Walking Is Worthy: Walking for Hypertension

Ashleigh Y. Peterson

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WALKING IS WORTHY: WALKING FOR HYPERTENSION

by

ASHLEIGH Y. PETERSON

EVIDENCE-BASED PRACTICE PROJECT REPORT

Submitted to the College of Nursing and Health Professions

of Valparaiso University,

Valparaiso, Indiana

in partial fulfillment of the requirements

For the degree of

DOCTOR OF NURSING PRACTICE

2022
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DEDICATION

Our Lord and Savior, Jesus Christ, deserves the most dedication for this project. He has granted me gifts and abilities to pursue this degree and complete this project and has graciously granted me family and friends that have guided and supported me the entire way. I am forever grateful for this opportunity.

I would also like to dedicate this project to my past and future patients whom I desire to come alongside to support a healthier lifestyle so they may live and serve in all the ways the Lord has created for them.
ACKNOWLEDGMENTS

I must give all the glory to God for providing the opportunity and ability to complete this project and this degree.

I would also like to thank my wonderful husband, Tyler, for supporting this dream of mine during the good and the hard days. He is forever my adventure partner and teammate, and I could not have done this without him. I must also thank my daughter Adeline ("Addie") and my son about to be born, Brooks, for giving me grander motivation to pursue what God has called me to, and I pray you have the courage to do hard things someday for God’s glory. You two are my favorite accomplishments and favorite work I will ever do.

I must thank my darling mother, Gail, for the endless love and support through all my endeavors throughout life. You have been an unwavering rock through all the ups and downs, and you continually show me how to love people well and have an optimistic zest for life! No thank you will ever be enough.

To Drs. Brandy and Koch, I thank you for your expert guidance throughout my project. I have such high respect for both of you and your contributions to the nursing profession.
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ABSTRACT

Elevated blood pressure (BP), or hypertension (HTN), can cause a cascade of detrimental effects to the body. It is associated with increased risk of stroke, angina, myocardial infarction, heart failure, peripheral artery disease, end-stage renal disease, and abdominal aortic aneurysms (Whelton et al., 2018). HTN is also a major risk factor for the development of cardiovascular disease (CVD), which is the United States’ (U.S.) leading cause of death in men and women (U.S. Preventive Services Task Force [USPSTF], 2020). The PICOT question for this project was: does an eight-week (T) structured walking program utilizing a smartwatch for step counts and education (I) reduce BP and increase the number of minutes of weekly moderate-intensity walking (O) in adults aged 18 years or older with essential hypertension (P) compared to baseline (C)? Thirteen participants from a large family practice office in Northwest Indiana completed the eight-week within-group project. Baseline BPs were measured, minutes per week of moderate-intensity walking at baseline were recorded, and education about HTN was given verbally and visually using handouts. The participants were instructed to walk at a moderate intensity for at least 90 minutes per week during weeks one through four, at least 120 minutes during weeks five and six, and at least 150 minutes during weeks seven and eight. At four weeks, a follow-up visit served to reinforce education and adherence to the program. At the week eight visit, participant logs of minutes per week of moderate-intensity walking were collected, and BP was measured. Wilcoxon Signed Rank Tests were used to analyze systolic BP (SBP), diastolic BP (DBP), and minutes per week of moderate-intensity walking (MIW). Statistically significant differences were found in SBP ($p = .007$), DBP ($p = .021$), and minutes per week of MIW ($p = .005$). These findings indicate that a structured walking program can help people with HTN reduce their BP by walking at a moderate intensity for 90 to 150 minutes per week.
CHAPTER 1
INTRODUCTION

Background

Elevated blood pressure, or hypertension, can cause a cascade of detrimental effects to the body. It is associated with increased risk of stroke, angina, myocardial infarction, heart failure, peripheral artery disease, end-stage renal disease, and abdominal aortic aneurysms (Whelton et al., 2018). Hypertension is also a major risk factor for the development of cardiovascular disease (CVD), which is the United States’ (U.S.) leading cause of death in men and women (U.S. Preventive Services Task Force [USPSTF], 2020). Hypertension was responsible for more CVD deaths than any of the other modifiable risk factors for CVD (Whelton et al., 2018). Modifiable risk factors for CVD that are commonly found in people with hypertension include physical inactivity and/or low fitness, current cigarette smoking or exposure to secondhand smoking, diabetes mellitus, dyslipidemia and/or hypercholesterolemia, overweight and/or obesity, and unhealthy diet (Whelton et al., 2018).

Hypertension often has no symptoms, therefore necessitating blood pressure (BP) monitoring. BP is recorded using two numbers, the systolic blood pressure (SBP) and the diastolic blood pressure (DBP). SBP is the pressure that is exerted on the arteries during systole, or when the heart contracts (beats). DBP is the pressure exerted on the arteries when the heart relaxes between beats. Korotkoff sounds are the five sounds heard during auscultation when measuring blood pressure using a stethoscope and a blood pressure cuff, or sphygmomanometer. The SBP is the first Korotkoff sound, and the DBP is the fifth Korotkoff sound when a manual BP is being performed (Whelton et al., 2018).

New guidelines that were published in 2018 lowered the threshold for diagnosing elevated BP and hypertension (see Table 1.1). Evidence demonstrated there were increased risks of CVD events with SBP and DBP values that were below previous guidelines. The term
‘elevated blood pressure’ is defined as a SBP that is between 120 and 129 mmHg and a DBP that is less than 80 mmHg. Stage 1 hypertension is defined as a SBP between 130 and 139 mmHg or a DBP between 80 and 89 mmHg. Stage 2 hypertension is defined as a SBP greater than or equal to 140 mmHg or a DBP greater than or equal to 90 mmHg (Whelton et al., 2018).

Table 1.1

<table>
<thead>
<tr>
<th>New Guidelines for Blood Pressure Categories</th>
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<tbody>
<tr>
<td>Systolic</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>Normal BP</td>
</tr>
<tr>
<td>Elevated BP</td>
</tr>
<tr>
<td>Stage 1 HTN</td>
</tr>
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<td>Stage 2 HTN</td>
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</tbody>
</table>

*Note.* BP = blood pressure; HTN = hypertension.

Hypertension is divided into two categories based upon the identified etiology. Primary hypertension, or essential hypertension, is hypertension that has no identifiable cause. The historical features that have shown to correlate with primary hypertension include gradual increases in BP, family history of hypertension, and lifestyle factors that favor higher BP which include decreased physical activity, weight gain, high-sodium diet, job change requiring increased travel, and excessive consumption of alcohol. Often, primary hypertension is differentiated from secondary causes of hypertension on the basis of these factors (Whelton et al., 2018). Secondary hypertension is hypertension that is caused by a medical condition, such as primary aldosteronism, renovascular disease, obstructive sleep apnea, Cushing’s syndrome, or it can be drug or alcohol induced (Whelton et al., 2018). Regardless of the etiology, over time, the heart wall thickens to decrease oxygen demand and stress on itself due to the presence of
hypertension, and this can lead to left ventricular hypertrophy and eventual heart failure. Engaging in exercise leads to beneficial structure changes of the heart, but the structure changes found in hypertension are pathological. These changes are associated with myocyte hypertrophy and fibrosis (Hegde & Solomon, 2015).

Effective control of stage 1 hypertension has been shown to reduce cardiovascular disease by 10% (Lee et al., 2021; Whelton et al., 2018). Reducing any stage of hypertension can also prevent kidney damage and decrease the likelihood of morbidity from other health problems, such as peripheral artery disease, coronary artery disease, and stroke. Pharmacologic ways to reduce blood pressure (BP) can have side effects and potential noncompliance problems in those with hypertension, which makes nonpharmacologic interventions essential in helping to control hypertension (Lee et al, 2021). Some people with hypertension are able to avoid needing medications by using nonpharmacological interventions to reduce their BP. One of the ways that hypertension can be reduced is with regular physical activity (Lee et al., 2021; Whelton et al., 2018; World Health Organization [WHO], 2021).

**Data Supporting Need for the Project**

**Global and National Data**

Hypertension is a major cause of premature death worldwide (WHO, 2021). It is estimated that 1.13 billion people have hypertension, and it is responsible for about nine million deaths worldwide every year (Lee et al., 2021). Approximately 46% of Americans are classified as having hypertension under the new guidelines (Dempsey et al., 2018). The definition of controlled BP is a SBP less than 120 mmHg and a DBP less than 80 mmHg. In the U.S., approximately three in four adults with hypertension do not have it under control (Centers for Disease Control and Prevention [CDC], 2020a). Hypertension was responsible for or contributed to the death of greater than 494,873 people in 2018 in the U.S. (CDC, 2020a). It is estimated that hypertension costs the U.S. $131 billion each year (CDC, 2020a). It is often referred to as a
“silent killer” because hypertension does not usually have symptoms, making screening essential to identify individuals at risk.

There are situations when only lifestyle modifications are appropriate for treatment of hypertension. The Atherosclerotic Cardiovascular Disease (ASCVD) risk score is used to estimate the person’s risk of cardiovascular disease in 10 years using a person’s age, sex, race, SBP, DBP, total cholesterol, HDL cholesterol, LDL cholesterol, history of diabetes, smoking status, use of hypertension medication, use of a statin, and use of aspirin (American College of Cardiology [ACC], n.d.). A value less than 5% is considered low-risk, 5% to 7.4% is borderline risk, 7.5% to 19.9% is intermediate risk, and equal to or greater than 20% is considered high risk of developing cardiovascular disease within 10 years (ACC, n.d.). Twelve percent of U.S. adults have elevated BP, and 9% of U.S. adults have stage 1 hypertension but have an ASCVD risk score less than 10%. These two situations meet criteria for lifestyle modifications only. In the U.S., this is around 53 million people (Barone Gibbs et al., 2021).

Physical inactivity is one of the common CVD modifiable risk factors found in people who have hypertension. It contributes to the major underlying causes of hypertension (Whelton et al., 2018). Physical inactivity is defined as a self-reported lack of engaging in physical activity during the past month. Across the U.S., there were greater than 15% of adults who considered themselves physically inactive in 2020, which puts them at greater risk of hypertension (CDC, 2021b).

**Lifetime Risk**

The lifetime risk is a measure of risk that an event will happen in a person’s lifetime. The lifetime risk of hypertension has been studied extensively. For adults who did not have hypertension at the age of 45 years, 93% of African Americans, 92% of Hispanics, 86% of whites, and 84% of Chinese adults had a 40-year risk of developing hypertension (Whelton et al., 2018). Ninety percent of adults without hypertension at the ages of 55 or 65 years developed hypertension at some point in their lives in the Framingham Heart Study, which involved 6,000
participants over a 24-year study on the development of cardiovascular disease (Harvard University Press, 2021; Whelton et al., 2018). Important to note is that the cutoff for hypertension was 140/90 mmHg at the time of this study, which would mean there likely was a much higher percentage of adults who developed hypertension under the new cutoff guidelines of 130/80 mmHg (Whelton et al., 2018).

**State and City Data**

Over a third of Indiana Hoosiers were diagnosed with hypertension in 2017 (Indiana Department of Health, 2021). In 2019, the mortality rate of Hoosiers related to hypertension was 10.4% (CDC, 2021a). In the city where this project was implemented, Valparaiso, the prevalence of hypertension in those 18 years or older ranged from 18.7% to 35.4% (CDC, 2017). Data for the city was not available, but the percentage of Indiana Hoosiers that reported being physically inactive in 2020 was 28.3% (CDC, 2021b). These statistics demonstrate the relationship that exists between being physically inactive and having hypertension.

**Clinical Agency Data**

As of August 2021, there were 1,979 patients out of 15,260 total patients seen by five providers at the project site that had the ICD-10 code I10 Essential (primary) hypertension in their electronic medical record (EMR) (D. Smith, personal communication, August 5, 2021). If the patient has their hypertension under control using pharmacological therapy, the provider sees these patients every six months. If patients with hypertension require adjustment to their pharmacological therapy, the provider sees these patients every one month until their BP is under control. However, if the patient had a SBP greater than 140 mmHg or DBP greater than 90 mmHg, the patient would be seen within one month. If a patient had a SBP much higher than 140 mmHg or much higher than 90 mmHg, they would be seen within a few days for their safety (Dr. E. Lin, personal communication, June 22, 2021).

**Purpose of the Evidence-Based Practice Project**

**Purpose Statement and PICOT Question**
The purpose of this EBP project is to reduce BP in people who have elevated BP or hypertension through increased physical activity time and decreased sedentary time. The prevalence of hypertension and its detrimental effects to the body drove the desire to conduct a project to empower patients at no cost to improve their health outcomes. A modifiable risk factor related to this project, moderate-intensity physical activity, is feasible and readily available to almost every patient with hypertension. Specifically, this project will address the following PICOT question: does an 8-week (T) structured walking program utilizing a smartwatch for step counts and education (I) reduce BP and increase the number of minutes of weekly moderate-intensity walking (O) in adults aged 18 years or older with essential hypertension (P) compared to baseline (C)?

**EBP Project Description**

This EBP project will be implemented in a large family practice office in Valparaiso, IN. The project manager will be at the project site during the last week of August and first week and a half of September 2021. When a patient with the ICD-10 code I10 essential (primary) hypertension, regardless of BP control, is present in the office for a visit, the project manager will speak with the patient at the conclusion of their visit. The project manager will briefly explain the project and determine whether the patient is interested in participating in the project. If the patient decides to participate, baseline BP and other demographic information will be obtained, and enrollment in the program will begin. The intervention, which is based upon current evidence, will include an eight-week walking program that requires patients to walk at a moderate intensity for at least 90 minutes per week for the first two weeks, at least 120 minutes per week for the third and fourth week, and at least 150 minutes per week for weeks five through eight. See Appendix A for the Minutes Per Week of Moderate-Intensity Walking Log Sheet that participants will be required to fill out. Education on the first day (baseline day; see Appendix B) will be provided regarding the pathophysiology of hypertension, the consequences of hypertension, the important effects of physical activity on hypertension, and how to take their BP at home. The participants
will be instructed to download the mobile application, Pedometer & Step Counter (Version 2.0.0) [Mobile app] on their iPhone, or Step Tracker – Pedometer Free & Calorie Tracker (Version 1.2.1) on their Android phone (see figures C1 and C2 in Appendix C). They will be asked to record their step counts at the end of every day on a log sheet provided to them ('Daily Steps and Weekly Blood Pressure Log Sheet'; see Appendix D). As is standard of care at the project site, the participants will be asked to measure their BP at home once a week and record it on the Daily Steps and Weekly Blood Pressure Log Sheet. If the patient does not own an at-home BP monitor, they will be instructed to get a weekly BP measurement at a convenient location such as CVS, Meijer, Walgreens, YMCA, or Walmart. The expected outcome of this project will be reduced BP and increased number of minutes of physical activity. It is anticipated that these outcomes will result in a modest reduction in SBP, slight reduction in DBP, and an increase of physical activity time in minutes per week that meets or exceeds the American College of Cardiology and American Heart Association (ACC/AHA) recommendations.
CHAPTER 2

EBP MODEL AND REVIEW OF LITERATURE

Evidence-based Practice Model

This section provides an overview of the EBP model that was used to guide this project, the extensive literature search that was performed, the quality appraisal tools used to appraise the articles chosen for synthesis, and the critical synthesis of the literature.

Overview of EBP Model

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model was chosen to guide this evidence-based practice (EBP) project (JHNEBP, 2022). This model was chosen to guide this EBP project because it is easy to follow, has clearly defined steps, and is a powerful tool to integrate the best practices into clinical care. The steps are organized into three basic stages in the JHNEBP model: practice question, evidence, and translation, or PET. The ‘P’ stage involves seven steps that are recruiting the interprofessional team, determining responsibility for project leadership, scheduling team meetings, clarifying and describing the problem, developing and refining the EBP question, determining the need for an EBP project, and identifying key stakeholders. The ‘E’ stage involves five steps that are conducting an internal and external search for the evidence, appraising the level and quality of each piece of evidence, summarizing the individual evidence, synthesizing the findings, and developing the best evidence recommendations. The ‘T’ stage involves eight steps that are identifying practice setting-specific recommendations, creating an action plan, securing support and resources to implement the action plan, implementing the action plan, evaluating the outcomes to determine if improvements have been made, reporting the results to the key stakeholders, identifying the next steps, and finally disseminating the findings. Permission has been granted to use the JHNEBP model; see Appendix E for documentation.

