NON-PHARMACOLOGIC HYPERTENSION EDUCATION FOR PATIENTS WITH PERIPHERAL VASCULAR DISEASES

by

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As members of the DNP Project Committee, we certify that we have read the DNP project prepared by Cynthia Mitsuko Hill, titled Non-Pharmacologic Hypertension Education for Patients with Peripheral Vascular Diseases, and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

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Final approval and acceptance of this DNP project are contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

I hereby certify that I have read this DNP project prepared under my direction and recommend that it be accepted as fulfilling the DNP project requirement.

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DEDICATION

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ABSTRACT

Purpose: The purpose of this quality improvement project was to educate and improve awareness and knowledge of hypertension and of nonpharmacologic management of hypertension in patients receiving arterial angiograms in an outpatient vascular clinic in Tucson, Arizona. Providing hypertension education and resources to patients to promote a better understanding of how they can improve their overall health can significantly impact target community blood pressure goals.

Background: Hypertension is a major risk factor for coronary heart disease, chronic kidney disease, stroke, and peripheral vascular disease and is the most common reason for adult clinical visits and for the use of prescription drugs in the United States. In Tucson, Arizona the estimated prevalence of high blood pressure among adults aged 18 years and older was 30.6% in 2017. Evidence shows that undiagnosed/untreated hypertension and hypertension that is poorly managed can result in an increase in comorbidities and reduce the life expectancy of individuals affected by it. Hypertension is a public health issue, therefore, introducing healthy lifestyles to all patients could potentially have a positive impact on community health.

Methods: The project was guided using The Institute of Healthcare Improvement's Model for Improvement and Plan-Do-Study-Act cycle in the project development and implementation. Through the collaboration of the project lead and practice site staff participants, a hypertension education handout was developed. A pretest and posttest were administered to assess hypertension knowledge at baseline and hypertension knowledge after the intervention.

Results: Fifteen patients were identified as potential candidates to participate in project. Of those 15 patients, 12 patients consented to participate. The overall results from the data analysis

displayed a 26% improvement in scores after intervention. Four of the five questions displayed an improvement in scores on posttest following intervention.

Conclusions: The nonpharmacologic hypertension educational handouts proved to be an influential method of raising awareness and knowledge regarding hypertension management. The educational handout provided basic hypertension facts, the risks of living with uncontrolled hypertension, and different methods of hypertension treatment and management. This project provided education and awareness of hypertension and increased patient knowledge and confidence in their hypertension management to improve overall health outcomes.

INTRODUCTION

Hypertension is a major risk factor for coronary heart disease, chronic kidney disease, stroke, and peripheral vascular disease (Pugh & Dhaun, 2020). Hypertension affects 31% of the world's population and is far from being controlled despite many people receiving antihypertensive prescriptions. In addition to antihypertensive medications, healthy lifestyle implementations promote cardiovascular health and improve health-related quality of life. Patients with peripheral vascular diseases (PVD) accumulate multiple risk factors increasing their total cardiovascular risk (Clement, 2020). Clement (2020) reported that in this population, 20% of those who experience mild intermittent leg cramping, also known as claudication, present with myocardial infarction or stroke within five years with mortality being 10–15%. In a randomized clinical trial (RCT) by Arija et al. (2018), they found that the prevalence of hypertension in developed countries varies from 30 to 45%, with this percentage increasing from 60 years of age. The number of people receiving two or more antihypertensive medications has increased yet the prevalence of uncontrolled hypertension has not changed significantly (Arija et al., 2018). Hypertension is a common problem worldwide and more recently there is interest in vascular inflammation's role in hypertension development (Pugh & Dhaun, 2020).

Background Knowledge and Significance

Hypertension treatment is the most common reason for adult clinical visits and for the use of prescription drugs in the United States (US) and is also the leading cause of premature death and loss of disability-adjusted life years (Ferdinand & Nasser, 2017; Pugh & Dhaun, 2020). Hypertension is defined as a chronic elevation of systolic blood pressure greater than 130 mm Hg and/or diastolic blood pressure greater than 80 mm Hg and is classified as either essential or secondary hypertension. Most patients who suffer from hypertension are diagnosed with essential hypertension, also known as primary hypertension. Hypertension is the leading preventable risk factor for cardiovascular disease and the prevalence is rising worldwide due to the aging population and increased exposure to lifestyle risk factors such as unhealthy diets, physical inactivity, and smoking (Mills, Stefanescu, & He, 2020). Hypertension causes an estimated 9.4 million deaths yearly worldwide and is considered the most important risk factor for death and disability by the World Health Organization (WHO) (Ferdinand & Nasser, 2017).

Implementing healthy lifestyle modifications is a required first step in the treatment of hypertension (Ferdinand & Nasser, 2017). The modifiable lifestyle risk factors that contribute to the development of hypertension include obesity, cigarette smoking, high sodium intake, insufficient physical exercise, and excessive alcohol consumption (Morley et al., 2018; Ferdinand & Nasser, 2017). Cigarette smoking has also been linked to decreased arterial compliance leading to the development of PVD (Bevan & White Solaru, 2020; Morley et al., 2018). PVD is described as a lower extremity vascular disease related to high cardiovascular mortality and can be managed by cholesterol reduction, antiplatelet therapy, anticoagulation, peripheral vasodilators, blood pressure control, exercise therapy, and smoking cessation (Bevan & White Solaru, 2020). Controlling these factors can reduce mortality, symptoms, and complications.

The purpose of antihypertensive management is to minimize organ injury and reduce the incidence of hypertension morbidity and mortality. Evidence-based therapeutic lifestyle changes include weight reduction, Dietary Approaches to Stop Hypertension (DASH) eating plan, dietary sodium reduction, physical activity, smoking cessation, and moderation of alcohol consumption (Ferdinand & Nasser, 2017).

Hypertension management does not solely rely on pharmacological intervention. There is much evidence supporting healthy eating, physical activity, and smoking cessation when controlling blood pressure and all three are often used when creating nonpharmacological strategies for hypertension management. Although medications have been proven to lower chronically high blood pressure, lifestyle changes have also been demonstrated to have a positive effect. Kruk and Nowicki (2018) found that a healthy diet and regular physical activity correlate with lower blood pressure. Studies consistently demonstrate the beneficial effects of exercise on hypertension with reductions in both systolic and diastolic blood pressure (Hegde & Solomon, 2015; Kruk & Nowicki, 2018). Post-exercise hypotension can occur almost immediately, lowering the blood pressure and these effects can last for up to 24 hours (Hegde and Solomon, 2015). When exercise is consistently practiced as part of one's lifestyle, the effect of consistently lowering blood pressure will result in a sustained reduction of blood pressure.

Hypertension is a public health issue, therefore, introducing healthy lifestyles to all patients could potentially have a positive impact on community health. Improving and managing healthy lifestyle changes in the daily routine can help minimize cardiovascular risk (Arija et al., 2018). Persons who do not regularly exercise, and smoke cigarettes regularly are at higher risk for hypertension and PVD with mild intermittent claudication which could potentially lead to future comorbidities, like heart disease and strokes (Morley et al., 2018). Although the need for medication should not be ignored, advanced practice nurses can safely implement nonpharmacological interventions when treating hypertensive patients through educational opportunities and aid with their care management.

Local Problem

According to the CDC (2021) in Tucson, Arizona the estimated prevalence of high blood pressure among adults aged 18 years and older was 30.6% in 2017. In 2019, the United Health Foundation (UHF) (2021) found that 32.5% of Arizonans reported being told by a health professional that they have high blood pressure, which is an increase from 28.1% reported in 2011. Additionally, hypertension was the 10th leading cause of death with 1,019 deaths in 2017 (CDC, 2021). The UHF (2021) also reported the hypertension subpopulation statistics stating that Black males over the age of 65 with less than a high school education and making less than $25,000 a year make up most of the hypertension population in Arizona. It is evident that undiagnosed/untreated hypertension and hypertension that is poorly managed can result in an increase in comorbidities and reduce the life expectancy of individuals affected by it.

Intended Improvement

Project Purpose

The purpose of this quality improvement (QI) project was to educate hypertensive patients receiving arterial angiograms in an outpatient vascular clinic on nonpharmacological methods to lower their blood pressure. An identifiable problem exists: patients with hypertension are often unaware of the role of healthy lifestyle modifications in managing their hypertension diagnosis. This problem needs to be addressed because hypertension can increase the risk for other comorbidities. If patients are aware of the benefits of smoking cessation, physical exercise, and a DASH diet, they may be able to improve their overall health. Adherence to this regimen can reduce peripheral vascular complications like limb ischemia and amputation, in addition to systemic complications like stroke and myocardial infarction (Bevan & White Solaru, 2020). The goal was to provide hypertension education and resources to patients so that they can have a better understanding of how they can improve their overall health.

After check-in, patients were given a pretest that evaluated their knowledge of hypertension prior to their arterial angiogram. Prior to discharge, the patient was given verbal education as well as a handout educating them on hypertension and nonpharmacologic methods of lowering their blood pressure. A posttest was then administered at their two-week follow-up appointment, evaluating whether the patient retained the hypertension information.

In the US, approximately 32% of adults have hypertension, with 41.6% of them having less than a high school level education (UHF, 2021). Health literacy is a predictor of how a patient manages their health status, therefore, the US Department of Health and Human Services (USDHHS) and the American Medical Association (AMA) recommend providing health information at a 6th-grade reading level (Choudhury et al., 2016). Providing educational material that is easy to read and understand is imperative in spreading awareness in the community.

Project Question

In a population of patients receiving treatment for peripheral vascular diseases, will education on non-pharmacologic hypertension control improve knowledge of blood pressure two weeks after treatment?

Project Aims and Objectives

The purpose of the project was to provide an educational handout for patients on hypertension education and test their knowledge regarding hypertension. The pretest was given prior to the educational handout and the posttest presented the same questions after giving the patients time to read and retain the material.

- Aim 1: Educate staff, who voluntarily chose to participate, on educating hypertensive patients regarding healthy lifestyle modifications.
- Aim 2: Educate hypertensive patients receiving arterial angiograms in an outpatient Vascular clinic on nonpharmacological methods to lower their blood pressure.
- Aim 3: Offer an executive summary to the stakeholders regarding patient response after project conclusion.

