

Effects of Education on Medication Adherence and Blood Pressure in Hypertensive Adults

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Abstract

Hypertension affects many United States adults and is a modifiable risk factor of heart disease, the leading cause of death in the United States. Low medication adherence rates are associated with poor blood pressure control, poor health outcomes, and increased costs. The purpose of this quasi-experimental, evidence-based hypertension education project was to determine if evidence-based education improved medication adherence and blood pressure in hypertensive adults. A total of six participants took part in the project. Participants were recruited from a primary care clinic in rural Kansas. All participant communication, data collection, and implementation took place via email and phone. Two individual education sessions based on the American Heart Association's "Small changes make a big difference" took place. Participants were also taught how to correctly take blood pressure from home. Medication adherence was measured using the Hill-Bone Medication Adherence Scale. Blood pressure was measured using electronic health records and participant's home blood pressure monitoring log. There was no significant difference in pre- and post-intervention medication adherence scores or blood pressure readings. Participant feedback revealed positive feelings toward education provided. Nurse practitioners, and other healthcare providers, should improve patient's understanding of hypertension to decrease healthcare costs and increase quality of life in adults with hypertension.

Key words: hypertension, education, medication adherence, home blood pressure monitoring

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Hypertension (HTN) affects many U.S. adults and is seen frequently in the primary care setting. Medication nonadherence remains a barrier to effective disease management and exists for many reasons. Healthcare providers must be vigilant when determining treatment plans to ensure patients are successful in helping manage their HTN. Educating patients regarding the disease process, risks of uncontrolled HTN, and self-management tools may improve blood pressure (BP). A definition of terms for the evidence-based project can be found in Appendix A.

Significance

Prevalence and Impact

According to the World Health Organization (2019), one in four men and one in five women worldwide had diagnosed with HTN in 2015. Of those diagnosed, less than 20% had controlled blood pressure (World Health Organization [WHO], 2019). In the United States, one in three adults has been diagnosed with hypertension (Kirkland et al., 2018). High blood pressure is a leading modifiable risk of heart disease (Forouzanfar et al., 2017). A follow-up study from the National Health and Nutrition Examination Survey (NHANES) of 23,272 U.S. participants showed more than 50% of deaths from stroke and coronary heart disease occurred in adults with HTN (Ford, 2011). Rates of elevated systolic blood pressure and total deaths increased substantially between 1990 and 2015 (Forouzanfar et al., 2017). Hypertension is associated with chronic kidney disease, cerebrovascular disease, and ischemic heart disease (Forouzanfar et al., 2017; Kirkland et al., 2018). Angina, myocardial infarction, heart failure, and heart arrhythmia are complications of uncontrolled HTN (WHO, 2019).

Economic and Health System

Hypertension is associated with high costs to the healthcare system (Kirkland et al., 2018). Patients with HTN had triple the prescription medication expenditure, double the outpatient cost, 2.5 times the inpatient cost, and a higher annual adjusted expenditure than people without HTN (Kirkland et al., 2018). Complications from HTN add further financial stress to the health system. Total healthcare costs for HTN are estimated to be \$131 billion annually (Kirkland et al., 2018).

Individuals with HTN face nearly \$2,000 higher per year in annual healthcare expenditure when compared with non-hypertensive peers (Kirkland et al., 2018). Those with HTN had an annual prescription medication expenditure of \$2371 compared to \$814 in those without HTN (Kirkland et al., 2018). The recommended treatment for HTN costs an estimated \$187 per diagnosed person annually (Nuckols et al., 2011). Hospitalizations cost approximately \$213 per diagnosed person annually (Nuckols et al., 2011). This takes into account some diagnosed people do not require hospitalization. If blood pressures were lowered and better controlled, the annual cost of an adult with HTN could be lowered.

Local Issue and Diversity Considerations

In the state of Kansas, 31.6% of adults have been diagnosed with HTN (Kansas Department of Health and Environment [KDHE], 2017). Three out of four Kansas adults who have been diagnosed with HTN are taking medication for their BP (KDHE, 2017). Kansas adults with HTN are three times more likely to be diagnosed with diabetes and heart disease than those who have not been diagnosed with HTN (KDHE, 2017). Half of Kansas hypertensive adults measure their BP at home, but only 20% check daily (KDHE, 2017).

The total population of Rice County, KS, as of July 1, 2019, was 9,537 people (United States Census Bureau, n.d.). Rice County is not a particularly diverse population; 83% of its

residents are Caucasian, 11.5% are Hispanic, 2.5% are two or more races, and about 1% are African American, American Indian, or Asian (United States Census Bureau, n.d.). About 20% have a baccalaureate degree or higher education (United States Census Bureau, n.d.).

Problem & Purpose

Problem Statement

Medication nonadherence among hypertensive patients is associated with poor BP control, poor health outcomes, increased cost, and negative social consequences (Bosworth et al., 2016). Hypertension is a leading risk factor for heart disease and stroke (Centers for Disease Control and Prevention [CDC], 2020). A survey from 2011 to 2012 showed 82.8% of adults were aware they had HTN, 75.7% were taking medication for BP control, and only 51.9% had their BP controlled to less than 140/90 mmHg (Nwankwo et al., 2013). In 2015, WHO reported less than 20% of hypertensive adults had controlled BP (WHO, 2019). The increase in uncontrolled BP calls for a change in HTN management.

Factors contributing to uncontrolled BP include cost (Karakurt & Kasikci, 2012), medication adherence (Christensen et al., 2009; Karakurt & Kasikci, 2012; Vrijens et al., 2008), and patient understanding of HTN complications (Karakurt & Kasikci, 2012). Conn et al. (2016) performed a systematic review and meta-analysis, which revealed behavior change interventions improved medication adherence (MA) and were effective in lowering both systolic and diastolic blood pressures. Tan et al. (2019) performed a meta-analysis showing education had a positive effect on medication adherence.

Purpose Statement

The purpose of this hypertension education project was to determine if evidence-based education improved medication adherence and blood pressure in hypertensive adults at the

primary care clinic. The intended improvement of this project was to assist in blood pressure control, patient understanding of their disease process, and self-care techniques.

Facilitators and Barriers

The economic benefit of managing HTN acted as a facilitator for the evidence-based project. Controlled BP results in fewer medication adjustments, follow-up visits, and hospitalizations (Nuckols et al., 2011). Since HTN costs the U.S. approximately \$131 billion annually, controlled BP is beneficial to the healthcare system and economy (Kirkland et al., 2018). If blood pressures were lowered and better controlled, the annual cost of recommended treatment could be lowered from \$187 to \$37 per diagnosed person annually, and hospitalization costs could be lowered from \$213 to \$162 per diagnosed person annually (Nuckols et al., 2011). There were no shareholders for the evidence-based project.

Quality care and support systems were also facilitators of this project. Patient-centered, multidisciplinary approaches can improve BP control and MA (Bosworth et al., 2008; Bosworth et al., 2016; Hacıhasanoglu & Gozum, 2010; Tan et al., 2019; Xu et al., 2014). Counseling, motivational interviewing, and shared decision-making improve treatment adherence (Bosworth et al., 2016; Community Preventive Services Task Force, 2014). Personal support systems from the family, friends, and/or colleagues of the participants were additional facilitators of the project. Support from the project leader and providers at the clinic were also facilitators.

The largest barrier of the evidence-based project included a willingness to participate and sacrifice of participant's personal time. Some patients may not have been convinced their HTN needs better management. Due to the COVID-19 pandemic, this project was largely impacted and was a substantial barrier for the project. Recruitment techniques were not as effective as anticipated.

Sustainability

Many factors will promote or inhibit sustainability of the project intervention. Factors promoting sustainability include provider and clinic support, patients discussing their new knowledge with their provider, and patient's accessibility to the clinic. Factors that will inhibit sustainability include patients not taking their BP at home, prior knowledge conflicts that prohibit willingness to learn new information, and conflicting information between the American Heart Association education and provider's recommendations.

Review of Evidence**Inquiry**

The inquiry was: in adults 18 years and older with diagnosed hypertension, do two individual education sessions improve medication adherence and blood pressure control over a 5-month period in a primary care setting?

Search Strategies

The literature search occurred using PubMed, EBSCO, Cumulative Index to Nursing Allied Health (CINAHL), and Embase. Keywords for the search included hypertension management, blood pressure control, medication adherence, medication adherence and hypertension, patient education, patient education and hypertension, and home blood pressure monitoring. Articles were filtered to those dated 2011 to the present. Two articles were dated since 2008; the use of these studies was considered necessary due to more recent data not being available. A search of article reference lists was also performed to find articles related to the inquiry. Inclusion criteria included those published in English, studies reporting on at least one outcome of interest, and whose focus was hypertension. Exclusion criteria included those

involving participants under the age of 18, studies reporting on secondary hypertension, studies lacking scientific rigor, and studies not printed in English.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was used for an evidence-based search regarding the inquiry (Appendix B). Various types of studies were found to support the inquiry. Thirty-one articles and three evidence-based guidelines contributed evidence to the inquiry. According to Melnyk's levels of evidence (Melnyk & Fineout-Overholt, 2019), six studies are level I evidence (all systematic reviews and/or meta-analyses of randomized controlled trials), seven are level II evidence (five randomized controlled trials, one prospective study, and one systematic review on observational studies), six are level III evidence (all quasi-experimental), seven are level IV evidence (five cohort studies and two case-control studies), one is level VI evidence (qualitative study), and five are level VII evidence (three integrative literature reviews and two expert committee recommendations). An evidence table was created to assist in identifying studies and their content (Appendix C). An evidence grid was also created to visualize the link between a study and the major themes of inquiry and literature search (Appendix D).

Evidence by Themes

Five major themes emerged during the literature search for the inquiry. Lifestyle changes are the first-line treatment option for adult hypertension, with pharmacotherapy ultimately being utilized (Armstrong et al., 2014; Benjamin et al., 2018; Go et al., 2014; James et al., 2014; Whelton et al., 2018). Adequate patient-centered education improves medication adherence and overall BP control (Bosworth et al., 2008; Bosworth et al., 2016; Hacıhasanoglu & Gozum, 2010; Tan et al., 2019; Xu et al., 2014). Improving medication adherence can be achieved through various interventions, including education (Bosworth et al., 2016; Chen et al., 2011;

Conn et al., 2016; Hacıhasanoglu & Gozum, 2010; Lam et al., 2015; Marcum et al., 2017; Tan et al., 2019; Tang et al., 2017). Nonadherence is associated with poor health outcomes and is prevalent in hypertensive adults (Ahn & Ham, 2016; Al-Noumani et al., 2019; Christensen et al., 2009; Fischer et al., 2010; Ho et al., 2009; Karkurt & Kasikci, 2012; Ma, 2016; Morrissey et al., 2017; Vrijens et al., 2008; Uchmanowicz et al., 2017; Yatim et al., 2019). Home blood pressure monitoring assists with the management and control of blood pressure (Bosworth et al., 2016; Hacıhasanoglu & Gozum, 2010; Morrissey et al., 2017; Persell et al., 2020).

Adult Hypertension Management

Management of HTN is focused on maintaining systolic blood pressure (SBP) below 140 mmHg and diastolic blood pressure (DBP) below 90 mmHg for adults 18 to 59 years old (Benjamin et al., 2018; James et al., 2014; Whelton et al., 2018). In adults 60 years and older, HTN management is focused on maintaining SBP under 150 mmHg and DBP under 90 mmHg (Benjamin et al., 2018; James et al., 2014; Whelton et al., 2018). Hypertension is defined as SBP greater than 130 mmHg and DBP greater than 80 mmHg on at least two separate occasions (Benjamin et al., 2018; Go et al., 2014; Whelton et al., 2018). Lifestyle interventions are the first choice of treatment; they include a healthy diet, weight control, and regular exercise (Go et al., 2014; James et al., 2014).

Pharmacotherapy is initiated when BP is 150/90 mmHg or higher in patients over 60 years old, or 140/90 mmHg or higher in those younger than 60 years old (Armstrong et al., 2014; Benjamin et al., 2018; Go et al., 2014; James et al., 2014). In most patients, including those with diabetes, initial treatment should include an angiotensin-converting enzyme inhibitor (ACEI), angiotensin receptor blocker (ARB), calcium channel blocker (CCB), or a thiazide-type diuretic (Armstrong et al., 2014; Benjamin et al., 2018; Go et al., 2014; James et al., 2014). In African

American patients, including those with diabetes, initial pharmacotherapy treatment should include a thiazide-type diuretic or CCB (James et al., 2014). For patients with chronic kidney disease, an ACEI or ARB should be initiated despite race or diabetes diagnosis (Armstrong et al., 2014; James et al., 2014).

A multidisciplinary, patient-centered approach to hypertension treatment is more effective in achieving BP control (Bosworth et al., 2016; Crabtree et al., 2013). Patient-centered care methods can improve treatment adherence and involve counseling, motivational interviewing, and shared decision making (Bosworth et al., 2016; Community Preventive Services Task Force, 2014). Self-management with self-care behaviors should also be part of HTN management.

Nonadherence to Treatment

Medication nonadherence has become an increasingly important factor in patient care because it is associated with adverse outcomes and higher costs (Ho et al., 2009; Lam & Fresco, 2015). Health beliefs play a major role in MA and self-care behaviors like diet, exercise, and weight management (Al-Noumani et al., 2019). A randomized control trial revealed that shifting patient beliefs about antihypertensive medications led to behavioral changes and better BP control and MA (Alhalaiqa et al., 2012). Behaviors of MA are complex and range from not taking prescribed medication, taking only some of the medication, or not taking them according to instructions (Ma, 2016).

