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Home Blood Pressure Monitoring Bundle for Hypertension Outcomes in Adult Patients Receiving Care in Public Health Clinics

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Abstract

Background: Hypertension (HTN) that is not adequately controlled leads to cardiovascular disease, stroke, and heart disease. It affects 116 million adults (47%) in the United States (U.S.). The HTN compliance rate in a South Texas public health clinic was 64%, below the national benchmark of 76%. Home blood pressure monitoring (HBPM) was recommended in a joint statement by the American Heart Association (AHA) and the American Medical Association (AMA). Literature evidence revealed that the HBPM bundle increased BP control (<140/90 mmHg) compliance.

Methods: A quality improvement (QI) bundle was initiated to address the low HTN compliance rate from a quality management perspective. The bundle consisted of HBPM, an antihypertension medication algorithm, lifestyle education, and a hypertension wallet card for patients to document their home blood pressure readings. Twenty participants, 15 females and 5 males, diagnosed with HTN received the HBPM bundle during the eight-week project. Two BP readings were collected pre-HBPM bundled, after eight weeks of intervention, two BP were taken post-HBPM bundles.

Results: Participants were 18 years and older with an average age of 54.6; the convenience sample comprised 75% females and 25% males, with the majority being African American (AA). The results showed that both pre-HBPM and post-HBPM bundle Systolic BP (SBP) and Diastolic BP (DBP) differences were significant with *p* values <.001 and <.027., respectively.

Conclusion: HBPM bundled significantly improved HTN adequately controlled <140/90 mm Hg for adult patients diagnosed with HTN in a public health center.

Keywords: adults, hypertension, uncontrolled BP, home HBPM, interventions, HTN wallet cards, vulnerable population, self-monitoring BP, and remote monitoring BP.

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Hypertension (HTN) is blood pressure (BP) greater or equal to 140/90 millimeters of mercury (mm Hg) (Centers for Disease Control and Prevention [CDC], 2022). A normal BP level is less than 120/80 mm Hg. Age, family history, lifestyle, race, and lower socioeconomic are risk factors that cause HTN (National Heart, Lung, and Blood Institute, 2022). HTN that is not adequately controlled can lead to cardiovascular disease, stroke, and chronic kidney disease (Tucker et al., 2017).

Hypertension affects 116 million adults (47%) in the United States (U.S.), and of those, only one out of four people have their BP under control (CDC, 2022). The CDC (2022) reports that HTN was a primary or contributing cause of over 690,000 U.S. deaths in 2021, and the total annual cost of uncontrolled HTN, defined as greater than 140/90 mm Hg, was $131 million. Statewide, 32.2% of adults in Texas had HTN, ranking 24th among the 50 states (American Health Rankings, 2023). Additional analysis of specific risk factors revealed that African Americans had the highest proportion (43.1%) of HTN. Adults with some post-high school (38.6%) and those over 65 years old (61.2%) were two groups that commonly experienced HTN. A greater proportion of men (35.3%) compared to women (29.2%) were also at risk. People with lower income, less than $25,000 annually, had the highest prevalence of HTN (American Health Rankings, 2023). Similar to state level data, HTN, known as the silent killer, impacted 28.8% of adults locally in one Southeast Texas county in 2019, with a greater proportion within the aged 65-plus population (Houston State of Health, 2023). African Americans had the highest prevalence at 39.6% compared to people from other races (Houston State of Health, 2023).

One local Texas organization's quality metric for HTN measured adequately controlled compliance rates for adult patients ages 18 years and older diagnosed with HTN. The compliance rate was 64% in the primary clinics, below the national goal of 76% (A. Russell, personal communication, May 5, 2023; National Committee for Healthcare Quality, 2023) (see Appendix A). Adequately controlled HTN was defined as < 140/90 mm Hg, and the national goal was based on the Quality Compass benchmarks (National Committee for Healthcare Quality, 2023). The prevalence rates among vulnerable populations served at this facility were 48.8% for African Americans and 36.2% for people who identify as Hispanic (A. Russell, personal communication, May 5, 2023). Heart disease, stroke, and chronic kidney disease were the primary causes of death for patients diagnosed with HTN at the facility. A quality improvement project that implemented a home blood pressure monitoring (HBPM) bundle in addressing the problem improved patients' adequately controlled HTN outcomes and reduced risks to their long-term health.