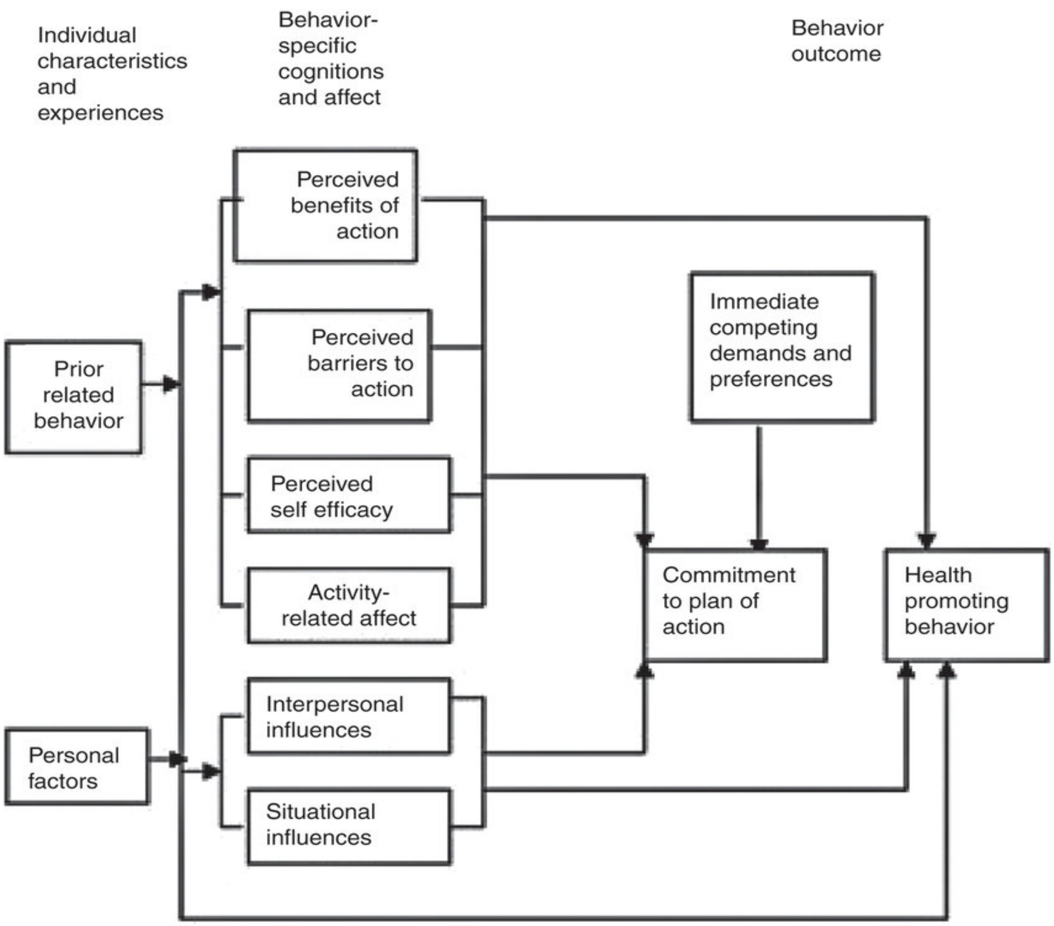
Theoretical Framework

Pender's Health Promotion Model

The theoretical framework chosen for this DNP project is the Health Promotion Model (HPM). With any change at the organizational level, there are theories to help guide how that change is brought to life in healthcare. The purpose of Pender's 1982 HPM is to assist those in healthcare in understanding the major determinants of health behaviors as a basis for behavioral counseling to promote healthy lifestyles. Kamran et al. (2015) stated that the health promotion model focuses on previous behaviors and personal factors as well as influences on behavioral motivation and expected outcomes of behavior (Figure 1). Change is necessary to create improvement opportunities and increase patient satisfaction, therefore leading to healthier outcomes.

Figure 1

Pender's Health Promotion Model



(Pender, 1982)

This project's focus is on evaluating patient knowledge of non-pharmacologic hypertension control by administering a pretest, providing education, and administering a posttest to measure whether the information was retained. The HPM is applicable to this project because it allows for patient and family engagement in creating achievable health goals that can result in positive outcomes with the right behavioral changes. The study by Kamran et al. (2015) showed that when using the model correctly, 71.4% of changes in systolic blood pressures were predicted, allowing them to draw the conclusion that perceptions are related to the final behavioral outcome. Patients are involved with decision-making and provide their perceptions, allowing them to identify which of their current behaviors can be modified and encourage them to make proper health decisions to improve their blood pressure and overall health.

Literature Synthesis

Evidence Search

An important component of this program evaluation project is a thorough search of the literature, which identified the modifiable risk factors of hypertension and the effects of nonpharmacological management on lowering blood pressure. The search was conducted using scholarly databases such as Google Scholar and PubMed. Both databases produced thousands of articles which were narrowed down based on language, availability, and relevance. The Centers for Disease Control and Prevention (CDC) website was used to discover the statistics on hypertension locally. Statistics such as prevalence, race, and education level in relation to hypertension were identified.

The search in Google Scholar was started using terms such as "readability level OR discharge education level," "hypertension and physical activity," "hypertension and healthy eating," "DASH diet and hypertension," "hypertension and peripheral vascular disease," "peripheral vascular disease and smoking," and "hypertension and smoking" and produced thousands of articles. Full-text articles published within the last five years and published in English were selected. The number of articles was narrowed down to 10 and selected to be utilized within this DNP project.

PubMed was also used in the literature search. Using the search terms as used in Google Scholar such as "hypertension and physical activity," "hypertension and healthy eating," “hypertension and peripheral vascular disease,” “peripheral vascular disease and smoking,” and “hypertension and smoking” initially produced thousands of articles. The search was narrowed down using filters allowing only for full-text articles, articles published within the last five years, and published in English. Six articles were chosen and synthesized for use in this DNP project.

The total number of studies chosen for this project is 16 articles and one expert website and excludes duplicate studies between the databases. The types of studies chosen were three randomized controlled trials, five expert journal articles, four systematic reviews, one quantitative study, one cross-sectional study, and two case-control studies. Overall, there was a significant amount of evidence available linking modifiable risk factors to hypertension, which can lead to worsening health-related problems for patients diagnosed with hypertension. This establishes an overwhelming need for nonpharmacologic intervention education for patients diagnosed with hypertension. The themes identified through this literature search were: Modifiable lifestyle risk factors contributing to the development of hypertension, effects of DASH diet and physical exercise on improving hypertension, cigarette smoking, and the development of PVD.

Comprehensive Appraisal of Evidence

Contributing Factors

The literature search is a critical step in recognizing modifiable risk factors that contribute to the development of hypertension, which is a health concern for patients and could lead to the advancement of worsening diseases such as PVD. Hypertension affects 31% of the world’s population (Arija et al., 2018). By examining modifiable risk factors that increase blood pressure, a plan can be formulated on practicing nonpharmacologic interventions to avoid a diagnosis of hypertension and the development of PVD, which will also reduce the risk of suffering from a myocardial infarction or stroke. Each source chosen discussed the factors contributing to hypertension and the most common factors being diet control (Ferdinand & Nasser, 2017; Miller et al., 2021; Mills et al., 2020; Morze et al., 2020), physical activity (Arija et al., 2018; Ferdinand & Nasser, 2017; Hegde & Solomon, 2015; Kruk & Nowicki, 2018; Mills et al., 2020; Thomas et al., 2019; You et al., 2018; Zhang et al., 2020), and smoking cessation (Bevan & White Solaru, 2020; Clement, 2020; Mills et al., 2020; Morley et al., 2018). Another factor to note is health literacy and its effect on managing health status (Choudhury et al., 2016). An expert website was also used to evaluate the problem of hypertension locally (CDC, 2021).

Lifestyle modifications are recommended for adults with hypertension, regardless of pharmacological therapy recommendations. The identifiable contributing factors are connected and, if not controlled, can impact the overall health of a patient. The prevalence of hypertension is rising globally though the awareness, treatment, and control of the disease are astoundingly low (Mills et al., 2020). Reduction in risk factors such as unhealthy diet, physical inactivity, and cigarette smoking is recommended for hypertension management and control and progression to PVD.

Diet

One large factor playing a role in the development of hypertension is an unhealthy diet. The identification of this modifiable factor has helped provide clinicians with credible evidence for recommending healthy dietary patterns for disease prevention (Morze et al., 2020). Cardiovascular diseases, among several other noncommunicable diseases, remain a major cause of disability and death worldwide. The American College of Cardiology (ACC)/American Heart

Association (AHA) guidelines on lifestyle management to reduce cardiovascular risk emphasize the benefits of the Dietary Approaches to Stop Hypertension (DASH) eating plan in hypertension prevention and control (Ferdinand & Nasser, 2017; Miller et al., 2021; Mills et al., 2020; Morze et al., 2020).

The DASH diet plan recommends the consumption of fruits, vegetables, low-fat dairy products with a reduced content of saturated and total fat, and a reduction in sodium intake. It has been suggested that DASH and other high-quality diets are inversely associated risk of all-cause mortality, cardiovascular disease, cancer, type 2 diabetes, and neurodegenerative disease (Miller et al., 2021; Morze et al., 2020). Notably, the effects of the DASH diet have been observed to be beneficial among adults from diverse backgrounds, including Black Americans and the socioeconomically disadvantaged population (Miller et al., 2021). The DASH diet was also successful in reducing blood pressure in normotensive participants (Mills et al., 2020).

Hypertension is a major burden for the adult population and adhering to a healthy diet as a first-line treatment option could have a significant impact on the prevention and management of hypertension. The DASH diet is an evidence-based lifestyle intervention to prevent and treat hypertension (Miller et al., 2021; Mills et al., 2020; Morze et al., 2020).

Physical Activity

Physical inactivity is another factor affecting the rising hypertension rate. Physical activity programs improve cardiovascular health and favor blood pressure control in patients diagnosed with hypertension (Arija et al., 2018; Ferdinand & Nasser, 2017; Hegde & Solomon, 2015; Kruk & Nowicki, 2018; Mills et al., 2020; Thomas et al., 2019; You et al., 2018; Zhang et al., 2020). Physical activity programs are key in non-pharmacological strategy in the treatment of hypertension and reducing PVD-related claudication. Physical activity such as brisk walking for at least 30 minutes daily, most days of the week is an essential lifestyle modification commonly recommended for patients diagnosed with hypertension and patients suffering from claudication due to PVD (Bevan & White Solaru, 2020; Ferdinand & Nasser, 2017; Kruk & Nowicki, 2018; You et al., 2018). Exercise can almost immediately lower blood pressure resulting in post-exercise hypotension and these effects can last for up to 24 hours (Hegde & Solomon, 2015). Even 10 minutes of vigorous physical activity every week can help reduce the prevalence of hypertension therefore, actively promoting exercise can help improve the effects of blood pressure control (You et al., 2018; Zhang et al., 2020). Thomas et al. (2019) was also able to consistently link physical activity not only to blood pressure response but also to a reduction in psychosocial stressors as well.

When exercise is consistently practiced as part of one's lifestyle, the effect of consistently lowering the blood pressure will result in a sustained reduction of blood pressure corroborating the close relationship between exercise and blood pressure control in hypertensive patients. Not only does physical activity lower blood pressure in hypertensive individuals, but also in normotensive individuals as well (Mills et al., 2020). The findings discussed indicate that physical activity is an evidence-based lifestyle intervention for the prevention and treatment of hypertension.

