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The Impact of a Blood Pressure Reduction Program in Optimizing Control of Hypertension Amongst Adult Females in an Outpatient Ambulatory Clinic

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing Practice at the University of Kentucky

By

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Lexington, Kentucky

2023

Abstract

Background: Hypertension (HTN) is a public health problem that, when well-controlled, can significantly reduce the risk of stroke, coronary heart disease, heart failure and death. Effective patient-provider communication strongly incentivizes an improvement in medical outcomes. Communication with patients can often be effectively delegated to other clinical staff, such as registered nurses (RNs) or clinical service technicians (CSTs) (Tavakoly Sany, Behzhad, Ferns & Peyman, 2020).

Purpose: Given the increased risk of all-cause and cardiovascular disease mortality of uncontrolled HTN, the purpose of this study was to implement and evaluate a standardized, evidence-based practice intervention via communication between APRN providers and patients to aid in improving blood pressure control among female patients in an outpatient ambulatory clinic.

Conceptual Framework: The Iowa Model of Evidence-Based Practice was used as a conceptual framework to guide the implementation of this study.

Methodology: This was a quasi-experimental approach as the intervention of the Blood Pressure Reduction Program (BPRP) was implemented without the randomization of subjects into experimental versus nonexperimental groups. The first part of the study was a retrospective medical record review of approximately 60 patients' information regarding demographics, blood pressure readings, and evaluate the effectiveness of the intervention previously done by the CST. For the second part of the study, a single-armed pre-post study design was utilized to evaluate the effectiveness of a standardized intervention implemented on approximately 20 patients by the primary investigator (PI) (Brooke Englert, APRN). This design allowed for outcome criteria to

be measured before and after re-implementation of a standardized practice of care. All analysis was conducted using IBM SPSS version 28 with an alpha level of 0.5 used for the indication of statistical significance. Blood pressure readings pre- and post-implementation of the BPRP were analyzed using a paired t-test.

Results: There was a total of 60 patients included in the CST sample, and 20 patients in the APRN sample. All participants were female and the average ages between groups did not differ. In the CST follow-up sample, 50 out of 60 patients (83%) responded to the telephone call and reported their blood pressure readings, while 19 out of 20 patients (95%) responded in the APRN follow-up sample. While the reduction in systolic blood pressure was better in the APRN follow-up group, neither the absolute ($p = 0.59$) or percent ($p = 0.54$) change was statistically significant between samples. The absolute change in diastolic blood pressure measures in the CST sample was 6.9 mmHg (SD = 13.9) compared to 5.5 mmHg (SD = 8.7) in the APRN sample. The percent change in diastolic blood pressure measures in the CST sample was 7.0% (SD = 15.5%) compared to 5.9% (SD = 9.7%) in the APRN sample. Neither absolute or percent change in diastolic blood pressure was statistically significant with $p = 0.63$ and $p = 0.75$.

Conclusion: This study led to an overall improvement in blood pressure readings in both the CST and APRN follow-up groups. While the reduction in systolic blood pressure was better in the APRN follow-up group, the reduction in diastolic blood pressure was slightly better in the CST follow-up group. The results of this study illustrate the benefits of this program and its workflow in reducing the rates of uncontrolled hypertension within a shorter time frame than usual care. The potential to continue enhancing the control of hypertension can be achieved through a collaborative, evidence-based team approach.

Acknowledgements

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As members of my DNP committee, Dr. Beverly "Beth" Woods, Dr. Julianne Ewen and Dr. Deidra Beshear offered sound advice and were instrumental in the success of my project. As my clinical mentor, colleague and friend, I can't thank Dr. Deidra Beshear enough for her personal and professional guidance throughout this journey. She was a constant source of support and encouragement in my attempts to simultaneously juggle an often-overwhelming workload along with my DNP studies. My success throughout this program would not have been achieved without these powerful, invaluable women. Lastly, I'd like to acknowledge the DNP faculty. As professors, mentors and clinical preceptors, each and every one of them were vital in my professional growth. I truly cannot thank them enough.