Literature Review

A search strategy for evidence included using multiple databases (Reavy, 2016). The five databases searched were Cochrane, Medline, PubMed, Multidisciplinary Digital Publishing Institute (MDPI), and Cumulative Index of Nursing and Allied Health (CINAHL). These databases supported disciplines for medicine, nursing, and pharmacy. Keywords were adults, hypertension, uncontrolled BP, home HBPM, interventions, HTN wallet cards, vulnerable population, self-monitoring BP, and remote monitoring BP. The search yielded 95 articles. Of those, eleven studies were relevant and answered the PICOTS question. The eleven articles included six randomized clinical trials (RCT), two systematic reviews, two meta-analyses, and one qualitative study (see Appendix B).

The American Heart Association (AHA) and American Medical Association (AMA) 2017 joint statement recommended self-monitoring blood pressure (SMBP) or HBPM for adults diagnosed with HTN (Whelton & Carey, 2018). Ostchega et al. (2017) found that 16.7% of adults completed HBPM monthly or more. A review of the literature examined HBPM's impact on improving uncontrolled hypertension. Though AHA and AMA recommended HBPM, the literature supported the inclusion of co-interventions with that approach (Aekplakorn et al., 2016; Bryant et al., 2020; Egan et al., 2018; Margolis et al., 2018; McManus et al., 2018; Sheppard et al., 2020; Tucker et al., 2017). The evidence revealed themes for a variety of co-interventions, such as telemonitoring, pharmacist-led medication management protocol, physician-led, or nurse-led patient education with lifestyle counseling, and HTN wallet card (see Appendix C). Thus, HBPM intervention for this project consisted of implementing an HBPM bundle that included formulary medication algorithms, patient education, and issuing a HTN wallet card.

HBPM Bundle

Generally, SMBP was used synonymously with HBPM and defined as monitoring BP outside the clinical setting, usually at home (Tucker et al., 2017). The researchers targeted adult patients with BP >140/90 mm Hg in the outpatient primary care setting. In several studies, the population, diagnosis, and setting were similar (Egan et al., 2018; Hanlin et al., 2018; Margolis et al., 2018; Meador et al., 2021). Earlier systematic review studies conducted by Tucker et al. (2017) demonstrated that patients tolerated self-monitoring well. Margolis and colleagues' work with HBPM validated the effectiveness up to 18 months post-implementation in improving uncontrolled BP compared to usual care (UC). Similarly, Egan et al. (2018) and Hanlin et al. (2018) used the elements to measure accurately, act rapidly, and partner with patient (MAP)

intervention. This intervention included partnering with patients to use HBPM to increase better BP control.

The effectiveness of HBPM in improving uncontrolled HTN was in combination with other co-interventions (Egan et al., 2018; Margolis et al., 2018; Tucker et al., 2017). Researchers used telemedicine HBPM with pharmacist-led, nurse-led, or automated reminders (Margolis et al., 2018; Tucker et al., 2017). Margolis et al. (2018) incorporated pharmacists' contacts in their home BP telemonitoring intervention. The pharmacists applied antihypertensive medication protocols and discussed adherence to lifestyle counseling. In Tucker et al.'s 2017 systematic review, the trials with telemedicine had physician-led, pharmacist-led, or nurse-led management integrated with the intervention or automation. However, Egan et al. (2018) study did not incorporate telemedicine, the intervention used MAP. MAP involved staff training for accurately measuring BP and acting rapidly to escalate antihypertensive medication protocol integrated with patients' HBPM. Hanlin et al. (2018) integrated MAP as the study framework for improving BP control. Tsuyuki et al. (2015) combined pharmacist-led physicians' collaboration for an antihypertensive medication management protocol. Dymek et al. (2019) study was also a pharmacist-led physician collaboration.

Education increased awareness of the control of HTN as a strategy to decrease uncontrolled BP for the healthcare team and patients (Carey et al., 2018). Staff received training on accurately measuring patients' BP based on the protocol in Egan et al.'s (2018) MAP intervention. Patients received education on HTN control, medication management, lifestyle counseling and nutrition, HBPM, and HTN wallet cards (Egan et al., 2018; Margolis et al., 2018; Tsuyuki et al., (2015); Tucker et al., 2017).