Smoking Cessation

Smoking is the single greatest modifiable risk factor for the development and progression of PVD and is associated with an immediate acute increase in blood pressure (Bevan & White Solaru, 2020; Mills et al., 2020; Morley et al., 2018). Since smoking is related to both blood pressure increases and PVD, it is necessary that all patients be informed of these associations and referred to relevant smoking cessation services at all interactions. Smoking slows healing and augments complication rates leading to higher increased mortality therefore smoking cessation is a key aspect of managing PVD and hypertension in primary care (Bevan & White Solaru, 2020; Morley et al., 2018).

Strengths of Evidence

The literature in this DNP project included many articles that did not mention the strengths of their research. One study mentioned the strength of the decision tree used, which ranked the importance of key factors in the development of hypertension (You et al., 2018). Another study discussed the strength of their intervention related to simplicity, cost-efficiency, and accessibility in primary care (Kruk & Nowicki, 2018). Using technology as a primary component in one study, they listed their strength as the ability to adopt a fully remote protocol allowing adults across the US to enroll in the study increasing the representativeness of their sample population and generalizability of their results (Miller et al., 2021).

Another strength of the chosen literature is the number of randomized controlled trials and systematic reviews. The systematic reviews provided a synthesis of several available studies and their data. These syntheses provided data for easy interpretation and are therefore the strongest level of evidence. Randomized controlled trials are considered the “gold standard” in evidence-based practice. Their ability to assign and administer treatments in a controlled way as well as their ability to conduct the trial blindly are just some of their many strengths to improve their credibility. Adding these types of articles to this DNP project strengthens the project because they include interventions and recommendations that future organizations can refer to knowing that the literature is evidence-based and current.

Weaknesses of Evidence

A few articles mentioned their inability to produce all conclusive data due to restrictions related to age, diseases, and location (Bevan & White Solaru, 2020; Hegde & Solomon, 2015; Mills et al., 2020; Morze et al., 2020). Other articles discussed their inability to determine which types of physical activities in specific are better for hypertension prevention and management and suggest future studies to explore this further (Arija et al., 2018; Kruk & Nowicki, 2018; Thomas et al., 2019; You et al., 2018). One study stated its use of technology limited their impact and limited their ability to collect labs and in-person blood pressure measurements. Another issue was their inability to find substantial evidence supporting the effectiveness of their chosen technology (Miller et al., 2021).

The use of a case-control study also adds to the weakness of the literature. Disadvantages in case-control studies are the potential for recall bias and their subjection to selection bias. Case-control studies can be used to establish correlation, but do not provide enough substantial evidence to establish causation. The case-control study used admits to recollection bias among the survey participants (Zhang et al., 2020). A cross-sectional study was also used and can be considered a weakness to this DNP project. Cross-sectional studies are unable to assess the incidence and cannot determine cause and effect. Their participants are often selected from a large and heterogeneous population. The cross-sectional study discussed in this DNP project states that the nature of their study provides limited evidence to determine a causal relationship between physical activity and hypertension (You et al., 2018). Though these types of articles can be considered weak, it is still helpful to include these studies to determine the prevalence, observe multiple risk factors, and study associations and outcomes.

Gaps and Limitations

The gaps and limitations vary, but overall, the articles contribute to the overarching theme of hypertension and/or PVD prevention and management based on the implementation of different nonpharmacologic lifestyle modifications. The applied interventions vary between each article based on age, race, location, diseases, and interventions, but the variability highlights the problem of hypertension and its prevalence in health care. This literature synthesis illustrates the importance of using different lifestyle modifications to improve the overall health of an individual.

METHODS

Project Design

This project aimed to improve patient education on nonpharmacologic methods to lower blood pressure through educational handouts at a vascular clinic in Tucson, Arizona. The patient's information retention was measured by first administering a pretest that was given prior to their arterial angiogram and a posttest at their two-week follow-up appointment. This project's design is a QI design utilizing a pretest and posttest with multiple choice answers. The project lead (PL) collected the data after the patient completed the posttest at their two-week follow-up appointment and compared them to the answers from the pretest at their initial appointment for their arterial angiogram.

After Institutional Review Board (IRB) approval was obtained from the University of Arizona (Appendix A), the PL provided educational handouts written at a 6th-grade reading level during discharge teaching after their arterial angiogram (Appendix E). The educational handouts were developed by the PL with approval by company stakeholders prior to incorporating them into discharge teaching. The pretest and the posttest developed also required stakeholder approval prior to practice implementation. The pretest and the posttest contained the same questions (Appendix D) and patients' knowledge retention was evaluated by their test scores after their follow-up appointment. The results will be shared with the stakeholders, who then will decide if they will continue providing hypertension information in discharge teaching.

Model for Implementation

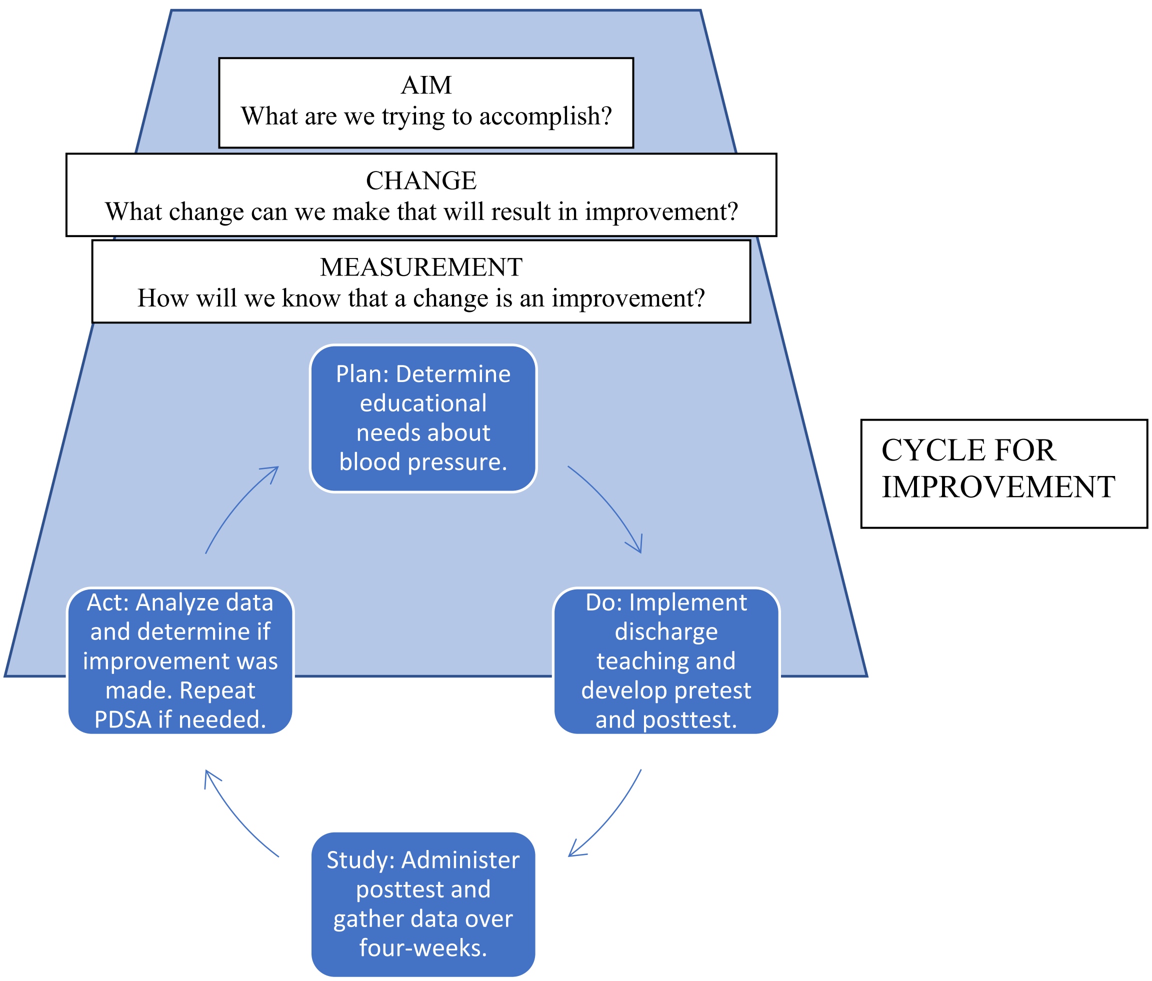
The Institute for Healthcare Improvement's (IHI) Model for Improvement is a two-part model used to facilitate QI in a healthcare setting (Institute for Healthcare Improvement [IHI], 2022). This model is not designed to replace any change models that are currently in place, but to accelerate the improvement (IHI, 2022). The first part of the model requires that three fundamental questions be addressed: *Setting Aims* -What are we trying to accomplish? *Establishing Measures* - How will we know that a change is an improvement? And *Selecting Changes* - What changes can we make that will result in improvement? (IHI, 2022). In this QI project, the PL aimed to educate hypertensive patients receiving arterial angiograms in an outpatient vascular clinic on nonpharmacological methods to lower their blood pressure. The intended outcome was that patients will be better educated on nonpharmacological methods to lower their blood pressure as evidenced by a posttest. Improvement included implementing teaching about high blood pressure before patients are discharged.

Plan-Do-Study-Act (PDSA) Cycle

The IHI model for improvement uses the Plan-Do-Study-Act (PDSA) cycle to test the changes and determine if there is an improvement (IHI, 2022). If no improvement is made, or additional changes need to be implemented, the cycle can be started again with the new interventions to improve the factor that inhibited the intended outcome. The PDSA cycle is a scientific method used for action-oriented learning through four steps: planning, doing, studying, and acting (IHI, 2022) (Figure 2).

Figure 2

IHI Model for Improvement PDSA Cycle



Plan

The first step is to plan the test by stating the objective and predictions of the project (IHI, 2022). The prediction will explain what will happen and why. After establishing the objectives and predictions, the plan to test the change will be developed. This requires the PL to address five questions: What is the change? Who will test the change? When will the change be tested? Where will the change take place? And What data needs to be collected to evaluate the change? (IHI, 2022). For this project, the plan began with determining who needs education about hypertension and nonpharmacologic methods for controlling blood pressure. Then after conducting a clinical research review, evidence supporting the need for blood pressure education was found.

Do

The second step is the “do” stage. This gives the PL the opportunity to try out the test on a small scale (IHI, 2022). During this stage, the PL carries out the test and documents all problems and unexpected observations, which will help the team know what may need to be changed after the first PDSA cycle (IHI, 2022). The PL is also responsible for analyzing the data and identifying trends. This gives the PL an idea of the direction the change is going and determines if there are any detectable improvements. The “do” phase of this project began after IRB approval. The PL created a pretest evaluating patients’ knowledge of hypertension that was administered to patients diagnosed with hypertension upon arrival for their arterial angiograms. The PL also developed handouts about hypertension and nonpharmacologic interventions to include alongside the standard instructions given to them at their discharge time.

