation for enhanced BP reduction strategies and, subsequently, possible reduced cardiovascular mortality and morbidity.

Purpose

The purpose of this practice improvement project was to increase patient access to adequate BP management opportunities and improve BP management for those with uncontrolled HTN through an interdisciplinary effort to implement a pilot HTN Clinic with

management protocols. Increasing access to rural healthcare providers may improve BP management for the rural residents, while also better utilizing resources for the clinic through an interdisciplinary effort between providers and nurses. Focusing on expanding access for BP monitoring and management through collaboration with nursing could result in more frequent health care visits with the nurse of the HTN Clinic versus waiting for openings with a primary care provider.

Measurements were to include provider quality indicators, number of patients seen and treated for BP, and BP readings for comparison. The practice improvement project included educational interventions for hypertensive patients with an emphasis on medication compliance and lifestyle modifications. The standardized treatment protocol (See Appendix F) served as a guide for nurses to titrate BP medications according to an algorithm reviewed and approved by providers, nurses and the administrator within the organization.

Project Objectives

The following are the project objectives to help guide the project:

1. Improve blood pressure management access for blood pressure control in adult, uncontrolled hypertensive patients in the rural primary care clinic by the end of the HTN Clinic implementation.
2. Develop an HTN management program that is efficient and benefits the patients, staff, and key stakeholders at the rural primary care clinic by the end of the practice improvement project.
3. Increase the percentage of controlled BP values in adult patients with uncontrolled HTN by 3% by the end of the HTN Clinic implementation according to the JNC-8 guidelines (BP \leq 140 mmHg).

4. Increase provider and staff perceptions of knowledge regarding best practice in hypertension management from the beginning of the HTN Clinic in-service to the conclusion of the HTN Clinic in-service and prior to implementing the HTN Clinic.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Literature Review and Synthesis

An extensive review of literature, which included articles involving human subjects, and indexed in PubMed, the Cochrane Database Library, The Agency for Healthcare Research and Quality, CINAHL, and other selected databases applicable to this project, was conducted between May 2018 to May 2019. Key search words included, but were not limited to: hypertension; primary care; ambulatory care; antihypertensive agents; hypertension protocol; alcohol intake; devices; BP goals; systolic; diastolic; diet; rural health; therapy; treatment; interventions; lifestyle measures; office visits; morbidity; mortality; performance measures; outcome; compliance; barriers; DASH, and rural health resulting in over 500,000 articles. The abstracts of 275 articles were reviewed, sorted by relevance to this project. The search was narrowed down using inclusion and exclusion criteria. Inclusion criteria included articles and data within the past ten years, rural geographical locations, peer reviewed articles, adult participants, settings in rural communities and participants with the diagnosis of hypertension. Exclusion criteria included editorials and letters, children and adolescents, and articles older than 2000.

According to the United Health Foundation Americas Health Rankings, in the past three years, cardiovascular related death has increased by over 2% per 100,000 people (Americas Health Rankings, 2018). Of statistical significance, there has been an 8% increase in primary care providers over the past two years per 100,000 people. Mostly, Nurse Practitioners (NPs) and Physician Assistants (PAs) have been the majority meeting the primary care needs as providers in rural areas. Although there may be more providers, the incidence of cardiovascular related deaths has increased. High BP affects people of all ages, education, and socioeconomic status. The

trends for high BP in the US revealed that individuals with less than a high school education and income less than \$25,000 annually dictated the highest rates of HTN (Americas Health Rankings, 2018).

Two main factors contributing to uncontrolled HTN exist according to the literature: provider prescribing practices and suboptimal patient adherence to medications and/or recommended lifestyle changes (Rose et al., 2007). Specifically, in a rural setting, demographic and socioeconomic factors and the health care team can all be associated with non-adherence (Bernier & Egan, 2019). Healthcare providers need to recognize that drug adherence is a major contributor to uncontrolled HTN. The two main factors related to HTN control are adequate dosing of prescribed BP medications and adherence with therapy (Burnier & Egan, 2019). Providing patients with education and self-management strategies has shown enhanced effectiveness in improving BP control (Proia et al., 2014).

Hypertension Prevalence and Risk Factors

Blood pressure is the force of blood in the arteries during circulation. Normal BP levels in the arteries is ≤ 120 mmHg systolic (the peak vessel pressure measurement), and ≤ 80 mmHg diastolic (the measurement of the vessels when the heart is at rest). When the BP reaches ≥ 130 mmHg, and/or ≥ 80 mmHg diastolic and is sustained, a condition known as HTN develops (Benjamin et al., 2018). In the US, over 75 million people have high BP and less than half are controlled (CDC, 2019). The estimated annual cost of HTN is greater than \$50 billion and is projected to reach nearly \$220 billion of direct costs over the next 15 years (Nelson, Whitsel, Khavjou, Phelps & Leib, 2016). High BP increases with tobacco use, obesity, physical inactivity, poor diet intake, high sodium intake, and excessive alcohol use (Benjamin et al., 2018).

Age, ethnicity, rural designation, and low-income status can all influence the probability of HTN (Khatib et al, 2014). Statistical data obtained by the National Health and Nutritional Examination Survey (NCHS) from 2015-2017 concluded that the prevalence of HTN was 29% and increased with age; the age groups were: 18-39 years, 7.5%; 40-59 years, 33.2%; and 60 years and older, 63.1% (Fryar, Ostchega, Hales, Zhang & Kruszon-Moran, 2015). Hypertension prevalence is higher among non-Hispanic blacks averaging $\geq 40\%$, compared with non-Hispanic whites at \geq than 27%. Additionally, the non-Hispanic Asian HTN rates compared to the overall US population was $\geq 25\%$ and Hispanics at $\geq 27\%$ (Fryar et al., 2015; Lackland, 2014). According to the World Population Review, the population of Minnesota is 83.8% white, 6% black or African American, 4.7% Asian, 1.1% Native American, and 4.6% of the population is not classified (Minnesota Population, 2019).

The small rural community of interest has $\geq 94\%$ white population and 1.4% American Indian with the remainder of the population being of mixed ethnicity (City-Data, 2019). According to the City Data (2019) for the rural community of interest, the median resident age is 42.1 years. The percentage of residents living in poverty in this small rural community is 17.8%. According to the Data USA for Grand Rapids, MN, 93% of residents have health insurance and, of those patients, primary care physicians in Grand Rapids, MN, see 1,111 patients annually on average, which represents a 0.6% increase from 2018 (Data USA, 2019). The data provided can serve as supporting references for the demand to address the barriers listed below.

Barriers

The health and economic challenges faced by many rural residents in the US have recently become the focus of rising nationwide interest, generating an important opportunity to address many of these long-standing issues (James et al., 2017). Rural communities are typically

less racially and ethnically diverse than urban areas, have decreased access to healthcare, and experience worse health outcomes. Rural populations within the US and worldwide have an increased likelihood of developing HTN (Bale, 2010). Limited access to healthcare due to rural geographical location or socioeconomic status pointedly impairs control of HTN in rural designated sites, which results in poorer health outcomes. Epidemiological studies suggest that the prevalence of uncontrolled HTN are affected by race, increasing age, and residence in the rural US (Mainous, King, Garr & Pearson, 2004).

Of the rural population, 11% of whites have undiagnosed or undertreated HTN. Health inequalities associated with HTN have been recognized as an important public health concern in low- and middle-income settings (Sarki, Nduka, Stranges, Kandala & Uthman, 2015). The data supports the need for improved access and support to healthcare in rural settings specifically in the rural community of interest. Changing and optimizing the delivery of rural health care is needed to improve outcomes in patients with HTN (Bale, 2010). Strategies, such as programs targeting therapeutic inertia and collaboration between nursing and providers, may significantly improve HTN control rates among rural populations (Bale, 2010).

The Community Preventative Services Task Force (CPSTF) was created in 1996 by the United States Department of Health and Human Services as a conduit for identification of specific evidence-based health interventions that may help save lives, lengthen lifespans, and improve life quality (United States Government, 2019). The CPSTF issued a recommendation in support of team-based care resulting in improved blood pressure outcomes substantiated by strong evidence-based on findings from 80 studies looking at team-based BP management (Community Preventative Services Task Force [CSPSTF], 2012).

The teams consisted of nurses, pharmacists, primary care providers, and patients working in collaboration to improve BP control. The collaborative team provided BP support and shared duties of BP care to complement the actions of the primary care provider (CSPSTF, 2012). The responsibilities that nurses undertook included medication management through developed protocols, facilitation of communication between providers and patients, establishment of regular follow up, and enhanced use of evidence-based guidelines (CSPSTF, 2012). Interdisciplinary team approaches through the CSPSTF provides evidentiary support that the efforts and objectives of this project may improve patients' hypertensive outcomes.

Consequences of Uncontrolled High BP

Uncontrolled HTN is associated with increased cardiovascular morbidity and mortality and an increased use of health care utilization yielding approximately \$49 billion spent annually in direct and indirect medical expenses (Merai, Siegel & Rakotz, 2019). Seventy-seven percent of persons who have a single, first stroke have uncontrolled HTN. Of the 35 million U.S. residents who have uncontrolled HTN, 81% (30 million) have health insurance. Of Americans that hold the diagnosis of uncontrolled HTN and have health insurance, 83% of those have a usual source of care. Although over two-thirds of the people with HTN have insurance, their HTN still remains uncontrolled. These current statistics expose gaps and barriers in the current health system that, if addressed, could lead to improved control of high BP for Americans resulting in a considerable reduction in HTN associated mortality and morbidity (Merai et al., 2019).

Physical consequences of uncontrolled HTN include heart attack, stroke, death, heart failure, kidney disease, memory decline, headache, dementia, depression, anxiety, and metabolic syndrome (Mayo Clinic, 2019). Patients with uncontrolled HTN versus controlled BP have

increased the risk of new-onset heart failure (Iyer et al., 2019). Untreated HTN affects the body, both short and long term, causing microvascular damage (Iyer et al., 2019). High BP causes blood-brain barrier breakdown by mechanisms involving inflammation, oxidative stress, and vasoactive circulating molecules (Pires, Ramos, Matin & Dorrance, 2013). A chronic and gradual increase in arterial pressure is associated with cognitive decline and dementia in older individuals (American Heart Association [AHA], 2019).

The Million Hearts Initiative is a United States Department of Health and Human Services action that emphasizes focusing on efforts of federal agencies, state and local governments, health care teams and systems, community-based organizations, employers, and persons, with the overall goal of preventing one million heart attacks and strokes by 2017 that is still in effect today (Benjamin et al., 2018). High BP is a major modifiable risk factor for heart attacks and strokes; thus, one major Million Hearts objective is to increase by 10 million the number of persons in the US whose high BP is controlled as an ongoing goal. To achieve this, Million Hearts aims to enhance detection and control of HTN by facilitating more accurate BP measurement and monitoring, improving BP treatment, and increasing awareness of HTN in populations considered at increased risk (Benjamin et al., 2018). Healthy People 2020 has six objectives related to BP including 10% reductions in both the proportions of adults and the proportions of children with high BP by 10% by the year 2020 (Healthy People, 2019).

Treatment Barriers

Blood pressure control in Americans presently is less than the optimal goal of less than or equal to (\leq) 140/90 mmHg, yielding only 54% of people controlled, despite the availability of evidence-based treatment guidelines and a wide variety of antihypertensive pharmacotherapy options (James et al., 2014). Potential barriers to optimal BP control include patient, provider,

payer, and pharmacologic barriers. Patient barriers include low health literacy, access to healthcare, high cost of drugs, and financial restrictions (Georgopoulos, 2012).

Provider-related barriers include lack of HTN education, poor communication/rapport with patients, lack of practice, and clinic structure fostering therapeutic goals through effective patient monitoring, lack of technological investment necessary to facilitate patient monitoring, time constraints, and competing priorities (Khatib et al., 2014). Payer related barriers include high cost of prescription medications including tiering payments and formulary placement, lack of clinical reimbursement that is not face-to-face, and lack of provider incentives (Khatib et al., 2014). Lastly, adverse effects of drug therapy and the complexity of medication regimen can have a negative impact on HTN management (Georgopoulos, 2012).

Other barriers impacting hypertensive outcomes include the healthcare system, patient intention, and patient capability (Khatib et al., 2014). Healthcare system barriers that patients in a rural setting may experience include availability of resources, affordability, mode of delivery, and acceptability of healthcare. Limitations in the extent of the control of high BP are commonly attributed to lack of access to healthcare, noncompliance with treatment, and a disproportionate burden of HTN among minorities (Nesbitt & Palomare, 2016).

Hypertension is one of the leading reasons for office visits to providers in the US, subsequently leading to the extensive treatment of high BP as a major contributor to the decline in the prevalence of heart disease and stroke over the past thirty years (Hyman & Palvic, 2001). Despite the increase in access to hypertension visits, the percentage of patients that have controlled BP, defined as $\leq 140/90$ mmHg, has yielded less than satisfactory results for adequately controlled blood pressure values (Pires, Ramos, Matin & Dorrance, 2013). According to the National Health and Nutrition Examination Survey (NHANES) an average of

30% of all patients with HTN are not aware of their condition resulting in no treatment, 15% are aware of having HTN but do not seek treatment, and an average of 26% of patients have treated their HTN, yielding only a total of 27% having controlled high BP (Fryar et al., 2015).

Diagnosis

The diagnosis of HTN is made when the BP is $\geq 140/90$ mmHg on two separate occasions (Hernandez-Vila, 2015). Blood pressure can be highly variable, and diagnosis should not be based on a single BP measurement (National Clinic Guideline Survey, 2011). Patients with suspected high BP should undergo repeated BP measurements in the clinic to confirm the diagnosis of HTN. Patients should sit in a relaxed position with feet flat on the floor after 5 minutes of resting (AHA, 2019). Blood pressure measurement is obtained with either an automated BP cuff or a trained healthcare professional that uses a stethoscope and sphygmomanometer. The size of the cuff should be measured to fit each patient individually (AHA, 2019).

Treatment Recommendations

Treatment guidelines, according to the Eighth Report of the Joint National Committee on Prevention Detection, Evaluation and Treatment of High BP guideline, emphasize proper BP measurement (Whelton et al., 2018). The JNC-8 guidelines have been chosen for this project according to the organizations previously developed protocol. The JNC-8 guidelines recommend the following: 1) pharmacological intervention is recommended in the general population for those with a BP $\geq 150/90$ mmHg in adults 60 and older or $\geq 140/90$ mmHg in adults ≤ 60 years of age. 2) pharmacological intervention should be initiated in patients with HTN and diabetes with BP $\geq 140/90$ mmHg or higher regardless of age (American Family Physician [AFP], 2014).

Patients diagnosed with HTN are required to have BP measurements based on two or more readings on two separate occasions to estimate the level of BP out of office and account for self-monitoring. The importance of screening and managing other cardiovascular risk factors in adults that have HTN and tobacco use, diabetes, hyperlipidemia, obesity, physical inactivity, poor diet, psychosocial stress, and/or sleep apnea is imperative. Current guidelines suggest basic screening for primary HTN to include a fasting blood glucose, complete blood cell count, fasting lipids, basic metabolic panel, thyroid stimulating hormone, urinalysis, and possible echocardiogram (Whelton et al., 2018).

Non-pharmacologic interventions that may reduce BP include weight loss of 10% or more for overweight or obese people, a heart healthy diet, sodium restriction, potassium supplementation, and physical activity of 150 minutes weekly (AHA, 2019). Men should be limited to no more than two alcoholic beverages daily and women no more than one standard alcohol drink(s) per day (Whelton et al., 2018).

According to the ACA and AHA, the Atherosclerotic Cardiovascular Disease (ASCVD) risk algorithm determines the ten-year lifetime risk of having heart disease or stroke (Rosenblit, 2019). The advantage of pharmacologic initiation for BP reduction is associated to atherosclerotic cardiovascular disease (ASCVD) risk for primary prevention in adults with no prior history of cardiovascular disease but have an estimated 10-year ASCVD risk of $\geq 10\%$ and systolic BP (SBP) of ≥ 130 mmHg or diastolic BP (DBP) of ≥ 80 mmHg. Initiation of BP lowering medication is recommended for primary prevention of cardiovascular disease in adults without a history of CVD and with an estimated 10-year ASCVD risk $\leq 10\%$ and SBP ≥ 140 mmHg or a DBP ≥ 90 mmHg (Whelton et al., 2018).

Recommended follow-up for patients with stage one HTN and low risk HTN should be followed up after 3-6 months of non-pharmacologic therapy. Adults with stage 1 HTN and high ASCVD risk of $\geq 10\%$ should be initiated with both non-pharmacologic (lifestyle modifications) and antihypertensive drug therapy with a repeat BP in 2-4 weeks. Metabolic syndrome can be positively impacted by lifestyle modification that focuses on improving insulin sensitivity through dietary modification, weight reduction, and moderate physical activity (Merai et al., 2019).

Hypertension treatment is advised for adults ≥ 65 years of age with an average SBP ≥ 130 mmHg with SBP treatment goal of ≤ 130 mmHg. For adults ≥ 65 years of age with high BP and a large burden of comorbidities, provider clinical judgment, patient preference, and a team approach to assess the risk versus benefit for decisions regarding treatment intensity of antihypertensive drugs is needed (James et al., 2014; Whelton et al., 2018). The current guidelines recommend that all adults should have a detailed and current evidence-based plan of treatment that guarantees the provision of treatment and self-management tactics, proper management of comorbid conditions, accurate and timely follow up with the healthcare team, and adherence to the cardiovascular evidence-based guidelines (Whelton et al., 2018).