Factors associated with nonadherence include socioeconomic status, lack of knowledge, self-efficacy, and health literacy (Ahn & Ham, 2016; Karakurt & Kasikci, 2012; Uchmanowicz et al., 2019). Gender, age, marital status, education, insurance, communication between patient and provider, lack of social support, length of time since diagnosis, and medication side effects

have also been revealed as characteristics of nonadherence (Ma, 2016; Uchmanowicz et al., 2019). A systematic review by Al-Noumani et al. (2019) concluded health beliefs impact MA, and education interventions are recommended to modify those beliefs. A separate systematic review and meta-analysis showed determinants of better medication adherence were older age, fewer prescribed medications, retirement/unemployment, and HTN diagnosis for more than ten years (Uchmanowicz et al., 2019).

Medication Adherence Interventions

Support from healthcare providers can benefit patients when managing their HTN (Community Preventive Services Task Force, 2014). Providing access to resources and follow-up phone calls are simple interventions to support patient's self-management (Community Preventive Services Task Force, 2014). Providers can support self-management by increasing knowledge, skills, and changing attitudes toward their disease process and risk factors (Bosworth et al., 2016). A multidisciplinary and shared responsibility approach by providers can improve self-management and MA (Bosworth et al., 2016; Community Preventive Services Task Force, 2014).

Educational, behavioral, and provider interventions have all been successful in improving patient MA (Al-Noumani et al., 2019; Marcum et al., 2017; Morrissey et al., 2017). Various types of reminders have also been effective in improving MA and overall clinical results (Bosworth et al., 2016; Costa et al., 2015; Ireland et al., 2011). A patient-centered approach should be used to individualize the care plan to ensure better adherence (Community Preventive Services Task Force, 2014).

Education for Adults with Hypertension

Educational interventions can increase MA, increase healthy lifestyle behaviors, and decrease BP, which aids in the management of HTN (Hacihasanoglu & Gozum, 2011). Group sessions have been found to be more effective than individual sessions (Conn et al., 2016; Yatim et al., 2019). Multiple education sessions are also proven to increase retention of information and adherence rates (Tan et al., 2019). Patient education on MA alone and when combined with healthy lifestyle behaviors education is an effective tool in controlling HTN in primary care (Hacihasanoglu & Gozum, 2011).

Effective education to improve MA should include information regarding behavioral changes, HTN disease process, benefits of HTN management, the role of antihypertensive medication to prevent complications, and side effects of medications (Hacihasanoglu & Gozum, 2011; Karakurt & Kasikci, 2012; Ma, 2016). Medication education alone has not been shown to improve treatment adherence or control HTN (Bosworth et al., 2016; Go et al., 2014). However, when medication education is combined with HTN education and behavioral interventions, adherence improves, and BP is reduced (Costa et al., 2015; Hacihasanoglu & Gozum, 2011).

Home Blood Pressure Monitoring

While BP measurement often takes place in the clinic setting, home blood pressure monitoring (HBPM) has become increasingly popular among patients (Agarwal et al., 2011). Blood pressure is a physiologic measure of adherence (Ireland et al., 2011). Measurement of BP at home can help in the diagnosis and management of HTN (Whelton et al., 2018). Adults whose BP is regularly measured have higher MA (Karakurt & Kasikci, 2012). Self-management of BP increases a patient's awareness of their disease process and assists the provider in achieving BP control (Costa et al., 2015). A BP tracking app and home monitor can be useful tools to improve HBPM (Persell et al., 2020). Home BP monitoring can reduce both systolic and diastolic blood

pressures (Agarwal et al., 2011; Morrissey et al., 2017). The American Society of Hypertension, American Heart Association, and Preventive Cardiovascular Nurses Association released a statement saying HBPM is more reproducible than office measurements and represents a better correlation with target organ damage measurements (Crabtree, 2013).

Evidence Discussion

The degree of direct evidence supporting the inquiry is plentiful. Medication nonadherence is a significant concern that can cause uncontrolled BP (Al-Noumani et al., 2019; Christensen et al., 2009; Karakurt & Kasikci, 2012; Ma, 2016; Morrissey et al., 2011; Vrijens et al., 2008). Patient characteristics associated with medication nonadherence include younger age, non-Caucasian race, chronic health problems, depression, complex regimens, and perceived or experienced side effects of medication (Ho et al., 2009; Ma, 2016; Uchmanowicz et al., 2017). Medication nonadherence among hypertensive patients is associated with poor blood pressure control, poor health outcomes, increased costs, and negative social consequences (Al-Noumani et al., 2019; Bosworth et al., 2016; Karakurt & Kasikci, 2012; Ma & Ham, 2016; Morrissey et al., 2011).

Interventions to improve MA exist and have been researched. Educating patients regarding their diagnosis is an effective way to improve BP control and increase MA (Bosworth et al., 2008; Bosworth et al., 2016; Hacıhasanoglu & Glozum, 2010; Tan et al., 2018; Xu et al., 2014). Education sessions are more effective when performed in a group setting (Conn et al., 2016; Yatim et al., 2019) and when multiple sessions occur (Tan et al., 2018).

Gaps

Gaps are found in the evidence content surrounding education, MA, and control of BP. The American Heart Association's handout for patient education will be utilized for the education intervention, but there is no research into its validity as an education tool. It is assumed to contain the most up-to-date, evidence-based information. Different teaching techniques have been studied, which provides a wide variety of approaches to provide education; however, a single type of education has not been found to be superior to others.

Limitations

Ho et al. (2009) states new strategies need to be tested to improve MA. While systematic reviews and meta-analyses were used in the literature review, many articles do not provide the same high level of evidence. While research is plentiful on MA and its importance, more research is needed on education's effect on improving MA and BP control.

Health Promotion Model

Nola Pender's health promotion model (HPM) serves as a framework to combine nursing and behavioral science views on factors that may affect health behaviors (Pender et al., 2015). Concepts in the HPM include personal experiences and factors, perceived barriers and benefits, wellness, behavior, motivation, and nurse-client relationship (Murdaugh et al., 2019; Pender et al., 2015). The goal of the HPM is to have improved health, a better quality of life, and enhanced functional ability at all stages of life (Murdaugh et al., 2019). Pender's HPM is applicable to the inquiry because the model is based on changing behaviors. Desired outcomes of the inquiry included improvement in MA and BP. In order to achieve these outcomes, self-care behaviors had to be acknowledged and improved after effective education sessions. The outcomes of the

inquiry are reliant on the individual's behavior, which is congruent with the HPM. Appendix E represents a diagram of the theory application for the project.

Sevinc and Argon (2018) used the HPM in post-myocardial infarction patients and saw significant differences in smoking status, hemoglobin A1C, functionality, and self-efficacy in patients who received care based on the HPM. Hussein et al. (2017) used Pender's model for HTN management in adults and found those in the intervention group had statistically significant improvement in BP measurements after the HPM was utilized. Pender's HPM has also been shown to improve nutritional behaviors in obese women; the study's authors assert the HPM should be used for improving health-promoting behaviors (Khodaveisi et al., 2017).

Methods

IRB Approval

The Operations Supervisor gave written permission for the project to be implemented at the clinic. An institutional review board (IRB) does not exist within the clinic. The University of Missouri – Kansas City's IRB was the primary IRB for the evidence-based project (Appendix F). The project leader submitted approval for not human subjects research. Faculty approval was also obtained (Appendix G).

Ethical Issues and Funding

Verbal consent was obtained for the use of demographic information, BP measurements, and MA surveys. Participant's personal information was protected, and health information was not shared. Autonomy was also respected; participants chose to participate in the education sessions and home blood pressure monitoring. All patients who met inclusion criteria were offered the opportunity to participate in the project. Participants were not excluded based on race, ethnicity, gender, sexual orientation, or religion. All patient information was maintained

according to the Health Insurance Portability and Accountability Act. A numbering system was used to protect participant's identities. There were no conflicts of interest for the project leader.

Direct and indirect costs totaling \$0.00 are represented in Appendix H. Direct costs were non-existent as this project took place virtually. Participants owned their own BP monitor, so it was not included as a cost. Indirect costs included the project leader's time for recruitment, implementation of education sessions, and coordination of data collection. Since no costs are associated with this project, no grants or project leader funding were necessary to complete the project.

Setting and Participants

The project site was a primary care clinic in rural Kansas. The clinic sees patients for acute illnesses, well-child exams, immunizations, annual adult physical exams, sports physicals, patient counseling, and geriatric care. The clinic serves Rice County, KS, which has a population of approximately 9,537 people (United States Census Bureau, n.d.). Nearly 20% of the county's population is over the age of 65 (United States Census Bureau, n.d.).

To meet inclusion criteria, participants had to be over the age of 18, diagnosed with primary HTN represented by the ICD-10 code I10 in their chart, taking an antihypertensive for BP control, have a home BP monitor, ability to speak and read English, and had been seen in the clinic in the last 12 months. Exclusion criteria included: secondary HTN, pregnancy, no antihypertensive pharmacotherapy, inability to speak and read English, inability to independently perform activities of daily living, and those not seen within the last 12 months. Convenience sampling was used to create the sample of participants. Eight people meeting inclusion criteria voiced interest in participating. Six participants completed the evidence-based education intervention and data collection.

Evidence-based Intervention

The proposed education intervention aimed to improve MA and BP. The intervention was two individualized education sessions over the phone using the American Heart Association's "Small changes make a big difference" (American Heart Association [AHA], 2019), which provided up-to-date, evidence-based information regarding HTN (Appendix I). The booklet was available on AHA's website for free. The booklet was emailed to each participant before the education phone call took place to allow a visual aid. Participants were also emailed an HBPM log and asked to record daily BP measurements (Appendix J).

Initial chart analysis of all clinic patients with the ICD-10 code was performed. This resulted in 992 potential participants. Over a five-day span, chart reviews were performed by the project leader to find patients meeting inclusion criteria. Four hundred thirty-six potential participants were recruited via email communication (Appendix K). Personnel at the clinic site assisted with recruitment if a potential participant reached out with questions. They legitimized the email from the project leader. Participants contacted the project leader by replying to the recruitment email to express interest in participation. This occurred over a 1-month period.

The project leader responded to participant emails to set a time for a phone call to gather demographic information, pre-intervention medication adherence using the Hill-Bone Medication Adherence Scale (HB-MAS), and initial education session. The project leader also attached the AHA education booklet and HBPM log in the email. The first phone call to participants lasted 30-40 minutes. Pre-intervention data was obtained, then the education session took place. Participants were able to follow along with the emailed booklet.

One month later, another email communication was sent to participants to set a time for the second education session. The second phone call took 15-20 minutes with each participant.

One month after the last education session, a time was set for a third and final phone call to gather post-intervention HB-MAS and the latest home BP reading. The third phone call to participants lasted 5-10 minutes. Recruitment, implementation, and data collection were performed exclusively by the project leader. Project implementation and data collection took place over a five-month period (Appendix L). Appendix M illustrates an intervention flow diagram of the evidence-based project.

Evidence-based Project Model

The Iowa model of evidence-based practice (EBP) was used for the project. The Iowa model consists of a key concept prompting the initiation of an EBP project (Melnik & Fineout-Overholt, 2019; Schaffer et al., 2012). The project leader developed a practice change with the intent of implementing and evaluating the practice change (Melnik & Fineout-Overholt, 2019; Schaffer et al., 2012). The project leader selected, reviewed, critiqued, and synthesized available research evidence (Melnik & Fineout-Overholt, 2019; Schaffer et al., 2012). The practice change was piloted, then a determination regarding the appropriateness of adoption was made (Melnik & Fineout-Overholt, 2019; Schaffer et al., 2012). Ongoing evaluation and dissemination took place (Melnik & Fineout-Overholt, 2019; Schaffer et al., 2012).

Change Process

The Transtheoretical Model (TTM) was used to explain a patient's behavioral change but was also applied to behavioral changes of an organization (Prochaska, 2008). It involved five stages: pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska, 2008). Those in the pre-contemplation stage did not intend to change in the next six months (Prochaska, 2008). Contemplation stage persons planned to change in the next six months. Those in the preparation stage planned to change in the next 30 days and had made previous attempts to

improve (Prochaska, 2008). Action and maintenance stage people had reached criterion, like zero smoking (Prochaska, 2008). People in the action stage had reached the criterion within the last six months (Prochaska, 20008).

Project Design

The evidence-based project utilized a quasi-experimental, pre-, and post-test design. Patients with HTN who met inclusion criteria were asked to participate in education sessions. Statistical analysis was performed to measure the impact of education on medication adherence, the primary outcome, and blood pressure, the secondary outcome—this study design allowed for the best comparison of participants pre- and post-intervention.

Validity

Various aspects promoted the internal validity of the evidence-based project. Recruitment of all diagnosed HTN patients who obtained care from the project site and consistent use of measurement tools enhanced internal validity. Type of home BP monitor utilized decreased internal validity. Using participant's home BP monitoring logs as a measurement of post-intervention analysis also affected internal validity. Pre-intervention BP measurement was obtained from the electronic health record; these BP measurements ranged from 2 weeks old to 8 months old. The external validity of the evidence-based project was high. Education gained for self-management of HTN can be applied to participant's other chronic conditions, allowing for transferability of the evidence-based project's data. Small sample size and use of convenience sampling negatively impacted external validity.