Study

The third step in the PDSA cycle is the “study” stage. During this stage, the PL collected, analyzed, and compared the results with the predictions stated earlier in the “plan” stage (IHI, 2022). The purpose of this change test was to collect evidence on the patients’ ability to retain information about hypertension and incorporate nonpharmacologic measures into their daily routine to assist in lowering their blood pressure following discharge education after their arterial angiogram. The results of the posttest provided insight into the knowledge patients retained about hypertension and nonpharmacologic interventions in lowering blood pressure. In this phase of the project, patients' knowledge of hypertension was reevaluated using a posttest consisting of the same questions as the pretest to assess if the hypertension teaching at their discharge was effective in improving their knowledge of hypertension and nonpharmacologic interventions.

Act

The final stage of the PDSA cycle is the “act” stage. This gives the PL the opportunity to refine the change based on what was learned from the data collected during the earlier stages of the cycle (IHI, 2022). During this stage, the PL presented the data to the team and discuss openly what went well with the change test and what should be addressed prior to the next cycle. The PL then identified what modifications should be made, discussed the modifications with the team, and then begin to develop a plan for the next cycle. In this specific improvement project, the PL assessed for any additional needs or ideas to help lower the blood pressure of hypertensive patients after an arterial angiogram and then repeat the PDSA cycle.

Setting and Stakeholders

The setting of this project is at Arizona Vascular Specialists in Tucson, Arizona. Tucson, Arizona is an active city within Pima County and home to approximately 548,000 people (DataUSA, n.d.). 87.3% of the population of Tucson, Arizona has health coverage, with 37.2% on employee plans, 25.7% on Medicaid, 10.2% on Medicare, 11.2% on non-group plans, and 2.96% on military or VA plans (DataUSA, n.d.). Arizona Vascular Specialists is a privately owned clinic in southern Arizona and is staffed with three board-certified vascular surgeons, three medical assistants (MA), one scrub technician, three registered nurses (RN), two receptionists, one chief executive officer (CEO), and one executive director. See Appendix A for the site approval letter.

Planning the Intervention

The participants were informed of this DNP project through a presentation during lunch hour four weeks before implementation. Prior to the presentation, the QI project disclosure was provided (Appendix B). The presentation first discussed hypertension, how it relates to peripheral vascular disease, and nonpharmacologic interventions to lower blood pressure. Then the presentation displayed the pretest and posttest questions (Appendix D) as well as initial ideas for educational handout content (Appendix E). The initial draft for the education handout is based on evidence-based material retrieved from UpToDate (2022). The meeting concluded with an open discussion with the participants regarding the content to include in the educational handout and when to administer the pretest and posttest. After the initial meeting, the PL finalized the educational handout with a schedule for the implementation and presented it for approval to the high stakeholders with high power two weeks before implementation. Once approved, the PL then held a meeting for all willing participants during lunch hour one week prior to implementation to go over the new change.

Participants and Recruitment

The participants are labeled as high or low stakeholders with high or low power. The executive director is a high stakeholder with low power who was informed of the project but did not participate in the implementation piece of the project. The CEO and three board-certified surgeons are the high stakeholders with high power who were informed of the project, helped contribute ideas, approved the pretest and posttest, and approved the evidence-based educational handouts. The RNs and the scrub technician are low stakeholders with high power. They were responsible for identifying patients who would be appropriate for the education and referring them to the PL. They also participated by administering the pretest and posttests and providing educational handouts on hypertension during discharge. Lastly the clinic MAs and receptionists are low stakeholders with low power. The MAs did not participate in the implementation portion of this project. The receptionists were responsible for alerting the PL when a patient checks into the clinic for their two-week follow-up appointment. Patients were recruited to participate in the project at the time of arrival to their arterial angiogram and after consenting to participate, they filled out the pretest and posttest during their appointments.

Consent and Ethical Considerations

Approval for this project was obtained through the IRB at the University of Arizona and from Arizona Vascular Specialists (Appendix A). The staff participants were provided a disclosure statement prior to the initial project proposal presentation about the plan for the project and the need for consent to participate in the project to completion (Appendix B). The only information collected from the staff was their contact information, which will not be included in the project and used solely for the PL to discuss any questions or concerns regarding the project. Staff was made aware that participation was completely voluntary, and they could withdraw from participation at any time. Ethical considerations were still in place to keep the staff safe throughout the project's duration. Patient-protected health information (PHI) was not collected during the implementation. The pretest and posttest questions were not invasive, patients were assigned a unique five-digit number identifiable only by the PL, and the unique five-digit numbers were used to compare the results from the pretest and posttest. Once the posttest score was recorded, the patients' tests were then shredded. This intention was to protect patients' PHI but allow for the PL to compare data and results. The data were analyzed by the PL and patient names will remain confidential and were not recorded for this project. There was no overall risk to the participants in this quality improvement project and excluded children and pregnant women. The project was a QI project and not human research (Appendix A).

Data Collection

Patients were identified by whether they have been diagnosed with hypertension. Once the qualified patient participant was checked into their room prior to their arterial angiogram, the PL or the RN explained the project. The PL or RN discussed the participation eligibility criteria and explained that there will be little to no risk as their personal information and PHI will not be recorded in the project. Once the patient confidentiality waiver as provided and consent was obtained, the patient took a pretest evaluating their knowledge of hypertension. After their procedure, prior to discharge, the PL or RN provided an educational handout about hypertension and nonpharmacologic interventions for lowering their blood pressure. Then at their two-week follow-up appointment, a posttest was administered to evaluate knowledge retention. The pretest and posttest and the educational handout were provided in English only (Appendix D). A signed consent form was required prior to receiving the pretest (Appendix B). The pretest and posttests were kept in a folder in the PL's office and were not accessible to anyone other than the PL. Each patient received a pretest and posttest that had a unique five-digit number labeled on the tests. The five-digit number was identifiable only by the PL by appointment time and date on the excel spreadsheet, which could be found on the PL's password-protected computer. After completion of the data analysis, the pretest and posttests were appropriately destroyed to remain compliant with Arizona Vascular Specialist's HIPAA protocol.

The DNP project committee and the high stakeholders with high power reviewed the pretest and posttests and the educational handout prior to implementation. The DNP project committee consists of three members: two doctoral-prepared nurse practitioners and one medical doctor of vascular surgery. The pretest and posttest were multiple-choice and true or false questions.

Data Analysis

Data was collected via paper pretest and posttest and organized using descriptive statistics to clearly identify trends. The data was stored on a password-protected computer in an Excel spreadsheet without patient identifiers for management and analysis prior to shredding the tests. The analysis was performed using descriptive data; results are not generalizable to all vascular clinics, or all patients diagnosed with hypertension. The Mann-Whitney U test was used to analyze the data and outcomes. The results from the data analysis were assessed and divided into common themes for discussion.

RESULTS

"The Non-pharmacologic Hypertension Education for Patients with Peripheral Vascular Diseases" quality improvement (QI) project began on July 25, 2022, at Arizona Vascular Clinic located in Tucson, Arizona, and ended on September 2, 2022.

Description of Sample

A total of 15 patients were identified as eligible to participate in this QI project. Twelve patients who met inclusionary criteria consented to participate in the hypertension education project. Of the 12 patients, 41.7% (n=5) were female, and 58.3% (n=7) were male. All patients have been told by a medical professional that they have hypertension, but only 83.3% (n=10) were on at least one anti-hypertensive medication. Patient demographics are shown in Table 1.

Table 1

Patient Sample Characteristics (n=13)

Characteristic		**n (%)**
Sex	Female	5 (41.7%)
	Male	7 (58.3%)
	Chose not to answer	0 (0%)
Hypertension diagnosis	Yes	12 (100%)
	No	0 (0%)
Hypertension medication	Yes	10 (83.3%)
	No	2 (16.7%)

Note. Demographic information was collected prior to the pretest.

Outcomes

The method of intervention delivery relied on pretests and posttests; therefore, the Mann-Whitney U test was used to analyze the differences between the pretests and posttests. The pretest and posttest consisted of five identical questions assessing knowledge of hypertension diagnosis, risk of uncontrolled hypertension, and hypertension management. There were three multiple choice questions as well as two true/false questions. There was a total of five points available, with each question worth one point. This test allowed for evaluating the improvement of knowledge retention upon completion of the posttest. All 12 patients completed the pretests and posttests. The mean score for the pretest was 2.8 (56%) with the minimum score being '2' points (40%), and the maximum score being '4' points (80%). The mean score for the posttest was 3.6 (72%) with the minimum score being '3' (60%), and the maximum score was '5' (100%). Descriptive statistics of the pretest and posttest scores are presented in Table 2. A complete breakdown of responses is presented in Table 3. A visual side-by-side representation of the pretest and posttest scores is presented in Figure 3.

Table 2

Descriptive Statistics of Pretest and Posttest Scores

	Pretest (n=12) T_{max} Score=5	**Posttest (n=12) T_{max} Score=5**
Mean (SD)	2.8 (0.83)	3.6 (0.65)
Median (min, max)	3 (2, 4)	4 (3, 5)

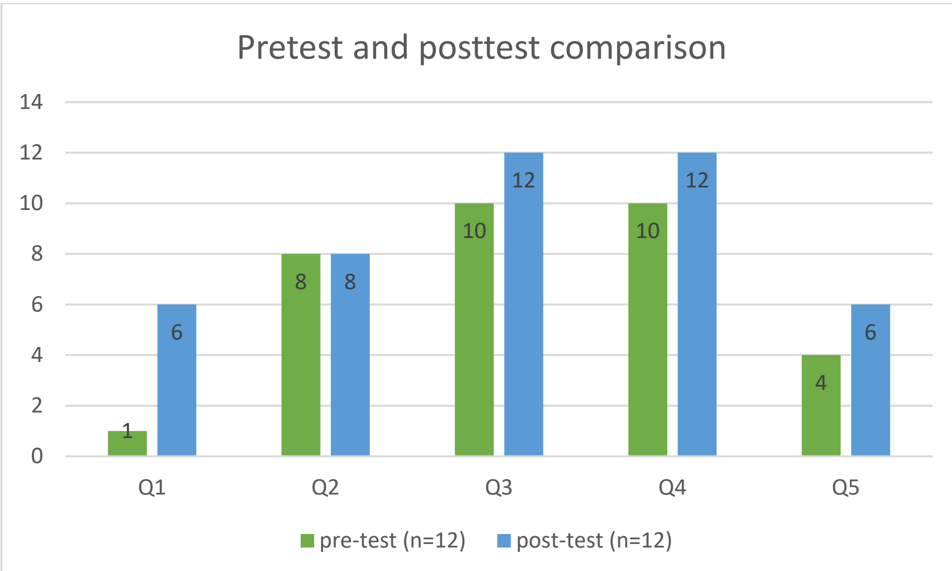
Table 3

Breakdown of Responses

	Pretest (n=12) Number correct (%)	**Posttest (n=12) Number correct (%)**
Q1 Knowledge of hypertension diagnosis	1 (8.3%)	6 (50%)
Q2 Risk of uncontrolled hypertension	8 (66.7%)	8 (66.7%)
Q3 Hypertension management	10 (83.3%)	12 (100%)
Q4 Hypertension management	10 (83.3%)	12 (100%)
Q5 Hypertension management	4 (33.3%)	6 (50%)

Figure 3

Pretest and Posttest Score Comparison



Mann-Whitney U Results

The Mann-Whitney U test was used to evaluate the overall scores of the pretest and posttest and the scores by topic. To evaluate significance, the pretest scores were compared to the posttest scores. The *p-value* significance was set at $p < 0.05$. The purpose of this project was to improve knowledge on non-pharmacologic interventions to reduce blood pressure in patients with peripheral vascular disease.