Dedications

I would like to dedicate my Doctorate of Nursing Practice to my husband, mom and dad. There were times throughout the program that I doubted myself and my ability to continue on this journey. I wouldn't have persevered without their unwavering love, support and encouragement. For that, I will forever be grateful. I hope I can utilize all of the knowledge gained throughout this program to continue to make them proud in both my personal and professional life.

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The Impact of a Blood Pressure Reduction Program in Optimizing Control of Hypertension Amongst Adult Females in an Outpatient Ambulatory Clinic

Background and Significance

Hypertension (HTN) is a public health problem that affects more than one billion people worldwide and is known to be the major risk factor for worldwide cardiovascular disease morbidity and mortality (Kuhmmer et al, 2016; Zhou et al., 2018). Additionally, accounting for 17.3 million deaths per year, cardiovascular disease is the leading cause of deaths across the globe (Zhou et al., 2018). Unfortunately, this number is expected to increase to greater than 23.6 million deaths per year by 2030 (Zhou et al., 2018). The Centers for Disease Control and Prevention (2021) reports that nearly half (47%) of adults in the United States have HTN and approximately only 24% of adults with the diagnosis of HTN have their condition under control. This number has worsened when compared to 2016 as 48% of adults diagnosed with HTN were well-controlled at that time (Kronebusch & Rismeyer, 2020). Various studies have shown that reducing systolic blood pressure by 10-12 mmHg and/or diastolic blood pressure by 5-6 mmHg can significantly reduce the risk of stroke, coronary heart disease, heart failure and cardiovascular death (Kuhmmer et al, 2016). Aspects of care affecting the management and control of hypertension differ amongst gender. For females, a collaborative focus on obesity management, hormonal influences throughout menopause, and regularly scheduled office visits for management of other chronic diseases should be prioritized (Kim & Kim, 2020).

Evidence based interventions and strategies have been established and implemented to decrease the rates of uncontrolled HTN. Kronebusch & Rismeyer (2020) validate that prior studies implementing nurse-led interventions have been successful in improving blood pressure control. Communication with patients can often be effectively delegated to other clinical staff,

such as registered nurses (RNs) or clinical service technicians (CSTs). Effective patient-provider communication strongly correlates with an improvement in medical outcomes, patient health literacy, patient adherence and psychosocial support (Tavakoly Sany, Behzhad, Ferns & Peyman, 2020).

The University of Kentucky (UK) Internal Medicine – Women's Health clinic had previously implemented similar procedures where the CST contacted patients via phone whose in-office blood pressure reading was above goal approximately two weeks after their initial office visit to review home blood pressure readings and medication compliance. Unfortunately, this process was halted by lack of staff and resources amidst the COVID-19 pandemic. This led to the inability to evaluate the program's effectiveness in improving blood pressure control.

Purpose and Objectives

Given the increased risk of all-cause and cardiovascular disease mortality of uncontrolled HTN, the purpose of this study was to implement and evaluate an evidence-based practice intervention to aid in improving blood pressure control among female patients in an outpatient ambulatory clinic. This program was piloted amongst patients at the University of Kentucky (UK) Internal Medicine – Women's Health clinic who have the diagnosis of hypertension and whose most recent in-office blood pressure reading was above goal. The Blood Pressure Reduction Program (BPRP) adhered to the guidelines endorsed by the 2017 American College of Cardiology/ American Heart Association, which recommends blood pressure remaining less than 130/80 (American College of Cardiology, 2017). Through implementation of a Blood Pressure Reduction Program in the UK Internal Medicine – Women's Health clinic, the specific aims of this study are as follows:

1. Evaluate the effectiveness of the intervention previously done by the CST to determine if there was a positive outcome,
2. Evaluate the effectiveness of the reimplementation of a standardized intervention done by a health care provider (Brooke Englert, APRN) through February 2023 to determine if there was a positive outcome, and
3. Compare the outcomes and assess for differences between the interventions done by the CST versus an APRN.