Due to the lack of optimal BP control in the US from the late 1980s to early 2000s, the National Committee for Quality Assurance (NCQA), which sets expectations and standards for managed care organizations (MCOs), added HTN control to the quality-assessment parameters (Singer, Izhar & Black, 2004). A study was completed to assess the effectiveness of quality improvement (QI) strategies in improving and optimizing BP in the US population (Walsh et al., 2006). The trial consisted of controlled before and after studies, and episodic time series assessing QI interventions targeting high BP control and reporting BP outcomes. The QI

strategies were subdivided into categories including provider education, provider reminders, patient education, self-management strategies, and team feedback. Patients in the intervention groups experienced a greater reduction in their SBP and/or DBP compared to the control group. There have been median increases in the percentage of individuals achieving target goals for SBP. Researchers indicated that focusing on high BP management by someone in addition to the patient's physician was associated with a significantly greater improvement in BP (Walsh et al., 2006).

A variety of approaches can improve and optimize BP control throughout the US. Collaborative efforts between patients, providers, and the community are at the forefront of optimization of BP control. The CPSTF has found strong evidence in the effectiveness for interventions that engage community health workers in a team-based care model to improve HTN (The Community Preventative Task Force [CSPTF], 2015). The CPSTF found satisfactory evidence for effectiveness of interventions including health education, outreach programs, enrollment and information agents to increase awareness of physical activity, dietary modifications, and tobacco cessation. The CDC has implemented evidenced based interventions for payers (CDC, 2018). These include low or no copayment for medications, 90-day supplies, innovative pharmacy packaging, standardized protocols for HTN management, medication therapy management programs, self-monitoring of BP with clinical support interventions, and improved care coordination within network primary care teams (CDC, 2018).

A study conducted by Bosworth et al. (2008) reviewed the outcomes of patient only, provider only, and the combination of patient and provider-focused interventions. The provider only group utilized best practice alerts through the electronic medical record (EMR), and treatment recommendations were built into the specific lab values and comorbidities of the

patient panel. The second group, which consisted of patients only, received nurse phone calls reviewing lifestyle modifications and HTN education. The third group was a combination of provider best practice alerts and HTN education through clinical staff. The researchers found no substantial statistical change in BP across the three groups. However, the greatest improvement of BP was found in the second and third group which included patient education. Bosworth et al. (2008) showed the benefit of patient engagement and education. In this study, the combination of both a tailored behavioral self-management intervention, self-monitoring home BP interventions, and provider pharmacotherapy treatment improved BP control among patients in the primary care setting. Therefore, there exists a positive correlation between provider and patient interventions to achieve the greatest success in BP improvement (Bosworth et al., 2008).

In the US, the extensive improvement in BP control over the last decade coincides with a greater number of antihypertensive medications prescriptions per each patient (Burnier & Egan, 2019). There are a substantial number of adults that are living with uncontrolled BP despite a variety of options for treatment. Of greater concern, lower income areas, such as in rural health, have higher rates of uncontrolled BP. The relationship quality between the patient, clinician, and the patient centeredness of treatment directly impact adherence (Osterberg & Blaschke, 2005).

Suboptimal adherence includes failure to initiate pharmacotherapy, patient compliance, and persistence on therapy long term (Burnier & Egan, 2019). As healthcare providers, there is evidence to support shared decision making on management, ensuring that patients understand the disease and consequences of the not receiving treatment, facilitation of BP self-monitoring, and effective medication titration to optimal levels (Vrijens, Vincze, Uruhart & Burnier 2008).

Quality Measures

In Minnesota (MN), quality measures or “metrics” are target measures that are driven by the MN Community Conceptual Measurement, an organization that originated in 2000 in an effort to reduce health care costs and improve patient outcomes (MN Community Measurement, 2019). The recommendations from the MN Community Measurement Committee for optimizing blood pressure control include:

- Adults age 18-59 BP targets $\leq 140/90$ mmHg
- Adults age 60-85 with diabetes BP Targets $\leq 140/90$ mmHg
- Adults age 60-85 without a diagnosis of diabetes BP targets $\leq 150/90$ mmHg
- Non-Tobacco User

These recommendations are in alignment with the current protocols for HTN management within the organization.

Theoretical Framework

Nola Pender’s Health Promotion Model (HPM) provides a simple and clear structure that worked well for implementation of the HTN Clinic. The model allows for the planning, intervention, and evaluation of HTN protocols guided by providers and the literature for nurses in primary care. Pender created the HPM using the expectancy and social values. The HPM is widely used to plan for and change unhealthy behaviors and promote health (Khodaveisi, Omid, Farokhi & Soltanian, 2017). The model is based on social cognitive theory according to which perceived benefits, barriers, and self-efficacy influence patient engagement in health promoting behaviors. The HPM was used to assess biological, psychological, and sociocultural factors that are predictive of patient behavior as it correlates to HTN within the HTN Clinic. The model is inclusive of patients’ commitment to health promoting behaviors. The HPM has been used to

explain and predict a person’s behavior and alter the response by implementing the health promoting behaviors.

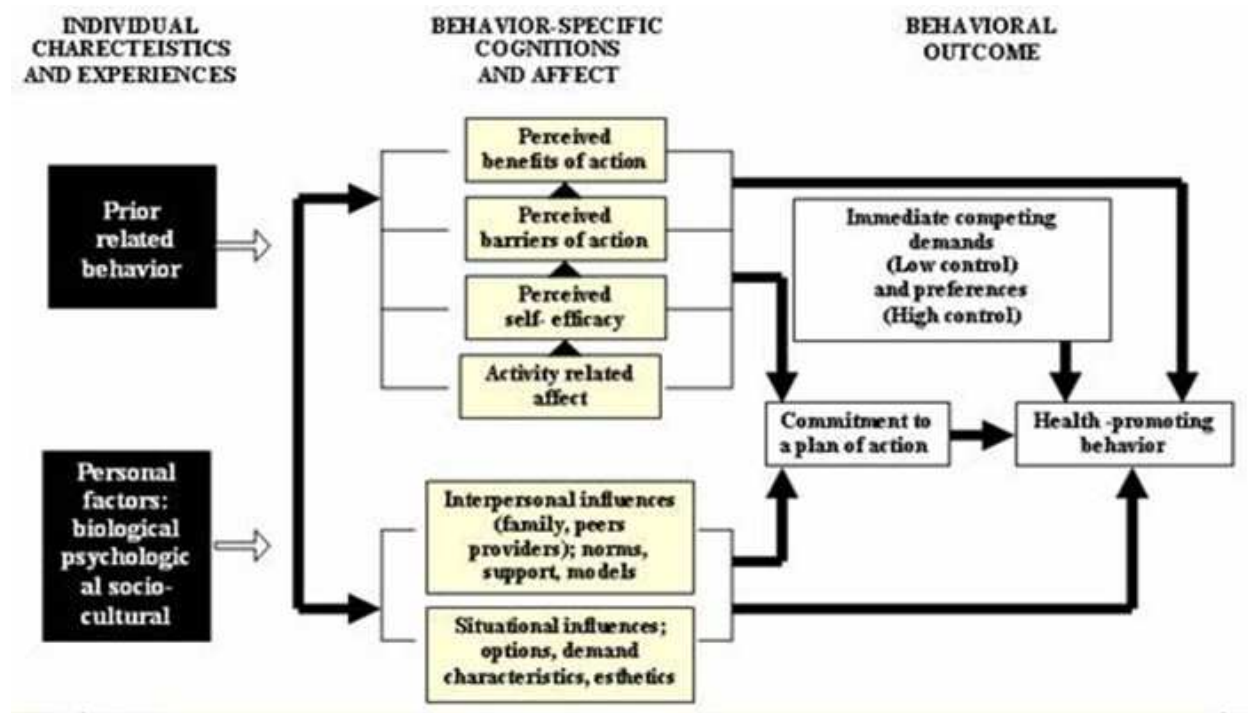


Figure 1. Nola Pender’s Health Promotion Model. (Current Nursing, 2010, *Health Promotion Model*. Retrieved from http://currentnursing.com/nursing_theory/health_promotion_model.html).

The HPM model was chosen to guide the project to support and enhance the patient, nurse, and provider engagement emphasizing on improved outcomes. By applying the Pender HPM, the patient is empowered to make a healthy difference in his or her life to better take the initiative to manage his or her own HTN. Four assumptions from the model were applied to the HTN Clinic. First, patients presenting to the HTN Clinic were actively seeking to regulate their health behaviors (Ho et al., 2010). The second assumption was that each patient is complex and interacts and transforms with the healthcare environment, along with being transformed by the healthcare environment over time. Health professionals, such as nurses and providers make up part of the dynamic environment to influence patients throughout their time being seen in the HTN Clinic reflects the third assumption. Finally, the fourth assumption was that patients need to

initiate behavior changes as a result of interacting with health professionals within the HTN Clinic in order to be successful in lowering blood pressure outcomes (Ho, Berggren & Dahlborg-Lyckhage, 2010).

The HPM focuses on three main areas including individualized characteristics and experiences, behavior-specific affect and cognitions, and outcomes from those behaviors (Pender, 2014). Motivational interviewing (MI) is a counseling technique that activates the patient's capability for beneficial change and enhances motivation to make the changes to achieve a desired outcome (Miller & Rollnick, 1999). The co-investigator worked with the RN supervisor to assign MI training to both RNs that would be working in the HTN Clinic. The organization agreed this would be a supportive element for patient care in all areas of education including tobacco cessation and diabetes management.

The two RNs were trained in MI over two scheduled eight-hour days through a series of online modules. The RNs used MI to directly counsel patients through the HTN Clinic. Through MI, individual characteristics of each patient were examined to identify the hypertensive patients' prior related behaviors that may have been contributing to high BP. Additionally, personal factors such as food limitations, financial status, and underlying conditions, such as depression or anxiety, were considered when educating the patient.

Through the model utilization, the patient was asked what their perceived benefits of improving their BP were. Identifying the perceived actions of what the patient expects to be required to do could improve his/her BP. Also, a review of personal influences, such as family members or children, were to influence the ability of the patient to improve his/her BP. Identifying each patient's behavior specific cognitions and perceived benefits of controlling BP can influence the outcome, which is BP control.

Educating the patient on the pathophysiology and long-term effects associated with HTN provided the patient with the knowledge to make decisions that could improve their HTN, such as salt restriction. The patient was taught the chronic nature of HTN and the effects on all the body systems. For example, patients with HTN who were eating a high sodium diet were educated and supported by nursing staff during visits in the HTN Clinic on how high salt intake increases their risk of higher BPs, thus leading to more risk for heart attack or kidney disease. Nurses discussed the importance of returning for another BP recheck, set the visit up per the protocol, and follow-up on the sodium education to further discuss the patient's perceived benefits from lowering salt intake (benefit of action) and alternatives to salt (possible barriers of action) to make the lifestyle change of lowering salt intake (health-promoting behavior) and, thus, lowering BP values.

Patient engagement in health promoting behaviors is essential to HTN control. The Pender HPM puts the patient in the driver seat of his/her healthcare. This model focuses on the relationship between the patients' personal characteristics and life experiences, behavior specific thought processes, and behavioral outcomes. The HPM model integration assumes that each patient in the HTN Clinic will maintain an active role in his/her life to create healthy behaviors. Healthy behaviors include sodium reduction, weight loss, physical exercise, tobacco cessation and limitation of alcohol. The model encourages patients to change their environment to support these behaviors.

A study conducted at a small rural village outside of the US, assessed the effects of the application of Pender's Health Promotion Model on management of adults with HTN and found that there was statistical significance in improvement of BP control for the study group compared with the control group (Hussein, Salam & Sayed, 2016). In addition, nurse led HTN

interventions were found to be successful in improving knowledge, lifestyle behaviors, and HTN control in adults in the study group compared to the control group. Therefore, utilization of Pender's HPM can increase awareness about risk factors of high BP and the disease process, which is essential to empower and motivate patients to adopt healthy lifestyles and adhere to medication management and prevent complication (Hussein, Salam & Sayed, 2016).

As another example, in rural areas, access to food can be limited by financial constraints or other factors such as transportation limitations. Rural shoppers may rely on more expensive and less healthy food, such as the types available at gas station convenience stores (Rural Health Information Hub [RHIHub], 2019). Some rural residents and households can be food insecure, meaning they cannot rely on access to nutritious and affordable food, which can increase the risk of high blood pressure and poor outcomes (RHIHub, 2019). Utilizing the HPM to assist the patient in engaging in dietary modifications and weight loss improves HTN outcomes by teaching patients to find and access healthy alternatives within their community.

Quality Improvement Method

The improvement model was the framework to guide the implementation process of this project and was developed by Associates in Process Improvement for use by the Institute of HealthCare Improvement to lay the foundation for quality improvement projects (Institute for Healthcare Improvement, 2019). The Plan-Do-Study-Act (PDSA) model tested for change within the project, including testing, planning, trialing, and observing results and acting on result of what has been learned (Plan Do Study Act, 2013). See Figure 2 for the PDSA Cycle of implementation.

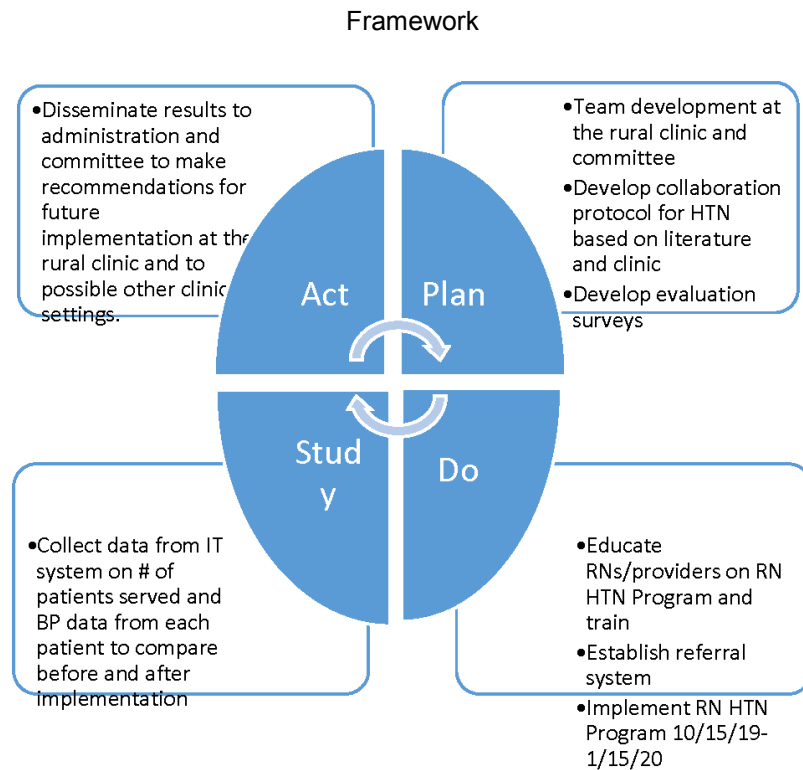


Figure 2. PDSA for Hypertension Services Project at Essentia Health, Grand Rapids, MN.

The “Plan” phase consisted of gathering the interested liaisons from the organization to discuss potential needs of the organization and community to better determine the need and intervention, such as the HTN Clinic via protocols already developed and used in other settings within this same organization. This phase also consisted of forming the practice improvement project committee and developing the review of literature to support the need and intervention.

The “Do” phase was the actual implementation phase of the HTN Clinic. This step also involved meetings with administration to ensure support with nursing staff, providers, and IT care in order to establish referral links within the EHR system, provider and staff cooperation, and staffing obligations. Also, the co-investigator desired to work with marketing from the organization to promote the service within the community, however this aspect was never completed due to time constraints.

The “Study” phase entailed of regular communication check-points with administration and staff to determine what was working well and what needed to be improved in order to keep the HTN Clinic running smoothly and remove any obstacles that might have arisen. Also, the co-investigator partnered with the IT department in order to obtain aggregate data on BP metrics (which are goal “metrics” or values of BP as defined by $BP \leq 140/90$ mmHg) at baseline of the patient being referred to the HTN Clinic compared to four weeks after the HTN Clinic implementation at the conclusion of data collection to see if there was indeed BP reduction individually for patient referrals and for the HTN Clinic as a whole. If trends were observed, such as a noticeable drop in patients referred to the HTN Clinic, then perhaps changes could have been made with either the process of referrals or marketing, thus communication with key stakeholders was important during this phase. In addition, the results were evaluated to determine meaningful relationships in order to present to the organization at the conclusion of the practice improvement project. Due to limited implementation times, no changes were needed.

The “Act” phase incorporated the results with the co-investigator’s recommendations to the organization’s administration, providers, and nurses to allow for feedback on the practice improvement project and the HTN Clinic process. The co-investigator also surveyed providers and nurses to ascertain the likelihood of the organization continuing the HTN Clinic in the future considering the results. The co-investigator was able to apply the quantitative data and qualitative feedback from this phase in order to further improve recommendations to similar practice improvement projects in the future regarding the HTN Clinic.

CHAPTER 3. PROJECT DESIGN

Congruence to the Organizational Goals

The organizational goal is to make a healthy difference in people’s lives (Essentia Health, 2019). The belief statement from Essentia is “We believe in having a meaningful presence in the communities we serve” (Essentia Health, 2019). Improving HTN metrics improves morbidity and mortality, subsequently resulting in improved patient outcomes. The values supported in this practice improvement project, including quality, hospitality, respect, joy, justice, stewardship and teamwork, were congruent with the mission values of the organization. This practice improvement project supported integrated health care services and the synergistic support of the soul and science of healing. The practice improvement project and the mission of the organization were aligned to “continually improve the people that are served”, which can be accomplished by improving patient BPs (Essentia Health, 2019).