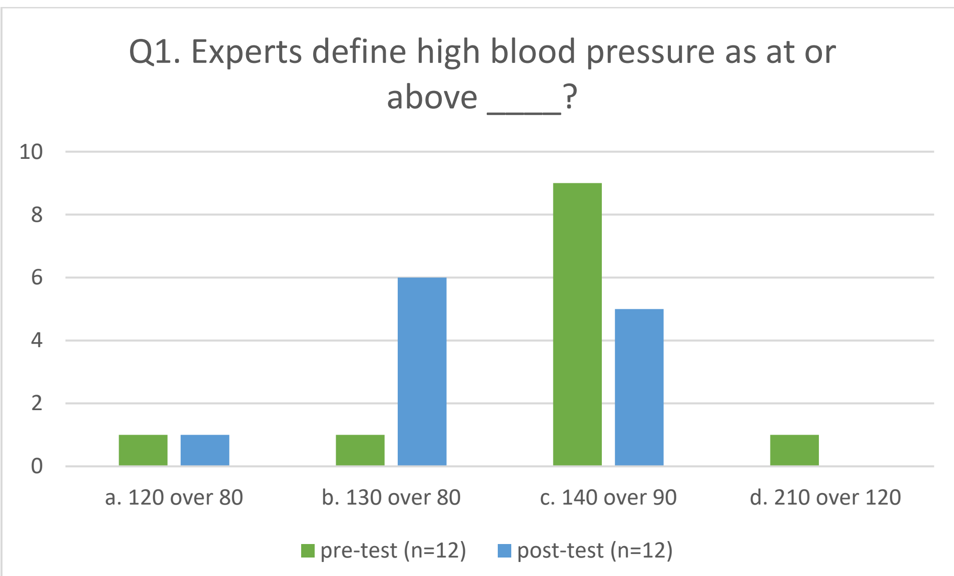
The evaluation of the pretest scores in comparison to the posttest scores produced results $p = 0.03$, U=35. Though the test shows improvement between the pretest scores (Mean=2.8, 56%) and the posttest scores (Mean=3.6, 72%), the improvement is not considered statistically significant.

Knowledge of Hypertension Diagnosis

One question was focused on primary knowledge of hypertension basics. Question 1 (Q1) evaluated the patient's knowledge of blood pressure readings and when blood pressure is considered "high." It is important to note that there was an improvement from pretest scores (n=1, 8.3%) to posttest scores (n=6, 50%) for Q1 indicating that the patient's knowledge of blood pressure readings improved after the education. Figure 4 provides a visual representation of pretest and posttest responses for Q1.

Figure 4

Knowledge of Hypertension Diagnosis (Q1)

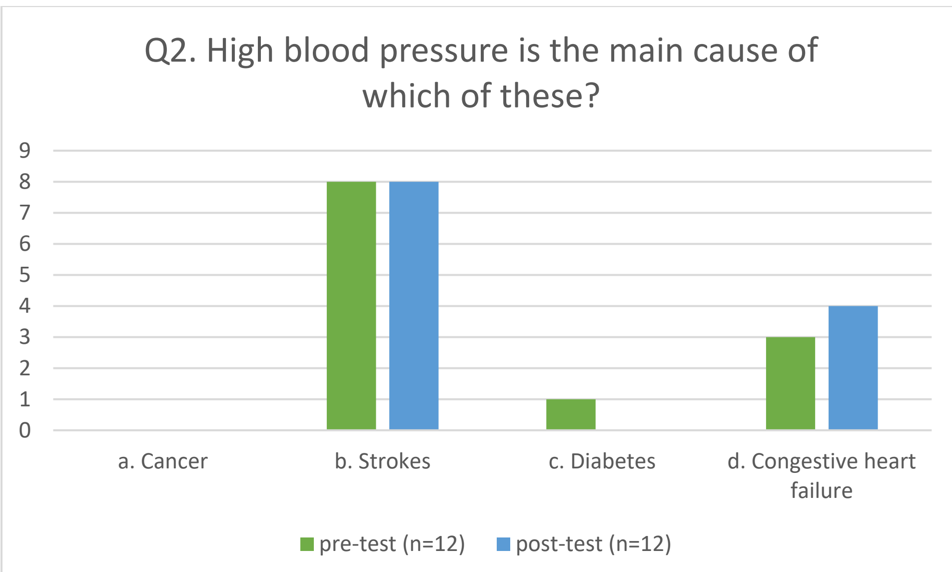


Risk of Uncontrolled Hypertension

One question assessed knowledge of risks of uncontrolled hypertension. Question 2 (Q2) evaluated the patient's understanding of their disease and what they are at risk of if their high blood pressure is left untreated or uncontrolled. Although the scores from the overall posttest (mean=3.6, 72%) were improved from the pretest (mean 2.8, 56%), the scores for Q2 did not change between the pretest (n=8, 66.7%) and posttest (n=8, 66.7%). This indicates that the education provided to the patient was either insufficient or not specific in emphasizing the risks of uncontrolled and/or untreated hypertension. Figure 5 provides a visual representation of pretest and posttest responses for Q2.

Figure 5

Risk of Uncontrolled Hypertension (Q2)

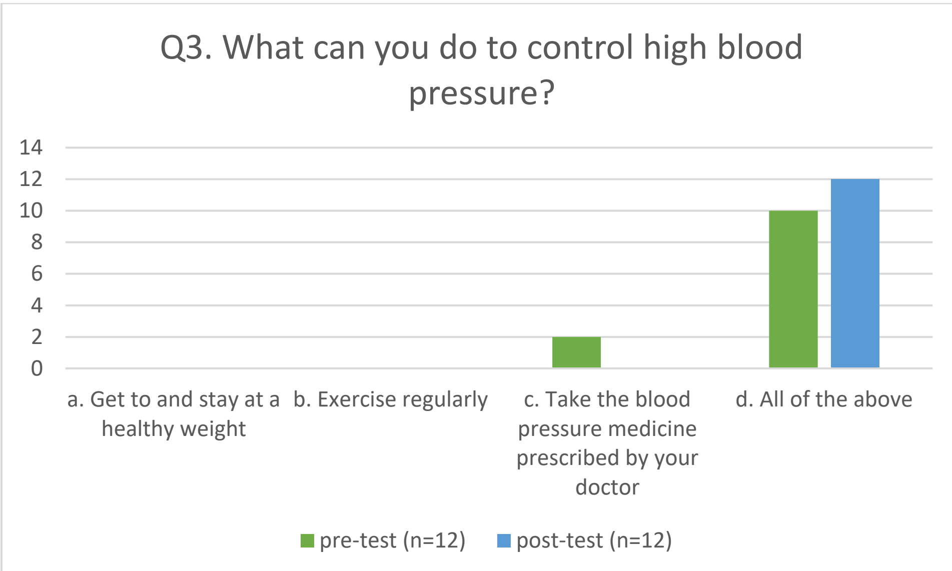


Hypertension Management

The final three questions evaluated the patients' knowledge of hypertension management. Question 3 (Q3) evaluated the patient's understanding of different methods to lower their blood pressure. All 12 patients selected the correct answer on the posttest (n=12, 100%), displaying improvement from pretest scores (n=10, 83.3%), therefore showing an improvement in understanding of the different non-pharmacologic means to lower blood pressure. Figure 6 provides a visual representation of pretest and posttest responses for Q3.

Figure 6

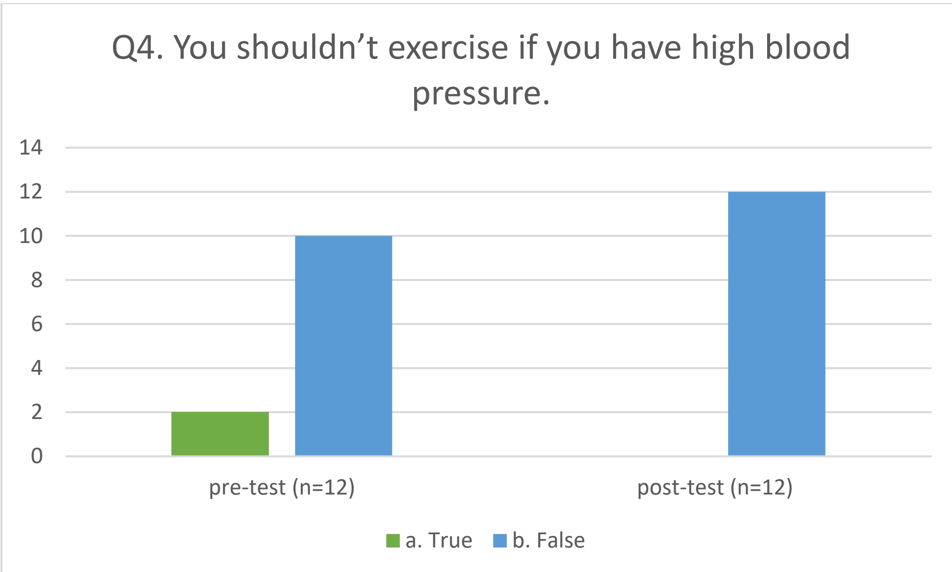
Hypertension Management (Q3)



Question 4 (Q4) evaluated the patient's knowledge of exercise's effects on blood pressure. Pretest scores (n=10, 83.3%) and posttest scores (n=12, 100%) indicate improvement in understanding of the benefits of exercise for those who are diagnosed with hypertension. Figure 7 provides a visual representation of pretest and posttest responses for Q4.