Research studies established the effectiveness of the HBPM bundle for improving uncontrolled BP and outcomes. The RCT by Tsuyuki et al. (2015) to improve BP control by primary care teams was pharmacist-led. The researchers bundled intervention comprised patient education on HTN, antihypertensive medication prescription, pharmacist contact for six months, wallet cards for recording, and written BP information. The percentage of patients who attained the recommended goal BP was significantly greater in the treatment group than in the UC group (raw rate, 58% in the intervention group compared to 37% in the usual care group; $p = 0.02$) (Tsuyuki et al., 2015).

Overall, the HBPM bundle had positive results for adult patients with uncontrolled BP in outpatient primary care settings compared to UC (Egan et al., 2018; Margolis et al., 2018; Tucker et al., 2017). Egan et al. (2018) found that HTN control increased from 64.4% to 74.3% ($p < 0.0001$ in 16,787 patients with HTN). The average difference in SBP change between the treatment group and the UC group in the Margolis et al. (2018) study was -10.7 mm Hg, 95% CI, [-14.3 to -7.3 mm Hg] from baseline to 6 months ($p < 0.001$). Self-monitoring with intensive co-interventions reduced clinic BP; SBP -3.2 mm Hg, 95% CI [-4.9 to -1.6 mm Hg] & DBP -1.5 mm Hg, 95% CI [-2.2 to -0.8 mm Hg] (Tucker et al., 2017). Results established better outcomes for improving uncontrolled HTN in adult vulnerable populations in outpatient primary clinics than in UC only. MAP was effective in increasing BP control in African Americans as in White adults with HTN (Egan et al., 2018).

Before implementing the HBPM bundle in practice, the following limitations and recommendations were considered based on the research studies in practice. Limitations found that the population was primarily White adults in the Egan et al. (2018) RCT, 83% in Margolis et al. (2018), and in McManus et al., (2018). In addition, 10.5% of the participants in McManus et

al., were African American and 0.4% Hispanic. Other studies by Aekplakorn et al. (2016), Bryant et al. (2020), Meador et al. (2021), Tsuyuki et al. (2015), and Tucker et al. (2017) did not specified race but did include men and women. These studies' implementation periods were six months. Different considerations were required when implementing an eight-week project. Bryant et al. and Margolis et al. recommended additional studies to determine the content, intensity, and duration of support needed for maintaining intervention benefits greater than six months. Programs need an ongoing evaluation for effectiveness, be interpreted cautiously, and provide further consideration with self-monitoring for patients with comorbidities (Margolis et al., 2018; McManus et al., 2020; Tsuyuki et al., 2015; Tucker et al., 2017).

Project Question

Does HBPM bundle improve systolic and diastolic blood pressure (BP) adequately controlled compliance rate of adult patients diagnosed with HTN in an outpatient setting in a public clinic?

Objectives

The project focused on increasing adequately controlled outcomes from performance compliance at 64% for adult patients diagnosed with HTN from a quality management perspective guided by the following objectives:

1. Facilitated a multidisciplinary team encompassing primary care clinical team, care coordination, pharmacy services, and quality.
2. Educated the team on their specific individual roles.
3. Implemented the HBPM bundle (home BP, formulary med algorithm, HTN wallet card, education).
4. Provided BP machines to patients who need them.

5. Collected data.
6. Analyzed data.
7. Wrote reports and provided them to stakeholders.

Framework

The Plan-Do-Study-Act cycle (PDSA) framework was generally used in QI (Melnyk & Fineout-Overholt, 2019). As a framework, PDSA provided the basis for testing the effectiveness of planned change in obtaining a desired outcome. PDSA's cyclic approach integrated testing and re-testing for continuous improvement (see Appendix D). The four steps of the PDSA model are an iterative process of building, refining, and improving, making it an ideal framework for the DNP QI project (Christoff, 2018).

Plan is the first stage of the PDSA cycle (Melnyk & Fineout-Overholt, 2019). In this stage, the DNP student proposed a plan to implement the HBPM bundle to address the uncontrolled HTN gap in a primary care setting. HTN, left unchanged, leads to stroke, cardiovascular disease, or death (CDC, 2022).