Review of Literature

PICOT Question and Search Methods

A review was conducted to determine evidence-based literature supporting the implementation of an intervention to evaluate home blood pressure readings and medication compliance through the BPRP. Utilizing the PICO format, the question guiding the review was: Among adult females with uncontrolled hypertension in an outpatient primary care clinic, how has an RN or CST follow-up phone call aided in improving blood pressure control? PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) were utilized for this search with times limited to studies no older than 12 years. The main terms applied to the search were "*hypertension", "hypertension control", "phone call", "follow up", "nurse call", "nurse",* and "*blood pressure control."* Additional filters applied were peer reviewed articles in English.

Analysis and Synthesis of Evidence

Searches yielded anywhere from 12-157 relevant results. Studies that were retrieved included prospective cohort studies (Lu, Chen & Hsu, 2019), randomized controlled trials (RCTs) (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kuhmmer et al., 2016;

Tavakoly Sany et al., 2020), before-and-after pilot studies (Zwar et al., 2014) and quality improvement projects (Kronebusch & Rismeyer, 2020). These studies took place in various settings and locations around the world, including primary care offices, public health centers, and hospitals (academic medical centers, municipal hospitals, private community hospitals) in regions including Italy (Cicolini et al., 2014), Taiwan (Lu, Chen & Hsu, 2019), Australia (Zwar et al., 2014), Iran (Tavakoly Sany et al., 2020), Brazil (Kuhmmer et al., 2016), and the United States of America (Brennan et al., 2010; Hebert et al., 2011; Kronebusch & Rismeyer, 2020). Interventions varied throughout these studies and included telephone calls, patient educational materials, home telehealth care, email alerts/reminders, face-to-face nurse visits, and both patient and provider educational sessions and/or workshops regarding effective HTN management, as well as communication training (Tavakoly Sany et al., 2020). These interventions aimed at decreasing the length of time between follow-up visits, increasing patient and healthcare workers' knowledge regarding HTN management and its importance, and implementing frequent monitoring and reporting of home blood pressure readings to more promptly intervene and optimize HTN management (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kronebusch & Rismeyer, 2020; Kuhmmer et al., 2016; Lu, Chen & Hsu, 2019; Tavakoly Sany et al., 2020; Zwar et al., 2014).

Summary of Evidence

Overall, the goal of all of the studies reviewed was to improve blood pressure control (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kronebusch & Rismeyer, 2020; Kuhmmer et al., 2016; Lu, Chen & Hsu, 2019; Tavakoly Sany et al., 2020; Zwar et al., 2014). Other individual aims included increasing the frequency of self-monitoring (Brennan et al., 2010), and decreasing the negative impacts associated with increased cardiovascular risk. The

length of studies ranged from 6 months to 7 years. The majority of studies reviewed utilized nurse led programs via phone, email, telehealth or in-person to educate patients on HTN, counsel on diet and lifestyle, and promote more precise blood pressure monitoring (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kronebusch & Rismeyer, 2020; Kuhmmer et al., 2016; Lu, Chen & Hsu, 2019; Zwar et al., 2014). One RCT primarily focused on the importance of patient-provider communication and health literacy on improving self-efficacy and medication adherence in patients with uncontrolled blood pressure (Tavakoly Sany et al., 2020). Another study primarily focused on the different aspects of care affecting the management and control of hypertension amongst gender (Kim & Kim, 2020). Out of numerous studies reviewed, the majority of them did result in an improvement in blood pressure readings, some resulting in as much as 93% of patients reaching their blood pressure goal of < 140/90 (Kronebusch & Rismeyer, 2020). The majority of studies retrieved were randomized controlled trials which is considered the highest level of evidence. (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kuhmmer et al., 2016; Tavakoly Sany et al., 2020) with a few studies having level II evidence (Kronebusch & Rismeyer, 2020; Lu, Chen & Hsu, 2019; Zwar et al., 2014).