Project Design

Plan

A preliminary discussion with the organization’s administration was completed to identify the current HTN management practices and the gaps in evidence-based practice via discussions, observations, and data review at Essentia Health Grand Rapids (EHGR) Clinic. The providers and nurses were informally questioned about the needs felt to benefit the practice. After a discussion with the clinic supervisor, chief medical officer, and clinic administrator, improving BP outcomes was determined to be a need regarding current resources available within the organization. Some clinics within the same system had already implemented HTN protocols into primary care, but not in this same rural setting; therefore, resources were already available, and a design could already be modeled within the rural clinic setting.

After discussing the administration and provider requests in improving BP metrics, two medical doctors (MD), six NPs, and five registered nurses (RNs) were interested in implementing the HTN Clinic. After implementation of the practice improvement project, one MD, one NP, and three RNs left the EHGR Clinic for their own reasons unrelated to this project, and, therefore, the actual number of providers was one MD, five NPs, and two RNs. The co-investigator then developed a committee and gathered the available evidence to support the practice improvement project. Some clinics within the same system had already implemented HTN protocols into primary care, but not in this same rural setting; in addition, no formal data had been collected for comparison, although some verbal feedback was provided.

A review of the current staffing was completed. The current RN staffing was two fulltime RNs. Data was pulled by the clinic supervisor yielding findings that there was enough RN allocated time available with the current staffing needs of the EHGR clinic for implementation of the HTN Clinic into the workflow. The RNs agreed that they also were agreeable to work to the full extent of their licensure, and therefore, would find value in working in the HTN Clinic in their current schedules.

Meetings were scheduled with the clinic supervisor, clinic administrator, two RNs, and the chief medical officer to discuss logistics and review the current protocol and establish a time for the educational session on the BP protocol with HTN management (See Appendix F & Appendix G). After IRB approval, the co-investigator confirmed the project implementation phase with the department manager within the organization. Prior to implementation of the HTN Clinic, data was pulled from the clinical dashboard in the EMR at the EHGR site with the diagnosis of HTN that is uncontrolled per the IT department regarding BP metrics and access to appointments before implementation of the HTN Clinic and provided to the co-investigator as

baseline data. A workflow was created in collaboration with IT and the co-investigator which included provider “triggers” within the EMR to initiate a referral to the HTN Clinic by the provider if the patient qualified for BP titration protocols, which provided the nurse with the capability of utilizing and adjusting medications per a protocol guide.

Do

The co-investigator coordinated with the department training liaison to provide an in-service for the two RNs regarding education on the HTN protocols for medication management and flow of patient visits to the HTN Clinic. The co-investigator organized two cohorts of EHGR staff, including providers and nurses, to be educated on the HTN clinic through a series of in-services and online training. A meeting was also scheduled with all medical staff on a regularly scheduled Monday morning meeting to announce to providers and staff the plan for the HTN Clinic format, training, and implementation dates.

The co-investigator delivered information regarding HTN through a PowerPoint presentation (Appendix G) in two separate in-services taught by the co-investigator. The first cohort included two full-time RNs who were required to complete the educational components of the online HTN Training. The co-investigator assigned each nurse training in the Primary Care Portal titled as: RN Role Education Hypertension Modules. The information in the modules included: HTN protocol, HTN competency, HTN Handoff Workflow from APRN/PA to RN, Blood Pressure Measurement, Standard Documentation text for Hypertension Visits, Team Based Care, Motivational Interviewing to Promote Health, Blood Pressure Protocol, and Lifestyle Changes. Required completion from each module was tracked with each participant gaining a “receipt” of completion by nursing. The co-investigator assisted each nurse through to the completion of the modules.

The nurses were required to attend a 60-minute in-service and PowerPoint presentation for a comprehensive review of the information. The in-service covered evidence based HTN information including pathophysiology, complications, current statistics, pharmacology, and lifestyle modifications. A three-ring binder which contained the HTN power point, HTN Clinic Protocol, Lifestyle Modification Resources, work-flow pamphlet, and contact information for the co-investigator were given to the RNs. Twenty minutes were allotted for questions and review of the material. The RNs were required to take a competency exam pertaining to the protocol and education that was delivered. The RNs had to achieve 100% pass rates in order to work in the HTN Clinic. Only the RNs that passed the exam and attended the educational session were qualified to rotate as an RN in the HTN Clinic and utilize the protocols.

The 10-point competency exam for the HTN management protocol was provided to each nurse (Appendix J). The results of the completed competency exam were collected by the manager and provided to the co-investigator after completion of the competency exam to evaluate this objective. The competency results were shared with the clinic supervisor which ensured completion of the assigned education for each staff member in a timely manner. The completed competencies were placed in the employees' permanent files. Both RNs were assigned MI online modules and successfully completed the training over two regularly scheduled days. the HTN Clinic continues, nursing staff will be required to complete the educational competency component annually.

The provider education component was completed via a PowerPoint presentation at their Medical Staff Meeting and was documented in their meeting minutes. Providers were given a series of questions in the PowerPoint pertaining to HTN management and verbally answered all posed questions with 100% accuracy. Following the in-service, a review of the information was

informally elicited between providers and the co-investigator. A five-point Likert scale survey was given to each provider at the conclusion of the in-service that was developed by the co-investigator. The questions were focused on the content that was provided in the PowerPoint seeking feedback if additional insight and knowledge was gained following the in-service. Additionally, three providers not in attendance were provided an individualized in-service regarding the HTN Clinic. The in-service included evidence-based information on HTN pathophysiology, management and complications. The providers were required to review the protocol to determine their level of support for the implementation of the project.

Upon the HTN Clinic implementation, patients meeting the criteria of 1) diagnosis of HTN, 2) Adult, and 3) uncontrolled BP measures upon presenting to the clinic for any visit type triggered a “Referral to HTN Clinic” and “Implement BP Protocols” alert in the EMR system for the provider to initiate. The provider seeing the patient initiated the referral as he or she decided as appropriate to the patient case. The referral was then sent to the front desk schedulers and a thirty-minute appointment was made for the patient and HTN RN within the HTN Clinic the same day as the provider visit, or another day, depending on the patient and nurse availability.

The HTN Clinic nurse visit was recognized as a nurse visit that was billable to the patient’s insurance without any incurred actual patient cost. Follow up visits were to be scheduled per the protocol and specific needs of the patient. The chart was to be routed for the ordering provider to review following the HTN Clinic RN visit. Anything falling outside the parameters of acceptable HTN values as referenced in the protocol were required to be routed to the ordering providing for further evaluation and determination for the next step for that patient. Patients were asked to wait in the waiting room until the HTN RN retrieved him or her when

ready for the visit. The nurse then initiated interventions according to the protocol (see Appendix F).

During the nurse visit in the HTN Clinic (if the patient had not been seen by the provider the same day) the patient scheduled was to have a full set of vital signs obtained and chart review including current medications and allergies. If the patient was seeing the nurse following his or her office visit with the provider, he or she was not required to get a full set of vitals if already done prior to the visit that same day. A BP was to be taken at the beginning of the visit after sitting for a minimum of five minutes and taken again before leaving the visit and recorded into the EMR. The RN provided the patient with HTN education and handouts that might have included any of the following: dietary modification, stress management, avoidance of tobacco, and/or physical activity. The educational material was already evidence-based and provided through the clinic's current available resources through the Krames website and were to be available in a folder format as handouts for each patient. During the visit the HTN RN utilized the algorithm if the patient met all the criteria for the protocol.

In cases where patients did not meet the protocol criteria, the encounter was to be routed to the primary care provider for review of the current status. Patients that met the protocol were to be managed by the HTN RN according to the protocol. A follow up visit according to the protocol was to be scheduled by the front desk registration upon check out and communicated to each patient. Patients were to be followed with the program for four weeks during this practice improvement project due to time constraints. One RN per day was to be staffed in the HTN Clinic two days per week for the full four weeks to ensure availability for the HTN Clinic.

Study

The co-investigator met with providers, RNs, and the clinic administrator at the after two weeks of implementation to gather verbal feedback regarding the HTN Clinic to ensure the process was running smoothly and to determine if any adjustments were needed to be made to either capture more data, change the process, enable more feedback, address obstacles, or discuss improvements. An additional survey was provided to providers/RNs at the conclusion of the implementation phase in order to evaluate the program, any suggestions for improvements, and intent to continue the program. The survey consisted of 10 questions evaluating the HTN Clinic (See Appendix B). The co-investigator gathered qualitative feedback pre- and post-implementation of the HTN Clinic through a focus group.

Secondly, the providers were given a HTN workflow “cheat sheet” for quick reference which included the EMR referral code, nursing staff eligible to manage patients, and the scheduling process for HTN Clinic visits. The co-investigator disseminated results of the project to leadership to increase their knowledge and probable intent to continue the HTN Clinic in the future. The co-investigator met with the senior leaders, healthcare providers and nursing staff post implementation to disseminate the results of the HTN clinic and inform staff of successes and challenges of the HTN Clinic.

Act

After four weeks of implementation of the HTN Clinic, BP trends were compared on each patient after implementation of the HTN Clinic with that of BP trends prior to implementation at baseline. Data was reviewed with the IT department of clinic access prior to implementation of the HTN Clinic and post implementation of the HTN Clinic, as well as a report of aggregate data on number of participants served, interventions triggered by the

protocol, resulting BP metrics, and access to visits. The co-investigator scheduled a meeting with the clinic administrator, providers, and RNs to discuss the results of the practice improvement project, feedback obtained, and future of the HTN Clinic along with any recommendations. The data could then be communicated in order to make any necessary adjustments to repeat the Plan, Do, Study, Act cycle in order to improve the process within the clinic.

Financial Impact

Implementing the HTN Clinic was projected to potentially save the organization potential costs. Nurses bill at CPT code of 99211 to generate revenue at each of the patient-nurse BP visits and save patient cost. Provider reimbursement increases with improved quality metrics and outcomes. In addition, providers were felt to be able to have less BP return visits overall to improve patient outcomes and possibly decrease healthcare costs with co-management with nursing staff in addition to possibly generating having more patient availability. Essentia already had the resources, so no added cost and RN staffing was able to accommodate scheduling, so no new hires were needed.

Timeline of Project

This project was presented to the key stake holders including the chief medical officer, nursing administrator and nursing supervisor with the support to implement the HTN Clinic for the year 2019-2020 (FY19-20). The IRB approval was officially granted on December 13, 2019 from NDSU and granted by Essentia Compliance on January 2, 2020. Therefore, the HTN Clinic ended up not being implemented until January 2, 2020 due to a delay in IRB language. The implementation schedule was chosen in accordance with working with the organizational timeframes. Data was collected after four weeks of implementation due to time constraints.

After analysis of the data, the final defense of the practice improvement project was scheduled March 11th, 2020.

Resources

Resources required to successfully deploy this project included time and commitment by providers, nurses, and staff to successfully complete the training components. Salary for staffing was also provided by the organization. The organization provided the training materials and protocols.

Protection of Human Subjects

An internal review board (IRB) application was filed with North Dakota State University (NDSU). Following successful IRB approval with NDSU, a formal IRB approval was sent to Essentia Health Grand Rapids for review. Official IRB approval was granted January 2, 2020. Adult patients within the Essentia Health Grand Rapids clinic with the diagnosis of HTN, along with the providers, nurses, and registration staff were included in the implementation of the project. There was no direct involvement between the co-investigator and patients during this practice improvement project and all data collected was initiated by authorized personnel already within the organization and provided to the co-investigator as aggregate data and/or without any patient identifiers.

Potential risks included breach of protected health information, incorrect dosing of medications, and inaccurate education taught to patients. The EHGR had prior intent to implement the HTN Clinic, so no patient consent was obtained. Risks to the participants were minimized through HIPPA compliance for the participants and through successful completion of competencies, as well as standards of practice that were in place already for RNs and providers

within the organization. No additional risk was anticipated as a result of this practice improvement project that wasn't already a potential by staff and providers at the clinic.

Potential benefits of the proposed project for the patients was improved health outcomes through lower BP metrics. Potential benefits to the organization and staff/providers were felt to be improved health care cost savings, improved provider productivity, and improved quality measures. Importance of knowledge to be gained was also to promote a synergistic relationship between providers and nurses to improve HTN metrics within primary care. Women and minorities were not specifically targeted for this practice improvement project.

CHAPTER 4. EVALUATION

Objective One

The first objective was to improve blood pressure management access for blood pressure control in adult, uncontrolled HTN patients. The organization was interested in finding out if the HTN Clinic improved access to BP management for patients. The objective was evaluated five main ways, two that directly correlate with the HTN Clinic implementation and three that could possibly have more indirect correlations.

First, data was obtained concerning how many total patients completed visits in the HTN Clinic versus how many were scheduled to be seen in the HTN Clinic. By knowing how many patients visited the HTN Clinic, more information on access to BP monitoring opportunities could be considered. IT personnel were also able to determine how often those same patients had visited the EHGR clinic during the month prior to the HTN Clinic implementation for considerations. Second, data was also acquired regarding how many of those patient visits within the HTN Clinic were scheduled the same day or if patients had a wait time.

Third, IT personnel were able to determine total HTN visits within the EHGR clinic overall for any adult, uncontrolled hypertensive patient four weeks prior to the HTN Clinic implementation as a baseline and one-month after the HTN Clinic implementation for comparison. The co-investigator worked with IT personnel to determine the estimated number of openings per provider that the EHGR clinic had over the course of the HTN Clinic implementation in order to better understand the number of potential openings for patients needing to address their HTN needs or might also reflect the total number of patients that were able to be seen for reasons other than HTN management, thus opening up provider time for other needs in the community not addressed by the HTN Clinic.

Fourth, evaluation of patient wait times to schedule an episodic of follow up appointment in primary care within two weeks of the request were reported by IT personnel one-month pre-implementation, the month during implementation and one-month post-implementation of the HTN Clinic, to potentially see if access actually was affected by using the HTN Clinic. Finally, qualitative verbal feedback regarding patient perceptions of the HTN Clinic and provider/RN feedback regarding using the HTN Clinic service to address adult, uncontrolled HTN patient needs was also gathered during an informal focus group led by the co-investigator during a regularly scheduled staff meeting for approximately 20-30 minutes.

Objective Two

The second objective was to develop an HTN management program that was efficient and benefitted the patients, staff, and key stakeholders at the rural primary care clinic by the end of the HTN Clinic implementation. This objective was measured by 1) evaluating the efficiency of the implemented workflow 2) evaluating RN and provider feedback from a post-implementation survey regarding both efficiency and benefit, and 3) qualitative feedback during focus group from the RN and providers perceptions of the implementation of the HTN Clinic workflow and outcomes.

A 10-question survey was developed by the co-investigator and administered to staff participants pre- and post-implementation which provided the co-investigator with quantitative data of the participants' perceptions of the program regarding efficiency and benefit. Questions one through ten were given in a Likert scale dissemination of "Strongly Agree", "Somewhat Agree", "Somewhat Disagree", "Strongly Disagree" as choices (Appendix B). The survey questions included information on providers' and RN's assessment of the HTN Clinic process, workflow, results, utilization of services, impact on practice, and intent to continue the program

in the future. A review of the surveys pre- and post-implementation served as a comparison tool to measure this objective. The survey was not developed from any pre-existing survey or from the literature review due to evaluating the specifics of the presentation limited to this practice improvement project. Finally, the coinvestigator also gathered qualitative feedback through the informal focus group of providers and nurses to determine effectiveness, benefit, and future support of the HTN Clinic (Refer to Appendix H).

Objective Three

Objective three was to increase the percentage of controlled BP values in adult patients with uncontrolled HTN by 3% by the end of the HTN Clinic implementation according to the JNC-8 guidelines ($BP \leq 140/90$ mmHg). This objective was evaluated by review of the BP data pre- and post-implementation via the clinical dashboard by IT personnel and given to the co-investigator for referred patients within the HTN Clinic and the overall HTN population served within the EHGR clinic. This objective was measured by pre- and post-measurements of individual BP metrics of the 10 patients referred and managed through the HTN Clinic. In addition, aggregate data compiled by IT personnel comparing data of uncontrolled BP percentages of all patients with a $BP \geq 140/90$ mmHg pre- and post-implementation of the HTN Clinic was collected one-month prior and one-month after the HTN Clinic implementation to see general fluctuations of the BP metrics for the EHGR clinic as a whole to possibly correlate with potential influence with implementation of the practice improvement project.

Objective Four

Objective four was to increase provider and staff perceptions of knowledge regarding best practices in HTN management from the beginning of the HTN Clinic in-services to the conclusion of the HTN Clinic in-service and prior to implementing the HTN Clinic. This

objective was evaluated for RNs and providers. The RN post-tests from the HTN management curriculum were collected by the manager and reported to the co-investigator in aggregate form for the two participants. The co-investigator was provided with verbal responses during and after the in-service from both RN's on knowledge and feedback regarding HTN management.

The provider post-test following the HTN management PowerPoint regarding the nurse-led protocols were also collected by the co-investigator through verbal feedback for the six providers through informal discussion between providers and the co-investigator. A five-point Likert scale survey developed by the co-investigator was given to each provider at the conclusion of the presentation (See Appendix C). The questions were focused on the content that was provided in the PowerPoint seeking feedback if additional insight and knowledge was gained following the in-service. Finally, RNs and providers had opportunity to provide feedback about knowledge during the informal focus group.