Literature Search
Sources Examined for Relevant Evidence

A research librarian assisted the project manager to perform an extensive literature search to find the most current evidence regarding nonpharmacological interventions to reduce BP in hypertensive patients. Databases that were searched included Turning Research Into Practice (TRIP), Joanna Briggs Institute (JBI), Cochrane Library, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline with Full Text via EBSCO, PubMed, and ProQuest/Nursing and Allied Health. See Figure 2.1 for the PRISMA flow chart for the literature search. Exclusion criteria in all databases was research that does not include a walking intervention based on fit and feasibility for the clinical population and the PICOT question.

Keywords for TRIP were “hypertension” AND “lifestyle modification”. Limiters included from 2016, guidelines, and USA. Two hundred and eighty-eight results were generated. Most were not applicable to this project. After careful review, two guidelines and one systematic review were utilized in the development of this project (Barnason et al., 2017; Barone Gibbs et al., 2021; Whelton et al., 2018).

For JBI, the keywords that were used included “hypertension” AND “lifestyle”. The limiters were 2016 to 2021, full text, recommended practices, best practice information sheets, evidence summaries, recommended practices, and systematic reviews. Five results were generated in which none were kept. The only relevant result did not include physical activity as an intervention for hypertension, which is a widely, well-known nonpharmacological intervention.

The keywords used for Cochrane included “hypertension” AND “lifestyle” and limiters included 2016 to 2021, Cochrane Reviews, and search word variations. Twenty-two results were generated, and one was kept (Lee et al., 2021). There were three other relevant systematic reviews for hypertension, however, they addressed diet and sodium restriction, and the project site felt that an exercise-based intervention would be more appropriate for their patient population.
Keywords that were used for CINAHL included “hypertension OR blood pressure” (MW Word in Subject Heading), “life style change*” OR “lifestyle change*” OR “lifestyle modification” OR “lifestyle intervention” (AB Abstract). Limiters included Scholarly (Peer Reviewed), the years 2016 to 2021, English language, and age groups 19-44 years and 45-64 years. One hundred and eleven results were generated. Articles that were fully reviewed were eliminated for various reasons including a multicomponent intervention was used, not being applicable to this EBP project, and the intervention would not be feasible for this project. One systematic review and meta-analysis was deemed eligible for synthesis (Lee & Chae, 2020).

The keywords used for Medline with Full text via EBSCO were “hypertension” OR “blood pressure” (MJ Word in Major Subject Heading) AND “life style change*” OR “lifestyle change*” OR “lifestyle modification” OR “lifestyle intervention” (AB Abstract). Limiters included 2016 to 2021, English language, ages: Adult: 19-44 years and Middle age: 45-64 years, and Scholarly (Peer Reviewed) Journals. One hundred and fifty-one results were generated, and one was kept (Perl et al., 2016). Reasons for exclusion include using a multicomponent intervention, not being applicable to this EBP project, and the intervention not being feasible for this project.

PubMed keywords were “hypertension” (MeSH Major Topic) AND “life style” (MeSH Major Topic). Limiters included 2016 to 2021, English language, Books and Documents, Clinical trial, meta-analysis, randomized controlled trial, review, and systematic review. Sixty-seven results were generated, and one was kept (Dempsey et al., 2018). The reason for the exclusions was not being applicable to this project.

The keywords for ProQuest/Nursing and Allied Health were Exact(“hypertension”) AND “lifestyle modification*”. The limiters included 2016 to 2021, age group: Adult 19-44 years and Middle ages: 45-64 years, English language, peer reviewed, and scholarly journals. One hundred and twelve results were generated, and none were kept. Reasons for exclusion included not being applicable to this project, multicomponent intervention, and an intervention that is not feasible for this project.
The systematic review by Lee et al. (2021) was citation chased for relevant RCTs. Seventy-three RCTs were used in the systematic review, but only 18 were reviewed because they fell within the date range 2016 to 2021 that was used consistently throughout the literature search. Three RCTs were eligible for synthesis (Baross et al., 2017; Chiang et al., 2019; Gradidge & Golele, 2018). Reasons for exclusion for other RCTs were a search using the DOI or other citation information did not return any results, inability to retrieve the article in English, multicomponent interventions, and some articles included patients that required an intervention to be restricted due to a health condition.

Figure 2.1
PRISMA Flow Chart of Literature Search
Levels of Evidence

The Melnyk & Fineout-Overholt’s levels of evidence hierarchy was used to level the evidence for this project (2015). This hierarchy is clearly depicted on a pyramid making it easy to use, and it includes multiple examples of evidence types for each level. There are seven different levels of evidence in this hierarchy, with level I being the highest level of evidence, which includes systematic reviews of RCTs and evidence-based clinical practice guidelines that are based on systematic reviews of RCTs. Level II includes evidence from at least one well-designed RCT. Level III includes evidence from well-designed controlled trials without randomization (quasi-experimental). Level IV has evidence from well-designed case-control and cohort studies, and Level V includes evidence from systematic reviews of descriptive and qualitative studies. Level VI includes evidence from a single, descriptive or quality study. Level VII is the lowest level and includes evidence from the opinions of authorities and/or reports of expert committees. As shown in Table 2.1, there were six level I evidence articles and four level II articles used for this project.

Analysis and Appraisal of Relevant Evidence

Three different instruments were used to appraise the quality of the evidence used for this project. The Appraisal of Guidelines for Research and Evaluation II (AGREE II) instrument was used to appraise the two clinical practice guidelines (CPGs), and the two Critical Appraisal Skills Programme (CASP) checklists was used to appraise the respective systematic reviews and RCTs. See Table 2.1 for a brief overview and see Appendix F for the Evidence Table that summarizes the evidence.

Clinical Practice Guidelines

For the two CPGs chosen for this project, the AGREE II instrument (see Appendix G) was used to evaluate their quality. This instrument has been widely used for CPGs because of its validity and reliability. The instrument allows the researcher to score each of the 23 items in the six quality domains on a 7-point Likert scale. A score of seven is the highest score for each item;
it is indicative of the appraiser “strongly agreeing” with the item in question. A score of one is the lowest and indicates “strongly disagree”. The appraiser can then develop an overall assessment of the quality of the CPG and whether the appraiser would recommend it for use (Melnyk & Fineout-Overholt, 2015). Use of this tool is granted if the citation is provided (Brouwers et al., 2010).

**Systematic Reviews**

There were four systematic reviews with one of them also being a meta-analysis. The CASP checklist specific for systematic reviews (see Appendix H) was used to measure the quality of these four articles (CASP, 2021a). The CASP checklist has a 28-year history of focusing on critically appraising evidence-based practice and is widely used around the world to help healthcare professionals make decisions based on research (Critical Appraisal Skills Programme (CASP), 2021c).

**Randomized Controlled Trials**

The four RCTs used for this project were evaluated for quality by the *CASP Randomized Controlled Trial Checklist* (CASP, 2021b). This checklist contains ten questions to guide the reader in evaluation of the quality of the RCT (see Appendix I).
Table 2.1

Summary of Evidence

<table>
<thead>
<tr>
<th>Lead Author/Yr</th>
<th>Database(s)</th>
<th>Level of evidence/Type</th>
<th>Quality/Tool</th>
</tr>
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<tbody>
<tr>
<td>Barnason (2017)</td>
<td>TRIP</td>
<td>I/SR</td>
<td>High/CASP</td>
</tr>
<tr>
<td>Barone Gibbs (2021)</td>
<td>TRIP</td>
<td>I/CPG</td>
<td>High/AGREE II</td>
</tr>
<tr>
<td>Baross (2017)</td>
<td>CC</td>
<td>II/RCT</td>
<td>High/CASP</td>
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<tr>
<td>Chiang (2019)</td>
<td>CC</td>
<td>II/RCT</td>
<td>High/CASP</td>
</tr>
<tr>
<td>Dempsey (2018)</td>
<td>PubMed</td>
<td>I/SR</td>
<td>Moderate/CASP</td>
</tr>
<tr>
<td>Gradidge (2018)</td>
<td>CC</td>
<td>II/RCT</td>
<td>Moderate/CASP</td>
</tr>
<tr>
<td>Lee, S. (2020)</td>
<td>CINAHL</td>
<td>I/SR&amp;MA</td>
<td>High/CASP</td>
</tr>
<tr>
<td>Lee, L. (2021)</td>
<td>Cochrane</td>
<td>I/SR</td>
<td>High/CASP</td>
</tr>
<tr>
<td>Perl (2016)</td>
<td>Medline</td>
<td>II/RCT</td>
<td>High/CASP</td>
</tr>
<tr>
<td>Whelton (2018)</td>
<td>TRIP</td>
<td>I/CPG</td>
<td>High/AGREE II</td>
</tr>
</tbody>
</table>

Note. CC = citation chased; CPG = clinical practice guideline; MA = meta-analysis; RCT = randomized controlled trial; SR = systematic review

Construction of Evidence-based Practice

Synthesis of Critically Appraised Literature

Physical Activity

Recommendations. Physical activity (PA) has been demonstrated to be one of the best nonpharmacological interventions for the prevention and treatment of hypertension. The 2017 ACC/AHA guidelines for hypertension recommend moderate-intensity aerobic physical exercise 90 to 150 minutes per week (Whelton et al., 2018), but a more recent scientific statement from the ACC/AHA in 2021 (Barone Gibbs et al.) recommended that all Americans get either 150 to 300 minutes per week of moderate-intensity PA, 75 to 150 minutes of vigorous intensity PA, or a combination of moderate- and vigorous- intensity PA for an equivalent amount of time. These
recommendations for aerobic exercise can lower SBP by 5 to 8 mmHg in people with hypertension and by 2 to 4 mmHg in people with normotension (Whelton et al., 2018).

**Aerobic Exercise.** Walking is a low-cost, safe, and feasible form of aerobic exercise that is often used as a leisure activity by both men and women (Baross et al., 2017; Dempsey et al., 2018; Gradidge & Golele, 2018; Lee & Chae, 2020; Lee et al., 2021; Whelton et al., 2018). Engaging in a walking program increases PA time and decreases sedentary time (Baross et al., 2017; Dempsey et al., 2018; Gradidge & Golele, 2018), which is beneficial. A single workout can reduce SBP by -2 to -12 mmHg which can last up to 4 to 16 hours (Barone Gibbs, et al., 2021). Breaking up sedentary time while at home or at work reduces SBP and DBP significantly, and its effects last into the evening hours (Dempsey et al., 2018). Over time, the more frequent PA will reduce SBP and DBP and can prevent progression to hypertension in patients who are at-risk (Barone Gibbs, et al., 2021; Lee et al., 2020). Activity levels above the 150 to 300 minutes per week of moderate-intensity PA recommendation show even greater health benefits (Barone Gibbs et al., 2021). Moderate-intensity PA is the most effective intensity of aerobic exercise to reduce SBP and DBP (Barone Gibbs et al., 2021; Gradidge & Golele, 2018; Lee & Chae, 2020; Lee et al., 2021; Whelton et al., 2018). Walking is a form of aerobic exercise that is easily accessible. As an intervention, walking is likely to reduce BP for various age groups and gender (Barone Gibbs et al., 2021; Dempsey et al., 2018; Gradidge & Golele, 2018; Lee et al., 2021). The frequency of walking has the best effect when done three times a week, compared to twice and four or more times per week (Barone Gibbs et al., 2021; Lee & Chae, 2020). Minutes per week is a common prescription for PA in general and can be used specifically for walking (Barone Gibbs et al., 2021; Gradidge & Golele, 2018; Lee et al., 2021; Whelton, et al., 2018).

**Pedometer**

Using a pedometer helps people with hypertension monitor their step counts and reveals trends in PA over time (Barone Gibbs et al., 2021). The use of pedometers has been shown to reduce SBP, and in some studies, reduces it significantly (Chiang et al., 2019; Lee et al., 2021).
A step goal of 12,000 steps per day has been shown to reduce SBP, in a manner that was clinically significant, but not statistically significant. The addition of a walking exercise for 30 minutes three days per week with a designated walking rate of greater than 103 steps per minute reduced SBP and DBP more than a step count goal of 12,000 alone (Chiang et al., 2019). Steps can be counted using a pedometer or another activity tracker, such as a smartwatch (Barone Gibbs et al., 2021; Chiang et al., 2019; Lee et al., 2021). Activity trackers objectively measure steps, distance, and PA duration for all types of activity intensity (Barone Gibbs et al., 2021).

**Education**

Educating patients with hypertension is crucial to their success in reducing their BP. Therapeutic patient education (TPE) should include pathophysiology and consequences of hypertension, self-monitoring of BP (SMBP) at home, and the importance of PA (Barnason et al., 2017; Perl et al., 2016; Whelton et al., 2018). A structured educational program can help patients significantly reduce their BP (Perl et al., 2016). TPE should be focused on initiating self-care behaviors rather than strictly information alone; this includes using teach-back and motivational interviewing (Barnason et al., 2017; Whelton et al., 2018). The benefits of educated patients were shown to be directly related to the higher levels of information they obtain and are not due to health care providers that may be more attentive than others (Perl et al., 2016). Although some health care providers may spend more time with the patient or may follow a patient’s hypertension more closely than another health care provider, the higher level of education allows the patient to be autonomous and to better manage their hypertension.

**Pathophysiology and Consequences.** Education on the pathophysiology and consequences of hypertension helps patients understand the importance of reducing their BP. It is essential to impress upon patients that physical inactivity is one of the main contributors to developing and continuing hypertension (Whelton et al., 2018). Education should include that high levels of SBP and DBP are associated with a higher risk of CVD (Whelton et al., 2018), and CVD is a leading cause of mortality and disability (Barnason et al., 2017). It is important for
patients to know that hypertension is a main cause of cardiovascular and cerebrovascular morbidity and mortality (Perl et al., 2016). Simplifying this information to account for lower levels of health literacy is important (Barnason et al., 2017; Whelton et al., 2018) and can be worded like the following: high BP is a main contributor to heart disease and stroke and is a leading cause of death worldwide. Adherence to lifestyle modifications such as PA are essential for the successful management of hypertension, and this relies heavily on the patient’s knowledge (Barnason et al., 2017).

**SMBP.** Home SMBP is the most practical approach to monitor BP in patients who have hypertension (Whelton et al., 2018). SMBP requires skill by the patient and a calibrated home BP cuff (Barnason et al, 2017; Whelton et al., 2018). Education about SMBP should focus on proper cuff size, proper cuff placement, timing of BP readings, and position of the patient during measurement. It is vital to educate patients how to interpret their home BP so they can get medical help when needed (Whelton et al., 2018). Instructions for patients regarding SMBP procedures include remaining still and avoiding smoking, caffeinated beverages, or exercise within 30 minutes before BP measurements, and ensuring longer than five minutes of quiet rest before taking the BP measurement. To sit correctly, the patient should sit with their back straight and supported with their feet flat on the floor with legs uncrossed, and support the arm on a flat surface, keeping the upper arm at heart level. The bottom of the cuff should be placed just above the antecubital fossa, or the bend of the elbow. The patient should be instructed to take at least two readings that are one minute apart in the morning before taking any medications and in the evening before eating dinner. It is optimal that the patient measures and records their BP daily, but ideally, a weekly BP measurement should be obtained starting two weeks after a change in a treatment regimen and during the week before an office visit (Whelton et al., 2018). Guidance on SMBP should be given along with follow-up in person or by telehealth to improve outcomes (Barnason et al., 2017).
**Importance of Physical Activity.** Patients will need a clear expectation of how PA will affect their BP because a lesser outcome than expected can cause dissatisfaction and decreased motivation to maintain the new PA regimen (Whelton et al., 2018). Patients should be educated that a minimum of three 30-minute PA sessions per week should be completed, and ideally, patients should strive to exercise 90 to 150 minutes per week (Barone Gibbs et al., 2021; Perl et al., 2016; Whelton et al., 2018). Education can include what the best evidence has shown to decrease BP in walking programs. Walking without other intervention can decrease SBP and DBP in a clinically significant way (Chiang et al., 2019; Gradidge & Golele, 2018). SBP and DBP can be decreased significantly by breaking up sedentary time with bouts of walking, which is feasible at most workplaces (Dempsey et al., 2018). This education about brief walking bouts throughout the day may encourage patients who are concerned about setting aside time to walk to achieve the weekly minute goal of 90 to 150 minutes. Education on the expected decreases in SBP and DBP can properly prepare patients on what to expect and can therefore increase adherence to a walking program.