Current State, Desired State and Gaps in Practice

The UK Internal Medicine – Women's Health clinic does not currently utilize standardized phone, telehealth or in-person follow-ups by an RN or CST through a program or protocol such as the BPRP primarily due to time constraints, provider and/or staff availability, and a lack of employee knowledge regarding the benefits of these follow-ups in optimizing blood pressure control. The desired state in this clinic is that *all* providers will enroll eligible patients into this program so an RN or CST can initiate follow-ups to review home blood pressure readings and medication compliance. Current gaps in practice that may impact the optimization

of HTN control include patient compliance with self-monitoring of blood pressure readings at home, the ability for patients to obtain a blood pressure monitoring device, medication adherence and lack of education regarding the impacts of uncontrolled HTN. The implementation of an evidence-based program, such as the BPRP, will address these gaps and aid in improving blood pressure control hence decreasing cardiovascular risk and patient morbidity and mortality, as well as increasing patient and staff knowledge regarding the health impacts of uncontrolled HTN.

Theoretical/Conceptual Framework or Model

To guide the implementation of the Blood Pressure Reduction Program, the Iowa Model of Evidence-Based Practice was used as a conceptual framework (University of Iowa Healthcare, 2019). The Iowa Model facilitates changes in practice on evidence-based research findings. Throughout its detailed process, the Iowa Model focuses on organization and collaboration to promote excellence in patient outcomes (White and Spruce, 2015).

According to the University of Iowa Healthcare (2019), the first step of the model is to identify a triggering issue or opportunity for improvement and then state the question or purpose. If this topic is considered to be a priority, a team is formed to assemble, appraise and synthesize evidence-based research. If there is sufficient evidence, research is then conducted to design and pilot a change in practice. If this change is appropriate for adoption into practice, it is then integrated to sustain practice change. The outcomes of this evidence-based practice change are then disseminated to the appropriate individuals (University of Iowa Healthcare, 2019).

For this current study, the BPRP focused primarily on improving blood pressure control among female patients in the UK Internal Medicine – Women's Health clinic. Specifically, the impact of blood pressure control in reducing rates of cardiovascular disease morbidity and

mortality was based on the paradigms outlined by the developers of the Iowa Model of Evidence-Based Practice (University of Iowa Healthcare, 2019). Thus, by implementing the BPRP to improve blood pressure control, there should be an overall improvement in patient outcomes, as well as an improvement in patient satisfaction, through using the Iowa Model of Evidence-Based Practice.

Methodology

Design of the Study

This was a quasi-experimental approach as the intervention of the BPRP was implemented without the randomization of subjects into experimental versus nonexperimental groups. The first part of the study was a retrospective medical record review of approximately 60 patients to evaluate the effectiveness of the intervention previously done by the CST. For the second part of the study, a single-armed pre-post study design was utilized to evaluate the effectiveness of this standardized intervention implemented for approximately 20 patients by the PI (Brooke Englert, APRN) as this design allowed for outcome criteria to be measured before and after re-implementation of a standardized practice of care.

Setting

Agency Description

This study took place at the UK Internal Medicine – Women's Health clinic in Lexington, Kentucky. This ambulatory primary care clinic is part of the UK Healthcare system and provides comprehensive and preventative care to female adults aged 18 and older. There are six providers consisting of four physicians and two advanced-practice nurses. The Women's Health clinic has approximately nine clinical support staff consisting of five certified medical assistants/clinical service technicians and three patient relations associates.

Congruence of Project to Agency's Mission/Goals/Strategic Plan

The implemented trial of the BPRP directly aligned with the mission, vision and values of UK Healthcare. The anticipated outcome of improving blood pressure control amongst study participants exemplified UK Healthcare's commitment of improving patient-centered care, supporting innovative research to drive positive change, and creating a healthier Kentucky (UK Healthcare, n.d.). UK Healthcare utilizes APRNs across the enterprise to collaborate with physicians in all specialties and provide quality care in both acute-care and outpatient, ambulatory care settings. The quality of care that APRNs provide is individualized to each patient and is exceptionally valuable to UK Healthcare (UK Healthcare, 2023).

Description of Stakeholders

There were seven key stakeholders pertinent to this study: patients/study participants, my DNP committee members (Dr. Julie Marfell, Dr. Julianne Ewen, Dr. Beverly "Beth" Woods, and Dr. Deidra Beshear), the Women's Health clinical support staff, the providers, the medical director, the Internal Medicine practice manager(s), and the Chief of the Department of Internal Medicine.