CHAPTER 5. RESULTS

Objective One

Objective one was to improve blood pressure measurement access for blood pressure control in adult, uncontrolled hypertensive patients in the rural primary care clinic by the end of the HTN Clinic. Evaluation for improving access looked at the total number of referrals to the HTN Clinic, how many patients followed through with the referral process, how many visits each referral patient made within the HTN Clinic, total number of HTN patients seen during the month prior to implementation compared to one-month after implementation, the number of available provider appointments, and wait times for appointments. In addition, the focus group post-implementation offered qualitative feedback regarding access and wait times for patients.

Referrals

Ten patients were referred to the HTN Clinic during implementation. Each of those 10 referred patients utilized the HTN Clinic twice to result in 20 total visits during the four-week HTN Clinic implementation phase. The first 10 appointments in the HTN Clinic were scheduled the same day as the provider visit, so these visits would be excluded when assessing if access to primary care visits was increased. The remaining 10 recheck visits were not following a provider visit so could be included in potential increased access for additional primary care visits since the HTN follow up visit that would normally have been scheduled with the provider was removed and given to the HTN Clinic.

All referred patients (N=10) completed or followed through with recommended visits for the HTN Clinic. All patients were scheduled and completed initial visits at the HTN Clinic the same day as the referral. All HTN Clinic patients utilized the HTN Clinic services twice each during the four-week implementation period. Each referred HTN Clinic (N=10) had visited the

EHGR clinic twice each in the 6 months prior to the HTN Clinic implementation and one of the patients even visited three times, thus needing to meet primary care providers in EHGR clinic a total of 21 times six months prior to the implementation of the HTN Clinic service.

Hypertensive Patient Visits and Access

The organization was interested in identifying if the HTN Clinic increased opportunity for BP management access by comparing pre-and post-implementation rates of total hypertension related visits. Table 1 depicts the number of needed HTN related visits for any hypertensive patients in the EHGR clinic, one-month prior, one-month during, and one-month post-implementation of the HTN Clinic. The one-month post-implementation time period also included the referred HTN Clinic patients, which were unable to be separated out per the IT department, so the data was not completely accurate for comparison. Although the data may suggest a possible increase of 0.014% HTN related visits from the start of the HTN Clinic to one-month post HTN Clinic implementation, there is insufficient evidence that the HTN Clinic was a direct result of the increase due to the inability to remove the target group from the total population of HTN patients at EHGR. In the table, the total of 20 HTN patients also included the 10 referred HTN Clinic patients.

Table 1

Evaluation of Total Hypertensive Patient Visits for any Patient with HTN at EHGR Clinic

Comparison of # Visits completed for HTN Management	Monthly HTN Patients Seen in EHGR	% HTN Patient Seen	Total HTN Patients in EHGR each Month
Prior to implementation (12/1/19 to 12/31/19)	17	0.013%	1324
During implementation (1/15/20 to 2/15/20)	20	0.015%	1337
Post-implementation (2/16/20-3/15/20)	16	0.012%	1337

There were no open provider appointment slots the entire month prior to the implementation of the HTN Clinic. Regarding further access considerations, provider open slots

during the HTN Clinic implementation phase was as follows regarding number of openings: Week 1 (n=2), Week 2 (n=0), Week 3 (n=1) and Week 4 (n=0), for a total of three open appointments at EHGR during the month of implementation. In review of the data of those who were referred to the HTN Clinic, 100% (N=10) were recommended to follow up in two weeks post the original HTN visit, and only 30% (n=3) of the patients that needed follow up for HTN would have had access to an appointment with their primary care provider, given the openings over that month. Comparison was made with one-month post-implementation revealing the following number of openings: Week 1 (n=2), Week 2 (n=1), Week 3 (n=4) and Week 4 (n=4) yielding 11 openings for the month following the HTN Clinic implementation.

Wait Times

The median wait times (MWT) for follow up patient appointment requests (with all appointments being 30 minutes for all episodic and follow-up visits whether they were for HTN or any other reason) were compared one-month prior, the month during, and one-month post-implementation of the HTN Clinic (Table 2). This dataset depicts the average wait time for any patient at EHGR to schedule a 30 minute follow up appointment for any complaint. Table 2 depicts the average number of days “Median Wait Time” for patients in primary care to access and schedule any 30-minute episodic (and/or follow up) appointment at EHGR primary care clinic. The table indicated a seven-day shorter “Wait Time” from pre-to post-implementation of the HTN Clinic.

Table 2

Median Wait Times (MWT) for Episodic (30 minute) Appointment in the EHGR Clinic

Comparison of MWT for Appointments	# of Days Wait to Schedule Appointment
One-month prior to HTN Clinic implementation (12/1/19 to 12/31/19)	9
During HTN Clinic implementation (1/15/20 to 2/15/20)	2
One-month after HTN Clinic implementation (2/16/20 to 3/15/20)	2

Table 3 below describes the number of days to get a 30 minute follow up in primary care (not including specialty) for any provider or RN one-month before, one-month during, and one-month post-implementation. The data in the table below results in a 7.3% increase in scheduled and completed appointments for patients requesting a 30-minute episodic visit \leq two weeks of appointment request for any appointment type within EHGR clinic.

Table 3

Episodic (30-minute) Appointment Requests for All Patients in the EHGR Clinic

Comparison of Appointments Seen < 2 weeks of Appointment Request for any Episodic Visit	% Patient Seen for Episodic Visits	Total Patients at EHGR
One-month prior to HTN Clinic implementation (12/1/19 to 12/31/20)	87.3% (n=4340)	N=4989
During HTN Clinic implementation (1/15/20 to 2/15/20)	92.2% (n=4600)	N=4989
One-month after HTN Clinic implementation (2/16/20 to 3/15/20)	94.6% (n=4720)	N=4989

Focus Group Feedback

The focus group was conducted after one month after the HTN Clinic implementation to collect qualitative data from the HTN Clinic RNs (N=2), clinic nursing supervisor (N=1), clinic administrator (N=1), and six providers (N=6) that included one MD and five APRNs. Both RNs verbalized informal feedback that all referred HTN Clinic patients were appreciative of the HTN

Clinic services. Both RNs felt that working in the HTN Clinic was an excellent use of their time and skill set and felt the HTN Clinic allowed them to work to the full extent of their scope.

When providers (N=6) were asked, “Do you feel the HTN Clinic service freed up the providers’ schedules and was a cost-effective use of nurse’s time?”, 83% (n=5) of the providers did not necessarily agree that they had more time available and 17% (n=1) was uncertain. However, 100% (n=6) of the providers agreed that they did have more quality time with patients and 20% (n=2) of providers commented that the HTN Clinic served as a conduit to restructure HTN visits differently and more efficiently when working with patients that have co-morbidities, with the remaining 80% (n=4) uncertain. All providers in the focus group agreed they would like to see a longer duration of the HTN Clinic to fully give an opinion.

Objective Two

Objective two was to develop a HTN management program that was efficient and benefitted the patients, staff, and key stakeholders at the rural primary care clinic by the end of the practice improvement project. The HTN Clinic was implemented at the EHGR clinic over four weeks. Nursing staff (N=2) completed the 10-point post-implementation survey that sought to assess successes and challenges of the HTN Clinic. The table below depicts the nurse’s responses ranging from “Strongly Agree” to “Strongly Disagree” (Table 4).

Table 4

Post-Implementation Nursing HTN Clinic Survey Results Questions 1-10 (N=2)

Abbreviated Survey Questions 1-5	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
1. Your education prepare...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
2. Enough time and resource...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
3. Able to follow algorithm...?	50% (n=1)	50% (n=1)	0% (n=0)	0% (n=0)
4. Referral process work...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
5. Patients return...?	50% (n=1)	50% (n=1)	0% (n=0)	0% (n=0)
6. Patients informed...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
7. Collaborative with provider...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
8. Patients desire to continue...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
9. Did access increase...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)
10. Did patients' value...?	100% (n=2)	0% (n=0)	0% (n=0)	0% (n=0)

Note. Nursing answers ranged from “strongly agree” to “somewhat agree” from possible Likert scale of Strongly Agree, Somewhat Agree, Somewhat Disagree, and Strongly Disagree. The full survey questions are in Appendix B.

The table below (Table 5) depicts the providers (N=6) pre- and post-implementation survey results (See Appendix C).

Table 5

Breakdown of Providers Ratings to Questions 1-5

Abbreviated Survey Questions 1-5	Very Likely (Pre)	Somewhat Likely (Pre)	Very Likely (Post)	Somewhat Likely (Post)	Somewhat Unlikely (Post)
1. Intent to refer...?	100% (n=6)	0% (n=0)	100% (n=6)	0% (n=0)	0% (n=0)
2. Improve quality numbers...?	67% (n=4)	33% (n=2)	83% (n=5)	17% (n=1)	0% (n=0)
3. Improve patient's HTN knowledge...?	83% (n=5)	17% (n=1)	100% (n=6)	0% (n=0)	0% (n=0)
4. Referral process affects...?	100% (n=6)	0% (n=0)	100% (n=6)	0% (n=0)	100% (n=6)
5. Patient positive outcomes...?	100% (n=6)	0% (n=0)	100% (n=6)	0% (n=0)	0% (n=0)

Note. Provider answers ranged from “somewhat likely” to “somewhat unlikely” from possible Likert scale of Very Likely, Somewhat Likely, Somewhat Unlikely, and Very Unlikely. No providers indicated “very unlikely”, so these were left off this table. The full survey questions are in Appendix C.

After completion of the HTN Clinic, the co-investigator formed a focus group of providers and nurses to gather qualitative data regarding the successes and challenges of the HTN Clinic that also surveyed perceptions (Appendix H). The first question focused on nursing perceptions on preparedness for working in the HTN Clinic after the training. The two nurses both felt they were adequately trained to work in the HTN Clinic after completion of the training modules. One nurse commented that she learned additional knowledge on medication monitoring parameters and felt this was a benefit to her position. The second nurse felt that the training modules were user-friendly. Both nurses voiced that they felt confident they could manage patients HTN after the in-service.

The second question posed sought to ascertain provider (N=6) and nurse (N=2) perceptions on utilization of the HTN referral process. Eighty-three percent of providers (n=5) agreed that the referral process was efficient and worked well in practice. A challenge that one provider discussed was the actual order for the HTN referral in the EMR. The provider did not like the vagueness of the order which gave full authorization for utilization of the protocol for pharmacotherapy. The provider felt the order needed to have more specific instructions for patients that may have more than one medication for HTN control. Overall, 100% (n=2) of nurses and 83% (n=5) of providers felt the referral process was straightforward and easy to implement. Fifty percent of providers (n=3) commented that it was a benefit to have the RN see their patients for HTN after their primary care visit to reinforce information they had already provided. One hundred percent of providers felt that the collaboration with the nursing staff made visits more efficient.

Providers (N=6) and two registered nurses (N=2) were questioned on the scheduling process for HTN. Sixty-seven percent (n=4) of providers indicated that there were no issues with

scheduling from their perspective with the remaining 33% (n=2) without an opinion. Both RNs said that they initially ran into some obstacles with scheduling and assisting with scheduling of the HTN Clinic. The first barrier they noted was an unawareness from the call center that the HTC Clinic existed. The second barrier was that the IT department had not built in a separate HTN Clinic visit for the nursing staff so there was confusion on how to schedule. After learning this information, the co-investigator communicated with all personnel that schedule appointments for EHGR which included EHGR call center and all staff at EHGR including lab, pharmacy, and radiology. The co-investigator worked with IT personnel to create a visit type for RNs termed “HTN CLINIC”. After successfully notifying all designated parties, the RNs did not have problems with scheduling of HTN Clinic appointments.

The co-investigator discussed with providers (N=6) and nurses (N=2) whether they felt that hypertensive patients benefitted from the HTN Clinic. All providers and nurses deemed the HTN Clinic a successful conduit to HTN management. Each provider felt the collaborative efforts between the departments enhanced patient outcomes and overall quality of care. Specifically, one provider mentioned that two patients referred to the HTN Clinic were highly satisfied with the education provided by the nursing staff. Another provider appreciated the close follow up the nurses had with the referred HTN patients and saw the clinic as an asset to the organization. The last comment posed by one provider indicated that all patients with a diagnosis of HTN, whether controlled or uncontrolled, would benefit from the HTCN Clinic. Overall, all of the providers, nurses, and patients found value and satisfaction in the implementation of the HTN Clinic.

When asked the question “Do you feel the hypertension clinic service freed up the providers’ schedules and was a cost-effective use of nurses’ time?” 67% (n=4) of providers

agreed that they did have more quality time with their patients and enhanced the opportunity to focus the visit on more complex or pressing issues while the remaining 33% (n=2) providers did not have an opinion. Thirty-three percent (n=2) felt the collaboration with RNs through the HTN Clinic enabled them to structure their visits differently and more efficiently when working with patients that have co-morbidities. All providers agreed they would like to see a longer duration of the HTN Clinic to fully give an opinion.

Collectively, 100% of providers (N=6) and 100% of nurses (N=2) felt that BP outcomes were positively influenced by the HTN Clinic. Qualitative results indicated that one provider felt the HTN Clinic offered additional support and follow up for patients that previously would not respond to pharmacotherapy alone. An additional advantage that 33% (n=2) providers commented on was the positive influence on other co-morbidities as a result of the HTN Clinic. Qualitative data from one provider noted that the dietary and lifestyle education component of the HTN Clinic positively affected two patients that had concurrent diabetes and obesity. Another provider mentioned a patient that also suffered from recurrent depression and lacked the desire to care for his or her HTN. The nursing staff that cared for that particular patient mentioned to the provider how “grateful” they were to have that additional support within the healthcare team. All providers indicated support that the HTN Clinic would improve patients’ hypertensive outcomes and improve provider quality numbers.

Lastly, when asked if providers (N=6) and RNs (N=2) would desire to continue the HTN Clinic services, 100% of providers and nursing staff indicated to continue to implement the HTN Clinic within the EHGR clinic. All providers felt that the HTN Clinic was a great collaboration between all the departments. All providers and nurses emphasized support and satisfaction with the results and process of the HTN Clinic and agreed that the HTN Clinic participants would

have better BP control, improvement in managing patient HTN, as well as improved quality metrics. The clinic administrator and chief medical officer suggested implementing the HTN Clinic in several other organizational rural sites, feeling it would add value to the organization's patient populations.

One hundred percent (N=6) of providers supported the HTN Clinic implementation verbally and made referrals. All providers were part of a focus group pre- and post-implementation of the HTN Clinic. The results of the qualitative feedback are listed in Table 6.

Table 6

Provider's Qualitative Feedback Pre- and Post-Implementation

Pre-Implementation	Post-Implementation
Do you feel the HTN Clinic will provide enhanced support to your hypertensive patients?	
"Based on the information in the in-service I feel this would augment my current practice nicely"	"I really like how the patients had reinforcement of information that I had already provided, it seemed to really sink in". "I thought it would great to get the patients in for follow-up with the RN because it opened up access for me for more acute things."
"The process is very similar to what we are doing with our diabetics so I can see this working well for the clinic."	
Do you anticipate positive outcomes for patients' participating in the HTN Clinic?	
"This is a great service to offer. I agree that there is evidence to support collaboration between nurses and providers to deliver the best care for our patients. As a provider, I can see the benefits of reinforcement of information for patients with chronic diseases, which is why I find the collaboration with nurses so effective."	"I've already seen the benefit of having another person to be a contact for my more complex hypertensive patients. The patients in the program seemed more engaged in caring for themselves."
"I definitely can see positive effects for patients, not only with improved BP, but also with quality of life."	"My patients that attended the BP clinic learned other positive health changes that I see benefiting their other chronic diseases."
Do you anticipate that the HTN Clinic to improve your quality numbers?	
"Yes"	"Yes, it really has made a different in the quality metrics."
"I could see our numbers improving" -"I believe so"	

Objective Three

Objective three was to increase the percentage of controlled BP values in adult patients with uncontrolled HTN by 3% by the end of the HTN Clinic implementation according to the JNC-8 guidelines (BP \leq to 140/90 mmHg). The total number of patients with a diagnosis of HTN as defined by BP \geq to 140 mmHg systolic and/or 90 mmHg diastolic were compared pre-versus post-implementation. Pre-implementation data of controlled blood pressure for EHGR hypertensive patients as a whole clinic four-weeks pre-implementation was 86.7% (n=1148, N=1324) and post-implementation was 87.9% (n=1175, N=1337) four-weeks post-HTN Clinic implementation. All patients in the HTN Clinic (N=10) were included in the post-implementation data set, even though the HTN Clinic patients were to have been removed. Contrary to earlier planning IT personnel ended up not being able to remove the target population, therefore true comparison of pre-implementation to post-implementation data was not possible .

Of the patients enrolled in the HTN Clinic, 100% (N=10) started with uncontrolled blood pressure according to the JNC-8 guidelines within the organization. All of the HTN Clinic patients were able to each have two visits over the four-weeks of implementation. The first BP value recorded was upon the initial visit upon qualification for a referral to the HTN Clinic, and the second BP value was taken upon each patient's follow-up visit within the HTN Clinic per the same nursing staff after at least 2-weeks' time from the first HTN Clinic visit. The 10 HTN Clinic patient BP values and brief demographic are listed below in Table 7.