The *Do* stage followed, and the trial period started, testing out the change on a small scale. Although the organization had 16 primary care clinics, only one served as the DNP QI pilot project setting. The pilot allowed testing the effectiveness of the HBPM bundle before replicating it in other clinics.

Study is the third stage focused on analyzing the data collected during the change and determining what was learned about the impact of the change. The Tableau dashboard provided data analyses during the DNP project. The fourth stage, *ACT,* was when the elements of the change were refined based on what was learned and tested, and the cycle repeated. Results from the project were disseminated to the stakeholders.

Methods

The project to improve the compliance rate for patients with uncontrolled HTN in a public primary care clinic using an HBPM bundle was a quality improvement (QI) project. The organization's compliance rate for adequately controlled HTN was 64%, below the national goal of 76% (A. Russell, personal communication, May 5, 2023). The QI project HBPM bundle was piloted in a lower-performing clinic. The goal was to improve the outcome in eight weeks using a multidisciplinary team.

SWOT analysis in project planning was the strengths, weaknesses, opportunities, and threats for successful completion (Reavy, 2016). The core team brainstormed to complete the SWOT analysis and identified potential risks (see Appendix E). There were five strengths and opportunities, four weaknesses, and three threats. The weaknesses and threats identified in the SWOT analysis were populated in the risk management tool with strategies to mitigate the risks to the DNP project (see Appendix F). Reavy (2016) recommended risk management before implementation and developing a plan to minimize the impact on the project's success. The core team completed the ABARIS Consulting Incorporated organizational change readiness assessment to determine the project facility's readiness to change (see Appendix G). The organizational assessment score was 71; a 50 or higher meant the organization was ready to change (C. Plonien, personal communication, March 19, 2023). The DNP student lead was the enabler in improving the organization’s readiness for change if the score was less than 50.

It is vital to manage a project's budget and have a plan of estimated costs before project implementation (Reavy, 2016). The financial risk to the DNP project was minimal because the remote monitoring budget was approved by the organization for the project (see Appendix H). When implementing the DNP project, a key element was a document to plan and share the

project details for stakeholders and process owners (Terharr & Crickman, 2021). The Gantt chart was a project management tool used by the DNP student. It delineated the activities, responsible persons, and a timeframe to meet the project milestones (see Appendix I).

Population

Predominantly, the community project clinic consisted of the vulnerable population, socioeconomically disadvantaged, and racial minorities, African American and Hispanic. There were small percentages of White, and Asian adult men and women were the identified population who speak English. (A. Russell, personal communication, May 5, 2023). The average age was 54 with uncontrolled HTN (A. Russell, personal communication, May 5, 2023). About 1,800 patients had uncontrolled HTN, and a sample size of 20 participants was followed for the intervention pilot. The participants' inclusion criteria for the QI project comprised African American, Hispanic, White, and Asian adult men and women 18 and older. The eligible age was based on the NCQA definition for patients with uncontrolled HTN. Finally, the participants were patients with two clinic visits with a primary care provider in the measuring timeframe. Exclusions included patients with BP adequately controlled, children, and adolescents.

Setting

The QI project setting was a public primary care clinic in Southeast Texas surrounding a large metropolitan city. It was part of an integrated healthcare system with two hospitals and several community primary care and pediatric clinics. The clinic offered patient-centered medical home care for adults, adolescents, and pediatrics. Laboratory, pharmacy, diagnostics for mammography, and x-ray services were onsite for patients' convenience. On average, the project clinic provided services for an estimated 3,000 patients diagnosed with HTN annually (O. Jennings, personal communication, May 5, 2023). Clinic leadership comprised a medical

director, a nurse manager, and an operations manager. An estimated 50 qualified licensed practitioners (physicians, nurse practitioners, physician assistants, registered nurses, and licensed vocational nurses) comprised the workforce (L. Barson, personal communication, May 5, 2023). Ancillary staff includes pharmacists, population healthcare, and social workers within the project setting. Health education and other social services were available for primary care patients.