The patients were the consumer stakeholders directly impacted by this process change. Their willingness to participate and actively engage in the BPRP was directly related to the program's success. Additionally, they were the principal source of data collection by providing their home blood pressure readings. The APRN/PI, as a professional stakeholder, was the primary data collector throughout the implementation of the BPRP. This included being the key source of contact for patients enrolled in this program, and included the responsibility for phone follow ups as well as documenting and disseminating this information to other healthcare providers, when applicable. The APRN, along with the medical director, served as the key

supervisor of the BPRP and was one of the main professional stakeholders for this program. This included working with the other Women's Health providers (including the primary care providers of the patients enrolled in the BPRP) in reviewing the participants' home blood pressure readings and making any applicable pharmacologic changes in blood pressure management. The medical director was the primary administrative stakeholder and shared the responsibility with the APRN/PI as the key supervisor of the BPRP and as a committee member. Additionally, as the direct supervisor of clinic operations, the medical director served as a resource for all Women's Health providers and staff. The medical director and the practice manager are vital administrative stakeholders, are the primary sources for data retrieval from quality improvement performance measurements for outpatient care, and disseminate findings from the BPRP to the Department of Internal Medicine to increase the potential for the growth of program implementation in other outpatient clinics.

Potential Facilitators and Barriers to Implementation

The implementation of the BPRP at the UK Women's Health clinic aligns with the mission, vision and values of UK Healthcare. Additionally, both leadership and staff are committed and motivated to making changes within this clinic to promote patient satisfaction and improve optimal health outcomes. This program primarily utilized current staff and resources, so factors such as space and money did not pose as barriers. The main barriers to the implementation of the BPRP included patient compliance with self-monitoring of blood pressure readings at home, the ability for patients to obtain or afford a blood pressure monitoring device, time constraints and provider/patient availability.

Sample

Part one of the study reviewed data obtained by the CST between September 2020 to June 2021 from approximately 60 female patients at the UK Internal Medicine – Women's Health clinic aged 19-84 with uncontrolled HTN. In reviewing this data, there was a lack of structure in when and how blood pressure readings were obtained. There was also a lack of follow up in patients whose home blood pressure readings remained above goal.

The population for the second part of this study was female adults identified with uncontrolled HTN. A purposive sample of 20 patients was chosen to participate in the study. The inclusion criteria were female patients at the UK Internal Medicine – Women's Health clinic aged 19-84 who were able to effectively communicate in English, have the diagnosis of HTN, and whose most recent in-office blood pressure reading was above goal. The BPRP adhered to the guidelines endorsed by the 2017 American College of Cardiology/ American Heart Association, which recommends blood pressure remaining less than 130/80 (American College of Cardiology, 2017). Exclusion criteria for participation in the BPRP included: any female patient 85 years or older, any patient whose HTN is managed by a specialist (i.e. Cardiology, Nephrology), and/or any patient whose HTN management is complicated by multiple co-morbidities, such as chronic or end-stage renal disease, renal artery stenosis, obstructive sleep apnea, adrenal gland tumors, etc. No exclusion was made on racial/ethnic groups.

Procedure

IRB Submission Process

The UK Medical Institutional Review Board (IRB) completed an expedited review and approved the BPRP. Support was obtained from the medical director of the UK Internal Medicine – Women's Health clinic prior to IRB submission to demonstrate organizational

backing and facilitate approval. All data and results from this study were constructed on de-identified chart records obtained from the UK medical records and informational technology (IT) departments. All patient information was stored on password and firewall protected, encrypted computers linked to UK servers.

Description of Evidence-Based Intervention

Based on an integrative review of the literature, this evidence-based intervention was developed with the aim of improving blood pressure control (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kronebusch & Rismeyer, 2020; Kuhmmer et al., 2016; Lu, Chen & Hsu, 2019; Zwar et al., 2014). The first part of this study utilized previously acquired data collected by the CST from September 2020 to June 2021. This data was stored on an Excel spreadsheet on a password and firewall protected, encrypted desktop computer in the Internal Medicine - Women's Health clinic office previously collected by the medical director and a prior medical assistant for the office's internal records. This data was accessed after confirmation of IRB approval and HIPAA waiver. After IRB approval, the PI reviewed the Excel spreadsheet and accessed the medical record to obtain additional data. Subjects chosen were patients of all providers in the Women's Health clinic.