Table 7

Hypertension (HTN) Clinic Blood Pressure (BP) Results

Patient	BP Pre-HTN Clinic	BP Post- HTN Clinic	# of HTN Visits 6 months prior to HTN Clinic
Patient #1: Age > 60 yrs.	166/94	138/86	3
Patient #2: Diabetes, Age > 60 yrs.	172/108	140/88	2
Patient #3: Diabetes, Age > 60 yrs.	145/94	132/82	1
Patient #4: Diabetes, Age < 60 yrs.	147/93	138/78	2
Patient #5: Age <60 yrs.	179/68	139/60	4
Patient #6: Age < 60 yrs.	152/78	132/72	3
Patient #7: Diabetes, Age > 60 yrs.	146/92	126/72	1
Patient #8: Diabetes, Age < 60 yrs.	140/50	130/58	1
Patient #9: Age < 60 yrs.	152/90	148/89*	3
Patient #10: Diabetes, Age > 60 yrs.	146/55	138/60	1

Note. *Not at goal post-evaluation of HTN Clinic.

Blood pressure values for all (N=10) HTN Clinic patients were 0% controlled (BP \leq 140/90) upon referral to the HTN Clinic compared to 90% (n=9) controlled upon the second visit in the HTN Clinic. According to the JNC-8 guidelines, 100% (n=10) referred HTN Clinic patients were considered to have HTN upon first visit within the HTN Clinic with the following criteria: 1) age \geq to 60 years with a systolic BP \geq 150 and/or a diastolic \geq or 90 mmHg or age \leq 60 years with a systolic BP \geq 140 and/or a diastolic \geq or 90 mmHg . 2) diagnosis of diabetes with systolic BP \geq or equal to 140 and/or diastolic \geq 90 mmHg. One patient, #9, was not at goal according to the JNC-8 guidelines as determined by the organization. Patient #9's age was less than 60 years and the target blood pressure should have been at \leq 140/90 mmHg or less to be at goal. Patient # 8 would be considered to meet the criteria for diagnosis of HTN as the JNC-8 guidelines state that patients with diabetes and systolic BP \geq 140 mmHg should have pharmacological intervention.

Objective Four

Objective four was to increase provider and staff perceptions of knowledge regarding best practices in HTN management from the beginning of the in-service to the conclusion of the HTN Clinic in-service and prior to implementing the HTN Clinic. This was completed through a series of focus group questions and post-presentation surveys.

Following the pre-implementation in-service, providers were given a five-point post-survey regarding the content in the in-service presentation. The following information in Table 8 reflects the results of the provider post-survey results following the in-service presentation (Appendix K).

Table 8

Providers Post-Survey Results Following Presentation for Questions 1-5

Abbreviated Survey Questions 1-5	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
1. Objectives met...?	100% (n=6)	0% (n=0)	0% (n=0)	0% (n=0)
2. Information reinforced guidelines...?	83% (n=5)	17% (n=1)	0% (n=0)	0% (n=0)
3. Improve outcomes and practice...?	83% (n=5)	17% (n=1)	0% (n=0)	0% (n=0)
4. Provided information...?	83% (n=5)	17% (n=1)	0% (n=0)	0% (n=0)
5. Provided new ideas...?	0% (n=0)	100% (n=6)	0% (n=0)	0% (n=0)

Note. Provider answers ranged from “strongly agree” to “somewhat agree” from possible Likert scale of Strongly Agree, Somewhat Agree, Somewhat Disagree, and Strongly Disagree. The full survey questions are in Appendix K.

Both RNs (N=2) passed the HTN competency test with perfect scores. During the focus group, when asked about knowledge and training, both nurses felt adequately trained to work in the HTN Clinic post training. One nurse commented that she learned additional knowledge on medication monitoring parameters and felt the additional knowledge would benefit to her position. The second nurse felt that the training modules were user-friendly. Both nurses felt

confident managing patients with HTN after completing the training in-service. All providers (N=6) also voiced that the process improved provided insight regarding the RN scope of practice for HTN management including utilization of protocols.

CHAPTER 6. DISCUSSION AND RECOMMENDATIONS

Interpretation of Results

The purpose of this practice improvement project was to establish a HTN Clinic at EHGR to optimize HTN management as a multidisciplinary collaborative effort. The creation of the HTN Clinic was intended to help improve access to HTN services, improve patient HTN outcomes, and deliver high quality care. The practice improvement project was structured using the PDSA model to guide the process and provide sustainable and efficient HTN services for EHGR.

Objective One

Objective one aimed to improve blood pressure management access for BP control in adult, uncontrolled hypertensive patients at EHGR by the end of the HTN Clinic implementation. This objective was partially met. The HTN Clinic was successfully implemented and offered the community additional access for BP control within the EHGR community.

After implementation of the HTN Clinic, there was a seven-day shorter wait time that patients could access a thirty-minute episodic appointment in primary care. Access to services is often affected by many different variables. Although the data revealed more patients could access an appointment in primary care in less than two weeks (7.3% increase to access 30 minute follow up or episodic appointments in less than 2 weeks of appointment request), faster appointment access (evidenced by 7-day shorter wait times), an increase in the number of HTN patients seen at the EHGR clinic overall (0.027% HTN patient increase one-month post-implementation from one-month pre-implementation), and increased access to provider appointments in general, the co-investigator cannot attribute these improvements solely as a direct result from the

implementation of the HTN Clinic alone. Many variables were factored in including provider schedules, unexpected absences, illness, and maternity leave which may have altered the results.

The data was difficult to aggregate per the IT personnel, as there were multiple variables such as missed appointments, no-shows, and last-minute cancellations. However, information was compiled regarding the estimated number of openings per provider at the EHGR clinic one-month prior, one-month during, and one-month post implementation of the HTN Clinic in order to better understand the number of potential openings for patients needing to address medical needs. The results might also be reflective of the total number of patients that were able to be seen for reasons other than HTN management, thus opening up provider time for other needs in the community not addressed by the HTN Clinic.

There were no open appointment slots during the month prior to the HTN Clinic implementation, however there were several factors impacting this data. The month observed was December 2019, so there might have been an “end of the year rush” of patients getting into the clinic to meet their insurance deductible. Another factor was that one of the providers was unexpectedly gone for personal reasons during the month prior to implementation, thus contributing to less appointment slot opportunities.

Over the four-week timeframe during the HTN Clinic implementation, only three appointments were not filled for all providers scheduled in primary care in the EHGR clinic. The results from provider comparison of provider openings pre- and post-implementation may support that an additional 10 patient appointments were removed from the provider visits, and seven of those were filled within primary care for alternate visits. Though this information can't be “proven,” the co-investigator considers that there was a possibility that more patient visits could be addressed that were not related to HTN management, thus improving potential access

for other healthcare needs within the community as well. Post-implementation of the HTN Clinic (2/16/20-3/15/20) there were 11 (n=11) appointment slots not filled over the four-week time frame. The HTN Clinic possibly opened appointments for patients to have required HTN follow-up when providers may not have had open slots, therefore, increasing opportunity to get patients to blood pressure goals more quickly. Due to a short data collection time, the results could not accurately determine if increased appointment opportunities were directly related to the implementation of the HTN Clinic or not.

The co-investigator recognizes that patient volumes, provider access, and patient BP metrics need to be considered when evaluating the data. The co-investigator would argue that the HTN Clinic may have been a supporting element for the increase to services but can't be proven from the results from this practice improvement project; therefore, this objective was partially met. If the practice improvement project could have been implemented over at least a six-month, as was originally planned, and been able to exclude data from the 10 HTN Clinic patients, the data would have been more robust for which to make more accurate correlations. Then, the data could have been more useful in order for objective to be fully evaluated as intended for the organization.

Objective Two

The second objective was to develop a HTN management program that was efficient and benefited the patients, staff, and key stakeholders at the rural primary care clinic. The objective was met. The EHGR pre- and post-implementation surveys indicated support by providers and nurses that the HTN Clinic would improve patients' hypertensive outcomes and improve quality metrics. Extended data collection could have further supported the actual impact the HTN Clinic could have made. Furthermore, the focus group data and qualitative feedback supported

continuing to implement the HTN Clinic. Finally, the HTN Clinic is still being implemented even after completion of the practice improvement project further supporting that the HTN Clinic was efficient and of benefit to all those involved.

Objective Three

Objective three was to increase the percentage of controlled BP values in adult patients with uncontrolled HTN by 3% by the end of the HTN Clinic implementation according to the JNC-8 guidelines ($BP \leq 140/90$ mmHg). Data did not determine if the objective was met or not, as the BP measurements from referred patients were only seen in varying amounts of time and only two BP measurements per patient was obtained; there was insufficient data to gauge if this objective was successfully met. The results suggest improvement in the HTN Clinic patients based on two visits, but other factors (stressors, lifestyle, diet, etc.) may have impacted the results from such a small implementation period.

The objective was originally expected to be measured over a six-months duration, but a delay in IRB approval within the organization and other unexpected factors contributed to only a four-week implementation. Blood pressure measurements from the results could hardly account for significant lifestyle modifications or adequate time for some of the patient's medication changes to take place over that short time, particularly if the patient was only referred towards the end of the implementation data collection phase. The results do suggest improvements in patient BPs, supporting that further ongoing data collection would improve the outcomes of this practice improvement project objective.

Pre-implementation data of controlled BPs for EHGR hypertensive patients (86.70% , n=1148, N=1324) compared to one-month post-implementation (87.9%, n=1175, N=1337) was improved, although improvement was not at the 3% mark that was the organizational goal. In

addition, the post-implementation data also included the 10 HTN Clinic patients due to IT abilities, thus possibly falsely elevating the controlled BP values and thus not able to accurately compare pre versus post-implementation data. Therefore, one cannot conclude that the overall increase in controlled HTN patients at EHGR was a result of the HTN Clinic. Studying the HTN Clinic for at least 6 months for data collection and implementation is recommended to improve results and see if any correlations could be more accurately made.

The co-investigator was interested in comparing data from a neighboring clinic that also implemented the HTN services. The co-investigator communicated with the clinic supervisor of the alternate rural site seeking input and suggestions on their processes. The clinic supervisor did not provide specific data but did offer some valid points. The clinic supervisor found that the HTN Clinic allowed the nurses to work at the full extent of their scope of practice and resulted in increased patient satisfaction ratings. The supervisor also indicated that the providers utilized the HTN Clinic for a wide majority of their hypertensive patients and believed they had improved outcomes.

Evidence in the literature supports that team-based care can increase the proportion of people with controlled BP and decreases both systolic and diastolic BP (Proia et al., 2014). The results of this practice improvement project further supported that a team-based approach between providers and nurses increases the proportion of adults with controlled HTN. Applying the team-based approach for all patients with chronic diseases may improve patient outcomes. Collaboration between nurses, providers, and pharmacists, increases the level of support and resources patients can access for their HTN management (Proia et al., 2014). In addition, a physician-pharmacist collaboration study also included improved mean systolic BP outcomes

over nine months over standard approaches, further suggesting that collaboration efforts can be a useful strategy in improving BP for patients (Carter et al., 2009).

Objective Four

Objective four was to increase clinician and staff perceptions of knowledge regarding best practices in HTN management from the beginning of the in-service to the conclusion of the in-service and prior to implementing the HTN Clinic. This objective was met, as the results indicated that RNs and all providers indicated increased knowledge in post-test surveys and focus group discussions.

The nursing post-implementation survey supported that the education adequately prepared them for managing patients within the HTN Clinic. The co-investigator was provided with verbal responses from both RNS during and after the in-service stating they had increased knowledge on HTN management. Providers also reported increased knowledge as a result of the collaborative practice improvement project.

Recommendations

The co-investigator recommended EHGR to continue the HTN Clinic. The results of the survey indicated endorsement for the collaborative HTN services. Providers also recognized the ability of the HTN Clinic to be another beneficial adjunct to current practice, optimizing BP control within the rural setting. Enrollment in the HTN program may also have the potential to support and improve quality metrics. The implementation of the collaborative efforts between the interdisciplinary team may increase the possibility of enhancing the quality of care, improving health outcomes, and reducing health care costs (Foti, Auerbach, & Magnan, 2018). Researchers have also found that collaborative intervention models can help reduce healthcare disparities pertaining to BP management in at-risk patients (Carter et al., 2009). Rural areas should

continue to develop creative approaches to limit healthcare disparities and improve patient outcomes, such as improved BP control.

The rural community was an ideal setting for the practice improvement project, since it already had similar models implemented within the same organization at different locations and desired to serve rural patients. For example, the HTN Clinic targets communities that need access improvement. The co-investigator identified an array of considerations that may enhance HTN management. The clinic was implemented on a smaller scale at one site, however, the HTN Clinic was originally created for utilization at all Essentia Health East Clinics and could easily be implemented at various locations within the organization's various sites.

The organization should consider implementing the HTN Clinic developed in this practice improvement project site and continue collecting data to support the future use of collaborative models in rural healthcare. The data can be used to better understand if collaboration truly impacts patient outcomes and improves access to HTN management. Another recommendation is to have the organization re-evaluate the chosen clinical guidelines for BP management and determine if newer evidence might better support management protocols.

Since the initial creation of the HTN protocols, there has been low utilization over the last three years which may be due to absent marketing. The organization and other entities considering similar projects should consider marketing the HTN Clinic to optimize participants and interest for providers, patients, and organizations. The practice improvement project could also impact the body of knowledge pertaining to collaborative services offered by organizations to improve patient outcomes.

The HPM was an applicable model to guide the HTN Clinic, as there are many personal, social, and clinical factors that influence managing HTN. The model also demonstrates how

health promotion education can be used to teach patients how to improve their health by modifying behaviors they can control. Providers can recommend treatment, but unless the patient desires to make a change to better his or her own health, there will be no change initiated by the patient. In addition, the PDSA model was beneficial to structuring this practice improvement project overall, as well as helping to delineate the phases and steps that needed to be addressed throughout the project within the organization. The results from this practice improvement project also provided the organization with further information to start another cycle of the PDSA to adjust and continue with data collection for further cycles.

Strengths

Following implementation of this practice improvement project, there were several strengths identified by the co-investigator. First, the project was supported by the organization providing initial buy-in from senior leadership resulting in ease of implementation. Previously created evidence-based resources were available for the co-investigator to adopt at the EHGR clinic and provided an easy transition for implementation. The co-investigator had access to clinics currently utilizing the HTN Clinic which served as a reference point for the EHGR clinic. Lastly, providers and staff of the EHGR clinic were adept and willing to engage in multidisciplinary approaches to improve quality of care, providing the perfect setting for the practice improvement project. Of note, the HTN Clinic continues to be implemented after the conclusion of the practice improvement project, further demonstrating applicability to the clinic and community.

Project Limitations

Reflecting upon the implementation of the practice improvement project offered some limitations ascertained by the co-investigator. The first limitation presented was a limited time in

which to implement the HTN Clinic. Delays occurred at multiple intervals, however one of the most unexpected was the delayed organizational approval for implementation of the HTN Clinic surrounding one portion of the IRB language that ended up being ultimately resolved without further need for intervention. Related to multiple delays, there ended up being a shortened time between the staff in-service and the implementation of possible patient referrals.

Decreased referral opportunities coupled with no marketing and decreased provider ability to participate initially during the provider education session, led to lower patient numbers in the HTN Clinic than anticipated. Only three providers attended the in-service in person with the subsequent three providers receiving a synopsis of the content in an individualized approach at later times, thus further delaying the potential of patient referrals. There was also an unexpected absence of one of the providers, due to personal reasons, which decreased the target provider participation.

There were a few limitations with the protocol for future utilization. One provider had concerns about the sustainability of the HTN Clinic in the future given the changing guidelines, which may be a barrier for future use of the program. The HTN Clinic protocol guidelines will likely need to be updated with future BP control guidelines as changes in evidence-based guidelines also change to accommodate higher patient acuity and complexity.

Lastly, the co-investigator did not have enough data to fully support the positive influence of HTN outcomes as a direct result of the HTN Clinic. The initial desired outcome of Objective Three was to increase the percent of controlled patient blood pressures by 3% over six months for all patients with a diagnosis of uncontrolled HTN or $BP \geq 140/90$. The co-investigator did not have six months of data, and increased data collection time and implementation would benefit future projects.

Application to the Doctor of Nursing Practice Roles

A doctor prepared APRN engages in many roles including nurse-clinician, educator, researcher, advocate, innovator, and scholar. The doctoral prepared APRN possesses the skills and knowledge necessary to care for patients of all complexities and backgrounds. The co-investigator focused on these attributes during the development and facilitation of the practice improvement project. Scholarly work was performed through comprehensive literature review on current evidence-based practices for HTN management, risks, and outcomes.

The practice improvement project was disseminated in an educational in-service that allowed the co-investigator to function as “educator.” Advocacy was demonstrated through the development of a practice improvement project that served the needs of the rural community through increasing knowledge of the harmful effects of uncontrolled BP and how to positively change lifestyle behaviors to improve BP management outcomes. The innovator role was demonstrated through creation of a new process to optimize BP management in a rural setting with limited provider access. The co-investigator demonstrated leadership through interprofessional collaboration between providers and nurses to implement an evidence based HTN Clinic designed to meet the needs of the providers, patients, key stakeholders, and nursing staff.

Dissemination Plan

The practice improvement project was successfully implemented over a four-week timeframe within a rural clinic and yielded possible positive results, including improved BP control and increased access to HTN services for the organization. The paper will be published within the university library upon the co-investigator’s graduation. The practice improvement project was disseminated through a poster presentation on campus, and through a three-minute

video process through the university. The co-investigator intends to disseminate the research and results through an oral presentation targeting the additional clinics within the Essentia Organization, including Family Practice and Cardiology, as approached by the organization. Additionally, the co-investigator intends on creating a local “Healthy Community Group” within the rural community consisting of neighboring medical facilities, providers, and community members to disseminate the information in an informal question and answer setting.