Outcomes

The primary outcome of the evidence-based project was MA. Post-intervention HB-MAS did not show a significant change in medication adherence as pre-intervention surveys revealed

already high MA scores. The secondary outcome of the evidence-based project was improved BP. Blood pressure measurements were obtained from the electronic health record for pre-intervention data and from the patient's home BP log for post-intervention data. One of six participants showed an improvement in BP. Both primary and secondary outcomes impact participants' HTN management and treatment. Appendix N represents a logical flow of outcomes to analyze content.

Measurement Instruments

The HB-MAS is a 9-item survey regarding medication adherence. It originated from a 14-item Hill-Bone Compliance to High Blood Pressure Therapy Scale (HB-HBP). Permission to use the Hill-Bone Medication Adherence Scale (HB-MAS) was obtained (Appendix O). The scale consists of nine questions regarding medication adherence using a Likert scale (Appendix P). A low score indicates a high rate of medication nonadherence (Kim et al., 2000). The HB-HBP has been shown to be valid with a Cronbach's alpha of 0.74 and 0.84 (Kim et al., 2000). Participants completed the adherence scale pre- and post-intervention for consistency in data.

Improvement in BP was measured using a pre-intervention BP measurement from the participant's electronic health record and post-intervention BP measurement from the participant's home BP monitoring log. The HBPM log was available for free download from the American Heart Association's website. Blood pressure values obtained from automatic or manual cuffs are physiologic measurements that show the validity and reliability of the measurement. Participants were taught how to properly take their BP during the education sessions.

Quality of Data

An a priori power analysis by G*Power (Faul et al., 2007) with a significance level of 0.05, power of 0.8, and effect size of 0.3 determined 64 participants would provide an ideal sample size for the evidence-based project. While recruitment allowed for a high number of participants, only six people agreed to participate.

Consistent use of the HB-MAS pre- and post-intervention provided quality data. The HB-MAS provided subjective information, so the quality of data had the potential to be affected. While BP measurements are objective, the use of the patient's home log for post-intervention BP measurement could have affected the quality of data. Pre-intervention BP measurements were collected through the electronic health record. Length of time since BP collection in the clinic varied among participants from two weeks to six months. This also could have affected the quality of data.

Collection of demographic information, pre-intervention HB-MAS, and pre-intervention BP measurement occurred over a one-month period. The education sessions took place over three months. Post-intervention data collection of MA and home BP measurements occurred over a one-month period. The data analysis then took place. Once data collection and analysis occurred, comparisons against benchmark studies took place to strengthen the reliability of findings.

Statistical Analysis

Statistical analysis was performed to determine if a significant change in medication adherence or blood pressure measurement occurred after the education sessions. Data was entered into RedCAP then transferred to SPSS software for statistical analysis. Descriptive statistics were used for participant's demographic information. Descriptive statistics were also used for pre- and post-intervention HB-MAS scores and BP measurements. Due to the small

sample size, no further analysis was performed. The data collection and statistical analysis tables can be viewed in appendix Q & R.

Results

Setting and Participants

The recruitment, implementation, data collection, and data analysis of the evidence-based project took place from October 2020 to February 2021. The clinic was a primary care clinic in rural Kansas. A chart analysis using ICD-10 code 'I10' showed the potential for 992 participants. After chart review, 436 potential participants were identified and emailed a recruitment letter. Eight people voiced interest in participating, three voiced no interest in participating, and 32 emails were rejected due to an invalid email address. The second attempt of recruitment took place one month after the initial attempt. No additional participants were recruited. Six people responded with a date and time to begin pre-data collection and the first education session. Six participants completed both educational sessions and pre- and post-intervention data collection.

Two participants were between the ages of 51 and 60. Four participants were between the ages 61 and 74. Two were female, and four were male. All participants were white. Levels of education varied: one had a high school education, two had an associate's degree, two had a bachelor's degree, and one had completed graduate school. One participant had been diagnosed with HTN for 5-10 years; five participants had been diagnosed for greater than ten years. Half of the participants were on one medication to control BP, two participants were on two medications, and one participant was on three or more medications to control BP. No participants used tobacco products; however, two participants had previously used tobacco products. Four participants drank alcohol-containing beverages on a social basis, one drank on a weekly basis, and one reported never drinking alcohol-containing beverages.

Intervention Course

The evidence-based project began in the summer of 2020 with CITI training, IRB approval, site approval, and faculty approval. Planning and coordination with the clinic site occurred through the summer. Recruitment for the project took place in October 2020. A clinic administrator assisted the project leader in compiling a report of patients with the ICD-10 code 'I10'. Chart reviews occurred to determine which participants met the established inclusion criteria. Eligible participants were emailed a recruitment letter and encouraged to reply if interested.

Prior to the education session and data collection, the project leader familiarized themselves with the AHA booklet and HB-MAS to ensure accuracy of information and data collection. Individual times were then set with each participant to gather demographic information, pre-intervention HB-MAS, and administer the first education session. Pre-intervention BP measurements were retrieved from the electronic health record once a participant agreed to participate. Due to a low number of participants, a second recruitment email was sent in November 2020. This resulted in no additional participants. Education sessions took place from November 2020 to January 2021 based on the participant's availability. All six participants completed pre-intervention data collection, two education sessions, and post-intervention data collection.

Post-intervention data collection took place at least one month after the participant's last education session. This occurred in February 2021. Data was entered into RedCAP then SPSS software for statistical analysis. Data analysis and interpretation took one month and occurred in March 2021. Data collection is represented in Appendix Q.

Outcome Data

Medication adherence was analyzed as an outcome of the evidence-based project using descriptive statistics. Medication adherence was measured using the HB-MAS pre- and post-intervention. The measurement tool was utilized during the first and last phone call with each participant. Four out of six participants scored 36 out of 36 possible points on the pre-intervention HB-MAS, which demonstrates the highest level of MA. Two participants scored 35 on pre-intervention HB-MAS. Pre-intervention MA scores indicated an already high level of MA. All six participants scored 36 on post-intervention HB-MAS, indicating high MA. Overall, no significance was found between pre- and post-intervention medication adherence.

Blood pressure measurements were also analyzed as an outcome of the evidence-based project using descriptive statistics. Pre-intervention BP readings from participant's electronic health records and post-intervention BP readings from participant's home BP logs were used for analysis. Before the education intervention, no participants had high BP, according to The Eighth Joint National Committee for the Management of Hypertension in Adults guidelines (James et al., 2014). Post-intervention BP readings also demonstrated controlled BP in all six participants. This reading was collected during the final phone call with participants. No significance was found in pre- and post-intervention BP measurements. No missing data existed. All six participants completed pre- and post-intervention data collection. A statistical analysis table is represented in Appendix R.

Discussion

Successes

While analysis showed no significance in the measured outcomes, participants voiced positive feedback regarding the education intervention. The small sample size allowed the project leader more time to communicate with participants without feeling overwhelmed with

time management. Participants were grateful to receive information from a reliable source. Many voiced appreciations on the details of how to correctly take a BP from home. They also appreciated the individualized phone calls and a genuine attempt at improving their overall health.

Strengths

Several strengths of the study existed, despite the lack of significant improvements in BP or MA. The clinic coordinator was helpful to the project leader providing computer access and assisting with a report of all diagnosed HTN patients. The clinic staff was also helpful in assisting the project leader with recruitment in the event a patient called the clinic inquiring about the recruitment email. The rural setting of the project site was also a strength as some participants and potential participants had previously met the project leader while in the clinic. This allowed for the familiarity of the name they saw on the recruitment email.

The implementation of the intervention was the biggest strength of the study. Positive feedback from all participants reinforced the need to provide patient-centered care. Due to the COVID-19 pandemic, the project took place virtually. Participants were not required to leave their place of work or home to participate in the project. Anticipated times for the phone calls were provided before participants agreed to a date and time to speak with the project leader. This allowed for flexibility in their own schedules and may have helped prevent the loss of a participant throughout the study.

Results and Literature

Data analysis did not reveal significant changes in MA scores or BP measurement. However, participants enjoyed the individualized interactions and appreciated the extra support in learning about and managing their HTN. Literature states adherence to HTN management can

improve quality of life (Hacihasanoglu & Gozum, 2011). Reinforcement and encouragement of healthy self-care activities can assist providers in gaining patient buy-in for helping manage their HTN.

Limitations

Internal Validity

Threats to internal validity existed in this evidence-based project. A major confounding factor to the study was that participants might have received care at another healthcare setting and received conflicting information regarding HTN and management strategies. Imprecision when implementing the education intervention may have also existed. Since the project leader and participants never met face-to-face, it was unknown if each participant was truly following the provided handout during the education session phone calls.

The collection of data was the largest threat to internal validity. The HB-MAS provides subjective information which is not as reliable as an objective measurement of MA, such as pharmacy refill information or pill counts. All data collection occurred over the phone, so participants were only able to listen to the questions and answer options. This could have resulted in confusion when answering questions or unintentional dishonesty out of the participant's concern about judgment from the project leader. The use of participant's home BP reading as the post-intervention measurement also threatened internal validity. It was unknown if participants had checked their BP at home, if their method of measuring was accurate, or if dishonesty in actual BP reading existed.

External Validity

Due to the small sample size and homogeneity among participants, this project was not generalizable to other rural, primary care clinics similar to the project setting. All participants

were of the same race, similar age range, and had been diagnosed with HTN for over five years, which limits the generalizability of results.

Sustainability of Effects and Plans to Maintain

Plans for sustainability were suggested to the clinic. Providing education to newly diagnosed patients or those who have poor BP control could encourage patients to take part in their HTN management. The booklet may not have to be followed in its entirety, but pertinent information should be pointed out. While the project took place virtually and the education was emailed, a hard copy could be provided to patients in the clinic. This would be a cost that was not incurred during the project. Home BP logs could also be provided for patients to utilize and return at their follow-up appointments to assist with disease management. The medication adherence scale could be used for any chronic condition if a provider has concerns about a patient's medication-taking behaviors. The project site was receptive to sustainability suggestions. There was no cost associated with this project, so no financial concerns regarding sustainability exist.

Efforts to Minimize Limitations

One limitation of the study was data collection and the inconsistencies that potentially occurred. Data collection would have been preferred to be collected in-person, with a sheet of paper participants filled out alone. However, the project was transformed into an all-virtual design due to the COVID-19 pandemic. Efforts to minimize bias in data collection included the project leader prefacing each conversation with the assurance that no information would be shared and names would not be recorded when scores were obtained.

Another limitation to the study was the platform on how education was provided to participants. Again, the transition to an all-virtual project design prohibited the meeting of the

project leader and participants face-to-face. Efforts to minimize this limitation included sending a copy of the AHA education booklet to participants and ensuring they had it in front of them during education sessions. The project leader was also careful to verbalize page numbers as a way to ensure participants were able to follow along without difficulty.

The effect of these limitations on the interpretation and application of findings is unknown. Since participants showed high MA and adequate BP control before the education intervention, there were no significant changes in MA or BP post-intervention. This makes it difficult to determine if a relationship existed between the limitations and findings.

The small sample size of this project is also a limitation. Virtual recruitment is an assumed factor in the small sample size. While over 400 potential participants received an email, only eight replied. Emails on file may have been out of date, the email may have been sent to the patient's spam folder, or patients may have assumed it was spam due to the unknown sender's email address. The student investigator sent a second email to all potential participants in an effort to gain more participants and minimize this limitation.

Interpretation

Expected and Actual Outcomes

The expected outcome of this study was improved MA based on HB-MAS and controlled BP. Data analysis revealed no statistical significance in MA or BP. The difference in expected and actual outcomes could be due to several factors. The largest contributor was the small sample size showing already high MA and controlled BP. This prevented the ability to show improvement post-intervention. Willingness to participate was another contributor. Patients who agreed to participate had a high drive to partake in the study, which could reflect their self-care

routine. Those with poor self-care routines, low MA, and uncontrolled BP may not have been as likely to participate due to low internal motivation.

Intervention Effectiveness

Data analysis revealed no statistical significance in post-intervention MA and BP. This makes it difficult to infer a causal relationship between the education intervention and measured outcomes. Despite the lack of significant findings, the primary care setting is the most likely place for a causal relationship to occur between education and MA and BP. Primary care providers manage many chronic diseases for a variety of patients, which allows for a unique opportunity to educate patients on multiple disease processes at one time. While the education intervention was focused on HTN, many aspects of the education could also be applied to other cardiac diseases, diabetes, and obesity.

Intervention Revision

Intervention modifications to improve the attainment of the outcomes exist. The first modification would be to provide the education in person. A virtual layout is useful when necessary. However, participants stated an in-person education session would have been preferred to a phone call. Another modification would be to provide education in a group setting, which has been found to be more effective than individual sessions (Conn et al., 2016; Yatim et al., 2019). Multiple education sessions should be continued as they have been shown to increase retention of information and adherence rates (Tan et al., 2019).

Impact on Healthcare System, Costs, and Policy

Many hypertensive adults do not have controlled BP, which puts them at risk for serious, life-threatening conditions like stroke or myocardial infarction. Research has shown education to be beneficial in improving MA and BP control in hypertensive adults. High costs are associated

with HTN, so it would be appropriate for providers to deliver patient education in addition to pharmacotherapy when managing HTN in the primary care setting. Overall, this pilot study can provide information regarding the usefulness of an easy-to-read handout from the AHA and its impact on MA and BP control. If more patients have controlled BP, they could experience fewer visits to their provider's office and decreased costs due to their HTN. No funding sources were utilized.