Figure 7

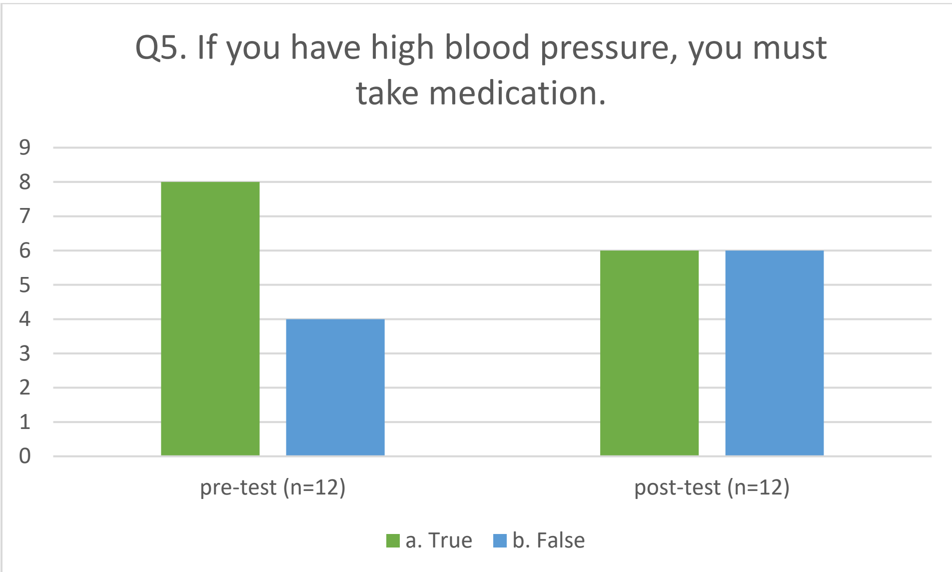
Hypertension Management (Q4)



The final question (Q5) assessed knowledge of medication use. There was a slight, but notable, improvement from pretest scores (n=4, 33.3%) to posttest scores (n=6, 50%). The improvement from pretest scores to posttest scores for the questions related to hypertension management indicates that the education provided to the patients was useful in teaching different non-pharmacologic methods for lowering blood pressure. Figure 8 provides a visual representation of pretest and posttest responses for Q5.

Figure 8

Hypertension Management (Q5)



DISCUSSION

Summary

Hypertension is the leading preventable risk factor for cardiovascular disease with its prevalence rising, affecting 31% of the world's population (Mills, Stefanescu, & He, 2020). Patients with hypertension are often unaware of nonpharmacologic methods to lower their blood pressure. Participating in lifestyle modifications such as smoking cessation, physical exercise, and following a DASH diet could improve their overall health. Cigarette smoking increases the risk for other comorbidities such as PVD. Patients with PVD accumulate multiple risk factors increasing their total cardiovascular risk (Clement, 2020). Adherence to these lifestyle modifications can reduce the risk of systemic complications like stroke, myocardial infarction, and peripheral vascular complications such as limb ischemia and amputation (Bevan & White Solaru, 2020).

Current evidence heavily supports the implementation of nonpharmacologic interventions for improved management of hypertension and PVD. While medications have been proven to lower chronically high blood pressure, lifestyle modifications are a required and often effective first step in hypertension and PVD treatment. Modifying sodium intake, physical activity, and cigarette smoking contribute to the reduction of high blood pressure and decreases the incidence of PVD (Morley et al., 2018; Ferdinand & Nasser, 2017; Morley et al., 2018). The purpose of antihypertensive treatment and management is to minimize organ injury and reduce the incidence of hypertension morbidity and mortality through evidence-based therapeutic lifestyle modifications.

Hypertension is a public health issue and the need for education on healthy lifestyle modifications could potentially positively impact the overall health of the community. Education on healthy lifestyle implementations in one's daily routine can help minimize cardiovascular risk (Arija et al., 2018). The need for medication should not be ignored, but advanced practice nurses should habitually encourage non-pharmacological interventions when treating patients with hypertension.

The purpose of this QI project was to educate staff on educating hypertensive patients regarding healthy lifestyle modifications, educate hypertensive patients receiving arterial angiograms in an outpatient vascular clinic on nonpharmacological methods to lower their blood pressure, and offer an executive summary to the stakeholders regarding patient response after project conclusion.

Interpretation

The results of the pretest and posttest scores show a 26% improvement in scores after the intervention. This percentage increase display patterns of knowledge improvement after receiving hypertension education. The pretest and posttest consisted of five identical questions divided into three themes: knowledge of hypertension diagnosis, risk of uncontrolled hypertension, and hypertension management.

Knowledge of Hypertension

The purpose of the first question was to evaluate basic hypertension knowledge. The multiple-choice question asked how experts define high blood pressure. Many patients chose the same incorrect answer, 140/90, for Q1 on the pretest which used to be the correct answer based on AHA guidelines from 2003. The guideline was updated in 2017, reflecting the most current evidence used in practice today, which defines hypertension as a chronic elevation of systolic blood pressure greater than 130 mm Hg and/or diastolic blood pressure greater than 80 mm Hg (Arija et al., 2018). The increased number of correct responses to Q1 on the posttest indicates the effectiveness of providing basic hypertension facts on the hypertension education handout.

Risk of Uncontrolled Hypertension

The second question evaluated knowledge of the risks of uncontrolled hypertension. Hypertension can affect or lead to several comorbidities, but significantly increases the risk for coronary heart disease, chronic kidney disease, stroke, and peripheral vascular disease (Pugh & Dhaun, 2020. Improving patients’ understanding of their disease could potentially improve their management of it as well. The scores for Q2 did not improve or worsen from pretest to posttest. These results indicate that the hypertension education provided did not sufficiently or clearly explain the risks of uncontrolled hypertension. Alteration of the handout to present the risks of uncontrolled hypertension clearly and concisely is warranted to further improve hypertension knowledge.

Hypertension Management

Questions 3, 4, and 5 evaluated the patients' knowledge and understanding of hypertension management. There was a 20% improvement on question three in the posttest after the intervention. All 12 patients chose the correct answer on the posttest showing an improvement in understanding the effects of lifestyle modifications on hypertension. Lifestyle modifications have been demonstrated through many evidence-based articles to positively affect blood pressure reductions in both systolic and diastolic blood pressures (Hegde & Solomon, 2015; Kruk & Nowicki, 2018). Therefore, patients should receive continued education on lifestyle modifications.

Question 4 was a 'true or false' question evaluating the patients' knowledge of exercise participation and hypertension management. This question also had a 20% improvement on the posttest after intervention implementation indicating knowledge retention of exercise's effects on blood pressure management. Understanding the importance of physical activity is key in non-pharmacologic hypertension treatment and management because physical activity improves cardiovascular health and improve blood pressure control (You et al., 2018; Zhang et al., 2020). Physical activity such as brisk walking for at least 30 minutes daily, most days of the week can also reduce PVD- related claudication (Bevan & White Solaru, 2020).

Question 5 was a 'true or false' question evaluating the patients' knowledge of the implications of medication use. There was a notable 50% increase in the posttest after intervention implementation. This displays an increased understanding of patients' knowledge of medication implications. Medications are clinically proven to lower chronically high blood pressure but are not necessarily required, as lifestyle modifications have also been clinically proven to be effective in blood pressure control and are a required first step prior to prescribing medication (Ferdinand & Nasser, 2017). The need for medication management should not be overlooked if indicated, but hypertension management does not rely solely on medication use.

Implications

Practice

The implications of this QI project for future practice are that there are evidence-based interventions available to provide patients with education on knowledge, awareness, and availability of resources to promote lifestyle modifications. The information on the hypertension educational handout is based on current evidence-based practices and is available to use as a resource in educating hypertensive patients at Arizona Vascular Specialists in Tucson, Arizona on hypertension management. The educational material could also be implemented at other medical clinics serving the adult population because it is not specific to patients with PVD. Although the project sample consisted only of patients with PVD, the information is applicable to all adults to increase awareness and knowledge of nonpharmacologic hypertension management. The hypertension educational handout can be printed and placed in waiting rooms and/or distributed with discharge instructions; thereby offering patients the material and further encouraging positive change in patients' behaviors and personal factors as well as improving behavioral motivation and outcomes. This displays accordance with Pender's HPM.

Education

This QI project contained several education topics relevant to nonpharmacologic hypertension management. The results of this project displayed evidence that an educational component can improve patients' knowledge of nonpharmacologic hypertension management. The results of this project support previous studies' recommendations regarding the importance of nonpharmacologic implementation education for both new and existing hypertension diagnoses. The findings in this project have the potential to aid in effective hypertension education, therefore encouraging providers to incorporate and/or implement nonpharmacologic hypertension education material for their adult population within their medical clinic.

Research and Policy

The results of this QI project can potentially encourage future research in healthcare. Future research suggestions include incorporating nonpharmacologic hypertension education to individuals who are categorized as having elevated blood pressure but have not yet been diagnosed with stage one hypertension and how the knowledge and awareness of nonpharmacologic methods to lower their blood pressure impacts their change in lifestyle behaviors. If that research concludes with positive results, healthcare providers can implement nonpharmacologic hypertension education into their practice when developing a plan of care for those with hypertension or at risk for hypertension. This project revealed that adults with PVD at Arizona Vascular Specialists in Tucson, Arizona are responsive to educational handouts, therefore, creating an opportunity for education and/or clinical practice within other clinics.

The positive impact of promoting nonpharmacologic hypertension knowledge and awareness within this QI project should be referenced when restructuring or establishing new organizational policies within medical clinics or larger healthcare facilities.

Strengths and Limitations

Strengths

This QI project successfully used evidence-based research to provide awareness and knowledge of hypertension to patients with PVD at Arizona Vascular Specialists in Tucson, Arizona. The method of administering the pretest prior to receiving sedation medication for their peripheral vascular disease treatment allowed the patients to have clear and collected thoughts for an optimal baseline assessment of their hypertension knowledge prior to the intervention. The administration of the posttest at their two-week follow-up appointment ensured sufficient time to review the hypertension educational handout prior to reassessing hypertension knowledge improvement. Another strength of this QI project is that the hypertension educational handout was created by healthcare professionals to distribute to patients in a medical clinic, therefore, encouraging applicability to other medical clinic settings. The hypertension educational handout can also be saved on a computer to provide online resources on healthcare websites or emailed directly to patients.

Limitations

The results of the QI project showed a positive impact, but limitations still exist. The small sample size, the short duration of the intervention, and the specificity of the patient population contribute to potential study limitations. Because of these limitations, this QI project is not applicable to all vascular clinics and the findings are not generalizable.