REFERENCES

- American Family Physician. (2014). *Guidelines for the Management of Hypertension in Adults - Practice Guidelines - American Family Physician*. Retrieved from <https://www.aafp.org/afp/2014/1001/p503.html>
- America's Health Rankings United Health Foundation. (2019). *Analysis of CDC, Behavioral Risk Factor Surveillance System*. Retrieved from <https://www.americashealthrankings.org/search?q=mn>
- American Heart Journal. (n.d.). *Evaluation of a Self-Management Hypertension Program*. 157(3), 450-456. DOI: 10.1016/j.ahj.2008.11.003
- Antonakoudis, G., Poulimenos, L., Kifnidis, K., Zouras, C., & Antonakoudis, H. (2007). BP control and cardiovascular risk reduction. *Hippokratia*, 11(3), 114–119. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/19582204>
- Bakris, G., Ali, W., & Parati, G. (2019). ACC/AHA Versus ESC/ESH on hypertension guidelines. *Journal of the American College of Cardiology*, 73(23), 3018–3026. <https://doi.org/10.1016/j.jacc.2019.03.507>
- Bale, B. (2010). Optimizing hypertension management in underserved rural populations. *Journal of the National Medical Association*, 102(1), 10–17. [https://doi.org/10.1016/s0027-9684\(15\)30470-3](https://doi.org/10.1016/s0027-9684(15)30470-3)
- Benjamin, E. J., Virani, S. S., Callaway, C. W., Chamberlain, A. M., Chang, A. R., Cheng, S., Muntner, P. (2018). Heart Disease and Stroke Statistics—2018 Update: A Report from the American Heart Association. *Circulation*, 137(12). <https://doi.org/10.1161/CIR.0000000000000558>

- Bosworth, H.B., Olsen, M.K., Dudley, T., Orr, M., Goldstein, M.K., Datta, S.K., McCant, F., Gentry, P., Simel, D.L., and Oddone, E.Z. (2009). Patient education and provider decision support to control BP in primary care: A cluster randomized trial. *American Heart Journal*, 157(3), 450-456. DOI: 10.1016/j.ahj.2008.11.003
- Bosworth, H. B., Olsen, M. K., Dudley, T., Orr, M., Neary, A., Harrelson, M., Oddone, E. Z. (2007). The Take Control of Your BP (TCYB) study: Study design and methodology. *Contemporary Clinical Trials*, 28(1), 33–47. <https://doi.org/10.1016/j.cct.2006.08.006>
- Buford T. W. (2016). Hypertension and aging. *Aging research reviews*, 26, 96–111. doi: 10.1016/j.arr.2016.01.007
- Burnier, M., & Egan, B. M. (2019). Adherence in hypertension. *Circulation Research*, 124(7), 1124–1140. <https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.118.313220>
- Caldwell, J. T., Ford, C. L., Wallace, S. P., Wang, M. C., & Takahashi, L. M. (2016). Intersection of living in a rural versus urban area and race/ethnicity in explaining access to health care in the United States. *American Journal of Public Health*, 106(8), 1463–1469. doi.org/10.2105/AJPH.2016.303212
- Carter, B. L., Arderly, G., Dawson, J. D., James, P. A., Bergus, G. R., Doucette, W. R., Chrischilles, E. A., Franciscus, C. L., & Xu, Y. (2009). Physician and pharmacist collaboration to improve blood pressure control. *Archives of Internal Medicine*, 169(21), 1996–2002.
- Centers for Disease Control and Prevention (2019). *High BP*. Retrieved from <http://www.cdc.gov/bloodpressure/index.htm>
- Community Preventive Services Task Force, T. (2012.). Cardiovascular Disease Prevention: team-Based Care to Improve Blood Pressure Control Task Force Finding and Rationale

- Statement. *USA.Gov*. Retrieved from
<https://www.thecommunityguide.org/findings/cardiovascular-disease-team-based-care-improve-blood-pressure-control>
- Damush, T. M., Jackson, G. L., Powers, B. J., Bosworth, H. B., Cheng, E., Anderson, J., Plue, L (2010). Implementing evidence-based patient self-management programs in the Veterans Health Administration: Perspectives on delivery system design considerations. *Journal of General Internal Medicine*, 25 Suppl 1(Suppl 1), 68–71. doi:10.1007/s11606-009-1123-5
- Dittus, R.S., Alvarez, V., Cobb, J., and Speroff, T. (2006). Improving BP control through provider education, provider alerts, and patient education. *Annals of Internal Medicine*, 145(3), 165-75. doi:10.7326/0003-4819-145-3-200608010-00004
- Essentia Health. (2019). *Mission and Values*. Retrieved from
<http://www.essentiahealth.org/main/mission-vision-and-values.aspx>
- Ezzati, M., Oza, S., Danaei, G., and Murray, C. (2008). Trends and cardiovascular mortality effects of state-level BP and uncontrolled hypertension in the United States. *Circulation*, 117, 905-914. doi/full/10.1161/CIRCULATIONAHA.107.732131
- Ford, J. A., Turley, R., Porter, T., Shakespeare, T., Wong, G., Jones, A. P., & Steel, N. (2018). Access to primary care for socio-economically disadvantaged older people in rural areas: A qualitative study. *PloS One*, 13(3), e0193952. doi.org/10.1371/journal.pone.0193952
- Foti, K., Auerbach, J., & Magnan, S. (2017). Improving hypertension control population-wide in Minnesota. *Journal of Public Health Management and Practice*, 1. doi.org/10.1097/PHH.0000000000000590
- Fryar, C. D., Ostchega, Y., Hales, C. M., Zhang, G., & Kruszon-Moran, D. (2015). *Key Findings Data from the National Health and Nutrition Examination Survey. Hypertension*

- Prevalence and Control Among Adults: United States*. Retrieved from https://www.cdc.gov/nchs/data/databriefs/db289_table.pdf#2.
- Georgopoulos, L. (2012). Breaking down the barriers: Innovative approaches to the management of hypertension. *Journal of Managed Care Medicine*, 15(3), 58–68.
- Grand Rapids, MN | *Data USA*. (n.d.). Retrieved August 15, 2019, from <https://datausa.io/profile/geo/grand-rapids-mn/>
- Hacihasanoglu, R., and Gozum, S. (2011). The effect of patient education and home monitoring on medication compliance, hypertension management, healthy lifestyle behaviors and BMI in a primary health care setting. *Journal of Clinical Nursing*, 20, 692-705.
DOI:10.1111/j.1365-2702.2010.03534.x
- Harshman, Richerson, Hadker, Greene, Brown, Foster, Turner, Skrepnek & Doyle. (2008). Impact of hypertension management/health promotion program. *Journal of Occupational and Environmental Medicine*, 50(3):359-65. doi: 10.1097/JOM.0b013e3181638657.
- Hassid, D., Lash, D., & Jackevicius, C. A. (2017). *SPRINT Trial*. *California Pharmacist*, 64(2), 34–40.
- Healthy People 2020. (2019). *Heart Disease and Stroke*. Retrieved August 26, 2019, from <https://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-stroke/objectives/>
- Hernandez-Vila E. (2015). A review of the JNC 8 BP guideline. *Texas Heart Institute Journal*, 42(3), 226–228. doi:10.14503/THIJ-15-5067
- Heydari, A., & Khorashadizadeh, F. (2014). Pender’s health promotion model in medical research. *JPMA. The Journal of the Pakistan Medical Association*, 64(9), 1067–1074.
Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/25823190>

- Ho, A. Y. K., Berggren, I., & Dahlborg-Lyckhage, E. (2010). Diabetes empowerment related to Pender's Health Promotion Model: A meta-synthesis. *Nursing & Health Sciences, 12*(2), 259–267. doi.org/10.1111/j.1442-2018.2010.00517.x
- Hussein, A. A., Abd El Salam, E. A. E., & Farid Amr, A. E. sayed. (2016). A theory guided nursing intervention for management of hypertension among adults at rural area. *Journal of Nursing Education and Practice, 7*(1), 66. doi.org/10.5430/jnepv7n1p66
- Hyman, D. J., & Pavlik, V. N. (2001). Characteristics of patients with uncontrolled hypertension in the United States. *New England Journal of Medicine, 345*(7), 479–486. doi.org/10.1056/NEJMoa010273
- Institute for Healthcare Improvement. (2019). *Science of improvement: How to improve*. Retrieved from: <http://www.ihl.org/resources/Pages/HowtoImprove/ScienceofImprovementHowtoImprove.aspx>
- Iyer, A. S., Ahmed, M. I., Filippatos, G. S., Ekundayo, O. J., Aban, I. B., Love, T. E. Ahmed, A. (2010). Uncontrolled hypertension and increased risk for incident heart failure in older adults with hypertension: Findings from a propensity-matched prospective population study. *Journal of the American Society of Hypertension: JASH, 4*(1), 22–31. doi: 10.1016/j.jash.2010.02.002
- James, C. V., Moonesinghe, R., Wilson-Frederick, S. M., Hall, J. E., Penman-Aguilar, A., & Bouye, K. (2017). Racial/Ethnic health disparities among rural adults — United States, 2012–2015. *MMWR. Surveillance Summaries, 66*(23), 1–9. doi.org/10.15585/mmwr.ss6623a1

- James, P.A., Oparil, S., Carter, B.L., Cushman, W.C., Dennison-Himmelfarb, Handler, J., Ortiz, E. (2014). 2014 Evidence-based guideline for the management of high blood pressures in adults: Report from the panel members appointed to the Eighth Joint National Committee. *Journal of the American Medical Association*, *311*(5), 507-520. DOI: 10.1001/jama.2013.284427
- Jones, L. M., Rosemberg, M.-A. S., & Wright, K. D. (2017). Opportunities for the Advanced Practice Nurse to enhance hypertension knowledge and self-management among African American women. *Clinical Nurse Specialist*, *31*(6), 311–318. doi.org/10.1097/NUR.000000000000033
- Kamran, A., Azadbakht, L., Sharifirad, G., Mahaki, B., and Mohebi, S. (2015). The relationship between BP and the structures of Pender’s health promotion model in rural hypertensive patients. *Journal of Education and Health Promotion*, *4*(29). DOI: 10.4103/2277-9531.154124
- Khanna, R.R., Victor, R.G., Bibbins-Domingo, R., Shapiro, M.F., and Pletcher, M.J. (2012). Missed opportunities for treatment of uncontrolled hypertension at physician office visits in the United States, 2005-2009. *Archives of Internal Medicine*, *172*(17), 1344-1345. DOI: 10.1001/archinternmed.2012.2749
- Khatib R, Schwalm J-D, Yusuf S, Haynes RB, McKee M, Khan M, et al. (2014) Patient and Healthcare Provider Barriers to Hypertension Awareness, Treatment and Follow Up: A Systematic Review and Meta-Analysis of Qualitative and Quantitative Studies. *PLoS ONE* *9*(1): e84238. doi.org/10.1371/journal.pone.0084238
- Kitt, J., Fox, R., Tucker, K. L., & McManus, R. J. (2019). New approaches in hypertension management: A review of current and developing technologies and their potential impact

- on hypertension care. *Current Hypertension Reports*, 21(6), 44. doi.org/10.1007/s11906-019-0949-4
- Khodaveisi, M., PhD, Omidi, A., Ms, Farokhi, S., Ms, & Soltanian, A. R., PhD (2017). The effect of Pender's Health Promotion Model in improving the nutritional behavior of overweight and obese women. *International Journal of Community-Based Nursing and Midwifery*, 5(2), 165–174.
- Kolasa, K. M. (n.d.). Summary of the JNC 7 guidelines for the prevention and treatment of high BP. *Journal of Nutrition Education and Behavior*, 35(5), 226–227. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/14521821>
- Lackland, D. T. (2014). Racial differences in hypertension: Implications for high BP management. *The American Journal of the Medical Sciences*, 348(2), 135–138. doi.org/10.1097/MAJ.0000000000000308
- Mackinney, Coburn, Lundblad, McBride, Mueller & Watson, (2014). *Access to Rural Health Care-A Literature Review and New Synthesis Prepared by the RUPRI Health Panel*. Retrieved from http://www.rupri.org/Forms/HealthPanel_Access_August2014.pdf
- MacQueen, I. T., Maggard-Gibbons, M., Capra, G., Raaen, L., Ulloa, J. G., Shekelle, P. G., ... Hempel, S. (n.d.). Recruiting rural healthcare providers today: A systematic review of training program success and determinants of geographic choices. *Journal of General Internal Medicine*, 33(2), 191–200. doi.org/10.1007/s11606-017-4210-z
- Mainous, A. G., King, D. E., Garr, D. R., & Pearson, W. S. (2004). Race, rural residence, and control of diabetes and hypertension. *The Annals of Family Medicine*, 2(6), 563–568. doi.org/10.1370/afm.119

- Mancia, G. (2014). Hypertension: Strengths and limitations of the JNC 8 hypertension guidelines. *Nature Reviews. Cardiology*, *11*(4), 189–190.
doi.org/10.1038/nrcardio.2014.12
- Mantovani, M. de F., Kalinke, L. P., Silva, Â. T. M. da, Arthur, J. P., Radovanovic, C. A. T., & Bortolato-Major, C. (2018). Effectiveness of case management performed by nurses for BP control in adults with hypertension. *JBI Database of Systematic Reviews and Implementation Reports*, *16*(9), 1779–1784. doi.org/10.11124/JBISRIR-2017-003647
- Merai R, Siegel C, Rakotz M. (2019). *CDC Grand Rounds: A Public Health Approach to Detect and Control Hypertension*. *MMWR Morb Mortal Wkly Rep* 2016; 65:1261–1264
- Mezue, K., Goyal, A., Pressman, G. S., Matthew, R., Horrow, J. C., & Rangaswami, J. (2018). BP variability predicts adverse events and cardiovascular outcomes in SPRINT. *The Journal of Clinical Hypertension*, *20*(9), 1247–1252. doi.org/10.1111/jch.1334
- Miller & Rollnick. (1999). Treatment, C. for S. A. (1999). Chapter 3—Motivational Interviewing as a Counseling Style. Center for Substance Abuse Treatment. Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK64964/>
- Minnesota Department of Health. (2014). *State Statistics*. Retrieved from <http://www.health.state.mn.us/divs/orhpc/funding/grants/pdf/rhc.pdf>
- Minnesota Population. (2019-07-11). *World Population MN*. Retrieved 2019-08-15, from <http://worldpopulationreview.com/states/minnesota/>
- MN Community Measurement. (2019). *Our story: The need for MNCM*. Retrieved from <http://mncm.org/about-us/our-story/#the-need-for-mncm>
- Monahan, M., Jowett, S., Nickless, A., Franssen, M., Grant, S., Greenfield, S., ... McManus, R. J. (2019). Cost-Effectiveness of Telemonitoring and Self-Monitoring of BP for

- Antihypertensive Titration in Primary Care (TASMINH4). *Hypertension*, 73(6), 1231–1239. doi.org/10.1161/HYPERTENSIONAHA.118.12415
- National Rural Health Association. (2018). *About Rural Health Care*. Retrieved from: <https://www.ruralhealthweb.org/about-nrha/about-rural-health-care>
- Nelson, S., Whitsel, L., Khavjou, O., Phelps, D., & Leib, A. (2016). *Prepared for*. Retrieved from http://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm_491513.pdf
- Nesbitt, S., & Palomarez, R. E. (2016). Review: Increasing awareness and education on health disparities for health care providers. *Ethnicity & Disease*, 26(2), 181–190. doi:10.18865/ed.26.2.181
- Oparil, S., & Schmieder, R. E. (2015). New Approaches in the Treatment of Hypertension. *Circulation Research*, 116(6), 1074–1095. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/25767291/>
- Osterberg L, Blaschke T. Adherence to medication. *New England Journal of Medicine*. 2005; 353:487-497. doi 10.1056/NEJMra050100
- Pender NJ, Murdaugh CL. (2014). *Health. Promotion in nursing practice 5th ed*. New York: Pearson.
- Plan-Do-Study-Act (PDSA) Cycle. (2013). *PDSA*. Retrieved from <https://innovations.ahrq.gov/qualitytools/plan-do-study-act-pdsa-cycle>
- Patel, P., Ordunez, P., DiPette, D., Escobar, M. C., Hassell, T., Wyss, Arterial. (2017). Improved BP control to reduce cardiovascular disease morbidity and mortality: The standardized hypertension treatment and prevention project. *Revista Panamericana de Salud Publica*