**Recommendation for Best Practice**

Based on the synthesis of the literature and the feasibility of implementation at the project site, the most appropriate intervention is a walking program that utilizes pedometers/activity trackers and education with follow-up. Walking should be done at a moderate intensity for a total of 90 to 150 minutes weekly. Pedometers or activity trackers should be used to monitor step counts and PA. Education on pathophysiology and consequences of hypertension, SMBP, and the importance of PA should be given, and follow-up should occur to reinforce education.

An additional extensive literature search was completed after data were analyzed to find potential new findings in the literature. Findings from this search are discussed in Chapter 5.
CHAPTER 3

IMPLEMENTATION OF PRACTICE CHANGE

Information about the participants, setting, comparison, intervention, proposed outcomes, and projected timeline are included in this chapter. Details regarding protection of human subjects are also included.

The implementation of practice change included a walking program that increased in total minutes per week over the course of eight weeks. Education was provided at baseline, and a pedometer mobile application or smartwatch was used to track the number of steps the participant takes per day.

Participants and Setting

This project was implemented at a large family practice office in Northwest Indiana. Two physicians and three nurse practitioners in the office were key stakeholders. Recruitment of participants was done at the conclusion of a scheduled office visit. Inclusion criteria were people 18 years or older, those who had the ICD-10 code I10 essential (primary) hypertension, and had access to a smartphone or smartwatch. Exclusion criteria included those who were pregnant, younger than 18 years, people who were unable to walk at a moderate intensity, people who were at moderate or high cardiac risk as determined by their provider, and those who did not have the mental capability to follow program requirements or log their information.

Pre-Intervention Group Characteristics

Every participant in this project had the ICD-10 code I10 essential (primary) hypertension in their electronic medical record (EMR). The participants’ ages ranged from 31 to 66 years. There were 14 males and 12 females.

Intervention

Preparing and planning for the intervention began once discussions with key stakeholders about project site feasibility were synthesized with the recommendation for best
practice. The project manager discussed the project’s design with the key stakeholders.

Prevalence data for ICD-10 code I10 Essential (primary) hypertension for the five providers at the site that are included in this project was sought from the clinical manager. The project manager briefly described the important details of the project design to all key stakeholders in separate one-on-one meetings and developed a 21-slide PowerPoint detailing the entire project design (refer to Appendix J). The presentation was sent by email, and key stakeholders were encouraged to review it on their own time unless they preferred the project manager review it in-person. The project manager followed up with key stakeholders and determined if they had questions, suggestions, or comments. One provider requested clarification about the recruitment process, which was provided by the project manager. It was determined that the project manager would be present at the clinical site to recruit participants at the end of their scheduled provider visits if they had the ICD-10 code I10 in their EMR. Trials of the selected mobile applications were completed to determine ease of use and validity in step counts. Two free mobile applications, each compatible with a certain smartphone, were determined to be easy-to-use and valid within 3% of actual step counts.

To implement the practice change, participants were recruited at the end of their scheduled office visits with their providers. The project manager met with them individually in the private room to briefly explain the project to the patient and determine their interest in participating. Every potential participant was informed that their decision to participate had no impact on the care given by their provider. Once a person decided to participate, the project manager educated the participant and provided handouts as outlined in the paragraphs below. This was considered the baseline day. In some instances when the current room was needed for scheduled patient visits, the project manager led the participant to another private room across the office.

The participants were educated that essential (primary) hypertension is not caused by another medical condition and that physical inactivity is one of the most common reasons for the
development of hypertension. Education included the consequences of hypertension including having a higher risk of developing CVD, and that CVD is a leading cause of death and disability. It was explained that hypertension is a main cause of heart and brain death and disability.

Proper home SMBP technique was taught on baseline day and was reinforced when meeting with the project manager again at the 4-week visit. As was standard of care at the project site, participants were encouraged to take their BP once per week either at home or at a location convenient to them, but this was not required for the project. Education included avoidance of smoking, caffeine, and exercise for at least 30 minutes before taking their BP. The project manager provided guidance about the proper cuff size, proper cuff placement, and the position of quietly sitting with feet flat on the floor, legs uncrossed, and resting for 5 minutes before BP was measured. The participant was instructed not to talk during BP measurement, to sit with their back straight, and to have the arm supported at heart level.

The participants were educated that regular walking at a moderate intensity helps to maintain a healthy blood pressure and can reduce blood pressure in patients with hypertension. They were taught that evidence has shown that walking at a moderate intensity can reduce SBP and DBP significantly, and that breaking up sedentary time with short bouts of walking is effective in reducing SBP and DBP as well. Participants were informed that walking has been shown to reduce SBP by 9 mmHg and DBP by 6 mmHg, which improves cardiovascular health and reduces risk of heart disease, stroke, and kidney disease.

Handouts were given to participants to log their minutes per week of walking, their daily step counts, and their weekly BP measurement; the handouts also served as visual reinforcement of the education given by the project manager on baseline day. A handout was created to give participants ideas for BP measurement locations and for walking locations in case the weather was not feasible for outdoor walking. Participant handouts included the Minutes Per Week of Moderate-Intensity Walking Log Sheet (Appendix A), the patient education sheet (Appendix B), the Daily Steps and Weekly Blood Pressure Log Sheet (Appendix D), and the
Ideas for Walking sheet (Appendix K). Since weekly BP measurements are standard of care for patients with hypertension at this project site, the Daily Steps and Weekly Blood Pressure Log Sheet included an area to record these BPs, which was not part of the intervention for this project.

Moderate-intensity walking was described to the participants in three ways to encourage participant autonomy by choosing their preferred method of monitoring their intensity. One way was to explain that moderate-intensity walking is achieved when a person walks an average of 100 steps per minute (Chiang et al., 2019; Tudor-Locke et al., 2019). If a participant chose to walk on a treadmill, they were instructed to walk at a 2.5 to 3.5 miles per hour pace. Lastly, another way was explained as a brisk walking rate that keeps their heart rate between 64% and 76% of their maximum heart rate. The CDC’s equations were used to estimate the participants’ age-related minimum and maximum heart rate in beats per minute (bpm) that reflects moderate-intensity exercise. Their age in years was subtracted from 220 and then multiplied by 0.64 to calculate the minimum heart rate. Next, their age in years was subtracted from 220 and then multiplied by 0.76 to calculate the maximum heart rate. This calculation was completed by the project manager, with the individualized range of heart rates by age provided to the participants. Participants who chose to count their heart rate were shown how to count either a radial or carotid pulse over the course of a minute.

The participants’ BPs were measured by the project manager at every visit using a Welch Allyn Tycos 767 Wall Mounted Sphygmomanometer and 3M Littmann Classic III stethoscope.

At the week eight visit, the participants’ log sheets of step counts, weekly BP measurements, and minutes per week of moderate-intensity PA were collected. Final BP was measured. A satisfaction survey (refer to Appendix L) was given at this visit to determine the likelihood of adherence to the walking program for present participants and future patients. Participants were also provided positive reinforcement for their efforts and encouragement to continue or increase their level of PA moving forward.
Comparison

Participants served as their own comparison. Their week eight SBP, DBP, and number of minutes of moderate-intensity walking were compared to their baseline SBP, DBP, and number of minutes of moderate-intensity walking. Baseline SBP ranged from 112 to 166 mmHg and averaged 136 mmHg. Baseline DBP ranged from 62 to 110 mmHg and averaged 83 mmHg. At baseline, the number of minutes engaged in moderate-intensity PA per week was between zero and 315 minutes, with zero being the most common number of minutes reported at baseline.

Outcomes

At four weeks, the participants’ SBP and DBP were measured. At the conclusion of the eight-week intervention, SBP and DBP were measured. The number of minutes of PA data and daily step counts were obtained from participants’ logs at the week eight visit.

For primary outcomes, both the BP measurements and the minutes of PA per week data were analyzed separately using a Wilcoxon Signed Rank Test. For secondary outcomes, the average weekly step count data was analyzed using a Wilcoxon Signed Rank Test. SPSS Statistics was used to assess the outcomes, including the reliability and validity of the outcomes. Participants were grouped into two categories to control for medication changes; one category was those participants who had a change in their BP medications during the intervention period and the other category was those participants who did not have a change in their BP medications during the intervention period.

Time

The timeline of this project is presented in Appendix M. Recruiting participants marked the beginning of the implementation phase of this project. Recruitment began August 25, 2021 and continued through September 8, 2021. Each participant was required to complete eight weeks of the walking program for data to be used for analysis. Project implementation was scheduled to begin as soon as possible in order to recruit between 20 and 40 participants before the busy holiday season. Participants returned to the office at four weeks into the program for a
follow-up BP measurement. Education was reinforced at this time and questions were answered. This range of time was between September 23, 2021 and October 4, 2021.

At eight weeks, between October 22, 2021 and November 8, 2021, the participants were scheduled to come to the office for a post-intervention BP measurement and return their completed log sheets for data analysis. Participants were given a satisfaction survey to complete at this visit.

**Protection of Human Subjects**

Protection of human subjects was this project manager’s priority throughout the project. The project manager completed education and training about protection of human subjects included in the Doctor of Nursing Practice curriculum and completed an online ethics training course created by the Collaborative Institutional Training Initiative (CITI) on April 1, 2020 (see Appendix O). The project was determined to be exempt from Valparaiso University’s Institutional Review Board on July 16, 2021. The site facilitator confirmed that this project did not require IRB approval (see Appendix P). Confidentiality of participants’ identifying information was upheld by way of double-locked laptop and Excel sheet. The separate passwords were known only by the project manager. Participation in the project was completely voluntary and every potential participant was informed that their decision to participate would not affect the care given by their provider. An informational sheet (see Appendix N) was provided to participants that informed them about what they were being asked to do and that they could stop participating at any time without penalty. The educational sessions were held in a private location with the door closed. All information that was obtained in this project was reported without using any identifying information.
CHAPTER 4

FINDINGS

This chapter presents the results of the data analysis for the primary and secondary outcomes and includes the quantitative satisfaction survey results and open-ended qualitative findings. Demographic information for the participants and key project findings are presented. Overall, the participants in this EBP project significantly decreased their SBP and DBP and significantly increased their minutes per week of moderate-intensity walking. The participants reported they were satisfied with the walking program, and many stated they planned to continue walking following the completion of the project.

The primary outcome data met three out of four assumptions for parametric testing: normally distributed data, interval level data, and independence. Homogeneity of variance was not demonstrated in this data. Therefore, the Wilcoxon Signed Rank Test was chosen to complete the data analysis on the primary outcomes because it is the nonparametric equivalent to a dependent t-test. Descriptive statistics were used for the secondary outcome due to a small sample size that provided complete data for daily step counts.

Participants

Demographic information that was collected from each participant included age, gender, and BP medication information (shown in Table 4.1). Twenty-six participants were recruited, 12 of which were females (46.15%). The mean age of the 26 participants that were recruited was 50 years ($SD = 9.8$), ranging from 31 to 66 years. Twenty-one participants were on at least one BP medication at baseline. Thirteen participants completed the intervention (see Table 4.1). There were four females (30.77%) and nine males (69.23%). The mean age was 52.23 ($SD = 11.23$) years with a range of 31 to 66 years. Ten participants were on at least one BP medication (76.92%), and three participants (23.08%) had a BP medication change during the intervention period. There were no statistically significant differences in the gender or age of the participants
who completed the project and those who did not shown by a chi-square analysis (gender: $p = 0.116$) and $t$-test (age: $p = 0.5426$).

**Table 4.1**

*Descriptive Demographic Data for Baseline and Week Eight Participants*

<table>
<thead>
<tr>
<th>Data type</th>
<th>Baseline</th>
<th>Week eight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Participants</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>Attrition Rate</td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ($SD$)</td>
<td>50 (9.8)</td>
<td>52.23 (11.23)</td>
</tr>
<tr>
<td>Range</td>
<td>31-66</td>
<td>31-66</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12 (46.15%)</td>
<td>4 (30.77%)</td>
</tr>
<tr>
<td>Male</td>
<td>14 (53.85%)</td>
<td>9 (69.23%)</td>
</tr>
<tr>
<td>No BP medications</td>
<td>5 (19.23%)</td>
<td>3 (23.08%)</td>
</tr>
<tr>
<td>Taking BP medications</td>
<td>21 (80.77%)</td>
<td>10 (76.92%)</td>
</tr>
<tr>
<td>One BP Medication</td>
<td>13 (50%)</td>
<td>5 (38.46%)</td>
</tr>
<tr>
<td>Two BP Medications</td>
<td>7 (26.92%)</td>
<td>5 (38.46%)</td>
</tr>
<tr>
<td>Three BP Medications</td>
<td>1 (3.85%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

*Note.* BP = blood pressure; $SD$ = standard deviation

**Changes in Outcomes**

The PICOT question of this project was: does an 8-week (T) structured walking program utilizing a smartwatch for step counts and education (I) reduce BP and increase the number of minutes of weekly moderate-intensity walking (O) in adults aged 18 years or older with essential hypertension (P) compared to baseline (C)? Therefore, the primary outcomes include SBP, DBP,
and number of minutes of weekly moderate-intensity walking. The secondary outcome was average daily step count categorized by week.

**Statistical Testing and Significance**

Statistical Package for Social Sciences 25 (SPSS25) was the program used to complete data analysis. Primary outcome data did not meet all four assumptions that are required to use parametric testing. Because the project was a within-group design, the primary outcome data were analyzed using the Wilcoxon Signed Rank Test. For the secondary outcome data, only five participants provided complete step count data, so these data were analyzed using descriptive statistics. For the satisfaction survey, descriptive statistics were used to analyze quantitative data.

**Findings**

Table 4.2 presents the data collected from each participant at baseline and at their final, week eight visit. If a participant had a medication adjustment during the intervention period, it is noted in the last column. There were three participants who had medication adjustments during the intervention.
### Table 4.2

**Participant Data for Primary Outcomes**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline BP</th>
<th>Baseline number of minutes of moderate-intensity walking</th>
<th>Week eight BP</th>
<th>Week eight number of minutes of moderate-intensity walking</th>
<th>Medication adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>134/72</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>132/78</td>
<td>120</td>
<td>126/82</td>
<td>169</td>
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</tr>
<tr>
<td>3</td>
<td>124/74</td>
<td>315</td>
<td>128/74</td>
<td>590</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>150/100</td>
<td>210</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>140/99</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>130/80</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>142/84</td>
<td>30</td>
<td>124/78</td>
<td>370</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>126/82</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>144/90</td>
<td>0</td>
<td>140/80</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>132/70</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>124/72</td>
<td>0</td>
<td>124/62</td>
<td>147</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>120/70</td>
<td>90</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>130/74</td>
<td>35</td>
<td>124/82</td>
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<tr>
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<td>114/74</td>
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<td>134/86</td>
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<td>110/70</td>
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<td>144/70</td>
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<td>134/82</td>
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<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>164/106</td>
<td>100</td>
<td>118/78</td>
<td>0</td>
<td>Yes</td>
</tr>
<tr>
<td>Participant</td>
<td>Baseline BP</td>
<td>Baseline number of minutes of moderate-intensity walking</td>
<td>Week eight BP</td>
<td>Week eight number of minutes of moderate-intensity walking</td>
<td>Medication adjustments</td>
</tr>
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<td>-------------</td>
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<td>---------------</td>
<td>--------------------------------------------------------</td>
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<td>138/88</td>
<td>180</td>
<td>-</td>
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<td>22</td>
<td>132/78</td>
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<td>-</td>
<td>-</td>
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<td>23</td>
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<td>116/62</td>
<td>420</td>
<td>No</td>
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<tr>
<td>25</td>
<td>142/110</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>26</td>
<td>166/100</td>
<td>0</td>
<td>130/88</td>
<td>50</td>
<td>No</td>
</tr>
</tbody>
</table>

*Note.* BP = blood pressure; "-" = no data.