DNP Essentials Addressed

The Doctor of Nursing Practice (DNP) Essentials establishes, develops, and maintains the core competencies required of advanced practice nurses (APRN) (AACN, 2006). The eight Essentials provide APRNs with a framework for practice. This framework is necessary to consider especially in more complex healthcare systems. The Essentials help APRNs remain grounded in the foundational structure of practicing for the benefit of the patients and the community. This project uses four of the eight DNP essentials:

- *DNP Essential III* addresses the scholarship and analytical methods required by APRNs (AACN, 2006). This essential exists throughout this project, as evidenced by a comprehensive literature review collecting current and/or recent evidence-based literature and applying the gathered evidence into practice. Identifying the limitations of the project is also a valuable part of the project and allows for reflection
- *DNP Essential VI* emphasizes the interprofessional collaborative skills required by APRNs to improve healthcare outcomes (AACN, 2006). Collaboration between the PL, DNP committee, and practice site contributed to the successful implementation of this project intervention. The results for sustainability and plans for dissemination were provided in an executive summary to the practice site following data analysis and interpretation.
- *DNP Essential VII* focuses on clinical prevention and population health (AACN, 2006). This essential encourages APRNs to integrate health promotion and risk reduction considerations into their care. An objective of this project was to provide education and awareness of hypertension and increase patient knowledge and confidence in their

hypertension management to improve not only the health of one individual but ideally of the whole community.

- Lastly, *DNP Essential VIII* specifies the foundational practice that all DNP graduates are expected to display with the goal of improving patient outcomes through demonstrations of advanced levels of clinical judgment and delivery of care using evidence-based practice (AACN, 2006). This Essential provided a foundation for the PL to raise awareness and increase knowledge of nonpharmacologic hypertension management.

Conclusions

The nonpharmacologic hypertension education through the use of handouts given at discharge at Arizona Vascular Specialists in Tucson, Arizona proved to be an unparalleled method of raising awareness and knowledge regarding hypertension management. The educational handout provided basic hypertension facts, the risks of living with uncontrolled hypertension, and different methods of hypertension treatment and management in an easy-to-read and understandable format to spread awareness in the community. Although the sample size was small and specific, improvements were notable in the posttest scores compared to the pretest scores after the intervention. The results of this project indicate increased awareness and knowledge of nonpharmacologic hypertension management and can potentially provide confidence to implement lifestyle behavioral changes. Therefore, providing hypertension education is an effective way to educate patients diagnosed with prehypertension and patients diagnosed with hypertension on the importance of hypertension management.

Plan for Sustainability

This QI project is based on current and recent evidence, therefore, for this project to be sustainable, the content of the hypertension educational handout must be reviewed periodically and adjusted as necessary to display the most up-to-date evidence. Additionally, the PDSA cycle should continuously be evaluated and revised to reflect the incorporation of up-to-date evidence. Lastly, the educational handout can be provided in the waiting room in addition to discharge papers to increase awareness and knowledge among all patients and not just those receiving treatment for their peripheral vascular disease.

Plan for Dissemination

An executive summary was prepared and delivered to the high stakeholders with high power at Arizona Vascular Specialists in Tucson, Arizona. The executive summary highlights the implementation process, the key findings, and the results of the quality improvement project conducted at their site. The practice site will be given the option to decide whether they would like to continue with the hypertension education. The findings from this project were presented for final defense with project committee members in a PowerPoint presentation.

Funding

No source of outside funding was used or received for this quality improvement project.

APPENDIX A:

SITE APPROVAL/THE UNIVERSITY OF ARIZONA INSTITUTIONAL REVIEW BOARD AUTHORIZATION LETTER

Arizona Vascular Specialists
Matthew Namanny, DO, FACOS
Layla Corral Lucas, MD, FACS
Federico Yanquez, MD
6442 E. Speedway, Ste. 102
(520) 777-4090 | (520) 203-8795 | www.azvascularspecialists.com

April 27, 2022

University of Arizona Institutional Review Board
c/o Office of Human Subjects
1618 E Helen St
Tucson, AZ 85721

To Whom It May Concern:

Please note that Cynthia Hill, UA Doctor of Nursing Practice student, has the permission of Arizona Vascular Specialists to conduct a quality improvement project at our facility for her project, "Non-Pharmacologic Hypertension Education for Patients with Peripheral Vascular Diseases."

Mrs. Hill will conduct a presentation for the staff detailing the objectives of her project. The presentation will provide a description of the project, how they can participate, the time involved, and a link to an online survey at the conclusion of the project. Mrs. Hill's activities will be completed by *August 31, 2022*.

Mrs. Hill has agreed to provide my office with a copy of the University of Arizona Determination before she recruits participants. She will also present aggregate results to the providers after the project's conclusion.

If there are any questions, please contact my office.

Sincerely,

Amy Namanny, PharmD, MBA
CEO-Arizona Vascular Specialists
Office: (520) 777-4090
Fax: (520) 332-2941
anamanny@azvascularspecialists.com

University of Arizona IRB
845 N Park Ave., Suite 537A
Tucson, AZ 85719
Fax: 520-621-9810
VPR-IRB@arizona.edu

NOT HUMAN RESEARCH

July 8, 2022

Cynthia Hill

Dear Cynthia Hill:

On 7/7/2022, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	NON-PHARMACOLOGIC HYPERTENSION EDUCATION FOR PATIENTS WITH PERIPHERAL VASCULAR DISEASES
Investigator:	Cynthia Hill
IRB Submission ID:	STUDY00001477
Sponsor:	None
Prime Sponsor:	None
IND, IDE, or HDE:	None
Documents Reviewed:	• Hill Advisor_Co-PI Attestation Form_v2021-09 - 2022-06-21T101101.796 (1).docx, Category: Other; • IRB protocol, Category: IRB Protocol; • Patient intervention education, Category: Participant Material; • pre-test and post-test, Category: Data Collection Tool; • Project consent, Category: Consent Form; • Recruitment letter, Category: Recruitment Materials; • Site letter, Category: External Site Authorization;

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations.

IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities are research involving humans in which the organization is engaged, please

University of Arizona IRB
845 N Park Ave., Suite 537A
Tucson, AZ 85719
Fax: 520-621-9810
VPR-IRB@arizona.edu

submit a new request to the IRB for a determination. You can create a modification by clicking **Create Modification / CR** within the study.

All Covered Individuals must disclose all sponsored and non-sponsored Research Projects to the Office for Responsible Outside Interests (OROI) prior to Conducting Research if the individual is an Investigator. Please visit the OROI website for more information.

We value your feedback and would appreciate you taking the time to complete our survey about your experience with the IRB staff: https://uarizona.co1.qualtrics.com/jfe/form/SV_ehQ04WxNA06b42i.

If questions arise at any time during your study, please email the general IRB inbox at VPR-IRB@arizona.edu.

APPENDIX B:

CONSENT DOCUMENT (CONSENT FORM)

I am consenting to participate in Cynthia Hill's DNP project titled "Non-pharmacologic Hypertension Education for Patients with Peripheral Vascular Diseases." I am aware of the two surveys that I will be taking in addition to receiving an education on how I can better manage my hypertension. I understand that the care that I receive at Arizona Vascular Specialists will not be affected by this project. The risks and benefits have been explained to me and I agree to further engage in this project.

____
Print name

____
Sign name   date

APPENDIX C:

RECRUITMENT MATERIAL (RECRUITMENT LETTER)

Non-Pharmacologic Hypertension Education for Patients with Peripheral Vascular Diseases

The purpose of this quality improvement project is to educate hypertensive patients receiving arterial angiograms in an outpatient vascular clinic on nonpharmacological methods to lower their blood pressure. An identifiable problem exists: patients with hypertension are often unaware of the role of healthy lifestyle modifications in managing their hypertension diagnosis. This problem needs to be addressed because hypertension can increase the risk for other comorbidities. If patients are aware of the benefits of smoking cessation, physical exercise, and a low-sodium diet, they may be able to improve their overall health. The goal is to provide education to patients and provide resources so that they can have a better understanding of how they can improve their overall health.

Your participation is voluntary. If you choose to participate in this project, you will be sent an email after the conclusion of this presentation requesting consent to participate in the project and your contact information. Your information will remain confidential and not be shared with any additional parties. Demographic information will not be collected. After today's presentation, there will be an additional 1-2 brief meetings in preparation for the project implementation date.

There are no risks associated with participating in this project and there is no tangible benefit from your participation. Once again, the participation is completely voluntary, if you choose not to participate there will be no penalty or repercussions. You may also withdraw from the project at any time.

For questions or concerns regarding this project you may contact myself via email at chill1007@email.arizona.edu or via call/text at 520-205-1427.

Thank you for taking the time to participate in this DNP project.

Cynthia Hill, MS-RN
University of Arizona

APPENDIX D:

EVALUATION INSTRUMENTS (PRETEST AND POSTTEST INTERVENTION)

BLOOD PRESSURE QUIZ

1. Experts define high blood pressure as at or above ____?
    a. 120 over 80
    b. 130 over 80
    c. 140 over 90
    d. 210 over 120

2. High blood pressure is the main cause of which of these?
    a. Cancer
    b. Strokes
    c. Diabetes
    d. Congestive heart failure

3. What can you do to control high blood pressure?
    a. Get to and stay at a healthy weight
    b. Exercise regularly
    c. Take the blood pressure medicine prescribed by your doctor
    d. All of the above

4. You shouldn't exercise if you have high blood pressure.
    a. True
    b. False

5. If you have high blood pressure, you must take medication.
    a. True
    b. False

APPENDIX E:

PARTICIPANT MATERIAL (EDUCATIONAL HANDOUT)

Patient education: High blood pressure in adults (The Basics)

What is high blood pressure?
High blood pressure is a condition that puts you at risk for heart attack, stroke, and kidney disease. It does not usually cause symptoms. But it can be serious.

When your doctor or nurse tells you your blood pressure, they will say 2 numbers. For instance, your doctor or nurse might say that your blood pressure is "130 over 80." The top number is the pressure inside your arteries when your heart is contracting. The bottom number is the pressure inside your arteries when your heart is relaxed.

"Elevated blood pressure" is a term doctors or nurses use as a warning. People with elevated blood pressure do not yet have high blood pressure. But their blood pressure is not as low as it should be for good health.

Many experts define high, elevated, and normal blood pressure as follows:

- High – Top number of 130 or above and/or bottom number of 80 or above.
- Elevated – Top number between 120 and 129 and bottom number of 79 or below.
- Normal – Top number of 119 or below and bottom number of 79 or below.

How can I lower my blood pressure?
If your doctor or nurse has prescribed blood pressure medicine, the most important thing you can do is to take it. If it causes side effects, do not just stop taking it. Instead, talk to your doctor or nurse about the problems it causes. They might be able to lower your dose or switch you to another medicine. If cost is a problem, mention that too. They might be able to put you on a less expensive medicine. Taking your blood pressure medicine can keep you from having a heart attack or stroke, and it can save your life!