The second part of this study involved one subset of patients in the UK Internal Medicine – Women's Health clinic. These subjects were patients seen routinely by the PI. The primary investigator reached out to eligible patients and invited them to participate in the study at the time of their in-office visit. After enrollment and informed consent was obtained, each participant was contacted via phone or telehealth approximately two weeks after their initial office visit to review home blood pressure readings and medication compliance. Follow-ups occurred approximately every 2-4 weeks based on improvement of blood pressure readings until

each individual participant's goal had been achieved. This portion of the study took approximately 4 months.

Measures and Instruments (refer to Appendix 1)

The first part of this study utilized previously acquired data collected by the CST from September 2020 to June 2021 to obtain the medical record number, blood pressure readings (initial and subsequent) and the following demographic measures of all participants: age and ethnicity. This data was stored on an Excel spreadsheet on a password and firewall protected, encrypted desktop computer in the Internal Medicine - Women's Health clinic office. The second part of this study utilized the electronic medical record to obtain the medical record number, blood pressure readings (initial and subsequent) and the following demographic measures of all participants: age and ethnicity. The main outcome measure for this study of home blood pressure readings obtained by a biomedical instrument (sphygmomanometer) was documented into the patients' electronic medical record and saved onto a master Excel spreadsheet.

Data Collection (refer to Appendix 1)

Primary patient data within the UK Women's Health clinic was obtained from the electronic medical record, Epic. After the implementation of the BPRP, the PI utilized Epic to record each patient's deidentified data based on inclusion and exclusion criteria. Blood pressure readings from patients immediately prior to implementation of the intervention and at each follow-up were obtained. Throughout the program, the complete set of patient data (demographics and blood pressure readings) who are included in the study was maintained in an Excel spreadsheet. One spreadsheet included the patient's medical record number and associated study number which was saved as "DNP Project" and stored on the PI's password and firewall

protected, encrypted laptop computer linked to UK servers which was in sole custody of the PI and locked when not in use. At the conclusion of the study, all data was deidentified by exchanging each medical record number with an assigned study number. A second Excel spreadsheet included each participant's study number and study data. This was saved as "DNP Project – deidentified" on an Excel spreadsheet and entered into an electronic database for analysis. The medical record number and other patient identifiers were not recorded as part of the study database. All data was then transferred to the SPSS data analysis software.

Data Analysis (refer to Appendix 1)

The use of means or modal substitutions addressed any missing data for continuous or categorical variables. The use of descriptive statistics (i.e. means with standard deviations or frequencies with percentages) was utilized to describe the sample's demographic distribution. All analysis was conducted using IBM SPSS version 28 with an alpha level of 0.5 used for the indication of statistical significance. Blood pressure readings pre- and post-implementation of the BPRP was analyzed using a paired t-test as this is one of the most appropriate methods to analyze before and after comparison for continuous variables.

Results

Demographics

There was a total of 60 patients included in the CST sample, and 20 patients in the APRN sample. All participants were female. The average ages between groups did not differ. In the CST sample, the mean age was 62.4 years (SD = 12.6) compared to 60.1 years (SD = 11.0) in the APRN sample. In both groups, the majority were white, non-Hispanic (70.0% vs. 80.0%, respectively; see Table A1).