Conclusion

Practical Usefulness of Project

The evidence-based project had implications to be utilized at its conclusion. Costs associated with the implementation of the education were low, allowing sustainability by the project site. The education will continue to be useful in the primary care setting due to the rate of adults diagnosed with HTN and those with uncontrolled BP. Since pharmacotherapy alone may not provide adequate management of HTN, encouraging self-care behaviors like MA and HBPM will assist providers in improving HTN management for optimal BP control.

Further Study of Intervention

Access to the education handout was available online. Patients could be guided to the American Heart Association's website to ensure they receive accurate information about their disease process. Provider familiarity with the handout would ensure patients are receiving similar information among providers within the clinic site, which could help improve conflicting information they may receive. Additional outcomes to measure based on the education intervention could include weight change, exercise adherence, and diet adherence.

Dissemination

The evidence-based project was disseminated at the 2020 *6th Annual Show Me Association of Missouri Nurse Practitioners Conference* October 9-10 in Osage Beach, MO.

References

- Agarwal, R., Bills, J. E., Hecht, T. J. W., & Light, R. P. (2011). Role of home blood pressure monitoring in overcoming therapeutic inertia and improving hypertension control: A systematic review and meta-analysis. *Hypertension, 57*(1), 29–38. doi: 10.1161/HYPERTENSIONAHA.110.160911
- Ahn, Y.H., & Ham, O.K. (2016). Factors associated with medication adherence among medical-aid beneficiaries with hypertension. *Western Journal of Nursing Research, 38*(10), 1298-1312. doi: 10.1177/0193945916651824
- Alhalaqia, F., Deane, K.H.O., Nawafleh, A. H., Clark, A., & Gray, R. (2012). Adherence therapy for medication non-compliant patients with hypertension: A randomized controlled trial. *Journal of Human Hypertension, 26*(2), 117-126.
- Al-Noumani, H., Wu, J.R., Barksdale, D., Sherwood, G., AlKhasawneh, E., & Knafel, G. (2019). Health beliefs and medication adherence in patients with hypertension: A systematic review of quantitative studies. *Patient Education and Counseling, 102*, 1045-1056. doi: 10.1016/j.pec.2019.02.022
- American Heart Association [AHA]. (2019). Small changes make a big difference. Retrieved from <https://www.heart.org>
- American Pharmacists Association. (2020). Defining adherence. Retrieved from <https://www.pharmacist.com>
- Armstrong, C. (2014). JNC 8 guidelines for the management of hypertension in adults. *Am Fam Physician, 90*(7), 503-504.
- Benjamin, E.J., Virani, S.S., Callaway, C.W., Chamberlain, A.M., Chang, A.R., Cheng, S., Chiuve, S.E., Cushman, M., Delling, F.N., Deo, R., d Ferranti, S.D., Ferguson, J.F.,

- Fornage, M., Gillespie, C., Isasi, C.R., Jimenez, M.C., Jordan, L.C., Judd, S.E., Lackland, D., ... Muntner, P. (2018). Heart disease and stroke statistics-2018 update: A report from the American Heart Association. *Circulation*, *137*, e67-e492. doi: 10.1161/CIR.0000000000000558
- Bosworth, H.B., Fortmann, S.P., Kuntz, J., Zullig, L.L., Mendys, P., Safford, M., Phansalkar, S., Wang, T., & Rumpitz, M.H. (2016). Recommendations for providers on person-centered care approaches to assess and improve medication adherence. *J Gen Intern Med*, *32*(1), 93-100.
- Bosworth, H. B., Olsen, M. K., Neary, A., Orr, M., Grubber, J., Svetkey, L., Adams, M., & Oddone, E. Z. (2008). Take Control of Your Blood pressure (TCYB) study: A multifactorial tailored behavioral and educational intervention for achieving blood pressure control. *Patient Education and Counseling*, *70*(3), 338–347. doi: 10.1016/j.pec.2007.11.014
- Centers for Disease Control and Prevention [CDC]. (2020). *About high blood pressure*. <https://www.cdc.gov/bloodpressure/about.htm>
- Chen, S. L., Tsai, J. C., & Chou, K. R. (2011). Illness perception and adherence to therapeutic regimens among patients with hypertension: A structural modeling approach. *International Journal of Nursing Studies*, *48*(2), 235–245 doi: 10.1016/j.ijnurstu.2010.07.005
- Christensen, A., Osterberg, L.G., & Hansen, E.H. (2009). Electronic monitoring of patient adherence to oral antihypertensive medical treatment: A systemic review. *Journal of Hypertension*, *27*, 1540-551.
- Community Preventive Services Task Force. (2014). Team-based care to improve blood pressure

- control: Recommendation of the community preventive services task force. *Am J Prev Med*, 47(1), 100–102.
- Conn, V.S., Ruppap, T.M., & Chase, J.D. (2016). Blood pressure outcomes of medication adherence interventions: Systematic review and meta-analysis. *J Behav Med*, 39, 1065-1075. doi: 10.1007/s10865-016-9730-1
- Costa, E., Pecorelli, S., Giardini, A., Savin, M., Menditto, E., Lehane, E., Laosa, O., Pecorelli, S., Monaco, A., & Marengoni, A. (2015). Interventional tools to improve medication adherence: review of literature. *Patient Preference and Adherence*, 1303–1314. doi: 10.2147/PPA.S87551
- Crabtree, M.M., Stuart-Shor, E., & McAllister, M. (2013). Home blood pressure monitoring: An integrated review of the literature. *The Journal for Nurse Practitioners*, 9(6), 356-361.
- Faul, F., Erdfelder, E., Lang, A.-G. & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175-191.
- Fischer, M.A., Stedman, M.R., Lii, J., Vogeli, C., Shrank, W.H., Brookhart, A., & Weissman, J.S. (2010). Primary medication non-adherence: Analysis of 195,930 electronic prescriptions. *Journal of General Internal Medicine*, 284-290. doi:10.1007/s11606-010-1253-9
- Ford, E.S. (2011). Trends in mortality from all causes and cardiovascular disease among hypertensive and nonhypertensive adults in the United States. *Circulation*, 123, 1737-1744. doi: 10.1161/CIRCULATIONAHA.110.005645

- Forouzanfar, M.H., Liu, P., Roth, G.A., Ng, M., Biryukov, S., Marczak, L., Alexander, L, Estep, K., Abate, K.H., Aakinyemiju, T.F., Ali, R., Alvis-Guzman, N., Azzopardi, P., Banerjee, A., Barnighausen, T., Basu, A., Bekele, T., Bennett, D.A., Biadgilign, S., ... Murray, C.J.L. (2017). Global burden of hypertension and systolic blood pressure of at least 110 to 115mmHg, 1990-2015. *JAMA*, *317*(2), 165-182. doi: 10.1001/jama.2016.19043
- Go, A. S., Bauman, M. A., Coleman King, S. M., Fonarow, G. C., Lawrence, W., Williams, K. A., & Sanchez, E. (2014). An effective approach to high blood pressure control. *Hypertension*, *63*(4), 878–885. doi: 10.1161/HYP.0000000000000003
- Hacihasanoglu, R. & Glozum, S. (2010). The effect of patient education and home monitoring on medication compliance, hypertension management, healthy lifestyle behaviours, and bmi in a primary health care setting. *Journal of Clinical Nursing*, *20*, 692-705. doi: 10.1111/j.1365.2702.2010/03524.x
- Ho, P.M., Bryson, C.L., & Rumsfield, J.S. (2009). Medication adherence: Its importance in cardiovascular outcomes. *Circulation*, *119*, 3028-3035. doi: 10.1161/circulationaha.108.768986
- Hussein, A.A., El Salam, E. A.E.A. & Amr, A.E.F. (2017). A theory guided nursing intervention for management of hypertension among adults at rural area. *Journal of Nursing Education and Practice*, *7*(1). doi: 10.5430/jnep.v7n1p66
- Ireland, S.E., Arthur, H.M., Gunn, E.A., & Oczkowski, W. (2011). Stroke prevention care delivery: Predictors of risk factor management outcomes. *International Journal of Nursing Studies*, *48*(2), 156-164.
- James, P.A., Oparil, S., Carter, B.L., Cushman, W.C., Dennison-Himmelfarb, C., Handler, J., Lackland, D.T., LeFevre, M.L., MacKenzie, T.D., Ogedegbe, O., Smith, S.C., Svetkey,

- L.P., Taler, S.J., Townsend, R.R., Wright, J.T., Narva, A.S., & Ortiz, E. (2014). 2014 Evidence-Based guideline for the management of high blood pressure in adults report from the panel members appointed to the eighth joint national committee (JNC 8). *JAMA*, *311*(5), 507-520. doi: 10.1001/jama.2013.284427
- Kansas Department of Health and Environment [KDHE]. (2017). High blood pressure among Kansas adults. Retrieved from <http://www.kdheks.gov/brfss/publications.html>
- Karakurt, P. & Kasikci, M. (2012). Factors affecting medication adherence in patients with hypertension. *Journal of Vascular Nursing*, *30*(4), 118-126.
- Khodaveisi, M., Omid, A., Farokhi, S., & Soltanian, A.R. (2017). The effect of pender's health promotion model in improving the nutritional behavior of overweight and obese women. *Int J Community Based Nurs Midwifery*, *5*(2), 165-174.
- Kim, M.T., Hill, M.N., Bone, L.R., & Levine, D.M. (2000). Development and testing of the hill-bone compliance to high blood pressure therapy scale. *Progress in Cardiovascular Nursing*, *15*(3), 90-97.
- Kirkland, E.B., Heincelman, M., Bishu, K.G., Schumann, S.O., Schreiner, A., Axon, R.N., Mauldin, P.D., & Moran, W.P. (2018). Trends in healthcare expenditures among us adults with hypertension: National estimates, 2003-2014. *J Am Heart Assoc*, *7*, 1-13. doi: 10.1161/JAHA.118.008731
- Lam, W.Y. & Fresco, P. (2015). Medication adherence measures: An overview. *BioMed Research International*, *2015*, 1-12. doi: 10.1155/2015/217047
- Ma, C. (2016). A cross-sectional survey of medication adherence and associated factors for rural patients with hypertension. *Applied Nursing Research*, *31*, 94-99. doi: 10.1016/j.apnr.2016.01.004

- Marcum, Z. A., Hanlon, J. T., & Murray, M. D. (2017). Improving medication adherence and health outcomes in older adults: An evidence-based review of randomized controlled trials. *Drugs Aging, 34*(4), 191–201. doi: 10.1007/s40266-016-0433-7
- Melnyk, B.M. & Fineout-Overholt, E. (2019). *Evidence-based practice in nursing and healthcare*. Wolters Kluwer.
- Morrissey, E.C., Durand, H., Nieuwlaat, R., Navarro, T., Haynes, R.B., Walsh, J.C., & Molloy, G.J. (2017). Effectiveness and content analysis of interventions to enhance medication adherence and blood pressure control in hypertension: A systematic review and meta-analysis. *Psychology Health, 32*(10), 1195-1232. doi: 10.1080/08870446.2016.1273356
- Murdaugh, C.L., Parsons, M.A., & Pender, N.J. (2019). *Health promotion in nursing practice* (8th ed.). New York, NY: Pearson.
- Nuckols, T.K., Aledort, J.E., Adams, J., Lai, J., Go, M.J., Keesey, J., & McGlynn, E. (2011). Cost implications of improved blood pressure management among U.S. adults. *Health Research and Educational Trust, 46*(4), 1124-1157. doi: 10.1111/j.1475-6773-2010-01239.x
- Nwankwo, T., Yoon, S.S., Burt, V., & Gu, Q. (2013). Hypertension among adults in the United States: National health and nutrition examination survey, 2011-2012. *NCHS Data Brief, 133*, 1-8.
- Pender, N.J., Murdaugh, C.L., & Parsons, M.A. (2015). *Health promotion in nursing practice* (7th ed.). Upper Saddle River, NJ: Prentice Hall.
- Persell, S.D., Peprah, Y.A., Lipiszko, D., Lee, J.Y., Li, J.J., Ciolino, J.D., Karmali, K.N., & Sato, H. (2020). Hypertension coaching application or racking application on adults with

- uncontrolled hypertension: A randomized clinical trial. *JAMA*, 3(3), doi: 10.1001/jamanetworkopen.2020.0255
- Prochaska, J.O., Wright, J.A., & Velicer, W.F. (2008). Evaluating theories of health behavior change: A hierarchy of criteria applied to the transtheoretical model. *Applied Psychology: An International Review*, 57(4), 561-588. doi: 10.1111/j.1464-0597.2008.00345.x
- Schaffer, M.A., Sandau, K.E., & Diedrick, L. (2012). Evidence-based practice models for organizational change: overview and practical applications. *Journal of Advanced Nursing*, 69(5), 1197-1209. doi: 10.1111/j.1365-2648.2012.06122.x
- Sevinc, S. & Argon, G. (2018). Application of pender's health promotion model to post-myocard infarction patients in turkey. *International Journal of Caring Sciences*, 11(1), 409-418.
- Tan, J.P., Cheng, K.K.F., & Siah, R.C. (2019). A systematic review and meta-analysis on the effectiveness of education on medication adherence for patients with hypertension, hyperlipidaemia and diabetes. *J Adv Nurs*, 75, 2478-2494.
- Tang, K.L., Quan, H., & Rabi, D.M. (2017). Measuring medication adherence in patients with incident hypertension: A retrospective cohort study. *BMC Health Services Research*, 17(135), 1-16. doi: 10.1186/s12913-017-2073-y
- Uchmanowicz, B., Jankowska, E.A., Uchmanowicz, I., & Morisky, D.E. (2017). Self-reported medication adherence measured with Morisky medication adherence scales and its determinants in hypertensive patients aged ≥ 60 years: A systematic review and meta-analysis. *Frontiers in Pharmacology*, 10(168), 1-11. doi: 10.3389/fphar.2019.00168
- United States Census Bureau. (n.d.). QuickFacts. Retrieved from <https://www.census.gov/quickfacts/ricecountykansas>