**Primary Outcomes**

**Systolic Blood Pressure.** The overall mean baseline SBP for the participants was 136.27 (SD = 12.1) mmHg and ranged from 112 to 166 mmHg. For the participants who completed the intervention, the mean baseline SBP was 137.15 (SD = 15.53) mmHg and ranged from 112 to 166 mmHg. At week eight, the overall mean SBP was 125.08 (SD = 9.61) and ranged from 110 to 144 mmHg (see Table 4.3). The data analysis including all participants who completed the intervention demonstrated a statistically significant difference between baseline SBP and week eight SBP ($p = .007$). This means the participants’ SBPs reduced significantly after the intervention. Including the three participants that had a BP medication change during the intervention period could affect the results. However, when the analysis was completed without these three participants’ data, the results were still significantly different ($p = .036$) as shown in Table 4.4. This means that the SBP was reduced significantly regardless of a BP medication change during the intervention.
**Diastolic Blood Pressure.** The overall mean baseline for the participants’ DBP was 83.46 ($SD = 12.3$) mmHg and ranged from 62 to 110 mmHg. For the participants who completed the intervention, the mean baseline DBP was 81.77 ($SD = 12.04$) mmHg and ranged from 62 to 106 mmHg. At week eight, the overall mean DBP was 75.08 ($SD = 7.64$) with a range from 62 to 88 mmHg (see Table 4.3). The data analysis including all participants who completed the intervention demonstrated a statistically significant difference between baseline DBP and week eight DBP ($p = .021$). This means the participants’ DBPs reduced significantly after the intervention. Including the three participants that had a BP medication change during the intervention period could affect the results. However, when the analysis was completed without these three participants’ data, the results were still significantly different ($p = .025$) as shown in Table 4.4. This means that the DBP was reduced significantly regardless of a BP medication change during the intervention.

**Minutes Per Week of Moderate-Intensity Walking.** At baseline, the reported number of minutes engaged in moderate-intensity PA for all participants ranged from zero minutes weekly to 315 minutes weekly. The overall baseline mean number of weekly minutes was 53.46 minutes ($SD = 78$), and the baseline mean for those who completed the intervention was 53.07 ($SD = 88.33$) (see Table 4.3). Eleven out of 26 of the participants at baseline reported zero minutes weekly of moderate-intensity PA. At baseline, over 75% of all participants engaged in less than 90 minutes of moderate-intensity PA weekly which is below the 2017 ACC/AHA recommendations of 90 to 150 minutes per week.

At week eight, the reported number of minutes engaged in moderate-intensity walking for participants who completed the intervention ranged from zero minutes weekly to 590 minutes weekly. The overall mean number of weekly minutes was 195.85 ($SD = 168.09$) minutes (see Table 4.3). The data analysis including all participants who completed the intervention showed a statistically significant difference between baseline reported number of minutes of moderate-intensity walking and week eight reported number of minutes of moderate-intensity walking ($p = $
.005) as shown in Table 4.4. This means that participants who completed the intervention significantly increased their reported number of minutes of weekly moderate-intensity walking after the intervention. At the final visit, 30.7% of participants reported engaging in less than 90 minutes during week eight, which decreased from 75% at baseline. At week eight, 69% of participants reported engaging in greater than 90 minutes of moderate-intensity PA weekly, and 53.8% of participants reported engaging in greater than 150 minutes per week of moderate-intensity walking. Both meet or exceed the 2017 ACC/AHA recommendations of 90 to 150 minutes per week.

Table 4.3

*Descriptive Analysis for Baseline and Week Eight Participants*

<table>
<thead>
<tr>
<th>Data type</th>
<th>Overall Baseline (n = 26)</th>
<th>Baseline for participants who completed intervention (n = 13)</th>
<th>Week eight for participants who completed intervention (n = 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean SBP (mmHg)</td>
<td>136.27, SD = 12.1</td>
<td>137.15, SD = 15.53</td>
<td>125.08, SD = 9.61</td>
</tr>
<tr>
<td>Range</td>
<td>112-166</td>
<td>112-166</td>
<td>110-144</td>
</tr>
<tr>
<td>Mean DBP (mmHg)</td>
<td>83.46, SD = 12.3</td>
<td>81.77, SD = 12.04</td>
<td>75.08, SD = 7.64</td>
</tr>
<tr>
<td>Range</td>
<td>62-110</td>
<td>62-106</td>
<td>62-88</td>
</tr>
<tr>
<td>Mean # of Weekly Minutes of MIW</td>
<td>53.46, SD = 78</td>
<td>53.07, SD = 88.33</td>
<td>195.85, SD = 168.09</td>
</tr>
<tr>
<td>Range</td>
<td>0-315</td>
<td>0-315</td>
<td>0-590</td>
</tr>
<tr>
<td>Participants With BP Medication Change During Intervention</td>
<td>-</td>
<td>-</td>
<td>3 (23.08%)</td>
</tr>
</tbody>
</table>

*Note. # = number; MIW = moderate-intensity walking; SD = standard deviation*
Table 4.4

Data Analysis of Primary Outcomes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Null hypothesis</th>
<th>Test</th>
<th>Significance</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP</td>
<td>The median of differences between BaselineSYS and Wk8SYS equals 0.</td>
<td>Related-Samples Wilcoxon Signed Rank Test</td>
<td>.007 (n = 13)</td>
<td>Reject the null hypothesis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.036 (n =10)</td>
<td></td>
</tr>
<tr>
<td>DBP</td>
<td>The median of differences between BaselineDIA and Wk8DIA equals 0.</td>
<td>Related-Samples Wilcoxon Signed Rank Test</td>
<td>.021 (n = 13)</td>
<td>Reject the null hypothesis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.025 (n =10)</td>
<td></td>
</tr>
<tr>
<td># minutes of MIW</td>
<td>The median of differences between Baseline#Min.Mod.Walk and Wk8#Min.Mod.Walk equals 0.</td>
<td>Related-Samples Wilcoxon Signed Rank Test</td>
<td>.005</td>
<td>Reject the null hypothesis.</td>
</tr>
</tbody>
</table>

Note. SBP and DBP outcomes show the results for all participants who completed the intervention as shown by n = 13, and the results for the 10 participants that did not have a change in BP medications during the intervention as shown by n = 10. SBP = systolic blood pressure; DBP = diastolic blood pressure; # = number; MIW = moderate-intensity walking.

Secondary Outcome

Average Daily Step Count. Data reported by the five participants who provided complete step count data showed a mean of 8205.69 (SD = 3832.65) during week one of the intervention and a mean of 10059.91 (SD = 4042.75) during week eight of the intervention (see Table 4.5). There were not enough participants who reported complete step count data to run a t-test to test for significance. However, the mean difference shows that there was an increase in average daily step counts from week one to week eight in the five participants that completed the step count data.
Table 4.5

Secondary Outcome: Average Daily Step Count

<table>
<thead>
<tr>
<th>Week</th>
<th>Range</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>9466.57</td>
<td>5411.71</td>
<td>14878.29</td>
<td>8205.6856</td>
<td>3832.64582</td>
<td>14689173.990</td>
</tr>
<tr>
<td>Eight</td>
<td>10056.29</td>
<td>6040.86</td>
<td>16097.14</td>
<td>10059.9094</td>
<td>4042.75197</td>
<td>16343843.512</td>
</tr>
</tbody>
</table>

*Note.* Values are step counts.

**Satisfaction Survey**

Participant satisfaction was measured with 5-point Likert scale items that had a range of 1= strongly disagree to 5=strongly agree, including a middle neutral option (See Appendix L). Mean scores above 2.5 reflect higher satisfaction whereas scores below 2.5 reflect lower satisfaction. A reliability analysis was performed on the satisfaction survey that was created for this project, and it determined a Cronbach alpha value of 0.770, indicating strong internal consistency between survey items. The median values for items 1, 2, 4, and 5 were 5.00, and the median value for item 3 was 4.00 (see Table 4.6). This indicates that participants “strongly agreed” with positive statements about the program.
### Table 4.6

**Satisfaction Survey Analysis**

<table>
<thead>
<tr>
<th>Survey item</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>Mode</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I enjoyed this walking program.”</td>
<td>4.69 (0.48)</td>
<td>5.00</td>
<td>5.00</td>
<td>4.00-5.00</td>
</tr>
<tr>
<td>“This program was easy to follow.”</td>
<td>4.69 (0.63)</td>
<td>5.00</td>
<td>5.00</td>
<td>3.00-5.00</td>
</tr>
<tr>
<td>“I notice a difference in my health after completing this walking program.”</td>
<td>4 (0.82)</td>
<td>4.00</td>
<td>4.00</td>
<td>3.00-5.00</td>
</tr>
<tr>
<td>“I plan to continue walking to reduce my blood pressure.”</td>
<td>4.77 (0.44)</td>
<td>5.00</td>
<td>5.00</td>
<td>4.00-5.00</td>
</tr>
<tr>
<td>“I would recommend this program to a friend or family member.”</td>
<td>4.69 (0.48)</td>
<td>5.00</td>
<td>5.00</td>
<td>4.00-5.00</td>
</tr>
</tbody>
</table>

*Note. SD = standard deviation.*

Some open-ended qualitative findings of the satisfaction survey included statements such as “this has been a learning experience that shows walking can improve your health without major exercise,” and “this program challenged me to make decisions to improve my health by walking several times a week and watching food choices as well”. Other statements included “thanks! It was good to be accountable (at times)” and “it was hard to start, but as the weeks went on, it got easier to go harder and longer”. One participant noted the program was motivating for them and wrote “I feel better”. Another participant said it was “difficult to track in two places”
and offered an idea of having more reminders and a list of at-home BP devices for a quick reference to give future patients with HTN. Another participant said, “day to day fluctuations (things happening) make it difficult to stay on course”.

In conclusion, the primary outcomes of SBP and DBP were significantly reduced, and the primary outcome of minutes per week of moderate-intensity walking was significantly increased after this intervention. The secondary outcome of average daily step counts increased overall from week one to week eight. Participants reported overall satisfaction with the walking program, and 4.77 out of 5 reported they planned to continue walking to reduce their BP.
CHAPTER 5

DISCUSSION

The PICOT question for this EBP project was: does an eight-week (T) structured walking program utilizing a smartwatch for step counts and education (I) reduce BP and increase the number of minutes of weekly moderate-intensity walking (O) in adults aged 18 years or older with essential hypertension (P) compared to baseline (C)? An eight-week structured walking program was implemented that included daily step count tracking and education given at baseline and at a four-week follow-up visit. The weekly goal for moderate-intensity walking increased from at least 90 minutes during weeks one and two, to at least 120 minutes during weeks three and four, and to at least 150 minutes during weeks five through eight.

The findings of the statistical analyses for the primary and secondary outcomes will be explained in this chapter. The strengths and limitations of this EBP project will be discussed. Relevance of the EBP model that was selected to guide the implementation of this project will be evaluated, and future recommendations are explored.

Explanation of Findings

Primary Outcomes

Systolic Blood Pressure. The data analysis for all participants who completed the intervention demonstrated a statistically significant difference between baseline SBP and week eight SBP ($p = .007$). Even after three participants’ data were removed due to BP medication change during the intervention period, the SBP difference was still statistically significant ($p = .036$). This means the participants’ SBPs decreased significantly after the structured walking intervention, which is consistent with evidence found in the literature (Barnason et al., 2017; Barone Gibbs et al., 2021; Dempsey et al., 2018; Gradidge & Golele, 2018; Lee et al., 2020; Lee et al., 2021; Whelton et al., 2018). A systematic review and meta-analysis demonstrated that a moderate-intensity walking program lasting eight to 11 weeks produced the largest reduction in
BP compared to a higher or lower intensity and shorter or longer duration (Lee et al., 2020). Another RCT showed significant reductions in SBP in an intervention group who walked at a moderate intensity on treadmills for 30 minutes three times per week for 12 weeks (Gradidge & Golele, 2018).

In contrast, Baross et al. (2017) showed clinically significant, but not statistically significant, reductions in SBP in a walking group that walked on a treadmill for 30 minutes four times a week for six weeks. The intervention for this RCT (Baross et al., 2017) lasted only six weeks whereas the intervention for this EBP project lasted eight weeks. An eight-week intervention has been shown to be an ideal duration to significantly reduce SBP and DBP (Lee et al., 2020). Another RCT showed a clinically, but not statistically, significant reduction in SBP for a moderate-intensity walking group that had a goal of 12,000 steps per day (Chiang et al., 2019). This RCT’s intervention lasted eight weeks, but the moderate-intensity walking duration was only 90 minutes per week throughout the intervention. This may account for the nonsignificant reduction in SBP in Chiang et al. (2019) in comparison to this EBP project because this EBP project increased the minutes per week of moderate-intensity walking requirement above 90 minutes for weeks five through eight. Duration of at least 150 minutes or greater per week of moderate-intensity aerobic exercise has been shown to reduce SBP more than only 90 minutes per week (Whelton et al., 2018).

This EBP project utilized self-monitoring of BP, printed materials, and follow-up to increase adherence. This was similar to a systematic review that showed these interventions improved participants’ BP (Barnason et al., 2017). In a RCT, a structured educational program was given to two groups at different times. Group G-I received education at baseline, and Group G-II received education at six months. Group G-I had statistically significantly lower SBP at six months than Group G-II at the six-month visit. At 12 months, both groups showed similar reductions in SBP (Perl et al., 2016). This is consistent with this EBP project’s education at
baseline via verbal and visual modes to enhance learning and increase adherence to the walking program.

**Diastolic Blood Pressure.** The data analysis for all participants who completed the eight-week intervention demonstrated a statistically significant difference between baseline DBP and week eight DBP ($p = .021$). Even after three participants’ data were removed due to BP medication change during the intervention period, the DBP difference was still statistically significant ($p = .025$). This means the participants' DBPs decreased significantly after the structured walking intervention, which is consistent with evidence found in the literature (Barnason et al., 2017; Barone Gibbs et al., 2021; Dempsey et al., 2018; Gradidge & Golele, 2018; Lee et al., 2020; Lee et al., 2021; Whelton et al., 2018).

A structured educational program reduced DBP in one RCT, but the reduction was not statistically significant (Perl et al., 2016), which is not consistent with this project’s significant reduction in DBP. In the RCT, a structured educational program given at baseline for Group G-I showed nonsignificant reductions in DBP at six months into the intervention. Group G-II who received the structured educational program at six months showed nonsignificant reductions in DBP from baseline at six months (Perl et al., 2016). The reductions in DBP were not statistically significantly different between the groups at 12 months. This is somewhat consistent with this EBP project’s education at baseline via verbal and visual modes to enhance learning and increase adherence to the walking program; however, this EBP project showed significant reductions in DBP. Another RCT showed nonsignificant reductions in DBP in a walking group that walked on a treadmill for 30 minutes four times a week for six weeks when compared to a control group (Baross et al., 2017). However, the RCT lasted only six weeks. This EBP project lasted eight weeks, which was shown in Lee et al. (2020) to be an ideal duration to significantly reduce SBP and DBP. Another RCT showed a clinically, but not statistically, significant reduction in DBP for a moderate-intensity walking group that had a goal of 12,000 steps per day. This intervention’s duration was 90 minutes per week for eight weeks (Chiang et al., 2019), which
may account for the nonsignificant reductions in DBP in this RCT. The increased minutes per week of moderate-intensity walking in this EBP project was a minimum of 150 minutes during weeks five through eight, which may account for this project’s significant reductions in DBP.

**Minutes Per Week of Moderate-Intensity Walking.** The implementation of this EBP project included a minimum of 90 minutes per week of moderate-intensity walking in weeks one and two, a minimum of 120 minutes per week in weeks three and four, and a minimum of 150 minutes per week in weeks five through eight. This recommendation was based on two guidelines from the literature that recommended either 90-150 or 150-300 minutes per week of moderate-intensity PA (Barone Gibbs et al., 2021; Whelton et al., 2018). Gradidge & Golele (2018) demonstrated an increase in moderate-vigorous PA by patient report in the intervention group, which is consistent with the significant increase in minutes per week of moderate-intensity walking shown in this EBP project. This EBP project was a structured walking program that provided goals to every participant for weekly minutes of moderate-intensity walking that increased over eight weeks, which likely contributed to participants’ significant increase in actual walking. Follow-up visits also served to encourage adherence and as a reminder about the walking goals for the participants which was consistent with the findings in Barnason et al. (2017).