Findings

In the CST follow-up sample, 50 out of 60 patients (83%) responded to the telephone call and reported their blood pressure readings, while 19 out of 20 patients (95%) responded in the APRN follow-up sample. The absolute change in systolic blood pressure measures in the CST sample was 12.0 mmHg (SD = 16.7) compared to 14.3 mmHg (SD = 12.7) in the APRN sample. The percent change in systolic blood pressure measures in the CST sample was 7.7% (SD = 10.9%) compared to 9.4% (SD = 8.3%) in the APRN sample. While the reduction in systolic blood pressure was better in the APRN follow-up group, neither the absolute ($p = 0.59$) or percent ($p = 0.54$) change was statistically significant between samples. Conversely, the reduction in diastolic blood pressure was slightly better in the CST follow-up group. The absolute change in diastolic blood pressure measures in the CST sample was 6.9 mmHg (SD = 13.9) compared to 5.5 mmHg (SD = 8.7) in the APRN sample, which was not statistically significant ($p = 0.63$). The percent change in diastolic blood pressure measures in the CST sample was 7.0% (SD = 15.5%) compared to 5.9% (SD = 9.7%) in the APRN sample. This was also not statistically significant ($p = 0.75$) (see Table A2 and Figure B1).

Discussion

Hypertension is an exceptionally common public health problem that, when well-controlled, can significantly reduce the risk of adverse cardiac-associated morbidity and mortality. The primary purpose of this study was to implement and evaluate a standardized, evidence-based practice intervention via communication between APRN providers and patients to aid in improving blood pressure control among female patients in an outpatient ambulatory clinic. Additionally, this study also aimed to compare the outcomes and assess for differences between the interventions previously done by the CST versus the APRN.

Based on the guidelines endorsed by the 2017 American College of Cardiology/ American Heart Association, which recommends blood pressure remaining less than 130/80 (American College of Cardiology, 2017), approximately 15.8% of patients in the APRN sample and 25% of patients in the CST sample achieved their goal. Approximately 89.5% of patients in the APRN sample, however, achieved the goal of their blood pressure remaining less than 140/90 within 2-4 weeks, on average, when compared to 60% of patients in the CST sample (see Figure B1).

The interventions of this study aligned with the intentions of prior studies. In addition to the aim of improving blood pressure control, similar studies have led to a decreased length of time between follow-up visits, as well as the implementation of more frequent monitoring and reporting of home blood pressure readings to more promptly intervene and optimize HTN management (Brennan et al., 2010; Cicolini et al., 2014; Hebert et al., 2011; Kronebusch & Rismeyer, 2020; Kuhmmer et al., 2016; Lu, Chen & Hsu, 2019; Tavakoly Sany et al., 2020; Zwar et al., 2014). Brennan et al. (2010) supports that increasing the frequency of self-monitoring leads to a decrease in the negative impacts of uncontrolled hypertension and its associated increase in cardiovascular risk.

A previous randomized controlled trial primarily focused on the importance of patient-provider communication on improving self-efficacy and medication adherence in patients with uncontrolled blood pressure (Tavakoly Sany et al., 2020). Effective patient-provider communication strongly incentivizes an improvement in medical outcomes. When comparing the level of responsive amongst the CST and APRN follow-up samples, there was a 12% increase in patient response to the APRN when compared to the CST. The APRN made, on average, one to two phone calls to contact patients for their blood pressure readings. The APRN

left a voicemail after the first attempt, which led to the majority of patients submitting their blood pressure readings either through a returned phone call or secure message via the electronic health record within 24-48 hours. The noted increase in patient responsiveness may be due to the rapport created amongst each patient and the APRN as their primary care provider.

This study led to an overall improvement in blood pressure readings in both the CST and APRN follow-up groups. While the reduction in systolic blood pressure was better in the APRN follow-up group, the reduction in diastolic blood pressure was slightly better in the CST follow-up group. Neither change was statistically significant between samples. Although the improvement in blood pressure readings was similar between the CST and APRN samples, it did appear that the CST had to make multiple attempts over a longer period of time to gather this data. This could lead to a delay in the patient meeting with their healthcare provider to initiate pharmacologic therapy, or any other indicated interventions, to optimize management of their hypertension.