- Vrijens, B., Vincze, G., Kristanto, P., Urquhart, J., & Burnier, M. (2008). Adherence to prescribed antihypertensive drug treatments: Longitudinal study of electronically compiled dosing histories. *BMJ*, 1-6. doi: 10.1136/bmj.39553.670231.25
- Whelton, P.K., Carey, R.M., Aronow, W.S., Casey, D.E., Collins, K.J., Dennison-Himmelfarb, C., DePalma, S.M., Gidding, S., Jamerson, K.A., Jones, D.W., MacLaughlin, E.J., Muntner, P., Ovbigele, B., Smith, S.C., Spencer, C.C., Stafford, R.S., Taler, S.J., Thomas, R.J., Williams, K.A., ...Wright, J.T. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. *Journal of American College of Cardiology*, 71(19), e127-e248.
- World Health Organization [WHO]. (2019). Hypertension. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/hypertension>
- Xu, L.J., Meng, Q., He, S.W., Yin, X.L., Tang, Z.L., Bo, H.Y., & Lan, X.Y. (2014). The effects of health education on patients with hypertension in China: A meta-analysis. *Health Education*, 73(2), 137-149. doi: 10.1177/0017896912471033
- Yatim, H.M., Wong, Y.Y., Neoh, C.J., Lim, S.H., Hassali, M.A., & Hong, Y.H. (2019). Factors Influencing patients' hypertension self management and sustainable self-care practices: A qualitative study. *Public Health*, 173, 5-8. doi: 10.1016/j.puhe.2019.04.020

Appendix A

Definition of Terms

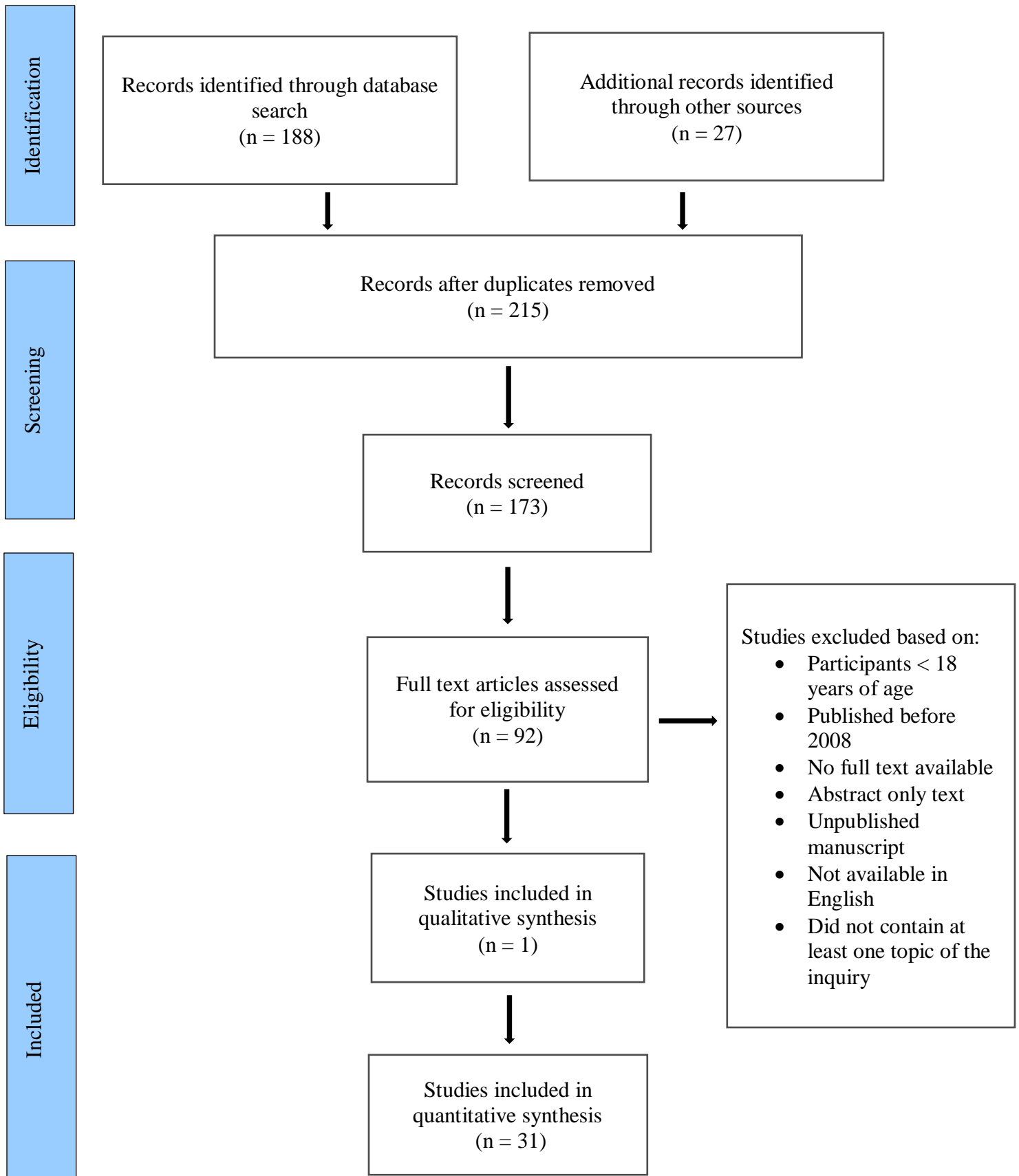
Blood pressure: the force of the blood moving through blood vessels (American Heart Association, 2016)

Hypertension: arterial systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg or currently taking an antihypertensive medication to lower blood pressure (James et al., 2014)

Medication adherence: the extent to which a patient takes medications with respect to timing, dosage, and frequency as agreed upon recommendations with a prescribing provider (American Pharmacists Association, 2020)

Appendix B

PRISMA



Appendix C

Synthesis of Evidence Table

Medication adherence interventions for hypertensive adults						
First author, Year, Title, Journal	Purpose	Research Design, Evidence Level, & Variables	Sample & Sampling, Setting	Measures & reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
Tan (2019). A systemic review and meta-analysis on the effectiveness of education on medication adherence for patients with hypertension, hyperlipidaemia and diabetes. J Adv Nurs.	Evaluate the effectiveness of the educational intervention in improving medication adherence in adult patients with hypertension (HTN), hyperlipidemia and/or diabetes	Systematic review and meta-analysis Level I Adults with diagnosed hypertension and/or diabetes	18 randomized controlled trials (RCT) with 2,307 participants Databases searched: PubMed, Embase, CINAHL, Cochrane, Science Direct, Scopus, and Web of Science	N/A	Education improves health literacy which improves medication adherence. Standardized mean differences, Cohen's d	Differences in educational interventions limited the quality of studies. Multiple education sessions are more beneficial to improve medication adherence which will be taken into consideration when forming the project's intervention.
Marcum (2017). Improving medication adherence and health outcomes in older	To determine whether interventions	Systematic review Level I	12 RCTs Databases searched:	N/A	Behavioral or educational methods and pharmacist-led	The review may not include all available articles due to databases

adults: An evidence-based review of randomized controlled trials. Drugs Aging.	aimed at improving medication adherence also improves health outcomes	Behavioral or educational, pharmacist-led, reminder or simplification	MEDLINE, Cochrane, and Google Scholar		methods were found to improve medication adherence and health outcomes. Reminder or simplification methods were found to only improve medication adherence.	searched; limited on only English printed studies; total number of participants in all 12 studies not stated by authors Patient-centered, multidisciplinary interventions should be developed and tested to improve medication adherence.
Tang (2017). Measuring medication adherence in patients with incident hypertension: A retrospective cohort study. BMC Health Services Research.	To compare adherence rates and associations with mortality using various definitions of adherence	Cohort study Level IV medication adherence rates, operational definitions of adherence	2,199 patients randomized sampling data from online charting, no setting	Medication possession ratios and proportion of days covered	Adherence estimates vary depending on operational definition used and baseline characteristics of groups. Mean, median, Fisher's exact test, multiple logistic regression models, Cox	Exclusion criteria most likely eliminated the sickest and most dependent on chronic medication patients, likely overestimating adherence rates; cannot recommend a single operational

					proportion hazard regressions	definition of adherence Future studies using pharmacy claims data should meticulously choose and define the utilized medication adherence definitions.
Bosworth (2016). Recommendations for Providers on Person-Centered Approaches to Assess and Improve Medication Adherence. Journal of General Internal Medicine.	Provide methods and tools that healthcare providers can implement to improve medication adherence	Expert panel recommendations based on previous level I systematic reviews and meta-analyses Level VII	N/A	N/A	Recommends implementing proven medication adherence interventions like motivational interviewing, counseling, and shared decision making.	Providers can use different methods to increase patient's self-care behaviors in their medical therapy.
Lam (2015). Recommendations for providers on person-centered approaches to assess and improve medication	To review subjective and objective medication adherence measures	Expert panel opinion Level VII	N/A	N/A	Recommends using a multi-measure approach when measuring medication adherence.	The list does not include all existent medication adherence

adherence. J Gen Intern Med.						measurements available Providers can choose the best measure for their aims then deliver tailored interventions to improve patient medication behaviors
Alhalaiqa (2012). Adherence therapy for medication non-compliant patients with hypertension: a randomized controlled trial. Journal of Human Hypertension.	Determine how effective adherence therapy is compared to usual treatment in reducing blood pressure in patients who are noncompliant hypertensive patients	Randomized controlled trial Level II controlled group (usual treatment), experimental group (adherence therapy)	136 participants convenience sampling Outpatient clinics in 3 hospitals	Morisky Medication Adherence Scale, Beliefs about Medicines Questionnaire, BP measurements, pill counting	Adherence therapy group had greater SBP and DBP reduction better recognized benefits of medications and took more of their medications	Only a four week follow up duration; no significant difference in rate of prescribing; patients knew they were monitored Providers can use adherence therapy to increase medication adherence rates
Community Preventive Sources Task Force (2012).	Evaluation of team approach effect on	Recommendation based on systematic	N/A	N/A	A team approach is beneficial to address patient's	Implementation would benefit from more

Team-based care to improve blood pressure control recommendation of the community preventive services task force. American Journal of Preventative Medicine.	blood pressure (BP) control	Reviews Level I			concerns related to HTN	research on patient-provider interaction and the use of the model to serve disadvantaged populations Providers can use a team-based approach when treating HTN.
Chen (2011). Illness perceptions and adherence to therapeutic regimens among patients with hypertension: A structural modeling approach. International Journal of Nursing Studies.	Testing a hypothetical relationship model between illness perception and adherence to prescribed medications and self-management behaviors in hypertension	Cross-sectional, descriptive, correlational design Level IV	355 patients Purposive sampling Cardiovascular clinic of Three hospitals in Taiwan	Chinese Illness Perception Questionnaire, Medication Adherence Inventory, Inventory of adherence to Self Management	Illness identification can affect adherence to medications. Control of disease had a direct effect on adherence.	Generalization limited; Self-report very subjective; results do not determine process of self-regulation
Hacihanoglu. (2010). The effect of patient education and home monitoring on medication compliance, hypertension management, healthy lifestyle behaviours and	Determine the effect of antihypertensive patient-oriented education and in-home monitoring for medication adherence and management of	RCT Level III Group A (education on medication adherence), Group B (education on	120 participants Convenience sampling Primary care facilities and	Self-efficacy, blood pressures	Healthy lifestyle behaviors and self-efficacy regarding medication adherence improved after	Standardization of the physical measurement tools was not compared by an accredited institution. Small convenience

BMI in a primary health care setting. Journal of Clinical Nursing.	hypertension in a primary care setting	medication adherence and lifestyle behaviors), Group C (control)	participants' homes		education sessions in Groups A and B. Chi-square, ANOVA, t-test	sampling may not be generalizable to all primary care settings. Nurses working in a primary care setting can influence medication adherence and lifestyle modifications to improve blood pressure outcomes.
Education for adults with hypertension						
First author, Year, Title, Journal	Purpose	Research Design, Evidence Level, & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
Conn (2016). Blood pressure outcomes of medication adherence intervention: systematic review and meta-analysis. J Behav Med.	Determine the overall effect of adherence interventions,	systematic review and meta-analysis Level I BP outcomes of medication adherence interventions	156 reports with 60,876 participants Databases searched: PubMed, Medline, PsycInfo, Cochrane, EBSCO, CINAHL,	Standardized mean, effect sizes	Significant reductions in BP after medication adherence interventions	Some studies may have been left out; some variables left out due to poor reporting; other factors influencing BP not explored Adherence interventions are