**Secondary Outcome**

**Average Daily Step Count.** Only five participants provided complete data on daily step counts, therefore descriptive analysis was used to analyze this data. Participants who did not provide complete step count data reported that lack of time and added effort were reasons they did not track their step counts. This EBP project did not specify a daily step count goal for the participants as was done in Chiang et al. (2019) which had a goal of 12,000 steps per day. However, all participants in this EBP project were encouraged to utilize a pedometer to measure their daily step counts. Barone Gibbs et al. (2021) noted that wearing an activity tracker, such as the smartwatch used in this project, helped participants stay aware of their PA, which increased
their likelihood of engaging in PA. The use of a pedometer was shown to reduce SBP significantly in Lee et al. (2021) which is consistent with what this project demonstrated in the portion of the participants who provided complete step count data.

**Additional Literature Search**

An additional extensive literature search was completed after data were analyzed to find potential new findings in the literature. Two new statements from the AHA were discovered using similar search criteria as described in chapter 2. The first scientific statement by Jones et al. (2021) reported similar recommendations that those with stage 1 HTN should only be given lifestyle modifications such as PA. An important additional recommendation was given for patients who are not at goal (<130/<80 mmHg) after six months of lifestyle modifications only; medication intervention should be considered at that time (Jones et al., 2021). The second science advisory emphasized that PA continues to be a therapeutic intervention that is cost-effective and as efficacious as some common cardiovascular medications (Kris-Etherton et al., 2021). Patients who received counseling to increase PA showed a 42% greater likelihood to be more physically active than patients who received no counseling (Kris-Etherton et al., 2021). A statement from the ACC and AHA in 2019 increased the minimum minutes per week of moderate-intensity PA recommendation to 150 minutes per week or 75 minutes per week of vigorous-intensity PA which differed from the 2017 ACC/AHA guidelines that recommended 90 to 150 minutes per week of moderate-intensity PA (Kris-Etherton et al., 2021; Whelton et al., 2018).

**Strengths and Limitations of the DNP Project**

**Strengths**

The project manager believes the accountability portion of this project is what helped participants adhere to the walking requirements and ultimately what led to the reduction in their BPs. A few participants commented at their final visit that having the accountability is what kept them going. The follow-up visits at four weeks, along with the log sheets that participants were asked to fill out at home throughout the intervention period, helped to increase accountability.
The ease of the intervention played a large role in the success of this project. Walking is an exercise option available to almost everyone and is inexpensive to implement. People may believe they need to complete drastic exercises to improve their BP so they may feel discouraged to perform any exercise. Therefore, the strong evidence base supporting walking as a viable option to help reduce BP enhances its appeal. Walking can be done alone, with other people, inside malls, outside in nature or downtown cities, inside workout gyms, or at workplaces. The possibilities are endless for places to walk at moderate intensity to help reduce BP. Two participants reported ‘feeling better’ when they walked which encouraged them to continue. The project manager believes the ease and versatility of the intervention contributed greatly to this project’s success.

Two key stakeholders were particularly invested in helping this project succeed at this office. One of them was brought on as a key stakeholder near the end of the development stage of this EBP project but was incredibly encouraging and welcoming to this project for their patients. The other key stakeholder was vital to this project being well developed. This stakeholder was invested from the beginning and provided insight into organizational operations and offered ideas to implement this project in the office. This project would not have been possible or as successful without this stakeholder.

The employees at the office where this project was implemented were incredibly kind and helpful, which made the development and implementation of this project easier and successful. The project manager is incredibly grateful to them for their efforts and kindness throughout the project.

Limitations

One of the biggest limitations to this project was that contact information of each participant was not collected. It was decided by one of the key stakeholders and the project manager that it would be best to utilize the organization’s reminder system for follow-up visits to remind participants to come back. The project manager did provide her school email to every
participant and pointed it out on the informational sheet (Appendix N) at the baseline visit. However, at the follow-up visit at four weeks, a few participants reported they did not know how to contact the project manager. Three participants had reached out to the office when they could not make a visit, which the project manager greatly appreciated. The project manager made sure to remind participants at every visit about contacting her through her email address for questions or comments. Having each participants’ contact information might have led to greater adherence and less attrition through use of weekly reminders to reach their target minutes per week of moderate-intensity walking.

Another limitation to this project was the complexity of recording daily step counts. Only five participants provided complete data for daily step counts. One participant reported the daily step count recordings were confusing and too much work. In addition to this, most of the participants had a smartwatch and for those who did not, they had a smart phone that had step count tracking ability without the need to download a mobile application. A lot of time and effort was spent finding a suitable and easy-to-use mobile application for the participants to track their daily step count, and the applications were never used. This mobile application seemed to add another level of complexity to the project that participants did not want to trifle with since their smartwatches or smartphones were already capable of tracking their step counts.

**Sustainability**

The sustainability of this EBP project can be easily implemented at the office with some changes from the original project design. The project manager developed an action plan (Appendix Q) for stakeholders and other providers at the office to easily implement this project during visits with patients who have HTN. It consists of three steps. Step one is to discuss BP categories with the patient who has HTN to improve the patient’s knowledge of ideal BP targets. This step also includes education about the effects of HTN on the body. Step two is recommending the structured walking program. This step would include setting goals for minutes per week of moderate-intensity walking for each patient, ranging from at least 90 minutes to at
least 300 minutes per week for maximal benefit. Providers will use critical thinking to determine appropriate goals. The action plan provides an example of a log sheet that patients can use to keep track of their weekly minutes. Step three is follow-up. This step consists of having patients send the log sheet with their minutes per week of moderate-intensity walking and at-home BP via MyChart message at one month, two months, six months, and one year. These timeframes can be adjusted as needed per the provider’s discretion. Step three is vital to holding the patient accountable because it requires them to report back with their progress and efforts.

This action plan was discussed with the key stakeholders of this project, and each received a printed copy. Three key stakeholders were thrilled to hear about the results of the EBP project and were planning to implement the action plan with their HTN patients with some adjustments. One key stakeholder said they would welcome the use of MyChart messages to help their patients stay accountable. However, when they had asked patients in the past to send an at-home BP reading to the provider a week after their visit, only a small portion of patients had done it. This stakeholder noted that it depended on the motivation level of the patient. The other four key stakeholders were overwhelmed with MyChart messages already so they felt that patients should instead keep their own log sheet at home to hold themselves accountable. The practice change will be maintained solely by the providers who are willing to educate their patients with HTN about this structured walking program that should only take a few minutes of their time to explain. Four key stakeholders were willing to implement the adjusted action plan. The follow-up messages via MyChart may not be a feasible option for these providers.

A recommendation for future projects would be to collect participants’ contact information, whether that be email or phone number. Participants may be hesitant about sharing personal information so reassurance that it will only be used for the project’s purposes may help ease hesitation. This may potentially increase adherence and decrease attrition for future projects.

Another recommendation would be to avoid requiring participants to track daily step counts. This added complexity and stress on participants and ultimately did not provide
substantive benefit to the intervention. It would be beneficial to only have patients focus on and track their weekly minutes of moderate-intensity walking. The moderate-intensity walking portion of this project’s intervention had the strongest evidence base so future projects should focus on this. Inherent to this recommendation would be to avoid using mobile applications that track step counts because most people have a smartwatch or smartphone that can perform this, and the mobile application just adds another barrier to participation.

Relevance for EBP Model

The 2022 Johns Hopkins Nursing Evidence-based Practice (JHNEBP) Model was used to guide the development and implementation of this project. All seven operational steps within stage one, ‘Practice Question’, were followed. Recruiting the interprofessional team was easily completed at this office thanks to the employees. The project manager held the responsibility for the project leadership; however, one key stakeholder was vital to the success of this project from start to finish. Reports from the office manager and substantive time spent in the office aided the project manager in clarifying and describing the problem of patients with HTN. This led to development and refinement of the EBP PICOT question and determining that there was a need for the EBP project at this office. Identifying key stakeholders occurred over time in the development phase of this project. The ‘schedule the team meetings’ step involved one-on-one meetings with key stakeholders rather than a team meeting because of each of their time constraints.

In stage two, ‘Evidence’, every step was followed. This strengthened this EBP project by ensuring all relevant evidence was used, and quality of the evidence was thoroughly evaluated. Internal and external evidence for this project was found, and each piece of evidence was appraised for quality and level of evidence. The project manager then summarized the evidence, synthesized the findings, and developed the best evidence recommendations.

In the last stage, ‘Translation’, all steps were followed as well. Early on, practice setting-specific recommendations were identified, and an action plan was developed. There was support
from key stakeholders to implement this EBP project with their patients who had HTN. The action plan was implemented, and outcomes were evaluated. The results of the data analyses were discussed with the key stakeholders, and the next steps were discussed. ‘Identifying the next steps’ is one of the final steps in this final stage, which guided the development of sustainability practices for this project in this office. The findings were disseminated at the office, at the Wisconsin Nurses Association 2022 Pharmacology and Clinical Update conference in April 2022, and at Valparaiso University’s Oral Presentations by the Candidates for the Doctor of Nursing Practice in April 2022.

The JHNEBP model was relevant in every step to guide this EBP project. Although some steps were obvious or straightforward to the project manager, other steps served to be helpful guides when planning a large project that had complexities along the way. Although there are several steps within the JHNEBP model, each step proved beneficial to guide this EBP project. No changes to the model are recommended at this time.

**Recommendations for the Future**

**Research**

There was some evidence that was found in the literature search regarding daily step counts and BP reduction, however more research could be done on the relationship between these two variables. This can guide healthcare provider recommendations on whether or not recording step counts is a useful tool to help patients reduce their BP.

More research needs to be done on the principles of motivation and accountability for people with HTN. The literature was not searched for use of the change theories, such as the Health Belief Model, and none of the RCTs used in this EBP project followed any theories or models that focus on changing behavior. More research should be conducted that uses a model such as the Health Belief Model to guide people with HTN to change their behavior to a healthier one. A provider may find it important to change a certain health behavior of a patient, but the
patient may be less concerned about changing that behavior. Exploring patients’ motivation to change can be beneficial to this intervention being successful in the future.

Research could also explore accountability for people with HTN. Patients may struggle to adhere to recommendations from their healthcare provider. Research on the best ways to hold patients accountable may also lead to this intervention being successful in the future.

Education

Patients need to be educated so that they can make proper decisions with regards to their health. It is essential that undergraduate students learn about the pathophysiology and detrimental effects of HTN so that they can in turn, educate their patients. It is vital for undergraduate students to learn primary and secondary prevention for HTN to help improve the lives of the patients for whom they care. Knowledge of tertiary prevention is essential because they will likely encounter patients in an outpatient and hospital setting who require tertiary prevention strategies such as cardiac or stroke rehabilitation programs and renal dialysis.

The same vital knowledge applies for graduate students, however, knowledge of guidelines and recommendations for diagnosis and treatment are required for graduate students to provide their patients with the best care. The most recent BP category recommendations and best evidence medications to treat HTN should be common knowledge for the graduate student. Lifestyle modifications should be well known so they can be offered for every patient who has HTN, whether they require medication or not. Although this project focused only on PA, other lifestyle modifications include sodium restriction, potassium supplementation, weight loss, a heart healthy diet such as the DASH diet, and alcohol intake of two standard alcohol drinks per day for men and one per day for women.

Conclusion

HTN has devastating consequences to a person’s body that can lead to death. Easy-to- implement lifestyle modifications such as a structured walking program have been shown to reduce BP in patients with HTN, providing an enticing and feasible option to combat this
worldwide health problem. This EBP project was designed to answer the PICOT question: does an eight-week (T) structured walking program utilizing a smartwatch for step counts and education (I) reduce BP and increase the number of minutes of weekly moderate-intensity walking (O) in adults aged 18 years or older with essential hypertension (P) compared to baseline (C)? This EBP project had statistically significant decreases in SBP and DBP in people with HTN by walking at a moderate intensity for a target number of minutes per week. Some participants walked at work while others walked with friends or family members. Some enjoyed walking alone outside while others preferred walking on a treadmill. The opportunities are endless for patients with HTN to implement this structured walking program to help reduce their BP. Providing a goal for number of minutes to walk each week seemed to have contributed to the statistically significant increase in reported minutes per week of moderate-intensity walking from baseline to week eight of this intervention. The increase from 25% of participants at baseline to 69% of participants at week eight who walked at least the minimum of 90 minutes per week at a moderate intensity as recommended by the 2017 ACC/AHA guideline is promising. Participants noted the accountability of the project is what encouraged them to continue walking as the weeks passed. Although only a small number of participants reported complete data for the secondary outcome of daily step counts, the means increased from week one to week eight without daily step count goals provided by the project manager. This EBP project’s outcomes were consistent with the outcomes reported in literature. With some changes to the intervention that were discussed, this EBP project can be implemented with ease in an office setting to help patients with HTN reduce their BP.
REFERENCES

American College of Cardiology (n.d.). ASCVD Risk Estimator Plus. Retrieved from 
https://tools.acc.org/ascvd-risk-estimator-plus/#!/calculate/estimate/


https://www.ahajournals.org/doi/epub/10.1161/HYP.0000000000000066


https://www.who.int/news-room/fact-sheets/detail/hypertension
AUTOBIOGRAPHICAL STATEMENT

Mrs. Peterson graduated Cum Laude from Indiana University Bloomington with a bachelor’s degree in Kinesiology in 2014 with a major in exercise science and two minors in biology and psychology. After realizing her calling was to follow in her mother’s footsteps and become a nurse, she graduated Cum Laude with her accelerated Bachelor of Nursing degree at Valparaiso University (VU) in 2016. Mrs. Peterson had the opportunity to serve on her first medical mission trip to Costa Rica and Nicaragua through VU’s spring break program. Her passion for children led her to work at summer camps, volunteer in various church nurseries, and teach Sunday school classes over the past 15 years. Mrs. Peterson’s nursing experience has been versatile, working first in a pediatric intensive care unit and then in postpartum, pediatrics, and women’s health. As her passion shifted to caring for new mothers, she learned the importance of education for better outcomes for her patients. During her Doctor of Nursing program at VU, Mrs. Peterson began serving as a clinical nursing instructor and an undergraduate teaching assistant for the bachelor’s program at VU. She is a member of the Coalition of Advanced Practice Registered Nurses of Indiana and is awaiting graduation to be officially credentialed as a Family Nurse Practitioner through the American Nurses Credentialing Center. She is expected to graduate Summa Cum Laude in May 2022. Mrs. Peterson will be presenting a poster detailing her evidence-based practice project at the Wisconsin Nurses Association 2022 Advanced Practice Registered Nurse Pharmacology and Clinical Update conference in Appleton, WI in April 2022. Mrs. Peterson desires to use her knowledge and skills to serve in medical mission work in the future.
ACRONYM LIST

ACC: American College of Cardiology
AGREE II: Appraisal of Guidelines for Research and Evaluation II instrument
AHA: American Heart Association
ASCVD: Atherosclerotic Cardiovascular Disease risk score
BP: blood pressure
CASP: Critical Appraisal Skills Programme
CC: citation chased
CDC: Centers for Disease Control
CINAHL: Cumulative Index to Nursing and Allied Health Literature
CITI: Collaborative Institutional Training Initiative
CPG: clinical practice guideline
CVD: cardiovascular disease
DBP: diastolic blood pressure
EBP: evidence-based practice
EMR: electronic medical record
HTN: hypertension
ICD-10: 10th revision of the International Statistical Classification of Diseases and Related Health Problems
IRB: Institutional Review Board
JBI: Joanna Briggs Institute
MA: meta-analysis
MIW: moderate-intensity walking
PA: physical activity
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT: randomized controlled trial
SBP: systolic blood pressure
SMBP: self-monitoring of blood pressure
SPSS25: Statistical Package for Social Sciences 25
SR: systematic review
TPE: therapeutic patient education
TRIP: Turning Research Into Practice
APPENDIX A

Minutes Per Week of Moderate Intensity Walking Log Sheet

Participant Number: 

Minutes Per Week of Moderate Intensity Walking Log Sheet

Instructions. Write the number of minutes you walked at a moderate intensity on whichever day you did it.