- Pan American Journal of Public Health*, 41, 1. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/28614461>
- Pires, P. W., Dams Ramos, C. M., Matin, N., & Dorrance, A. M. (2013). The effects of hypertension on the cerebral circulation. *American Journal of Physiology. Heart and Circulatory zphysiology*, 304(12), H1598–H1614. doi:10.1152/ajpheart.00490.2012
- Proia, K. K., Thota, A. B., Njie, G. J., Finnie, R. K. C., Hopkins, D. P., Mukhtar, Community Preventive Services Task Force, the C. P. S. T. (2014). Team-based care and improved BP control: Acommunity guide systematic review. *American Journal of Preventive Medicine*, 47(1), 86–99. doi.org/10.1016/j.amepre.2014.03.004
- Rose, A. J., Berlowitz, D. R., Orner, M. B., & Kressin, N. R. (2007). Understanding uncontrolled hypertension: Is it the patient or the provider? *Journal of Clinical Hypertension*, 9(12), 937–943. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/18046098/>
- Rosenblit, P. D. (2019). Extreme Atherosclerotic Cardiovascular Disease (ASCVD) Risk Recognition. *Current Diabetes Reports*, 19(8), N.PAG.
- Rosengren, A., Smyth, A., Rangarajan, S., Ramasundarahettige, C., Bangdiwala, S. I., AlHabib, K. F., ... Yusuf, S. (2019). Socioeconomic status and risk of cardiovascular disease in 20 low-income, middle-income, and high-income countries: The Prospective Urban Rural Epidemiologic (PURE) study. *The Lancet Global Health*, 7(6), e748–e760. doi.org/10.1016/S2214-109X(19)30045-2
- Saiz, L. C., Gorricho, J., Garjón, J., Celaya, M. C., Erviti, J., & Leache, L. (2018). BP targets for the treatment of people with hypertension and cardiovascular disease. *Cochrane Database of Systematic Reviews*, (7). doi.org/10.1002/14651858.CD010315.pub3

- Sarki, A. M., Nduka, C. U., Stranges, S., Kandala, N.-B., & Uthman, O. A. (2015). Prevalence of hypertension in low- and middle-income countries: A systematic review and meta-analysis. *Medicine*, *94*(50), e1959. doi.org/10.1097/MD.0000000000001959
- Singer, G. M., Izhar, M., & Black, H. R. (2004). Guidelines for hypertension: Are quality-assurance measures on target? *Hypertension*, *43*(2), 198–202. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/14752006/>
- SPRINT Research Group. (2015). A randomized trial of intensive versus standard blood-pressure control. *New England Journal of Medicine*, *373*:2103-2116. DOI: 10.1056/NEJMoa1511939
- Stephen, C., Halcomb, E., McInnes, S., Batterham, M., & Zwar, N. (2019). Improving BP control in primary care: The ImPress study. *International Journal of Nursing Studies*, *95*, doi.org/10.1016/j.ijnurstu.2019.03.019
- Thota, A. B. (2014). Team-based care to improve blood pressure control: Recommendation of the community preventive services task force. *American Journal of Preventive Medicine*, *47*(1), 100–102. doi.org/10.1016/j.amepre.2014.03.003
- Toscos, T., Carpenter, M., Flanagan, M., Kunjan, K., & Doebbeling, B. N. (2018). Identifying successful practices to overcome ccess to Care Challenges in Community Health Centers. *Health Services Research and Managerial Epidemiology*, *5*, 233339281774340. doi.org/10.1177/2333392817743406
- Turner, B., Skrepnek, S., and Doyle, J.J. (2008). Impact of a hypertension management/health promotion program on commercial driver's license employees of a self-insured utility company. *Journal of Occupational and Environmental Medicine*, *50*(3), 359-365. DOI: 10.1097/JOM.0b013e318163865

- US Department of Health and Human Services. (2020). *Heart Disease and Stroke | Healthy people 2020*. Retrieved January 29, 2020, from <https://www.healthypeople.gov/2020/topics-objectives/topic/heart-disease-and-stroke/objectives#4595>
- USA.GOV. (2019). *What is the CPSTF*. Retrieved from <https://www.thecommunityguide.org/task-force/what-task-force>
- Vallès-Fernandez, R., Rosell-Murphy, M., Correcher-Aventin, O., Mengual-Martínez, L., Aznar-Martínez, N., Prieto-De Lamo, G., ... Ma Bonet-Simó, J. (2009). A quality improvement plan for hypertension control: the INCOTECA Project (Interventions for Control of Hypertension in Catalonia). *BMC Public Health*, *9*(1), 89. doi.org/10.1186/1471-2458-9-89
- Vrijens B, Vincze G, Kristanto P, Uruhart J, Burnier M. Adherence to prescribed antihypertensive drug treatments; Longitudinal study of electronically compiled dosing histories. *British Medical Journal*, *2008*;336:1114-1117. doi; 10.1136/bmj.39553.670231.25
- Walsh, J., McDonald, K., Shojanian, K., Sundaram, V., Nayak, S., Lewis, R., & Goldstein, M. (2006). Quality improvement strategies for hypertension management: A systematic review. *Medical Care*, *44*(7), 646-657.
- Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Dennison Himmelfarb, Wright, J. T. (2018). 2017 ZCC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the prevention, detection, evaluation, and management of high BP in adults. *Journal of the American College of Cardiology*, *71*(19), e127–e248. doi.org/10.1016/j.jacc.2017.11.006

Williams, L., Bibbins-Domingo, K., Coxson, P.G., and Goldman, L. (2015). Costeffectiveness of hypertension therapy according to 2014 guidelines. *New England Journal of Medicine*, 372, 447-455. DOI: 10.1056/NEJMsa1406751

APPENDIX A. IRB APPROVAL LETTER



December 13, 2019

Dr. Heidi Saarinen
Nursing

Re: IRB Determination of Exempt Human Subjects Research:
Protocol #PH20100, "A Collaborative Hypertension Clinic Pilot Program in Rural Primary Care"

Co-investigator(s) and research team: Nicole Pink
Date of Exempt Determination: 12/13/2019 Expiration Date: 12/12/2022
Study site(s): Essentia Health Grand Rapids, MN Sponsor: n/a

The above referenced human subjects research project has been determined exempt (category #1, 4(ii)) in accordance with federal regulations (Code of Federal Regulations, Title 45, Part 46, Protection of Human Subjects). This determination is based on the protocol submission - received 11/25/2019, and information sheet - received 12/13/19.

Please also note the following:

- If you wish to continue the research after the expiration, submit a request for recertification several weeks prior to the expiration.
- The study must be conducted as described in the approved protocol. Changes to this protocol must be approved prior to initiating, unless the changes are necessary to eliminate an immediate hazard to subjects.
- Notify the IRB promptly of any adverse events, complaints, or unanticipated problems involving risks to subjects or others related to this project.
- Report any significant new findings that may affect the risks and benefits to the participants and the IRB.

Research records may be subject to a random or directed audit at any time to verify compliance with IRB standard operating procedures.

Thank you for your cooperation with NDSU IRB procedures. Best wishes for a successful study.
Sincerely,

Kristy Shirley, CIP, Research Compliance Administrator

A handwritten signature in purple ink that reads "Kristy Shirley".

For more information regarding IRB Office submissions and guidelines, please consult https://www.ndsu.edu/research/for_researchers/research_integrity_and_compliance/institutional_review_board_irb/. This Institution has an approved FederalWide Assurance with the Department of Health and Human Services: FWA00002439.

APPENDIX B. POST-IMPLEMENTATION NURSING HYPERTENSION (HTN) CLINIC

SURVEY

Please address each question with the response that most closely reflects your perceptions:

1. Did you feel your education prior to implementation of the HTN clinic was effective in preparing you to utilize the HTN protocols?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

2. Was there enough allocated time and resources to support and treat each patient in the HTN Clinic?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

*If you disagree, what were some of the problems?

3. Do you feel you were able to follow the HTN algorithm clearly and treat the patient per the guideline?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

4. Did the referral process work seamlessly between the provider, nurse, patient and scheduler?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

*If you disagree, what were some of the problems?

5. Did patients come back to the nurse for follow up with the HTN Clinic after the initial referral?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

6. Do you think patients were adequately informed about the HTN Clinic service (through marketing, provider education, etc.)?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

7. Did you feel you had a collaborative relationship with the provider to support and manage treating the patients' HTN needs?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

8. Did patients that were referred to the HTN Clinic intend/desire to continue recommended follow up with HTN Clinic?

9. Did you feel that access to provider clinic appointments increased after implementation of the HTN Clinic?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

10. Do you feel that patients found value in this program?

Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree

What did you feel worked well for the HTN Clinic and what could be changed or improved?

APPENDIX C. PROVIDERS PRE- AND POST- IMPLEMENTATION SURVEY

1. Do you plan to refer HTN patients to the HTN Clinic?
Very likely Somewhat likely Somewhat unlikely Very unlikely
2. Do you anticipate the HTN Clinic to improve your quality numbers and reimbursement rates?
Very likely Somewhat likely Somewhat unlikely Very unlikely
3. Do you anticipate the HTN Clinic to improve patient's hypertension knowledge and management of their hypertension?
Very likely Somewhat likely Somewhat unlikely Very unlikely
4. Do you anticipate the referral process will affect your daily workflow?
Very likely Somewhat likely Somewhat unlikely Very unlikely
5. Do you anticipate your patients will have positive outcomes participating in the HTN Clinic?
Very likely Somewhat likely Somewhat unlikely Very unlikely

APPENDIX D. PERMISSION TO USE HEALTH PROMOTION MODEL



PERMISSIONS
200 Old Tappan Road
Old Tappan, NJ 07675
globalpermissions@pearson.com

PE Ref. #: 210290

30 September 2019
NORTH DAKOTA STATE UNIVERSITY
600 E Blvd
Bismark, ND 58505-0230

NORTH DAKOTA STATE UNIVERSITY has our permission to use electronically content that appears in or accompanies our text, **HEALTH PROMOTION IN NURSING PRACTICE, 7th Ed.** by **PENDER, NOLA J.; MURDAUGH, CAROLYN L.; PARSONS, MARY ANN, ISBN 0133108767**, under the following conditions:

1. Content to be included is as follows: Health Promotion Model on page 35
2. The secure, password-protected website, , is restricted to 18 students enrolled in your course 899 S, taught by Heidi Saarinen at North Dakota State University.
3. The material may be used electronically. **The electronic version must be removed from the web site and destroyed by the end of 28 September 2020.** If you wish to reuse the material after that period, you must obtain a written extension. No further use of the content may be made without our written consent. Specifically, you have no right to sublicense, market, copy, sell or otherwise disseminate the content. All rights not expressly granted to you are reserved to Pearson Education, Inc.
4. **Permission does not allow the reproducing of any material in these pages copyrighted in or credited to the name of any person or entity other than Pearson Education, Inc. Should you desire to use such material, you must seek permission directly from the owner of that material.**
5. This permission is personal to you and may not be assigned or transferred by you without Pearson Education's written permission. Any assignment or transfer without our permission is void and unenforceable.
6. This Agreement contains the entire agreement between parties and supersedes and cancels all previous written or oral understandings or communications. This Agreement may not be modified in any manner except by an instrument in writing signed by an authorized signatory for each party.
7. THIS AGREEMENT SHALL BE GOVERNED AND CONSTRUED UNDER THE LAWS OF THE STATE OF NEW YORK APPLICABLE TO AGREEMENTS MADE AND FULLY PERFORMED THEREIN. THE STATE COURTS IN THE STATE OF NEW YORK IN NEW YORK COUNTY AND, IF THE JURISDICTIONAL PREREQUISITES EXIST AT TH ETIME, THE UNITED STATES DISTRICT COURT FOR THE SOUTHERN DISTRICT OF NEW YORK, SHALL HAVE THE SOLE AND EXCLUSIVE JURISDICTION TO HEAR AND DETERMINE ANY DISPUTE OR CONTROVERSY ARISING UNDER OR CONCERNING THIS AGREEMENT.
8. You agree to pay before or upon reproduction of the work the fee of \$3.06.
Payment must be made out to Pearson Education, Inc. and must be sent **WITH A COPY OF THIS AGREEMENT** to: Pearson Education, Inc., Subsidiary Rights, P O Box 403339, Atlanta, GA 30384 3339. All other correspondence should be directed to the grantor at globalpermissions@pearson.com.
If you agree to the above terms, please sign and return one copy of this agreement to my attention.

APPENDIX E. PERMISSION TO USE RURAL HEALTH INFORMATION

RE: Permission for Citation



Dorothea Nelson <dorothea@ruralhealthinfo.org>

8/15/2019 10:22 AM



To: Pink, Nicole

Hello, and thank you for your message.

The Rural Health Information Hub is a federally-funded information portal, and all of our services are free. You are very welcome to use any of the information on our site, but we do ask that you cite the source.

Hope this is helpful. Please let me know if I can provide any further information. Thank you for contacting the Rural Health Information Hub.

Best wishes,

Dorothea Nelson, MLS, MA

Information Specialist | Rural Health Information Hub

University of North Dakota Center for Rural Health

1301 N Columbia Road, Stop 9037 | Suite E231

Grand Forks, ND 58202-9037

Direct: 701-777-6032 | Toll-free: 1-800-270-1898

dorothea@ruralhealthinfo.org

ruralhealthinfo.org



Get updates from RHIhub on *what* you want, *when* you want it! Sign up for [Custom Alerts](#) and choose topics/states!

The Rural Health Information Hub (RHIhub) does not assume any legal liability for the accuracy, completeness, or usefulness of the information provided in this message. Web site links included in the message are for your convenience. The RHIhub is not responsible for the availability or content of these web sites.

APPENDIX F. HYPERTENSION PROTOCOL

HYPERTENSION MANAGEMENT PROTOCOL Specific to Registered Nurse role

EFFECTIVE DATE: March 2016
APPROVED BY: EH EMG Primary Care Department and EH P&T Committee
REVIEW DATE: March 2018

PATIENT POPULATION:

Patients referred by a provider with the diagnosis of primary hypertension will be managed by the registered nurse following this protocol after initiation of hypertensive therapy. The referral will include provider selection of medication that will be titrated by the RN per protocol.

This guideline is for dosing the listed outpatient hypertensive medication. It gives general information for managing hypertension, but all final dosing decisions are made by the trained RN staff in conjunction with the referring provider.

Please see JNC 8 Treatment Provider Algorithm: Attachment A

MEDICATION ORDERING:

1. The registered nurse, under this protocol, is authorized to adjust dosages of the provider initiated antihypertensive medication.
2. All modifications to therapy will be documented in the medical record and communicated to the referring or primary provider.

LAB MONITORING PROTOCOL:

Under this protocol, the registered nurse will have the authority to order labs to assess treatment and to monitor for adverse events from the drug therapy.

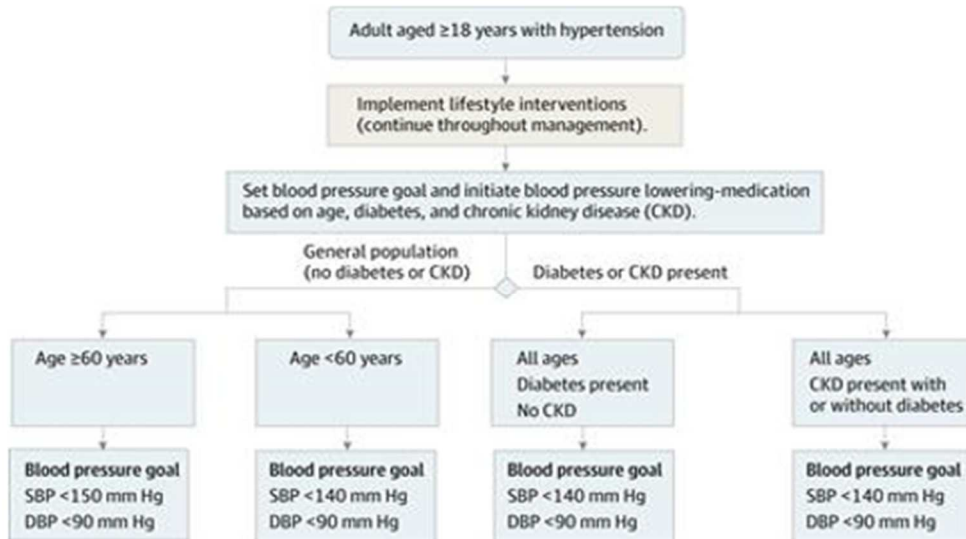
THIS PROTOCOL DOES NOT COVER:

- a. Combination therapy of more than three antihypertensive medications
- b. Management of any other condition other than hypertension
- c. A patient has SBP of >180 or a DBP of >110, resistant hypertension (not controlled with three medications) and/or suspicion of secondary hypertension.
- d. When the patient has any serious complaint of chest pain, shortness of breath, new onset palpitations or other acute issue during the visit.
- e. Any medications that are combined into one tablet

FOR PATIENTS WHO FALL OUTSIDE THIS PROTOCOL:

1. The referring or primary care provider (PCP) will be consulted and the registered nurse will make changes as directed and follow-up with patient as necessary until patient is at goal for at least six months.
2. The registered nurse will refer the patient back to primary physician with recommendation for specialist referral.