			ERIC, IndMed, EBM Review, pharmaceutical abstracts			important and are proven to work.
Costa (2015). Interventional tools to improve medication adherence: review of literature. Patient Preference and Adherence.	Review most commonly used interventions for adherence, measured outcomes, and improvements achieved	Review of Literature Level VII behavioral, educational, and integrated care interventions; self-management, and risk communication	N/A	N/A	Medication adherence continues to occur and is associated with poor health outcomes and quality of life.	Low level of evidence Introduced interventions to improve adherence to treatment
Ireland (2011). Stroke prevention care delivery: Predictors of risk factor management outcomes. International Journal of Nursing Studies.	To examine how different patient characteristics predict BP control and glucose targets in patients who have had a TIA/stroke and have HTN and/or diabetes	Prospective study Design Level II Participant Demographics; measurement of cognition, self-efficacy, social support, depression, PCP follow-up; physiological and	77 participants Canada academic teaching hospital and regional stroke center	Mini and Modified Mini-Mental State examination, Geriatric Depression Scale, Oxfordshire Stroke Classification System	At 6-month follow-up, 97% reported more than 80% adherence to medication, but only 57% met treatment targets Logistic regression analysis	Small sample size, limited generalizability

		adherence measurements				
Bosworth (2008). Take Control of Your Blood pressure (TCYB) study: A multifactorial tailored behavioral and educational intervention for achieving blood pressure control. Patient Education Counseling.	Evaluating how a personalized intervention improves blood pressure control	RCT Level II control (usual care, HBPM alone) or intervention (tailored behavioral intervention, both tailored behavioral intervention and HBPM)	319 participants Medical electronic database to identify patients with hypertension diagnosis	6-month and 24-month post-baseline evaluation; Morisky Self-Reported Medication Adherence Scale	Intervention the group had 9% increase in self-reported medication adherence from baseline while control group had 1% increase.	Self-reported adherence results might not be representing actual adherence; number of blood pressure medication taken by the participant only known from what the patient states
Nonadherence to hypertensive treatment						
First author, Year, Title, Journal	Purpose	Research Design, Evidence Level, & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
Yatim (2019). Factors influencing patients' hypertension self-management and sustainable self-care practices: A qualitative study.	To explore factors influencing patients with hypertension participating in self-management education and challenges of learning self-care practices.	Qualitative design Level VI	19 participants	N/A	Patient, family, and community-level factors influenced motivation and barriers to self-management behaviors.	A qualitative study with a small sample size Understanding of external and internal factors that influence self-care behaviors

Al-Noumani (2019). Health beliefs and medication adherence in patients with hypertension: A systematic review of quantitative studies. Patient Education and Counseling.	To identify different hypertension-related health beliefs and to examine their relationship to medication adherence	A systemic review of observational studies Level II	30 articles Databases searched: CINAHL, PubMed, PsycInfo, EMBASE	N/A	Higher medication adherence with fewer perceived barriers. Higher self-efficacy shows higher adherence to medication and self-care behaviors like diet, exercise, weight loss, and smoking.	Many studies used a cross-sectional design with non-probability sampling, limiting generalizability. Many studies also used self-reporting to measure adherence. Providers should evaluate patient beliefs about hypertension and medications and provide education when found to be helpful.
Uchmanowicz (2017). Self-reported medication adherence measured with Morisky medication adherence scales and its determinants in hypertensive patients aged ≥ 60 years: A systematic review and meta-analysis.	To estimate medication adherence in hypertensive patients greater than 60 years old and to explore determinants of adherence.	Systematic review Level I	13 studies totaling 5,247 participants	MMAS-8, Morsiky, Green, Levine medication adherence scale CI 95%	Medication adherence highest in oldest-old; adherence associated with age, socioeconomic status, and therapy-related factors	Some studies may not have been included in the analysis; comorbidities in some studies not available, which could alter adherence rates; other adherence

						<p>scales may provide different results</p> <p>Useful in primary care when taking care of older adults with hypertension and understanding factors of medication adherence</p>
Ahn (2016). Factors Associated With Medication Adherence Among Medical-Aid Beneficiaries With Hypertension. <i>Western Journal of Nursing Research</i> .	To examine factors associated with medication adherence among hypertensive medical-aid beneficiaries	<p>Cross-sectional study</p> <p>Level IV</p> <p>Health literacy, self-efficacy, medication adherence</p>	<p>289 participants</p> <p>Convenience sampling</p>	<p>Modified Morisky scale, the study questionnaire</p> <p>Hierarchical regression analysis</p>	<p>Higher health literacy and self-efficacy scores were more likely to have higher medication adherence</p>	<p>Description of enabling and predisposing factors in HTN medication adherence</p>
Ma (2016). A cross-sectional survey of medication adherence and associated factors for rural patients with hypertension. <i>Applied Nursing Research</i> .	Describe medication adherence and determine what various factors predict medication adherence	<p>Cross-sectional design</p> <p>Level IV</p> <p>demographic information,</p>	<p>1,159 participants</p> <p>Convenience sampling</p>	<p>Questionnaire for socio-demographic information; Morisky medication adherence scale; Social support rating</p>	<p>21.3% of patients were adherent to medication, and 78.7% were nonadherent</p> <p>Frequencies and percentages for categorical</p>	<p>Participants selected from only one hospital in one region. Some participants had lower education level- could not</p>

		adherent patients vs. nonadherent patients		scale.	variables, univariate analyses, <i>t</i> -tests and chi-square tests to compare characteristics of adherents and non-adherents.	understand questionnaire or how to fill out the scales; symptoms and complications self-reported possible underestimation
Karakurt (2012). Factors affecting medication adherence in patients with hypertension. <i>Journal of Vascular Nursing</i> .	To evaluate why patients may nonadherent to medication regimens and factors that affect their use of medications	Descriptive study Level IV sociodemographic characteristics, hypertensive profile, medication status	750 participants Convenience Sampling outpatient hypertensive clinic in Turkey	Questionnaire to collect data obtained from face-to-face interviews	Descriptive Statistics, Chi-square test	Instrument designed specifically for study; sampling Explained influences on adherence interventions that strengthen patient adherence to medication and BP control
Vrijens (2008). Adherence to prescribed antihypertensive drug treatments: a longitudinal study of electronically compiled dosing histories. <i>BMJ</i> .	To describe characteristics of dosing history in patients prescribed a once a day antihypertensive medication.	Longitudinal study Level II Drug treatment adherence over time	4,378 participants from 21 clinical trials Participants from prior studies whose information	Individual dosing history	Early discontinuation and suboptimal daily use are the most common reasons for poor adherence to once a day drug treatments	The studies had an array of objectives, drugs used, and lengths of follow-up Shows dosing patterns in long-

			was available in an electronic database		chronology plot, Kaplan-Meier curve	term drug treatment
Home blood pressure monitoring (HBPM)						
First author, Year, Title, Journal	Purpose	Research Design, Evidence Level, & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
Persell (2020). Effect of home blood pressure monitoring via a smartphone hypertension coaching application or tracking application on adults with uncontrolled hypertension a randomized clinical trial. JAMA.	To investigate the effect of a smartphone coaching app to promote home monitoring and hypertension-related behaviors compared with a blood pressure tracking app.	RCT Level III phone tracking app, phone coaching app	297 participants Electronic health record database search; mail and telephone call for participants Primary care offices, at-home monitoring	Surveys on medication adherence, diet, exercise, and sleep	self-confidence in controlling blood pressure was greater in the intervention group mean blood pressure readings, linear regression models	Small sample size Further research is warranted to see if the phone coaching app makes significant improvements in blood pressure.
Crabtree (2013). Home blood pressure monitoring: An integrated review of the literature.	To discuss how home blood pressure monitoring should be part of self-management.	Integrative review Level VI Home blood pressure	N/A	N/A	Home blood pressure monitoring should be incorporated into practice to	Low-level evidence Home blood pressure monitoring

		monitoring, hypertension			improve quality and outcomes.	underestimated in usefulness; encouraged to educate patients on its usefulness in managing their hypertension
Agarwal (2011). Role of home blood pressure monitoring in overcoming therapeutic inertia and improving hypertension control a systematic review and meta-analysis. Hypertension.	To measure the extent and benefits of home BP monitoring on BP reduction	Systematic review and meta-analysis of RCTs Level I Home BP monitoring, clinic BP monitoring, systolic and diastolic BP	37 studies with 9,446 participants Databases searched: Cochrane Library, EMBASE, Science Citation Index, ISI Proceedings	Baseline BP, therapeutic inertia	Home BP monitoring has the potential to reduce systolic and diastolic BP when compared to clinic BP monitoring alone. Standardized mean, I-squared,	Providers should encourage patients to monitor BP at home.
Adult hypertension management						
First author, Year, Title, Journal	Purpose	Research Design, Evidence Level, & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
Whelton (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and	Guidelines for diagnosing and treating hypertension	Recommendations based on multiple research studies Level VII	N/A	N/A	Guidelines for hypertension; behavior modifications first-line therapy, ACE-inhibitors, ARBs, thiazide diuretics, or CCB	Guides clinical practice with the treatment of hypertension

management of high blood pressure in adults.					first pharmacotherapy options	
Benjamin (2018). Heart disease and stroke statistics-2018 update.	Report on heart disease statistics based on current data with treatment options	American Heart Association's data on heart disease and updated treatment guidelines Level VII	N/A	N/A	Recommendations on hypertension treatment and statistics regarding race and medications	Useful in all practice settings when treating hypertension and other forms of heart disease.
James (2014). 2014 Evidence-based guideline for the management of high blood pressure in adults report from the panel members appointed to the eighth joint national committee (JNC 8).	Guidelines to provide evidence-based recommendations for the management of hypertension	Recommendations on hypertension treatment based on evidence Level VII	N/A	N/A	Recommendations include self-management techniques and pharmacotherapy options	Evidence-based guidelines for the treatment of hypertension.
Go (2014). An effective approach to high blood pressure control. hypertension.	Use the principles collected to develop hypertension algorithms that can be utilized in different practices and populations	Information from group recommendations Level VII	N/A	N/A	Recommendation for high blood pressure control and hypertension treatment algorithm development	The algorithm can be used in a variety of settings and populations.
Armstrong (2014). JNC 8 guidelines for the management of	Recommendations for management of hypertension	Recommendations on evidence-based practice	N/A	N/A	Recommendations for lifestyle modifications,	Highlights important

hypertension in adults. Am Fam Physician.	from JNC 8	guidelines Level VII			then pharmacotherapy based on race and other conditions.	findings in JNC 8
Nwankwo (2013). Hypertension among adults in the United States: National health and nutrition examination survey, 2011–2012	Survey results from prevalence, awareness, treatment, and control of hypertension.	Statistics and guidelines on the treatment of hypertension Level VII	N/A	N/A	Prevalence not increased from the previous year, control of blood pressure decreased	Reports data on how blood pressure control worsened over time

Appendix D

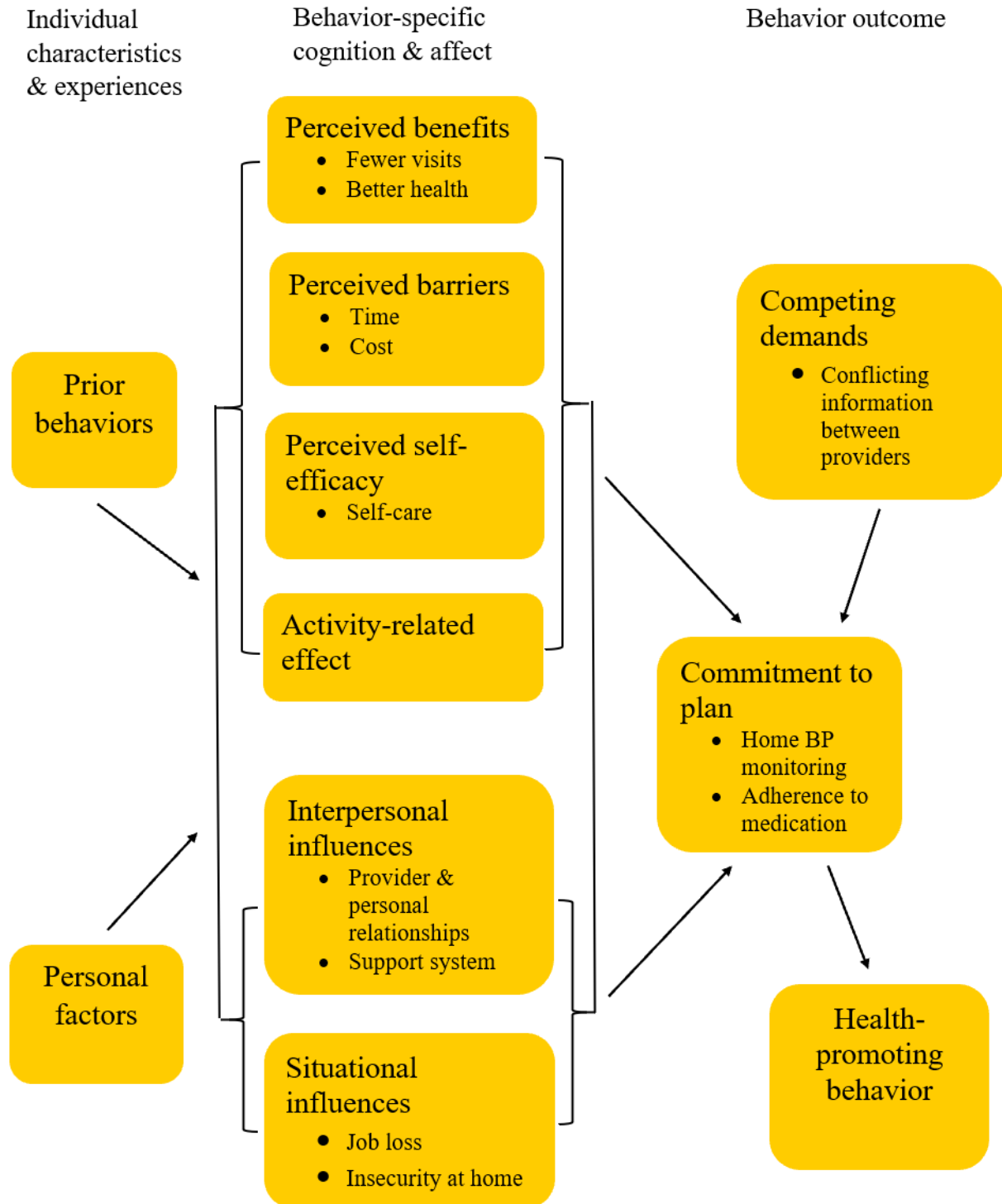
Evidence Grid

Article (last name of first author, date)	Lifestyle changes are the first line treatment option for adult hypertension, but pharmacotherapy is often ultimately utilized.	Adequate patient education improves medication adherence and overall blood pressure control.	Improving medication adherence can be achieved through various interventions, including education.	Home monitoring of blood pressure assists with management and control of blood pressure.	Nonadherence is associated with poor health outcomes and is prevalent in hypertensive patients.
Al-Noumani (2019)					X
Conn (2016)			X		
Christensen (2009)					X
Benjamin (2018)	X				
Ma (2016)					X
Hacihasanoglu (2010)		X	X	X	
Go (2014)	X				
Morrissey (2017)				X	X
Tan (2019)		X	X		
Karakurt (2012)					X
Ahn (2016)					X
Marcum (2017)			X		
James (2014)	X				
Tang (2017)			X		
Lam (2015)			X		
Uchmanowicz (2017)					X
Bosworth (2016)		X	X		
Chen (2011)			X		
Bosworth (2008)		X		X	
Ho (2009)					X