<table>
<thead>
<tr>
<th>Week</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</tr>
</tbody>
</table>

YOUR MODERATE-INTENSITY WALKING GOALS:

Week 1: at least 90 minutes during the week
Week 2: at least 90 minutes during the week

Week 3: at least 120 minutes during the week
Week 4: at least 120 minutes during the week

Week 5: at least 150 minutes during the week
Week 6: at least 150 minutes during the week
Week 7: at least 150 minutes during the week
Week 8: at least 150 minutes during the week
APPENDIX B

Tell me more: HIGH BLOOD PRESSURE

High blood pressure (BP) is a main contributor to heart disease, stroke, and kidney disease. High BP is a leading cause of death worldwide.

<table>
<thead>
<tr>
<th>What is HYPERTENSION?</th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal BP</td>
<td>&lt;120 mmHg</td>
<td>&lt;80 mmHg</td>
</tr>
<tr>
<td>Elevated BP</td>
<td>120-129 mmHg</td>
<td>&lt;80 mmHg</td>
</tr>
<tr>
<td>Stage 1 HTN</td>
<td>130-139 mmHg</td>
<td>80-89 mmHg</td>
</tr>
<tr>
<td>Stage 2 HTN</td>
<td>≥ 140 mmHg</td>
<td>≥90 mmHg</td>
</tr>
</tbody>
</table>

BP= blood pressure; HTN = hypertension

Calculating your TARGET HEART RATE range

Max. HR = 220 – age in years

MODERATE-intensity target HR range:

Max HR X 0.64 = _________ bpm
Max HR X 0.76 = _________ bpm

Pace of Moderate Intensity Walking:
- About 100 steps per minute
- 2.5 to 3.5 mph on treadmill

WALKING can decrease your BP by as much as 9 mmHg systolic and 6 mmHg diastolic!

Essential (primary) hypertension is not caused by another medical condition. It is often correlated with physical inactivity.

HOW TO TAKE YOUR BP AT HOME: Avoid smoking, caffeine, or exercise within 30 minutes of taking your BP. Wear the appropriate size cuff. Sit with back and arm supported. Legs should be uncrossed.

WALKING GOAL: 90-150 minutes per week of moderate intensity walking. Brief episodes of walking to break up sitting time can significantly decrease BP.
APPENDIX C

MOBILE APPLICATIONS FOR IPHONE AND ANDROID

Figure C1. Pedometer & Step Counter (Version 2.0.0) for iPhone

Figure C2. Step Tracker – Pedometer Free & Calorie Tracker (Version 1.2.1) for Android
APPENDIX D

Daily Steps and Weekly Blood Pressure Log Sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Step Count</th>
<th>BP (Sys/Dia)</th>
<th>Date</th>
<th>Step Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Week 1:</td>
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<td>Week 2:</td>
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<td>Week 3:</td>
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<td>Week 4:</td>
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<td>Week 5:</td>
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<td>Week 6:</td>
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<td>Week 7:</td>
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<td>Week 8:</td>
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</tr>
</tbody>
</table>

*Note. Dia = diastolic; Sys = systolic blood pressure*
APPENDIX E

PERMISSION TO USE JHNEBP MODEL

JOHNS HOPKINS EBP MODEL AND TOOLS- PERMISSION

Thank you for your submission. We are happy to give you permission to use the Johns Hopkins Evidence-Based Practice model and tools in adherence of our legal terms noted below:

- You may not modify the model or the tools without written approval from Johns Hopkins.
- All reference to source forms should include “©The Johns Hopkins Hospital/The Johns Hopkins University.”
- The tools may not be used for commercial purposes without special permission.

If interested in commercial use or discussing changes to the tool, please email ijhn@jhmi.edu.

Downloads:

JHEBP Tools-Printable Version

JHEBP Tools-Electronic Version

2022 JHEBP Tools- Printable Version

2022 JHEBP Tools- Electronic Version-coming soon

Do you prefer hands-on learning?

We are offering a 5-day intensive Boot Camp where you will learn and master the entire EBP process from beginning to end. Take advantage of our retreat-type setting to focus on your project, collaborate with peers, and get the expertise and assistance from our faculty.
### APPENDIX F

#### EVIDENCE TABLE

<table>
<thead>
<tr>
<th>Lead Author/ Year/Quality</th>
<th>Purpose/ Design/Sample</th>
<th>Interventions</th>
<th>Measurement/ Outcomes</th>
<th>Results/ Findings</th>
<th>Strengths/ Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnason/ 2017/High</td>
<td>Critical analysis of research studies about therapeutic patient education for certain cardiovascular conditions, including hypertension. Systematic Review</td>
<td>The HTN-focused studies had the following interventions: a) SMBP either alone or in combination with education given verbally or online or printed materials ($n = 10$) b) Counseling or coaching weekly, monthly, or bimonthly ($n = 4$) c) Printed materials/ education workbook, 1 in person and 1 with bimonthly telephone counseling ($n = 2$)</td>
<td>SBP; DBP; BP control; Use of lifestyle recommendations; Medication adherence; BP logs; Reaching target BP goal; Action or maintenance of change behaviors; Self-efficacy for BP control; HBP knowledge; Refill adherence.</td>
<td>Improvements in BP in: a) SMBP ($n = 9$) b) Counseling/ Coaching ($n = 4$) c) Printed materials ($n = 1$) (in-person) Interventions that provided follow-up (in-person or by telehealth) to support SMBP had better outcomes than SMBP alone. Recommendations include the following: -TPE delivery for monitoring of self-management should be done by multiple modes (face-to-face, telephone, telehealth, or combo) -Consistent information about self-management from healthcare team</td>
<td>Strengths: Extensive literature search. Ensured rigor of included studies. Limitations: Authors note potential of missed TPE articles due to mixed terminology and limitations in methodology in studies about self-management.</td>
</tr>
</tbody>
</table>
| Barone Gibbs/ 2021/ High | Focus on patient groups at mild to moderate risk of CVD who are recommended only lifestyle modifications for HTN. Describe recommendations with regards to PA based on average effects of PA. Guide clinicians in their use of PA interventions. Guideline | - | Recommendations for aerobic exercise for all Americans:
a) 150-300 min/week of moderate-intensity PA, or 
b) 75-150 min/week of vigorous-intensity PA, or 
c) a combination of moderate- and vigorous-intensity PA for an equivalent amount of time.

Aerobic exercise can reduce SBP and DBP an average of -4 mmHg and -3 mmHg respectively.

More frequent PA may be beneficial because a single workout can reduce SBP by -2 to -12 mmHg that lasts for 4-16 hours. It can | -

-Self-management education should be focused on initiating self-care behaviors rather than information alone. (Teach back, motivational interviewing).

-Comprehensive interventions addressing the process of self-management can be more effective for patients to take on self-care behaviors.

Strengths: Expert peer-reviewed. Disclosures are clearly presented.

Limitations: One PA recommendation is ambiguous, but with reason.
Make sure a patient is medically cleared to engage in PA; however, most patients who are prescribed lifestyle only treatment are at low enough risk and are considered safe without extensive medical clearance.

Wearable activity trackers are helpful in the assessment of PA.

<table>
<thead>
<tr>
<th>Study</th>
<th>Discuss implications of sedentary behaviors and their effects on BP.</th>
<th>Interrupting sitting or sedentary time with bouts of light- or moderate-intensity walking. Two studies had regular two to three minute walking breaks.</th>
<th>SBP and DBP</th>
<th>Reductions in SBP and DBP varied from 1 to 16 mmHg.</th>
<th>Strengths: Similar results were found across all studies.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dempsey/2018/Moderate</td>
<td>Systematic Review</td>
<td></td>
<td>SBP and DBP</td>
<td>In inactive overweight/obese adults: Significant reductions in SBP and DBP (-14 to -16 mmHg and -8 to -10 mmHg respectively) when sitting was interrupted with light-intensity walking.</td>
<td>Limitations: Methodology not described. Confidence intervals are not included.</td>
</tr>
<tr>
<td></td>
<td>11 experimental/“acute studies”</td>
<td></td>
<td>SBP and DBP</td>
<td>Sustained reductions in SBP and DBP with light intensity (-5 to -6 mmHg during the day and -2 to -13 mmHg after working hours) and moderate-intensity (-5</td>
<td></td>
</tr>
<tr>
<td>Lee/ 2020/ High</td>
<td>To evaluate how BP is affected by aerobic exercise in adults with HTN through a SR and meta-analysis. Systematic Review &amp; Meta-Analysis 37 RCTs with 1,813 participants.</td>
<td>20 studies used walking or running as intervention. Other studies used water-based training or aerobic dance. Three times per week was the most often frequency. Duration ranged from 4 to 37 weeks, and 12 weeks was the most frequent.</td>
<td>SBP, DBP, HR</td>
<td>Aerobic exercise significantly reduced both SBP and DBP by -8.29 mmHg and -5.19 mmHg, respectively.  Walking and running lead to -6.96 mmHg reduction in BP.  <strong>Intensity effect:</strong>  a) Moderate-intensity: -8.97 mmHg SBP &amp; -5.75 mmHg DBP  b) Vigorous intensity: -6.85 mmHg SBP &amp; -4.36 mmHg DBP  c) Low intensity: -2.93 mmHg SBP &amp; -1.62 mmHg DBP  <strong>Exercise frequency effect:</strong>  a) 3x/week: -9.16 mmHg SBP &amp; -5.55 mmHg DBP  b) 4+x/week: -6.96 mmHg SBP &amp; -4.50 mmHg DBP  c) 2x/week: -6.10 mmHg SBP &amp; -4.38 mmHg DBP  <strong>Duration effect on SBP:</strong>  a) 8-11 weeks: -9.12 mmHg SBP &amp; -5.42 mmHg DBP</td>
<td>Strengths: No bias reported. No conflicts of interest reported by authors. Reported risk of bias in articles used for review. PRISMA provided. ANOVA used. Strong literature search. Limitations: None</td>
</tr>
<tr>
<td>Lee/2021/High</td>
<td>To determine how walking affects BP and HR when it is used as a PA intervention.</td>
<td>Walking on a treadmill without stairs or uphill (n=18), outdoor walking (n=17), brisk walking (n=16), and Nordic walking (n=6). Comparisons were non-exercise and non-intervention controls.</td>
<td>SBP, DBP, HR. Measuring intensity: maximum HR, VO2max, walking distance per hour, per day, or per second, Borg Scale of Perceived Exertion, percentage of HR reserve.</td>
<td>SBP reduced by an average of 4.11 mmHg and DBP reduced by an average of 1.79 mmHg in those who walked versus no intervention. Walking interventions show moderate certainty to reduce SBP (MD= 4.41) and DBP (MD= 3.01) in adults that are 40 years of age or younger. Walking interventions show low certainty to reduce SBP (MD= 3.79) and DBP (MD= 1.74) in adults that are 41 to 60 years of age, and to reduce SBP (MD=4.30) and DBP (MD= 1.33) in adults who are older than 60 years. Duration ranged from 10 to 845 minutes per week with an average of 153 minutes per week.</td>
<td>Strengths: Extensive literature search. Clearly defined purpose and inclusion and exclusion criteria. Reports bias risk in studies. PRISMA provided. Clear explanation of data analysis. Limitations: Participants did not specifically all have hypertension; had varying health conditions.</td>
</tr>
</tbody>
</table>
Majority (n=62) of interventions were of moderate intensity. 13 low intensity; 11 self-paced, and 5 high intensity.

Walking significantly reduced SBP and DBP in both females and males.

The use of pedometers reduces SBP significantly (-3.8 mmHg, P < 0.001).

**Whelton/2018/High**

To guide health practitioners with the best evidence regarding the prevention, detection evaluation, and management of high BP in adults.

**Guideline**

Recommendations for lifestyle treatment only is for patients with elevated BP and patients with stage 1 hypertension who have an ASCVD risk score <10%.

New definitions:
- Normal: SBP <120 and DBP <80
- Elevated: SBP 120-129 and DBP <80
- Stage 1: SBP 130-139 or DBP 80-89
- Stage 2: SBP ≥140 or DBP ≥90

Home BP monitoring has not been shown to reduce or control BP on its own without other interventions, and it is practical for self-monitoring.

**Strengths:** Extensive literature search. Clear grades of quality and strength of evidence. Removes bias by including experts from various backgrounds.

**Limitations:** None
Education should be given to patient about HTN information, home BP equipment selection, that individual BP readings can vary substantially, and how to interpret results.

Recommend a structured PA program to increase PA in adults who have elevated BP or HTN.

Aerobic PA: 90-150 min/week 65-75% HR reserve can lead to a reduction of 5-8 mmHg in HTN and 2-4 mmHg in normotensive adults.

Recommend a target BP of <130/<80 in adults with HTN and known CVD or 10-year ASCVD risk of ≥10%.

Suggest that a target BP of <130/<80 in adults with HTN without increased CVD risk may be reasonable.

Cuff size for arm circumference:
- 22-26 cm: Small adult
- 27-34 cm: Adult
- 35-44 cm: Large adult
- 45-52: Adult thigh
<table>
<thead>
<tr>
<th>Correct HBPM procedures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Remain still</td>
</tr>
<tr>
<td>- Sit correctly</td>
</tr>
<tr>
<td>- Take multiple readings</td>
</tr>
<tr>
<td>- Record all readings</td>
</tr>
<tr>
<td>accurately</td>
</tr>
<tr>
<td>(Further described on page e25).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baross/2017/High</th>
</tr>
</thead>
<tbody>
<tr>
<td>To compare how 6 weeks of different kinds of training affected resting SBP, DBP, and MAP.</td>
</tr>
<tr>
<td>Randomized controlled trial</td>
</tr>
<tr>
<td>48 healthy, sedentary university students. 26 were male, 22 were female. All measures in female participants were taken at the same point of their menstrual cycle.</td>
</tr>
<tr>
<td>Randomly allocated to one of the following groups for 6 weeks:</td>
</tr>
<tr>
<td>a) Simultaneous walking and isometric handgrip (WHG)</td>
</tr>
<tr>
<td>b) Walking only (WLK)</td>
</tr>
<tr>
<td>c) Isometric handgrip only (IHG)</td>
</tr>
<tr>
<td>d) Control (CON)</td>
</tr>
<tr>
<td>a) 30 minutes of treadmill walking at intensity of 6.5km/hr 4x/week PLUS 10 sec of isometric handgrip exercise at 20% of their MVC, 3x during the walk (@ 5, 15, &amp; 25 min). Handgrip was done alternately, performing twice in dominant hand.</td>
</tr>
<tr>
<td>b) 30 minutes of treadmill walking at</td>
</tr>
<tr>
<td>Resting SBP, DBP, HR</td>
</tr>
<tr>
<td>Significant reduction in resting SBP in WHG group (127.8 ± 4.5 mmHg to 117.8 ± 3.6 mmHg) versus CON group (127.9 ± 4.3 mmHg to 127.8 ± 4.3 mmHg) (P &lt; 0.001).</td>
</tr>
<tr>
<td>Not significant reduction in resting SBP in WLK group (126.7 ± 3.4 mmHg to 122.1 ± 4.2 mmHg) or IHG group (127.1 ± 4.0 mmHg to 122.2 ± 3.7 mmHg) versus the CON group (P &gt; 0.05 for both).</td>
</tr>
<tr>
<td>Nonsignificant reductions in resting DBP versus CON group (77 ± 1.8 mmHg to 76.5 ± 3.0 mmHg) in:</td>
</tr>
<tr>
<td>a) WHG: 77.2 ± 2.8 mmHg to 73.5 ± 3.8 mmHg</td>
</tr>
<tr>
<td>Strengths: Randomization; strong analysis performed. Similar baseline values between groups.</td>
</tr>
<tr>
<td>Limitations: May be difficult to generalize due to sample characteristics. No confidence intervals reported.</td>
</tr>
</tbody>
</table>
**Exclusion criteria:** recent (6 months) history of medical treatment for serious illness (high BP, orthopedic injury, viral illness, or surgery).

Habitually active. Participated in any regular exercise training (3 or more times/week) in prior 12 months.

**Chiang/2019/High**

To determine the differences in metabolic syndrome and body composition under a daily 12,000-step intervention with and without moderate-intensity walking exercises.