Can I do anything on my own?
You have a lot of control over your blood pressure. To lower it:

- Lose weight (if you are overweight)
- Choose a diet low in fat and rich in fruits, vegetables, and low-fat dairy products
- Reduce the amount of salt you eat
- Do something active for at least 30 minutes a day on most days of the week
- Reduce how much alcohol you drink (if you drink more than 2 alcoholic drinks per day)

It's also a good idea to get a home blood pressure meter. People who check their own blood pressure at home do better at keeping it low and can sometimes even reduce the amount of medicine they take.

UpToDate. (2022). *Patient education: High blood pressure in adults (The Basics)*. Retrieved June 14, 2022, from https://www.uptodate.com/contents/high-blood-pressure-in-adults-the-basics?search=essential%20hypertension%20patient%20education&topicRef=4416&source=see link

APPENDIX F:

PROJECT TIMELINE

Completion Date	Planning	Pre-Implementation	Implementation	Evaluation
April 25, 2022	Submit project proposal to project chair.			
April 27, 2022	Site approval letter received			
May 24, 2022		Obtain proposal approval from project chair and sent proposal to committee.		
June 16, 2022		Proposal defense presentation with project committee.		
June 17, 2022	Revised proposal based on committee feedback			
June 19, 2022	Submit to UA IRB			
June 29, 2022	IRB return proposal requesting clarification. Resubmitted with changes			
July 8, 2022		Obtained IRB approval		
July 14, 2022		Present intervention to practice site	.	
July 25, 2022			Begin implementation and data collection	
September 2, 2022			Data collection concluded	
September-October, 2022				Data analysis
November 1, 2022				Final defense presentation to committee. Summary of findings provided to project site.

APPENDIX G:

LITERATURE REVIEW GRID

Project Question: In a population of patients receiving treatment for peripheral vascular disease, will education on non-pharmacologic hypertension control improve knowledge on blood pressure two weeks after treatment?

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
2018; Arija et al.	Physical activity, cardiovascular health, quality of life and blood pressure control in hypertensive subjects: randomized clinical trial	Randomized clinical trial	-The physical activity intervention program improved cardiovascular health and health related quality of life in patients and improved blood pressure control in primary care settings for those diagnosed with hypertension. -The physical activity showed a decrease in overall cardiovascular disease risk with overall decreases in systolic blood pressure levels	-Hypertension is the most common chronic disease and is a major risk factors in the development of other chronic diseases such as cardiovascular disease, type 2 diabetes mellitus and chronic kidney disease. -Hypertension affects 30-45% of people in developed countries and this number increases after the age of 60. -Hypertension is far from being controlled worldwide despite the number of antihypertensive drugs prescribed. -Physical activity is a modifiable risk factor that has positive effects on cardiovascular disease risks
2020; Bevan & White Solaru	Evidence-based medical management of peripheral artery disease	Research article	-Patients with peripheral artery disease experiencing claudication symptoms can find symptomatic relief and/or improvements with exercise therapy. -Interventions to aid in smoking cessation are safe tools to decrease the risk for peripheral artery disease.	-Peripheral artery disease has a high morbidity and high mortality. -Peripheral artery disease is a common condition that affects 220 million people around the world with increasing prevalence. -Despite medical treatments, peripheral artery disease can develop into coronary artery disease if chronically undertreated. -Treatment strategies include lifestyle modifications such as blood pressure control, smoking cessation, and exercise therapy.

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
2020; Clement	Hypertension and peripheral artery disease	Review article	-Patients with peripheral arterial diseases seem to develop multiple risk factors increasing their total cardiovascular risk. -The cause of high or low blood pressures should be addressed prior to discontinuing antihypertensive treatment in patients with critical limb ischemia who have multiple comorbidities.	-An advanced level of lower extremity artery disease can lead to critical limb ischemia. -Patients experiencing intermittent claudication present with a higher risk for myocardial infarction or stroke. -Peripheral artery disease have long gone unrecognized in the cardiovascular community.
2017; Ferdinand & Nasser	Management of essential hypertension	Meta-analysis review	-Hypertension is controlled by therapeutic lifestyle changes including weight loss and sodium restriction. -Effective hypertension treatment plans developed as a team combined with constant monitoring of blood pressures will significantly reduce high levels of uncontrolled hypertension in all patients.	-There is a high prevalence of hypertension and cardiovascular disease in the United States and is a main cause of death. -The treatment of hypertension is a critical intervention to decrease morbidity and mortality related to the cardiovascular system.
2015; Hegde & Solomon	Influence of physical activity on hypertension and cardiac structure and function	Evidence review article	-Physiologic and pathologic changes in the heart in response to exercise and hypertension have been identified separately, but the authors admit that their knowledge regarding the influence of physical activity on hypertension is limited. -Despite limitations, positive effects of physical activity on the hypertensive heart shows regression or prevention of left ventricular hypertrophy.	-Hypertension is the leading risk factor for morbidity and mortality around the world. -Treatment of hypertension can prevent progression or development of cardiovascular risk. - Lifestyle factors, such as physical activity, is known to be a modifiable risk factor in the development of hypertension.
2018; Kruk & Nowicki	Effect of the physical activity program on	Prospective lifestyle	-Regular physical activity is one of many forms of interventions that	-Regular physical activity is recommended for patients with arterial

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
	the treatment of resistant hypertension in primary care	intervention study	positively impacts patients with hypertension. -The findings were determined successful in that increased physical activity in patients with resistant hypertension found a reduction in transient blood pressure and experienced beneficial changes of body composition.	hypertension as an essential lifestyle modification, but much less is known about the effects of physical activity on the management and treatment of resistant hypertension. -Physical activity improves the function of many bodily organs and reduces mortality. -Individuals with uncontrolled blood pressure have a higher risk of cardiovascular incidents.
2021; Miller et al.	The nourish protocol: A digital health randomized controlled trial to promote the DASH eating pattern among adults with hypertension	Randomized control trial	-Smartphones offer an approach to encourage the DASH (Dietary Approaches to Stop Hypertension) eating pattern by combining apps with evidence-based behavior changes. -This study demonstrates the effectiveness of a digital health intervention to improve DASH adherence and to reduce blood pressure. -The program offered available treatment for Americans who continue to need help with behavioral interventions to manage their hypertension diagnosis and prevent the development of its adverse consequences.	-The DASH eating pattern is first-line evidence-based treatment option for hypertension, but adherence remains low. -There is much evidence showing that DASH can significantly lower blood pressure. -The increase in smartphone ownership offers a promising channel to encourage DASH eating pattern engagement.
2020; Mills et al.	The global epidemiology of hypertension	Evidence review article	-Prevalence of hypertension has increased, but hypertension awareness and treatment are low particularly in low and middle-income countries. -Risk factor modification such as high sodium intake, physical activity and	-Hypertension is the leading preventable risk factor for cardiovascular diseases and mortality in the world. -High-income countries experienced a slow decrease in hypertension prevalence, while low and middle-

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			unhealthy diets are recommended for prevention, management, and treatment of hypertension. -Hypertension is linearly associated with the risk of CVD, CKD, and mortality.	income countries have displayed significant increases in hypertension prevalence.
2018; Morley et al.	Peripheral artery disease	Journal article	-Half of all peripheral artery diseases can be attributed to smoking. -Patients with peripheral artery disease have worse outcomes if they continue to smoke. -Supervised exercise improves walking distance in patients diagnosed with peripheral artery diseases.	-Peripheral artery disease is linked to high risk of vascular complications such as myocardial infarction, stroke, vascular dementia, renovascular disease, and mesenteric disease. -Management of risk factors including smoking, diabetes and dyslipidemia is associated with reducing risks of vascular complications.
2020; Morze et al.	Diet quality as assessed by the healthy eating index, alternate healthy eating index, dietary approaches to stop hypertension score, and health outcomes: a second update of a systematic review and meta-analysis of cohort studies	Systematic review and meta-analysis	-High diet quality is inversely associated with risk of all-cause mortality, cardiovascular disease incidence or mortality, cancer incidence or mortality, type 2 diabetes, and neurodegenerative disease. -Healthy dietary patterns aid in the prevention of stroke and heart failure	-Poor diets are associated with progression of noncommunicable diseases. -Evidence-based recommendations are needed for the health effects of high diet quality. -It has been made increasingly aware that there is a need for in depth evaluation of nutrition research.
2020; Pugh & Dhaun	Hypertension and vascular inflammation	Journal article	-Hypertension is a major risk factor for coronary heart disease, chronic kidney disease, stroke, and peripheral vascular disease.	- Hypertension is a common problem worldwide and more recently there is interest in vascular inflammation's role in hypertension development.

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
			-Hypertension is the leading cause of premature death and loss of disability-adjusted life years.	- Hypertension treatment is the most common reason for adult clinical visits and for the use of prescription drugs in the United States.
2019; Thomas et al.	Physical activity moderates the effects of daily psychosocial stressors on ambulatory blood pressure	Quantitative correlational research	-Weekly and recent physical activity may affect the ambulatory blood pressure responses to psychosocial stress. -Significant increases in systolic and diastolic blood pressures in individuals who were less physically active. -Study findings are consistent with the notion that physical activity may be a significant moderator of the relationship between daily psychosocial stressors and cardiovascular health.	-Developing evidence has shown a correlation between exaggerated cardiovascular reactivity responses to psychological challenges or stressors, which significantly associates with future cardiovascular disease risk. -Regular physical activity has been linked to reductions in stress-related cardiovascular reactivity.
2018; You et al.	Hypertension and physical activity in middle-aged and older adults in China	Longitudinal study	-Vigorous physical activity for the middle-aged and older adults in China seemed to be more important than moderate and light activity to induce beneficial effects on prevention of hypertension. -Participants who partook in more than 10 minutes of vigorous or moderate physical activity every week were less likely to develop hypertension. -The authors of the study suggested patients perform proper physical activity to achieve normal weight, which would then decrease the rate of hypertension.	-Hypertension is one of the leading risk factors in the development of cardiovascular diseases. -Most recent hypertension guidelines suggest that patients diagnosed with hypertension should manage their blood pressure through non-pharmacological measures. -Lifestyle modifications, including physical activity, are standard first-line treatments for patients diagnosed with hypertension. -Favorable physiological changes and health benefits are associated with regular physical exercise.

Pub. Year; Author's Last Name	Title of Publication	Type of Study	Main Outcomes of Findings	Support for and or Link to Project
2020; Zhang et al.	Blood pressure control in hypertensive patients and its relationship with exercise and exercise-related behaviors: A case-control study	A case-control study	-Researchers found that physical exercise can help improve blood pressure control in middle-aged and elderly hypertensive patients. -The frequency of self-blood pressure monitoring, exercise, regular housework, and certain exercise-related behaviors were correlated with blood pressure control. -Physical exercise were primary factors in controlling blood pressures in hypertensive patients.	-Hypertension is a risk factor contributing to cardiovascular and cerebrovascular disease and mortality. -Blood pressure control in hypertensive patients faces significant challenges due unhealthy lifestyles

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