Xu (2014)		X			
Yatim (2019)					X
Fischer (2010)					X
Vrijens (2008)					X
Persell (2020)				X	
Crabtree (2013)				X	
Nwankwo (2013)	X				
Armstrong (2014)	X				
Alhalaiqa (2012)					X
Costa (2015)		X			
Ireland (2011)		X			
Agarwal (2011)				X	
Whelton (2018)	X				

Appendix E

Health Promotion Model in Relation to the Inquiry



Appendix F

IRB Approval



Institutional Review Board
University of Missouri-Kansas City

5319 Rockhill Road
Kansas City, MO 64110
816-235-5927
umkcirb@umkc.edu

Dear Lyla Jo Lindholm,

A member of the UMKC Research Compliance Office screened your QI Questionnaire to project #2030222-QI entitled "Education on Medication Adherence and Blood Pressure Control in Hypertensive Adults" and made the following determination:

QI Determination: The project has been determined to be a quality improvement activity not requiring IRB review.

If you have any questions regarding this determination, please feel free to contact our office at 816-235-5927, umkcirb@umkc.edu, or by replying to this notification.

Note Regarding Publications: It is appropriate to disseminate and replicate QI/program evaluation successes, including sharing the information external to an organization. This may include presentations and publications. The mere intent to publish the findings does not require IRB review as long as the publication does not refer to the activity as research.

Thank you,
UMKC Institutional Review Board

Appendix G

Faculty Approval



July 31, 2020

UMKC DNP Student, Allison Edwards

Congratulations. The UMKC Doctor of Nursing Practice (DNP) faculty has approved your DNP project proposal, *Effects of Education on Medication Adherence and Blood Pressure in Hypertensive Adults*.

You may proceed to IRB or QI approval.

Sincerely,

A handwritten signature in purple ink that reads "Lyla Lindholm".

Lyla Lindholm, DNP, RN, ACNS-BC
Clinical Assistant Professor, DNP Faculty
MSN-DNP Program Coordinator
UMKC School of Nursing and Health Studies
lindholml@umkc.edu

A handwritten signature in black ink that reads "Cheri Barber".

Cheri Barber, DNP, RN, PPCNP-BC, FAANP
Clinical Assistant Professor
DNP Program Director
UMKC School of Nursing and Health Studies
barberch@umkc.edu

DNP Faculty Mentor Dr. Willis-Smith, DNP
UMKC School of Nursing and Health Studies

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Appendix H

Budget Table

Item	Item Description	Quantity	Unit Cost	Cost
Team leader time	330 hours	N/A	N/A	\$0.00
Miscellaneous	No known miscellaneous costs at this time.	N/A	N/A	\$0.00
Total Cost				\$0.00

Appendix I

AHA Education Booklet



TYLENOL

Tylenol proudly supports the American Heart Association's efforts
to improve healthy choices related to living with high blood pressure.

OVERVIEW



What Is Blood Pressure?

When your heart beats, it pumps blood into your blood vessels. This creates pressure against the blood vessel walls.

This blood pressure causes your blood to flow to all parts of your body. A blood pressure (BP) reading consists of two numbers.



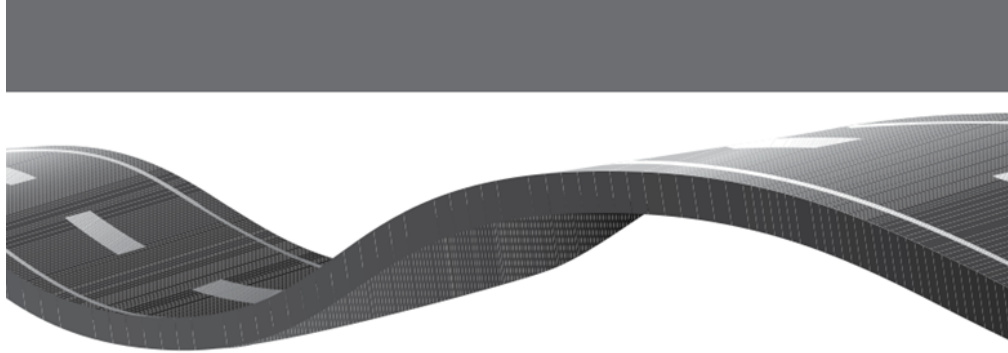
Systolic BP = Larger (first) number
Diastolic BP = Smaller (second) number

What Does It Mean to Have High Blood Pressure?

High blood pressure (HBP) is when your blood pressure is consistently too high.

Normal blood pressure is below 120/80 mm Hg.

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120



Nearly half of American adults have high blood pressure.

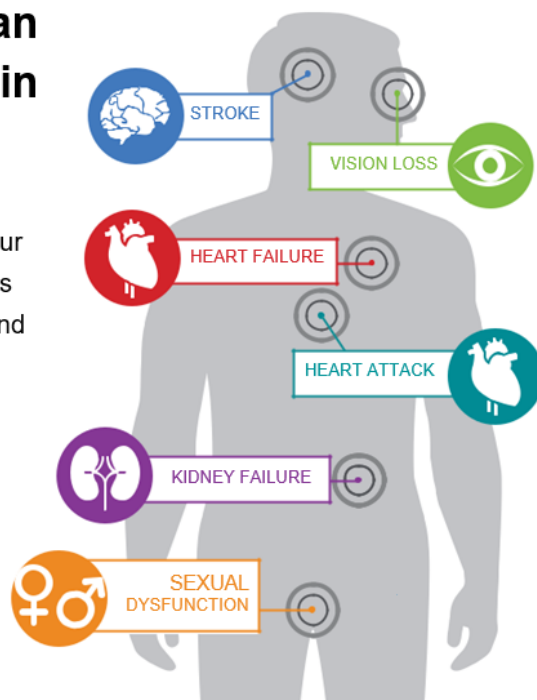
(Many don't even know they have it.)

The only way to find out if you have HBP is to have your blood pressure measured. For proper diagnosis, it's important to use an average based on two or more readings obtained on two or more occasions. Your healthcare provider or local pharmacist can check it for you.

Having HBP can hurt your body in many ways

It adds to the workload of your heart and damages your arteries and organs (such as your brain, kidneys, heart and eyes) over time.

The effects of HBP can be prevented or reduced if it's treated early and kept under control.



SELF-MONITORING



What Can I Do to Monitor BP?

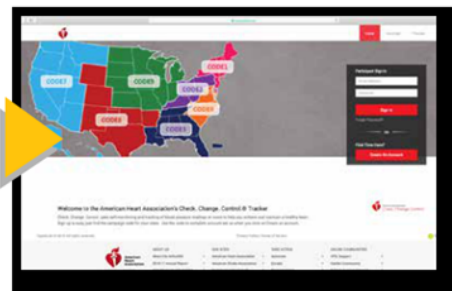
If you have HBP, home monitoring can help your healthcare provider determine whether treatments are working. Monitoring your BP at home is as easy as buying a BP cuff, using it correctly and tracking the numbers.



HBP monitors can be purchased in most pharmacies and online. An automatic, cuff-style, bicep (upper arm) monitor is recommended.

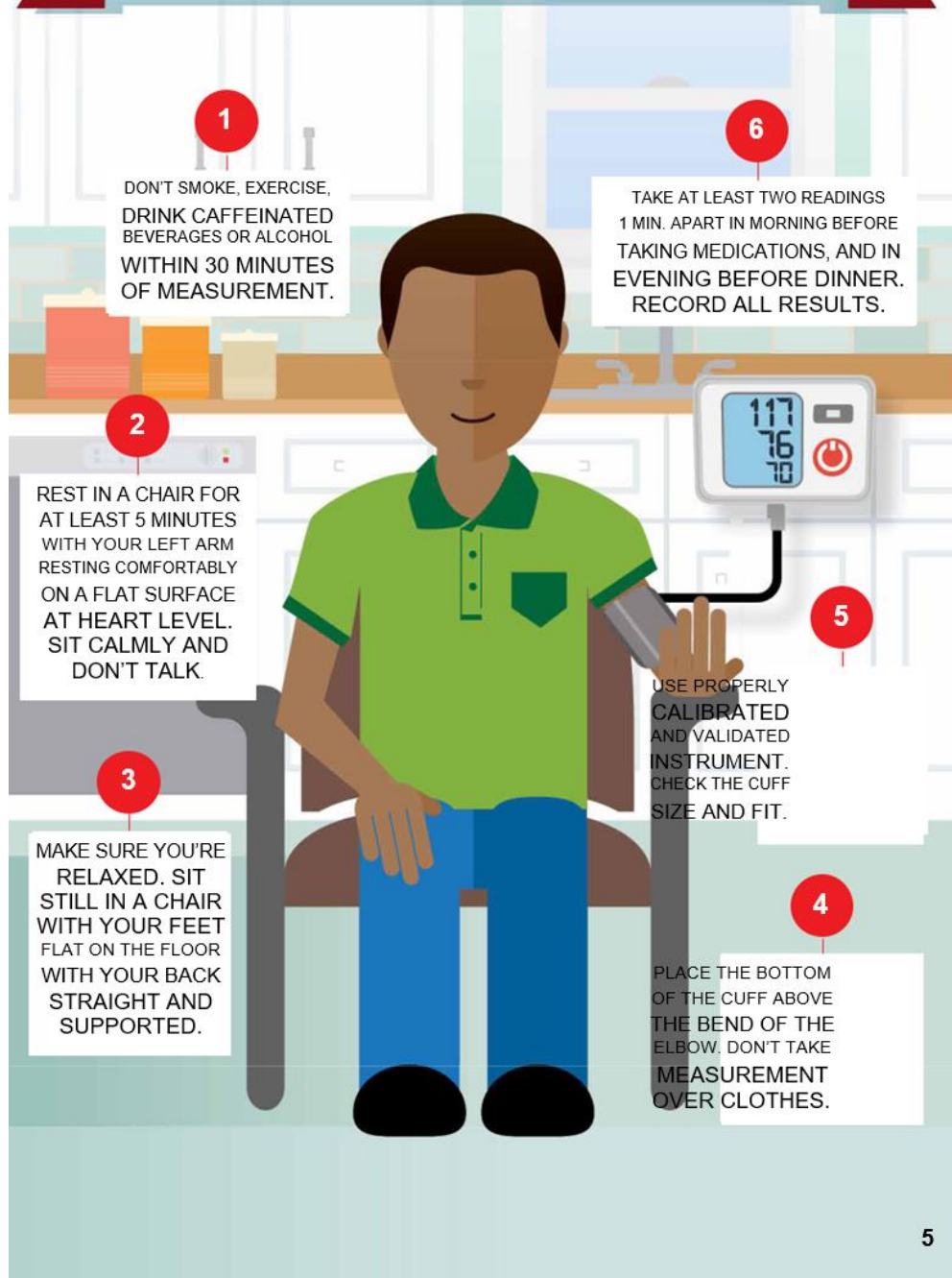
Ideally, you should measure and record your BP twice a day. Take at least two readings one minute apart in the morning before taking your medications and in the evening before dinner.

Use our Check. Change. Control.® Tracker (ccctracker.com/aha), a free online tool to help you track and monitor blood pressure. Just find the campaign code on the map for your state and sign up.



It's important to understand how to take your blood pressure properly so that you receive a correct reading.