Randomly assigned to one of the following groups for 8 weeks:

<table>
<thead>
<tr>
<th>Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a)</strong> Walking step goal group (WSG; walk 12,000 steps/day), or b) Walking exercise group (WEG; 12,000 steps/day PLUS 3 days/week included walking rate of &gt;103 steps/min for 30 continuous minutes), or c) Control group (CG; daily normal routine)</td>
<td>Daily step count and walking exercises monitored with a smartwatch and exercise log. Resting SBP, DBP, HR. Borg Scale of Perceived Exertion.</td>
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</tbody>
</table>

**SBP in mmHg:**

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) WSG</td>
<td>121.92 to 119.42</td>
</tr>
<tr>
<td>b) WEG</td>
<td>121.36 to 115.09</td>
</tr>
<tr>
<td>c) CG</td>
<td>127.00 to 122.33</td>
</tr>
</tbody>
</table>

**DBP in mmHg:**

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) WSG</td>
<td>76.92 to 77.17</td>
</tr>
<tr>
<td>b) WEG</td>
<td>79.55 to 73.45</td>
</tr>
<tr>
<td>c) CG</td>
<td>74.33 to 71.78</td>
</tr>
</tbody>
</table>

Average steps per day:

<table>
<thead>
<tr>
<th>Group</th>
<th>Range</th>
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<tbody>
<tr>
<td>a) WSG</td>
<td>11,340.46</td>
</tr>
<tr>
<td>b) WEG</td>
<td>12,288</td>
</tr>
<tr>
<td>c) CG</td>
<td>7,977.74</td>
</tr>
</tbody>
</table>

Mean RPEs for the WEG group during their 30 minute walking exercise were

**Strengths:**

Similar baseline characteristics. Thorough statistics performed.

**Limitations:** Participants were between age 18 and 22 and had no diabetes or other chronic diseases. Not statistically significant changes in

**Intensity of 6.5km/hr 4x/week**

c) While standing, 10 sec of isometric handgrip exercise at 20% of their MVC, 3x (@ 5, 15, & 25 min). Handgrip was done alternately, performing twice in dominant hand. All sessions done under supervision.

d) CON group continued normal daily routine.

**b)** WLK: 77.7 ± 3.0 mmHg to 75.9 ± 2.4 mmHg

c) IHG: 76.3 ± 3.3 mmHg to 73.9 ± 3.9 mmHg
Gradidge/2018/Moderate

**Inclusion criteria:**
- no diabetes or other chronic diseases.

**Determine the effect of walking on obesity. SBP was secondary measurement.**

- Randomized controlled trial, parallel, two group
- 115 employed women at a University in South Africa; mean age of 44.4 ± 11.5 years in CG; mean age of 37.4± 8.78 years in IG
- Exclusion: Pregnant, illiterate, or injured

**Randomly assigned to:**
- a) Intervention group (IG; walk at moderate intensity (5 to 5.5 km/hr; RPE score of 4 to 8/10) on treadmills for 30 minutes 3 days/week for 12 weeks while supervised)
- b) Control group (CG; no treatment)

**SBP, DBP, BMI. Sitting time and moderate-vigorous PA (MVPA) measured using Global Physical Activity Questionnaire (GPAQ).**

**SBP decreased -4.00 mmHg and DBP decreased -2.40 mmHg in IG. SBP and DBP increased in the CG (+5.00 and +5.00 mmHg respectively).**

- Increase in MVPA higher in IG (+193.5 min/week) versus CG (+25 min/week).
- Sitting time of CG increased by 120 min/day. No change in sitting time for IG.
- No DBP values were reported.

**Strengths:** ANCOVA; feasible intervention.

**Limitations:**
- Not all data reported in Table. Data that is reported in written section is not what is shown in the table. Attrition bias (12.8% attrition rate).
- The groups were different at baseline for SBP ($p=0.17$).

Perl/2016/High

**To evaluate if a structured educational program would decrease BP and increase adherence to**

- Crossover design. Randomly assigned to two groups: a) G-I (n=137) educational program immediately (T-0)

**SBP, DBP at T-6 for primary endpoint values.**

- Significantly reduced SBP in G-I at T-6 from T-0 ($P<0.01$).
- Significant difference in SBP between G-I and G-II at T-6 (139 (134-150)

**Strengths:** Similar baseline characteristics between groups. Statistically
| lifestyle modifications. Randomized controlled trial 183 patients from 13 centers. | b) G-II (n=119) educational program at 6 months (T-6) Follow up visits at T-6 and T-12 (after 12 months). | mmHg vs. 150 (135-165) mmHg; P < 0.01. DBP reduced, but not significantly, between the groups: T-0: G-I 80 (76-85) mmHg vs. G-II 84 (75-90) mmHg T-6: G-I 80 (75-85) mmHg vs. G-II 80 (76-89) mmHg. T-12: BP reduction was similar between G-I and G-II when both had completed intervention. G-I: SBP 134 (128-142) mmHg; DBP 80 (74-85) mmHg G-II: SBP 135 (130-142) mmHg; DBP 80 (74-86) mmHg. | significant results of intervention. Limitations: Antihypertensive drugs were changed throughout program, but researchers did not have control over this. |

**Note.** BMI = body mass index; CVD = cardiovascular disease; DBP = diastolic blood pressure; HBP = high blood pressure; HR = heart rate; HTN = hypertension; MVC = maximum voluntary contraction; PA = physical activity; RPE = rate of perceived exertion; SBP = systolic blood pressure; SMBP = self-monitoring of blood pressure; TPE = therapeutic patient education
APPENDIX G
AGREE II INSTRUMENT

How to assess the Quality (Methodological rigor and confidence in resulting Recommendations) of any Clinical Practice Guideline?

APPRAISAL OF GUIDELINES FOR RESEARCH & EVALUATION II (AGREE II) Instrument

**DOMAIN 1. SCOPE AND PURPOSE**
1. The overall objective(s) of the guideline is (are) specifically described.
2. The health question(s) covered by the guideline is (are) specifically described.
3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

**DOMAIN 2. STAKEHOLDER INVOLVEMENT**
4. The guideline development group includes individuals from all relevant professional groups.
5. The views and preferences of the target population (patients, public, etc.) have been sought.
6. The target users of the guideline are clearly defined.

**DOMAIN 3. RIGOUR OF DEVELOPMENT**
7. Systematic methods were used to search for evidence.
8. The criteria for selecting the evidence are clearly described.
9. The strengths and limitations of the body of evidence are clearly described.
10. The methods for formulating the recommendations are clearly described.
11. The health benefits, side effects, and risks have been considered in formulating the recommendations.
12. There is an explicit link between the recommendations and the supporting evidence.
13. The guideline has been externally reviewed by experts prior to its publication.
14. A procedure for updating the guideline is provided.

**DOMAIN 4. CLARITY OF PRESENTATION**
15. The recommendations are specific and unambiguous.
16. The different options for management of the condition or health issue are clearly presented.
17. Key recommendations are easily identifiable.

**DOMAIN 5. APPLICABILITY**
18. The guideline describes facilitators and barriers to its application.
19. The guideline provides advice and/or tools on how the recommendations can be put into practice.
20. The potential resource implications of applying the recommendations have been considered.
21. The guideline presents monitoring and/or auditing criteria.

**DOMAIN 6. EDITORIAL INDEPENDENCE**
22. The views of the funding body have not influenced the content of the guideline.
23. Competing interests of guideline development group members have been recorded and addressed.

**OVERALL GUIDELINE ASSESSMENT**
1. Rate the overall quality of this guideline.
2. I would recommend this guideline for use (Yes/Yes, with modifications/No)

**NOTES**

King Saud University Hospitals’ CPGs Program is supported by the Hospitals’ CPGs Committee and the Quality Management Department. KKUH/KAUH for more information please contact @ 91341, 91281 Email: yamer@ksu.edu.sa; dvillena@ksu.edu.sa

http://www.agreetrust.org/
APPENDIX H

CASP Checklist for Systematic Reviews

CASP Checklist: 10 questions to help you make sense of a Systematic Review

How to use this appraisal tool: Three broad issues need to be considered when appraising a systematic review study:

- Are the results of the study valid? (Section A)
- What are the results? (Section B)
- Will the results help locally? (Section C)

The 10 questions on the following pages are designed to help you think about these issues systematically. The first two questions are screening questions and can be answered quickly. If the answer to both is "yes", it is worth proceeding with the remaining questions. If there is some degree of overlap between the questions, you are asked to record a "yes", "no" or "can't tell" to most of the questions. A number of italicised prompts are given after each question. These are designed to remind you why the question is important. Record your reasons for your answers in the spaces provided.

About: These checklists were designed to be used as educational pedagogic tools, as part of a workshop setting, therefore we do not suggest a scoring system. The core CASP checklists (randomised controlled trial & systematic review) were based on JAMA 'Users' guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL, and Cook DJ), and piloted with health care practitioners.

For each new checklist, a group of experts were assembled to develop and pilot the checklist and the workshop format with which it would be used. Over the years overall adjustments have been made to the format, but a recent survey of checklist users reiterated that the basic format continues to be useful and appropriate.


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## Paper for appraisal and reference:

### Section A: Are the results of the review valid?

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>Can’t Tell</th>
<th>No</th>
<th>HINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did the review address a clearly focused question?</td>
<td></td>
<td></td>
<td></td>
<td>An issue can be ‘focused’ in terms of:</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>• the population studied</td>
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<td>• the intervention given</td>
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<tr>
<td></td>
<td></td>
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<td></td>
<td>• the outcome considered</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>Can’t Tell</th>
<th>No</th>
<th>HINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Did the authors look for the right type of papers?</td>
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<td></td>
<td></td>
<td>The best sort of studies’ would</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• address the review’s question</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>• have an appropriate study design</td>
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<td></td>
<td>(usually RCTs for papers evaluating interventions)</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
<td></td>
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</tbody>
</table>

### Is it worth continuing?

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>Can’t Tell</th>
<th>No</th>
<th>HINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Do you think all the important, relevant studies were included?</td>
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<td>Look for</td>
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<td></td>
<td>• which bibliographic databases were used</td>
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<td></td>
<td>• follow up from reference lists</td>
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<td></td>
<td>• personal contact with experts</td>
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<td>• unpublished as well as published studies</td>
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<td></td>
<td>• non-English language studies</td>
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<tr>
<td>Comments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Did the review’s authors do enough to assess quality of the included studies?

Yes  
Can’t Tell  
No

HINT: The authors need to consider the rigour of the studies they have identified. Lack of rigour may affect the studies’ results ("All that glitters is not gold" Merchant of Venice – Act II Scene 7)

Comments:

5. If the results of the review have been combined, was it reasonable to do so?

Yes  
Can’t Tell  
No

HINT: Consider whether
• results were similar from study to study
• results of all the included studies are clearly displayed
• results of different studies are similar
• reasons for any variations in results are discussed

Comments:

Section B: What are the results?

6. What are the overall results of the review?

HINT: Consider
• If you are clear about the review’s ‘bottom line’ results
• what these are (numerically if appropriate)
• how were the results expressed (NNT, odds ratio etc.)

Comments:
7. How precise are the results?  

HINT: Look at the confidence intervals, if given

Comments:

---

Section C: Will the results help locally?

8. Can the results be applied to the local population?

   Yes
   Can't Tell
   No

HINT: Consider whether
• the patients covered by the review could be sufficiently different to your population to cause concern
• your local setting is likely to differ much from that of the review

Comments:

---

9. Were all important outcomes considered?

   Yes
   Can't Tell
   No

HINT: Consider whether
• there is other information you would like to have seen

Comments:

---

10. Are the benefits worth the harms and costs?

   Yes
   Can't Tell
   No

HINT: Consider
• even if this is not addressed by the review, what do you think?

Comments:
APPENDIX I

CASP Checklist for RCTs

CASP Randomised Controlled Trial Standard Checklist:
11 questions to help you make sense of a randomised controlled trial (RCT)

Main issues for consideration: Several aspects need to be considered when appraising a randomised controlled trial:

- Is the basic study design valid for a randomised controlled trial? (Section A)
- Was the study methodologically sound? (Section B)
- What are the results? (Section C)
- Will the results help locally? (Section D)

The 11 questions in the checklist are designed to help you think about these aspects systematically.

How to use this appraisal tool: The first three questions (Section A) are screening questions about the validity of the basic study design and can be answered quickly. If, in light of your responses to Section A, you think the study design is valid, continue to Section B to assess whether the study was methodologically sound and if it is worth continuing with the appraisal by answering the remaining questions in Sections C and D.

Record ‘Yes’, ‘No’ or ‘Can’t tell’ in response to the questions. Prompts below all but one of the questions highlight the issues it is important to consider. Record the reasons for your answers in the space provided. As CASP checklists were designed to be used as educational/teaching tools in a workshop setting, we do not recommend using a scoring system.

About CASP Checklists: The CASP RCT checklist was originally based on JAMA Users’ guides to the medical literature 1994 (adapted from Guyatt GH, Sackett DL and Cook DJ), and piloted with healthcare practitioners. This version has been updated taking into account the CONSORT 2010 guideline (http://www.consort-statement.org/consort-2010, accessed 16 September 2020).

Citation: CASP recommends using the Harvard style, i.e. Critical Appraisal Skills Programme (2020). CASP [insert name of checklist i.e. Randomised Controlled Trial] Checklist. [online] Available at: insert URL. Accessed: insert date accessed.

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### Section A: Is the basic study design valid for a randomised controlled trial?

1. Did the study address a clearly focused research question?
   - **CONSIDER:**
     - Was the study designed to assess the outcomes of an intervention?
     - Is the research question 'focused' in terms of:
       - Population studied
       - Intervention given
       - Comparator chosen
       - Outcomes measured?

2. Was the assignment of participants to interventions randomised?
   - **CONSIDER:**
     - How was randomisation carried out? Was the method appropriate?
     - Was randomisation sufficient to eliminate systematic bias?
     - Was the allocation sequence concealed from investigators and participants?

3. Were all participants who entered the study accounted for at its conclusion?
   - **CONSIDER:**
     - Were losses to follow-up and exclusions after randomisation accounted for?
     - Were participants analysed in the study groups to which they were randomised (intention-to-treat analysis)?
     - Was the study stopped early? If so, what was the reason?

### Section B: Was the study methodologically sound?

4. Were the participants 'blind' to intervention they were given?
   - Were the investigators 'blind' to the intervention they were giving to participants?
   - Were the people assessing/analysing outcome/s 'blinded'?

5. Were the study groups similar at the start of the randomised controlled trial?
   - **CONSIDER:**
     - Were the baseline characteristics of each study group (e.g. age, sex, socio-economic group) clearly set out?
     - Were there any differences between the study groups that could affect the outcome/s?
### 6. Apart from the experimental intervention, did each study group receive the same level of care (that is, were they treated equally)?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Can’t tell</th>
</tr>
</thead>
</table>

**CONSIDER:**
- Was there a clearly defined study protocol?
- If any additional interventions were given (e.g. tests or treatments), were they similar between the study groups?
- Were the follow-up intervals the same for each study group?

### 7. Were the effects of intervention reported comprehensively?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Can’t tell</th>
</tr>
</thead>
</table>

**CONSIDER:**
- Was a power calculation undertaken?
- What outcomes were measured, and were they clearly specified?
- How were the results expressed? For binary outcomes, were relative and absolute effects reported?
- Were the results reported for each outcome in each study group at each follow-up interval?
- Was there any missing or incomplete data?
- Was there differential drop-out between the study groups that could affect the results?
- Were potential sources of bias identified?
- Which statistical tests were used?
- Were p values reported?

### 8. Was the precision of the estimate of the intervention or treatment effect reported?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Can’t tell</th>
</tr>
</thead>
</table>

**CONSIDER:**
- Were confidence intervals (CIs) reported?

### 9. Do the benefits of the experimental intervention outweigh the harms and costs?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Can’t tell</th>
</tr>
</thead>
</table>

**CONSIDER:**
- What was the size of the intervention or treatment effect?
- Were harms or unintended effects reported for each study group?
- Was a cost-effectiveness analysis undertaken? (Cost-effectiveness analysis allows a comparison to be made between different interventions used in the care of the same condition or problem.)
Section D: Will the results help locally?

10. Can the results be applied to your local population/in your context?

   CONSIDER:
   - Are the study participants similar to the people in your care?
   - Would any differences between your population and the study participants alter the outcomes reported in the study?
   - Are the outcomes important to your population?
   - Are there any outcomes you would have wanted information on that have not been studied or reported?
   - Are there any limitations of the study that would affect your decision?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Can't tell</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

11. Would the experimental intervention provide greater value to the people in your care than any of the existing interventions?