Implications for Practice, Education, Policy and Research

The findings in this study have important implications for future research to further explore both effective and efficient ways to promote a modest reduction in blood pressure and subsequently reduce the risk of stroke, coronary heart disease, heart failure and cardiovascular death. It is recommended that this study be replicated in a more stream-lined process with a larger, more inclusive sample. Prior research conducted by Tavakoly Sany, Behzhad, Ferns & Peyman (2020) supports that communication with patients can often be effectively delegated to other clinical support staff. The medical support staff (i.e. medical assistants) in the Women's Health clinic currently only measure blood pressure during the process of rooming patients and document these readings into the electronic health record. It is the provider's responsibility to

review the blood pressure readings and discuss the management plan with the patient. Kronebusch & Rismeyer (2020) found that including RNs or CSTs who have a particular passion for chronic disease management, however, may enhance both patient and staff satisfaction when they are able to work directly with patients on lifestyle management and goal setting to promote sustainable behavioral changes. Conducting a cost-effectiveness analysis will help determine if the time spent by the APRN is particularly valuable if this process can be effectively and more efficiently delegated to medical support staff, particularly given the improvement in blood pressure readings was similar between the CST and APRN samples (see Figure B1).

There is great potential for this type of program to be utilized with other chronic diseases. Collaborative and evidence-based care strategies similar to those utilized in the Blood Pressure Reduction Program have the aptitude to improve not only the control of hypertension, but other conditions such as diabetes and heart failure. Expanding the workflow of this blood pressure reduction program should be explored and measured for its effectiveness in optimizing the management of other chronic diseases.

Limitations

This study did have a few limitations. The sample size amongst the APRN sample group was small (n=19). Additionally, this program only included patients who were female. A larger sample size and the inclusion of males may have led to different results. Similar to previous studies, another limitation was the initial variability in blood pressure readings. Some patients had blood pressure readings much closer to goal at enrollment, while others needed a substantial reduction in blood pressure readings to achieve their goal. As previously mentioned, approximately 15.8% of patients in the APRN sample achieved the goal of their blood pressure remaining less than 130/80. When, however, considering the variability of blood pressure

readings at the time of enrollment and the consideration of when to initiate or adjust pharmacologic management (i.e. antihypertensives) based on recommendations from the American College of Cardiology (2017), the rate of patients who achieved a goal of their blood pressure remaining less than 140/90 increased exponentially to 89.5% (see Figure B1).

Conclusion

The results of this study illustrate the benefits of this program and a standardized two week follow up in reducing the rates of uncontrolled hypertension within a shorter time frame than usual care. Prior studies have supported the potential to continue enhancing not only the control of hypertension, but other chronic diseases, through a collaborative, evidence-based team approach (Kronebusch & Rismeyer, 2020). This process may also lead to an improvement in overall satisfaction by enhancing the effectiveness of communication between patients and their healthcare providers and staff. Although this study did show an increase in patient responsiveness in the APRN follow-up group, future studies that involve the conduction of a cost-effectiveness analysis will help determine if the time spent by the APRN is particularly valuable. Subsequent research will better ascertain if this process can be effectively and more efficiently delegated to medical support staff (i.e. RN and/or CST).

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Table 1. *Comparison of demographic characteristics between CST and APRN follow-up*

	CST follow-up (n = 60)	APRN follow-up (n = 20)	p
Age, mean (SD)	62.4 (12.6)	60.1 (11.0)	.47
Race/ethnicity, *n* (%)			.46
White, non-Hispanic	42 (70.0%)	16 (80.0%)	
Black, non-Hispanic	16 (26.7%)	3 (15.0%)	
Asian	1 (1.7%)	1 (5.0%)	
Hispanic	1 (1.7%)	0 (0.0%)	

Table 2. *Changes in blood pressure measures between CST and APRN follow-up*

	CST follow-up (n = 50) mean (SD)	APRN follow-up (n = 19) mean (SD)	p
Absolute change in systolic mmHg	12.0 (16.7)	14.3 (12.7)	.59
Percent change in systolic mmHg	7.7% (10.9)	9.4% (8.3)	.54
Absolute change in diastolic mmHg	6.9 (13.9)	5.5 (8.7)	.63
Percent change in diastolic mmHg	7.0% (15.5)	5.9% (9.7)	.75

Figure 1.

Data comparison between CST and APRN follow-up