HYPERTENSION TREATMENT ALGORITHM



MEDICATION TITRATION PROTOCOL:

Provider initiates Angiotensin- Converting Enzyme (ACE) Inhibitor DRUG	Follow-up	Not at blood pressure goal	Consult with provider if the patient has any of the following:
Lisinopril 5 mg	4 weeks	Discontinue current dose and titrate to next level	<ul style="list-style-type: none"> • Cough • Dizziness • Hyperkalemia • Rise in serum creatinine by 30% or more • Addition of new medication since last visit • Lip swelling or difficulty breathing • Falls
Lisinopril 10 mg	4 weeks	Discontinue current dose and titrate to next level	
Lisinopril 20 mg	4 weeks	Discontinue current dose and titrate to next level	
Lisinopril 40 mg (max dose)	4 weeks	Consult PCP	

Provider initiates Angiotensin receptor blocker (ARB) DRUG	Follow-up	Not at blood pressure goal	Consult with the provider if the patient has any of the following:
Losartan 25 mg	4 weeks	Discontinue current dose and titrate to next level	<ul style="list-style-type: none"> • Dizziness • Hyperkalemia • Rise in serum creatinine by 30% or more • Addition of new medication since last visit • Lip swelling or difficulty breathing • Falls
Losartan 50 mg	4 weeks	Discontinue current dose and titrate to next level	
Losartan 100 mg (max dose)	4 weeks	Consult PCP	

Provider initiates Thiazide diuretic (Chlorthalidone) DRUG	Follow-up	Not at blood pressure goal	Consult with the provider if the patient has any of the following:
Chlorthalidone 12.5 mg	4 weeks	Discontinue current dose and titrate to next level	<ul style="list-style-type: none"> • Hypokalemia • Recent gout flare • Hyponatremia • New or worsening hyperglycemia • Dizziness • Erectile dysfunction • Rise in serum creatinine by 30% or more • Addition of new medication since last visit
Chlorthalidone 25 mg (max dose)	4 weeks	Consult PCP	

Provider initiates Thiazide diuretic (HCTZ- hydrochlorothiazid DRUG	Follow-up	Not at blood pressure goal	Consult with the provider if the patient has any of the following:
HCTZ 12.5 mg	4 weeks	Discontinue current dose and titrate to next level	<ul style="list-style-type: none"> • Hypokalemia • Recent gout flare • Hyponatremia • New or worsening hyperglycemia • Dizziness • Erectile dysfunction • Rise in serum creatinine by 30% or more • Addition of new medication since last visit • Falls
HCTZ 25 mg (max dose)	4 weeks	Consult PCP	

Provider initiates Dihydropyridine calcium channel blocker DRUG	Follow-up	Not at blood pressure goal	Consult with the provider if the patient has any of the following:
Amlodipine 2.5 mg (recommended in elderly, >65 y/o)	4 weeks	Discontinue current dose and titrate to next level	<ul style="list-style-type: none"> • Dizziness • Peripheral edema • Headache • Flushing • Rash • Addition of new medication since last visit • Falls
Amlodipine 5 mg	4 weeks	Discontinue current dose and titrate to next level	
Amlodipine 10mg (max dose)	4 weeks	Consult PCP	

Provider initiates β -blocker DRUG	Follow-up	Not at blood pressure goal	Consult with the provider if the patient has any of the following:
Metoprolol XL 25 mg	4 weeks	Discontinue current dose and increase to next level	<ul style="list-style-type: none"> • Bradycardia • Erectile dysfunction • Fatigue • Dizziness • Dyspnea • Cold extremities • Worsening or new depression symptoms • Addition of new medication since last visit
Metoprolol XL 50 mg	4 weeks	Discontinue current dose and increase to next level	
Metoprolol XL 100 mg	4 weeks	Discontinue current dose and increase to next level	
Metoprolol XL 200 mg (max dose)	4 weeks	Consult PCP	

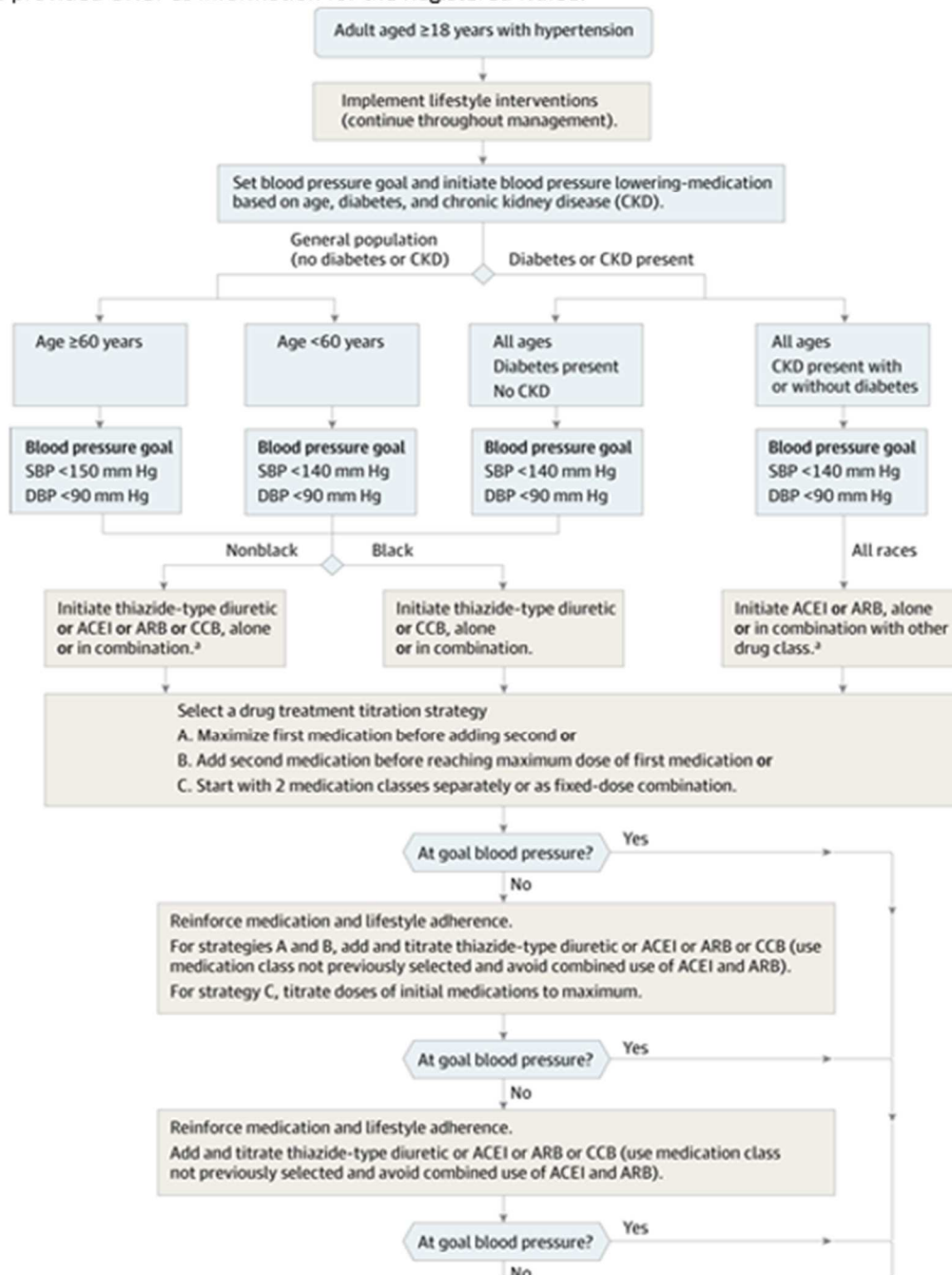
LAB MONITORING PROTOCOL

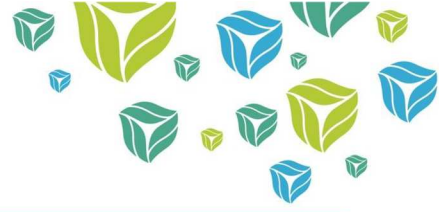
Drug Class	Lab Monitoring
Angiotensin Converting Enzyme (ACE) Inhibitor	BMP*- Order at baseline and at 4 week follow-up
Angiotensin Receptor Blocker (ARB)	BMP* Order at baseline and at 4 week follow-up
Thiazide-type diuretic	BMP* Order at baseline and at 4 week follow-up
Calcium Channel Blocker (Dihydropyridine)	None
β -blocker	None

*Basic metabolic profile (BMP) = Sodium, potassium, chloride, carbon dioxide, blood urea nitrogen, creatinine, calcium, anion gap, and glucose.

Attachment A: JNC-8 PROVIDER HYPERTENSION MANAGEMENT GUIDELINES

This document is to be used as a provider reference for evidence-based treatment of primary hypertension. It is provided ONLY as information for the Registered Nurse.





Hypertension Management **Quality Improvement Project**



APPENDIX H. FOCUS GROUP QUESTIONS

1. Did you feel the training prior to the implementation of the HTN Clinic was adequate?
If not, what could be changed/improved?
2. Did you feel that the referral process worked well for patients and providers?
If not, what could be changed/improved?
3. Did you feel that the scheduling for patient visits with the HTN Clinic worked well?
If not, what could be changed/improved?
4. Do you feel that the HTN Clinic benefitted patients with uncontrolled HTN?
If not, what could be changed/improved?
5. Do you feel that the HTN Clinic service helped free the providers' schedules and/or be a cost-effective use of nursing time?
If not, what could be changed/improved?
6. Do you feel that patient blood pressures were positively affected by the HTN Clinic service?
If not, what could be changed/improved?
7. Would you like to continue with the HTN Clinic service?
If not, what could be changed/improved?

APPENDIX I. ESSENTIA HEALTH GRAND RAPIDS IRB APPROVAL



January 9, 2020

To Whom it May Concern:

Ms. Nicole Pink proposed to conduct a practice improvement project at Essentia Health to fulfill the requirements of her DNP program. We welcome Ms. Pink's project, "A Collaborative Hypertension Clinic Pilot Program in Rural Primary Care", to be hosted at the Essentia Health Grand Rapids Clinic and sponsored by Jared Lund, MD. The project which involves education, competency exams, and implementation of nurse-led hypertension protocols to improve blood pressure outcomes has the potential to improve the care and health of the patients in this rural community.

This project has been reviewed by our Human Research Protection Program manager and determined not to meet the definition of research with human subjects (see attached). As such, review by Essentia Health's Internal Review Board is not necessary.

If you have any further questions, please feel free to contact me at 218.786.3008 or kdean@eirh.org. We look forward to learning the results of Ms. Pink's project and appreciate the opportunity to continue to work with students from your program.

Sincerely,



Kate Dean, MBA
Executive Director
Essentia Institute of Rural Health

Ph: 218-786-3008

Email: kate.dean@essentiahealth.org



Essentia Health

January 9, 2020

To whom it may concern,

Re: A Collaborative Hypertension Clinic Pilot Program in Rural Primary Care

Thank you for submitting the Human Subject Research Determination Form and information for the project listed above. Based on a review of the documentation you provided, this project does not meet the definition of research with human subjects, according to the Office of Human Research Protections (OHRP) [guidance](#): "Research means a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge."

Because the project does not meet the federal definition of human subjects research, it will not require further review by the Essentia Health Institutional Review Board or a scientific review committee. If during the process of data collection or analysis it becomes clear that findings could be generalizable or benefit others, please submit your project for IRB review at that time.

If you have any questions concerning this letter, please contact me at 218-576-0489.

I wish you success with your project.

Sincerely,

Deneice Kramer, MBA, MA, CCRP
Manager, Human Research Protection Program

APPENDIX J. IN-SERVICE POST-TEST

Competency Test for HYPERTENSION MANAGEMENT PROTOCOL: Specific to Registered Nurse role

1. A patient is seen in clinic by a primary care provider and has a new diagnosis of primary hypertension. The provider starts Lisinopril 10 mg and enters a referral for the RN to titrate the medication per hypertension management protocol. According to the protocol, the patient should be seen by the RN in clinic in:
 - a. 2 weeks
 - b. 4-6 weeks
 - c. 4 weeks
 - d. When the patient prefers
2. For a new initiation of Lisinopril, the patient should have their basic metabolic panel (BMP) drawn:
 - a. 2 weeks
 - b. At initiation and yearly
 - c. Every 4 weeks
 - d. At initiation and at 4 weeks
3. Your referred patient presents to see you in 4 weeks after provider initiation of Lisinopril 10mg. You are seeing her for her first RN visit using the hypertension management protocol per provider order. She is 45 years old and has no diagnosis of CKD or diabetes. Her blood pressure today is 150/92 with a pulse is 88. What is your plan?
 - a. If she had no adverse side effects or contraindications, discontinue her Lisinopril 10mg and start her on Lisinopril 20mg po daily. Follow up in 2 weeks.
 - b. If she had no adverse side effects or contraindications, instruct the patient to add Lisinopril 20mg po daily to her medication regimen. Follow up in 4 weeks.
 - c. If she had no adverse side effects or contraindications, discontinue her Lisinopril 10mg and start her on Lisinopril 20mg po daily. Order a BMP if not done prior to RN visit. Follow up with the patient in 4 weeks.
4. The same patient presents 4 weeks later for an RN visit. She is on Lisinopril 20mg daily and her blood pressure is 138/80. She reports having a non-productive cough that won't go away. What would be your next step?
 - a. Discontinue the Lisinopril and notify the provider.
 - b. Her blood pressure is within normal limits so continue her medication and ask the patient to call you if she doesn't feel better in a couple weeks.
 - c. Discontinue Lisinopril 20mg po daily and increase the dose to Lisinopril 40mg po daily.
5. A 67-year-old man is referred to you for hypertension management under the Hypertension protocol. This is a 4 week follow up with you after starting Amlodipine 2.5mg po daily. He reports that his blood pressure has been great especially since his heart doctor started him on another medication. What would you do?
 - a. Gather vital signs, complete an assessment, and find out which medication the patient has been started on. If he was started on metoprolol, you will discontinue the Amlodipine and seek direction from the primary care provider.
 - b. Order a BMP and notify the primary care provider of the medication prescribed by the cardiologist.
 - c. Assess the blood pressure. If patient is not symptomatic and blood pressure is at goal, continue current regimen and assess the patient in 2 weeks.
6. An 82-year-old patient is referred to you for you with hypertension related to chronic kidney disease and is on multiple medications for blood pressure. Lisinopril 10mg po daily and HCTZ 12.5mg po daily were added to his medication regimen 4 weeks ago. His blood pressure 144/94.
 - a. Ask the provider to put in a referral for RN hypertension management per protocol.
 - b. Offer patient education and assessment of hypertension. Obtain any additional orders from the provider directly.

- c. Inform the provider you cannot see this patient for hypertension.
 - d. Assess patient's blood pressure and symptoms. If blood pressure is not at goal, increase Lisinopril to 20 mg po daily and set up visit in 4 weeks.
 - e. Assess patient's blood pressure and symptoms. If blood pressure is not at goal, increase HCTZ to 25 mg po daily and set up visit in 4 weeks.
7. A 30-year-old patient is referred to you after the provider initiated HCTZ 12.5mg for primary hypertension. He has an extensive mental health history but no other medical problems. An initial BMP was drawn 4 weeks ago and all labs are within normal limits. The patient's blood pressure today is 138/92. The patient feels great and informs you that he was put back on his lithium. What is your plan?
- a. Complete assessment, and notify the provider that the patient is started on lithium.
 - b. Discontinue HCTZ and notify the primary care provider immediately.
 - c. Patient's blood pressure is not at goal, increase HCTZ 25mgpo daily and have patient return in 4 weeks.
8. A 70-year-old female patient presented for a 4week follow up of her blood pressure after initiation of Losartan 25mg po daily. She is a healthy woman with no history of diabetes or CKD. The provider entered the appropriate referral for RN hypertension management per protocol. Upon assessment, you find her BP is 182/98. She is short of breath but states that she has had a severe cold this week. What is your plan?
- a. Her blood pressure is not at goal. Discontinue her current Losartan dose and increase her Losartan to 50mg po daily.
 - b. Complete assessment. Order the BMP and notify the provider of the results. Discontinue Losartan and have patient follow up in 2 weeks.
 - c. The patient is symptomatic and her blood pressure is above the parameters that can be managed by the RN hypertension protocol. Notify the PCP for further orders.
9. A provider refers a patient who has been on Metoprolol XL 100mg po daily for a few years. The provider is requesting additional education and monitoring as this patient's blood pressure is no longer controlled. The patient is seen by the RN for education and returns in 4 weeks with a provider order for RN hypertension management per protocol. The patient's blood pressure is 166/80 with a pulse rate of 66bpm. What's your plan?
- a. Assess patient. Discontinue current dose and increase Metoprolol XL to 200mg po daily. Return in 4 weeks.
 - b. Assess patient. Patient's heart rate is below desired rate. Notify provider immediately.
 - c. Continue with current education plan. No change in medications. Have patient return in 4 weeks.
 - d. Patient is at maximum Metoprolol XL dose. Assess patient and notify them of patient's status.
10. A provider refers a 59-year-old patient who has been on Metoprolol XL 100mg po daily for a few years. The provider is requesting additional education and monitoring as this patient's blood pressure is no longer controlled. The patient is seen by the RN for education and returns in 4 weeks with a provider order for RN hypertension management per protocol. The patient's blood pressure is 132/80 with a pulse rate of 56bpm. What's your plan?
- a. Assess patient. Patient is not at goal. Increase Metoprolol XL to 200mg po daily (max dose).
 - b. Continue with current education plan. No change in medications. Have patient return in 4 weeks.
 - c. Patient is at maximum Metoprolol XL dose. Assess patient and notify the provider.
 - d. Assess patient. Discontinue current dose and notify provider of the patient's vital signs.

APPENDIX K. PROVIDER POST-INSERVICE SURVEY

1. Where the objectives of the presentation met?

Strongly Agree, Somewhat Agree, Disagree, Strongly Disagree

2. Did the information reinforce current practice guidelines?

Strongly Agree, Somewhat Agree, Disagree, Strongly Disagree

3. Do you think the HTN Clinic will improve hypertensive outcomes and enhance your current practice?

Strongly Agree, Somewhat Agree, Disagree, Strongly Disagree

4. Did the in-service provide information you expect to implement?

Strongly Agree, Somewhat Agree, Disagree, Strongly Disagree

5. Did the in-service provide information on new ideas for HTN management?

Strongly Agree, Somewhat Agree, Disagree, Strongly Disagree