   CONSIDER:
   - What resources are needed to introduce this intervention taking into account time, finances, and skills development or training needs?
   - Are you able to disinvest resources in one or more existing interventions in order to be able to re-invest in the new intervention?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>Can't tell</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

APPRAISAL SUMMARY: Record key points from your critical appraisal in this box. What is your conclusion about the paper? Would you use it to change your practice or to recommend changes to care/interventions used by your organisation? Could you judiciously implement this intervention without delay?
### 2017 ACC/AHA Hypertension Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal BP</td>
<td>$&lt; 120 \text{ mmHg}$ and $&lt; 80 \text{ mmHg}$</td>
<td></td>
</tr>
<tr>
<td>Elevated BP</td>
<td>$120 - 129 \text{ mmHg}$ and $&lt; 80 \text{ mmHg}$</td>
<td></td>
</tr>
<tr>
<td>Stage 1 HTN</td>
<td>$130 - 139 \text{ mmHg}$ or $80 - 89 \text{ mmHg}$</td>
<td></td>
</tr>
<tr>
<td>Stage 2 HTN</td>
<td>$\geq 140 \text{ mmHg}$ or $\geq 90 \text{ mmHg}$</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Whelton et al., 2018
• **Target of aerobic exercise:** 90-150 minutes of moderate-intensity per week (Whelton et al. 2018)

• More recent suggest: 150-300 min/week of moderate-intensity OR 75-150 min/week of vigorous intensity OR combo of intensities for equivalent amount of time (Barnes Gibbs et al., 2011)

• Greatest reductions in SBP and DBP in a walking program:
  - Moderate intensity (-8.97 mmHg SBP, -5.75 mmHg DBP)
  - 3 times/week (-9.16 mmHg SBP, -5.55 mmHg DBP)
  - 8-11 weeks (9.12 mmHg SBP, -5.42 mmHg DBP)
  - (Lee & Choe, 2016)

• Walking significantly reduces SBP & DBP in both males and females. (Lee et al., 2011)

• Short bouts of walking to break up sedentary time reduces SBP and DBP significantly. (Dempsey et al., 2018)

• There is sustained reduction of SBP and DBP into evening hours with walking bouts to break up sedentary time during the day. (Dempsey et al., 2018)

• Use of pedometers significantly reduced SBP and increased PA time. (Chang et al., 2019; Lee et al., 2011)

• Education should include:
  - Pathophysiology & Consequences of HTN
  - SMBP
  - Importance of PA
  - (Barnason et al., 2017; Perl et al., 2016; Whelton et al., 2018)

• Follow-Up is essential for adherence. (Barnason et al., 2017; Whelton et al., 2018)
POPOPULATION OF INTEREST

- Adults aged 18 to 64 years
- Diagnosed with essential (primary) HTN: ICD-10 code I10
- Sedentary lifestyle or activity that does not meet the 2017 ACC/AHA guidelines of 90 to 150 minutes per week of moderate-intensity exercise
- Owns a smartphone
- Can be on hypertensive medications
  - If there are any changes in the hypertensive medication during the project, the participant is welcome to continue the program, but ATP will leave out their data in the project evaluation stage.

PROJECT SUMMARY

- **Walking program: Moderate-intensity Walking**
  - Weeks 1 & 2: Walking for at least 90 minutes per week
  - Weeks 3 and 4: Walk for at least 120 minutes per week
  - Weeks 5 through 8: Walk for at least 150 minutes per week

- **Pedometer**
  - Download free mobile application Pedometer & Step Counter (Version 2.0.0) for iPhone or Step Tracker – Pedometer Free & Calorie Tracker (Version 1.2.1) for Android

- **Education**
  - Pathophysiology and consequences of HTN
  - SMBP
  - Importance of PA
WHAT DEFINES MODERATE AND VIGOROUS INTENSITY WALKING?

- Estimated Maximum HR = 220 – (age in years)
- Moderate activity HR range (64%-76%):
  - Max. HR X 0.64 =
  - Max. HR X 0.76 =
- Vigorous activity HR range (77-93%):
  - Max. HR X 0.77 =
  - Max. HR X 0.93 =
  (CDC 2020)

PROJECT DESIGN

Recruitment:
- August 25-September 10, 2021
- Project Manager (AYP) will be recruiting 10-110 participants in the office at the conclusion of their scheduled visit.
- AYP will:
  - Briefly describe the project
  - Determine interest in participating
  - Obtain baseline BP and other demographic information
  - Educate the participant on the pathophysiology and consequences of HTN, how to take a proper BP at home, and the importance of PA.
**PROJECT DESIGN (CONTINUED)**

**Implementation:**
- Participation begins immediately after baseline visit and continues for 8 weeks for each participant.

**Measurements:**
- BP in office at baseline, 4 weeks, and 8 weeks.
  - Two readings, one minute apart will be averaged.
- Weekly Home BP²
- Minutes per week of moderate intensity walking⁶
- Daily Step Count⁸

---

**PEDOMETER & STEP COUNTER (VERSION 2.0.0)**

[Image of a mobile app application screen showing steps tracking and calorie count]
EDUCATION

- Education will be given verbally and using a handout.
  - I will write in the blanks on the "target heart rate range" box for participants to use as a reference.

- Please let me know if you have any suggestions regarding this handout.

- The focus of this project is decreasing BP and increasing physical activity time through walking. Therefore, the education on here is tailored to physical inactivity as it relates to hypertension.
- Project manager will provide her school email address for contact information about the project.
- At baseline visit, participant will schedule a nurse BP follow-up visit in the office at 4 weeks and 8 weeks from baseline.
  - Participant will be informed that a nurse visit for BP check is FREE.
  - AYP will perform these visits.

- Each participant will receive:
  - Daily Step Count and Weekly BP Log Sheet
  - Minutes Per Week of Moderate-Intensity Walking Log Sheet
  - Education Handout
  - Ideas for Walking & BP Measurement Locations Sheet
  - Informational Handout
- Excel Sheet on locked AYP Laptop will hold participant name and corresponding Participant Number.
- Demographic forms will be always kept with AYP in a folder. This form does not have identifying information; only participant number.
### Daily Steps and Weekly Blood Pressure Log Sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Step Count</th>
<th>BP (Sys/Dia)</th>
<th>Date</th>
<th>Step Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Week 1</td>
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<td>Week 2</td>
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<td>Week 3</td>
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<td>Week 4</td>
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<td>Week 6</td>
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<td>Week 7</td>
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<tr>
<td>Week 8</td>
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</table>

Note: Dia = diastolic, Sys = systolic blood pressure

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### Minutes Per Week of Moderate Intensity Walking Log Sheet

Instructions: Write the number of minutes you walked at a moderate intensity on whichever day you did it.

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**YOUR MODERATE-INTENSITY WALKING GOALS:**

- **Week 1:** At least 30 minutes during the week
- **Week 2:** At least 30 minutes during the week
- **Week 3:** At least 60 minutes during the week
- **Week 4:** At least 120 minutes during the week
- **Week 5:** At least 150 minutes during the week
- **Week 6:** At least 150 minutes during the week
- **Week 7:** At least 150 minutes during the week
- **Week 8:** At least 150 minutes during the week

Three 40-minute sessions per week
Three 20-minute sessions per week
Two 10-minute sessions per day or six
PARTICIPANT DEMOGRAPHIC INFORMATION

IDEAS FOR WALKING INSIDE & OUTSIDE
WHERE TO MEASURE BP

Idea for walking
For walking routes in Valparaiso visit
https://www.valparaiso.org/Health/Walking-Routes
- Window shop downtown Valparaiso or Outlet Mall in Michigan City
- Explore a new park!
- Check out the Prairie Parkland Bike Trail (paved and includes walkway)
- Old Fairgrounds Park has a walking track
- Dunes State Park/Indiana Dunes National Lakeshore

It is cold or rainy outside - where can I walk?
- Meijer
- Walmart
- Southlake Mall
- YMCA
- BeachWalk
- Dress in warm layers and walk outside!
Contact Info:

Ashleigh Peterson BSN, RN, ashleigh.peterson@valpo.edu

Please let me know if you have any questions, concerns, or suggestions!

Thank you so much for helping me help your patients reduce their BP!!
References


**APPENDIX K**

**Where can I take my blood pressure if I do not have a cuff at home?**

- CVS
- Walgreens
- Meijer (near the Pharmacy)
- Walmart (near the Pharmacy)
- YMCA

**Ideas for walking**

For walking routes in Valpo, visit:  
https://www.valpoparks.org/194/Walking-Routes

- Window shop downtown Valparaiso or Outlet Mall in Michigan City
- Explore a new park!
- Check out the Prairie Duneland Bike Trail (paved and includes walkers!)
- Old Fairgrounds Park has a walking track
- Dunes State Park/Indiana Dunes National Lakeshore

**It is cold or rainy outside – where can I walk?**

- Meijer
- Walmart
- Southlake Mall
- YMCA
- Treadmill
- Dress in warm layers and walk outside!
APPENDIX L

Walking is Worthy: Walking for Hypertension
Satisfaction Survey

I want to thank you again for participating in this evidence-based practice change project, Walking is Worthy: Walking for Hypertension. It is my hope that it has helped you reduce your blood pressure, and I encourage you to stay physically active to stay heart healthy!

Please fill out this satisfaction survey. Your feedback will be used to improve future walking programs and other initiatives to improve the care of patients within this practice.

Directions. Check the box that best answers the question.

<table>
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<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree or Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tr>
<td>1. I enjoyed this walking program.</td>
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<td>2. This program was easy to follow.</td>
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<td>3. I notice a difference in my health after completing this walking program.</td>
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<td>4. I plan to continue walking to reduce my blood pressure.</td>
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<td>5. I would recommend this program to a friend or family member.</td>
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Please write below if you have any comments.

Thank you!
## APPENDIX M

*Implementation Calendar*

| August 2021 | **August 25**: Begin recruitment of participants. Eight-week period begins as soon as participant is recruited.  
Project manager (AYP) will help participant schedule four-week and eight-week visits.  
Education given. Four handouts/log sheets given. AYP measures BP.  
AYP fills out demographic form for participant, and AYP will keep for records/data collection. |
|---|---|
| September 2021 | **September 8**: End recruitment of participants. Target numbers reached.  
Between **September 23** and **October 4**: Week four follow-up visit. AYP will take two BP measurements, five minutes apart, and average them.  
Education will be reinforced, and questions will be answered. |
| October 2021 | Between **October 22** and **November 4**: Week eight follow-up visit. AYP will take two BP measurements, 5 minutes apart, and average them. AYP will collect log sheets with data from participants. A satisfaction survey will be given to complete at this visit. |
| November 2021 | Final week eight follow-up visits. Develop codebook. |
APPENDIX N

Informational Handout for Participants in Evidence-Based Practice Project

Project Manager’s Name: Ashleigh Peterson BSN, RN | Valparaiso University DNP Student

Project Title: Walking is Worthy: Walking for Hypertension

INTRODUCTION

You are being asked to participate in an evidence-based practice project based on your provider’s recommendations. The purpose of this project is to examine how an 8-week walking program affects blood pressure and physical activity time in people who have high blood pressure. Strong research has shown that increasing your physical activity may reduce your blood pressure. If you do not understand any of the information provided on this form, please feel free to ask Ashleigh, the project manager, for clarification.

WHAT AM I BEING ASKED TO DO?

On day one (baseline day), you will have your blood pressure taken, receive education, and be given two log sheets and two handouts. Next, you will be asked to download a free mobile application to your smartphone, Pedometer & Step Counter (Version 2.0.0) for iPhones and Step Tracker – Pedometer Free & Calorie Tracker (Version 1.2.1) for Androids. This app will track the number of steps you take each day. You will be asked to record your steps at the end of every day, to record the number of minutes of moderate- or vigorous-intensity walking you do each week, and to record a weekly blood pressure measurement that you take at home or at a convenient location for you. You will be asked to come to the office for a nurse visit (this visit is free) at 4 weeks and at 8 weeks from your baseline day to get an in-office blood pressure measurement.

| Baseline Day | Blood pressure measured.  
|             | Demographic information collected.  
|             | Current number of minutes of physical activity recorded.  
|             | Education provided and 3 handouts/2 log sheets given.  
|             | Mobile app download.  
| 4 week Visit | Blood pressure measured.  
|             | Education reinforced.  
| 8 Week Visit | Blood pressure measured.  
|             | Two log sheets collected. (Daily Step Count; Minutes Per Week of Walking)  
|             | Satisfaction survey given.  

WHAT ARE MY RIGHTS AS A PARTICIPANT?

Your participation in this project is completely voluntary. You do not have to participate in this project if you do not want to, and you can decide to be done with the project at any time. Your choice whether or not to participate will not have any impact on the care you receive from your provider.

CONFIDENTIALITY

It is important to me to protect your confidentiality as a participant in my project. I will not share your name as a participant with anyone outside of this medical office. After my project is complete, I will be presenting the results in both an oral presentation and through written methods as required for my educational program. No names will be used in my presentations so your confidentiality as a participant will be protected.

If you have any questions, please email the project manager at ashleigh.peterson@valpo.edu.
This is to certify that:

**Ashleigh Peterson**

Has completed the following CITI Program course:

**Group 1: Social Behavioral Educational Researchers**
(Curriculum Group)

**Group 1: Social Behavioral Educational Researchers**
(Course Learner Group)

**1 - Basic Course**
(Stage)

Under requirements set by:

**Valparaiso University**

Verify at [www.citiprogram.org/verify/?w7484fe8d-da9d-4c69-8bdf-0471e8c3fbeb-36134680](http://www.citiprogram.org/verify/?w7484fe8d-da9d-4c69-8bdf-0471e8c3fbeb-36134680)
APPENDIX P

July 20, 2021

Franciscan Physician Network
Valparaiso Health Center
2421 Laporte Ave
Valparaiso, IN 46383

To whom it may concern,

The project manager has verified that her project, Walking is Worthy: Walking for Hypertension, does not require IRB approval at the Franciscan Physician Network Valparaiso Health Center. One of the site facilitators of this project, Dr. Eugene Lin, MD has confirmed that this project is an evidenced-based practice project and therefore does not require IRB approval.

Sincerely,

[Signature]

Ashleigh Peterson BSN, RN
Doctoral Nursing Student

[Signature]

Dr. Eugene Lin, MD
EBP Project Site Facilitator
APPENDIX Q

ACTION PLAN:
WALKING INTERVENTION FOR HYPERTENSION PATIENTS

STEP 1
Discuss BP categories with patient.

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<th>Systolic</th>
<th>Diastolic</th>
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<tbody>
<tr>
<td>Normal BP</td>
<td>&lt;120 mmHg</td>
<td>&lt;80 mmHg</td>
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<td>Elevated BP</td>
<td>120-129 mmHg</td>
<td>&lt;80 mmHg</td>
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<td>Stage 1 HTN</td>
<td>130-139 mmHg</td>
<td>or 80-89 mmHg</td>
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<td>Stage 2 HTN</td>
<td>≥140 mmHg</td>
<td>or ≥90 mmHg</td>
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Educate on HTN effects.
- Main contributor to heart disease, stroke, and kidney disease.
- Leading cause of death worldwide.
- Associated with increased risk of angina, HF, PAD, and AAA.

STEP 2
Recommend structured walking program with **goals** for minutes per week of moderate-intensity walking (MIW). Can increase to 150-300 minutes per week for increased health benefits.

**Minutes Per Week of Moderate Intensity Walking Log Sheet**

Instructions: Write the number of minutes you walked at a moderate intensity on whichever day you did it.

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**YOUR MODERATE-INTENSITY WALKING GOALS:**
- Week 1: at least 90 minutes during the week
- Week 2: at least 90 minutes during the week
- Week 3: at least 120 minutes during the week
- Week 4: at least 120 minutes during the week
- Week 5: at least 150 minutes during the week
- Week 6: at least 150 minutes during the week
- Week 7: at least 150 minutes during the week
- Week 8: at least 150 minutes during the week

STEP 3
Follow-up via MyChart message: patients send minutes per week of MIW data and BP at **one month, two months, six months, and one year**.