STEPS FOR ACCURATE BP MEASUREMENT



BP RAISERS

Learn Which Substances Could Raise Your Blood Pressure

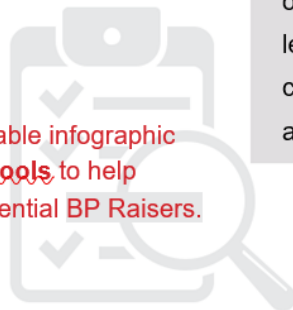
It is critical to understand what medications and substances may affect your blood pressure. Talk to your healthcare professional or pharmacist if you have any questions or concerns.

Examples include:

- Alcohol
- Amphetamines
- Antidepressants
- Caffeine
- Certain medicines to treat mental health
- Certain cancer medications, such as angiogenesis inhibitors
- Corticosteroids, such as prednisone
- Decongestants
- Herbal supplements
- Illicit and recreational drugs
- Immunosuppressants
- Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)
- Oral birth control

If you suffer from chronic pain and have HBP, talk to your healthcare provider or pharmacist if you have questions about what pain relievers may be right for you. The American Heart Association recommends avoiding NSAIDs for over-the-counter pain relief for those with HBP because they may further elevate blood pressure or make your BP medication less effective. Instead, consider pain relievers such as acetaminophen.

Download a printable infographic at heart.org/BPTools to help easily identify potential BP Raisers.



LIFESTYLE CHANGES

Even Small Changes Will Make a Big Difference

You can manage your blood pressure and keep it in check, by:



not smoking, vaping or using tobacco products



eating a heart-healthy diet



reaching and maintaining a healthy weight



getting regular physical activity



limiting your sodium (salt)



limiting your alcohol intake



taking your medications properly

Take these small steps to big changes. Start with one or two. Learn more at [heart.org/mylifecheck](https://www.heart.org/mylifecheck).





It's a Team Effort

It takes a team to treat your high blood pressure successfully. You and your healthcare providers need to work together.

Be your own health advocate by following a healthy lifestyle, such as reducing sodium, exercising and checking blood pressure as part of your daily routine.

Remind yourself that as long as you and your team of healthcare providers work together, you **CAN** manage your blood pressure. Work with your team to create an exercise, diet and medication plan that's right for you.

Visit heart.org/BPTools for more information.

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TYLENOL

Tylenol proudly supports the American Heart Association's efforts to improve healthy choices related to living with high blood pressure.

Appendix K

Recruitment Email

Dear Medical Center patient,

My name is Allison Edwards. I am a nurse practitioner student at The University of Missouri Kansas City. I am conducting a quality improvement project where I will provide education on hypertension (high blood pressure) to Medical Center patients.

You have met the criteria to participate. The only requirement to participate is that you must have a home blood pressure monitor and working telephone. If you choose to participate, simply respond to this email and I will send you more information. We will spend about 20 minutes on the phone on 3 separate days.

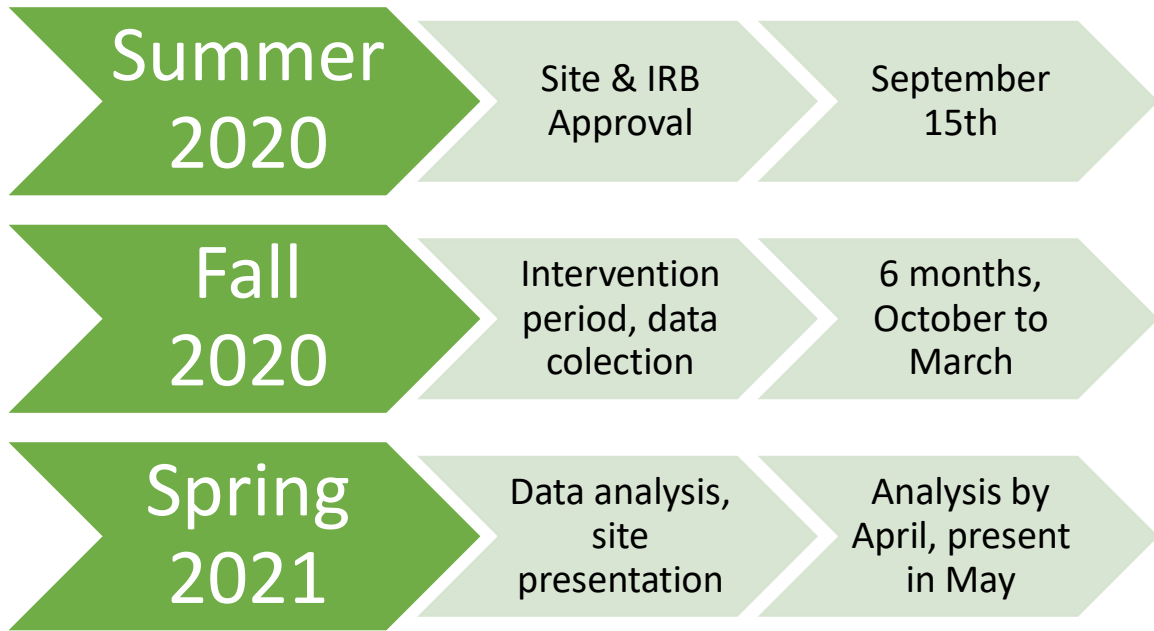
I hope you will consider taking part in my quality improvement project. I sincerely look forward to meeting you. If you have any questions, please feel free to email me at: *personal email address removed*.

Thank you,

Allison Edwards, BSN, RN

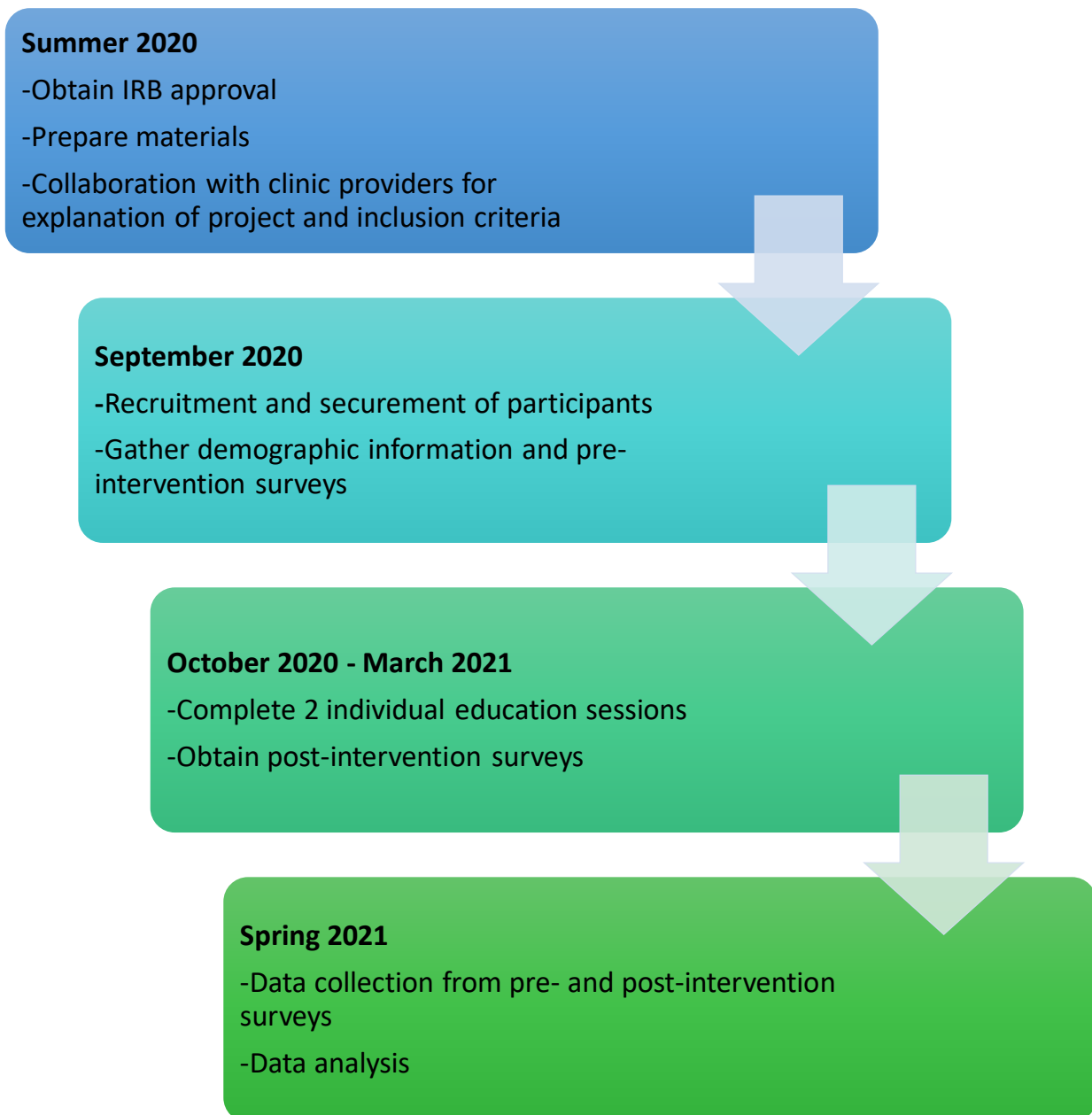
Appendix L

Project Timeline Flowchart



Appendix M

Intervention Flow Diagram



Appendix N

Logic Flow Model

Logic Model for DNP Project					
Student: Allison Edwards					
Inquiry, PICOTS: In adults 18 years and older with diagnosed hypertension, does a group education session increase medication adherence, home blood pressure monitoring, and blood pressure control over a 6-month period in a primary care setting?					
Inputs	Intervention(s)	Outputs	Outcomes -- Impact		
	Activities	Participation	Short	Medium	Long
<p>Evidence, sub-topics</p> <ol style="list-style-type: none"> adult hypertension management nonadherence to treatment medication adherence interventions home blood pressure monitoring education for adults with hypertension <p>Major Facilitators or Contributors</p> <ol style="list-style-type: none"> economic benefit quality care support systems <p>Major Barriers or Challenges</p> <ol style="list-style-type: none"> time and willingness to participate no follow-up from participants 	<p>EBP intervention which is supported by the evidence in the Input column</p> <p>Education session to improve medication adherence.</p> <p>Major steps of the intervention</p> <ol style="list-style-type: none"> Pre-medication adherence and pre-blood pressure measurements Two education sessions using AHA's hypertension handout. AHA's HBPM log provided. Post-intervention medication adherence and BP measurements. Home BP log rates. 	<p>The participants</p> <p>Adults over age 18, diagnosed hypertension, on antihypertensive for blood pressure control</p> <p>Site</p> <p>Medical Center</p> <p>Time Frame</p> <p>Seven months</p> <p>Consent or assent Needed</p> <p>Consent to participate Zero known risk</p> <p>Other person(s) collecting data</p> <p>no</p> <p>Others directly involved in consent or data collection</p> <p>Yes; clinic staff</p>	<p>Outcome(s) to be measured</p> <p>Primary: medication adherence Secondary: blood pressure, HBPM</p> <p>Measurement tool(s)</p> <ol style="list-style-type: none"> Hill-Bone Medication Adherence Scale pre- and post-BP measurements <p>Statistical analysis to be used</p> <ol style="list-style-type: none"> descriptive statistics 	<p>Outcomes to be measured</p> <p>Medication adherence Blood pressure</p>	<p>Outcomes that are potentials</p> <p>Weight loss Smoking cessation Other chronic disease management</p>

Appendix O

Permission for Use of Hill-Bone Medication Adherence Scale

nursingjhu.qualtrics.com/jfe/form/SV_exjPYdNyu0xYWxf

JOHNS HOPKINS
SCHOOL of NURSING

Request Hill-Bone Blood Pressure Adherence Scale

Please consider this message as permission to use the Hill-Bone Scale(s).*

Click the link below to access articles regarding scoring, validation and the original scales. We request that you cite the scale using the references provided in the link. We appreciate you sharing the findings of your project with us.
Link: https://nursing.jhu.edu/faculty_research/research/projects/hill-bone/hill-bone-scales-confirmation.html

Please don't hesitate to reach out to us at SON-HillBone@jhu.edu if you have any follow-up questions.

Best,
The Hill-Bone Scales team

* Note: Please do not share these documents with anyone else outside your project. We ask that anyone who wishes to use the scale should submit a formal request using the link provided for proper authorization.

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Appendix P

Hill-Bone Medication Adherence Scale

Removed for permission concerns.

Appendix Q

Data Collection Table

Participant ID	Pre- Intervention Systolic BP	Pre- Intervention Diastolic BP	Post- Intervention Systolic BP	Post- Intervention Diastolic BP	Pre- Intervention HB-MAS	Post- intervention HB-MAS
<i>1</i>	120	74	118	85	36	36
<i>2</i>	128	72	133	72	36	36
<i>3</i>	118	78	124	81	35	36
<i>4</i>	122	72	121	70	35	36
<i>5</i>	142	74	128	72	36	36
<i>6</i>	138	68	130	74	36	36

Appendix R

Statistical Analysis Table

	Pre-intervention average medication adherence	Post-intervention average medication adherence	Pre-intervention average systolic blood pressure	Pre-intervention average diastolic blood pressure	Post-intervention average systolic blood pressure	Post-intervention average diastolic blood pressure
Intervention patient group N=6						
HB-MAS score	35.67	36				
Question 1	3.67	4				
Question 2	4	4				
Question 3	4	4				
Question 4	4	4				
Question 5	4	4				
Question 6	4	4				
Question 7	4	4				
Question 8	4	4				
Question 9	4	4				
Systolic blood pressure			128		126	
Diastolic blood pressure				73		76