Measurement and Analysis

Data collection included the outcome variables for the HBPM bundle documented in the EHR. The outcome variables included were systolic and diastolic BP, BP rechecks and documentation, one or more antihypertensive medications or adjustments, referral to remote BP monitoring, provision, and education of the HTN wallet cards, and lifestyle (see Appendix J). The DNP student collected the BP readings the nurses obtained using an automated BP device, the Omron HEM-907XL. Age, race, gender, and BP uncontrolled > 140/90 mm Hg were part of the data collection. A de-identification coding process ensured the participants' privacy and confidentiality. The DNP student project lead assigned the master code using A= 05, B = 06, …, Z=31 for initials, and then MAP1, MAP2, …, for participant assigned number. Therefore, the prefix for the patients were the numbers of their initials followed by the assigned MAP1, MAP2, ..., to the last participant. Only the DNP student was responsible and accountable for this process. Furthermore, the DNP student maintained the participant's anonymity by encrypting the participants associated with the coded identification master list (see Appendix K).

Data were collected retrospectively from the EHR at the end of each week by the DNP student and entered manually into the database on an Excel spreadsheet. The data collected remained password-protected on a computer at the DNP student's work in a locked office. The DNP student retrieved data from the HER, which has a multifactor authentication process. The

process required a password change every 90 days. Based on the uncontrolled HTN database, the DNP student analyzed the data according to the statistician recommendations and DNP student input. Subsequently, data outcomes reflected the different variables as aggregated data to ensure participants' anonymity.

The Omron HEM-907XL BP machine was used to measure the participants' BP during the clinic visit with the primary care provider. The nurses documented the readings in the vital sign flowsheet in the EHR. Ostchega et al. (2009) assessed the validity of the Omron HEM-907XL with the gold standard mercury sphygmomanometer for BP, a physiological measure. BP readings were compared in 509 individuals using the 2002 Association for the Advancement of Medical Instrumentation (AAMI) criteria. The Omron device met the validity of the AAMI criteria except for the diastole in the participants' 13-19 years group (Ostchega et al., 2009). The kappa accuracy was k = 0.68 above chance for HTN > 140/90 mm Hg (Ostchega et al., 2009). Concurrent readings obtained by two technicians were significantly and highly correlated for both systolic BP (SBP) and diastolic BP (DBP) readings (systolic, r=0.99; diastolic, r=0.96 [P<.0001]) (Ostchega et al., 2009). The BP devices are calibrated annually by the biomedical department.

The Omron HEM-907XL was a digital upper-arm electronic BP monitor designed to be used in a clinical setting. The article was free to access and does not require permission. Still, the DNP student requested permission from the author to reuse the article (see Appendix L) and appropriately cited it in the references. The manufacturer listed the device as reliable and valid as it met the AAMI standards, the European Society of Hypertension International Protocol (ESH-IP), and the British Hypertension Society (BSH) (see Appendix M).

Procedure (Intervention or Change or Process)

The organization supported the DNP student bundle proposal (see Appendix N). The DNP student QI project, from a quality management perspective, was rolled out in three phases to foster a successful implementation (see Appendix O). The following steps were implemented for the project:

1. Week one: Education Phase
    a. The DNP student educated the multidisciplinary core team during the first week. During that time, the DNP student coordinated the meetings and training via WebEx and onsite and directed the team based on the delineated education phase.
    b. The DNP student provided oversight and collaboration with core team members for training the clinical staff in preparation for the execution phase as outlined in the education plan.
2. The DNP student reaffirmed the clinic's primary care leadership triad's commitment during week one.
3. Week two to week nine: Execution Phase
    a. At the start of week two, the DNP student, core team, and frontline staff met in the onsite meeting room for verification that all core personnel and equipment were ready for the participant’s arrival and to implement the HBPM bundle.
    b. When the participants arrived at the project setting, nursing obtained the participants’ BP following the MAP process and documented the results in the EHR vital signs flowsheet. Participants received instructions on voiding,

sitting with feet on the floor, arms to heart level, and not moving or talking when an automated BP machine was used.

c. The nurses rechecked BP >140/90 and documented the results in the EHR on the vital sign flowsheets in a new column to capture a second reading.
d. Nurses flagged the charts for participants with two BP >140/90 and notified the providers. The participants were placed in the exam room in preparation for the providers' visits.
e. During the visit, the providers discussed with the participants with two BPs > 140/90 about the HBPM for better control and clicked the referral in the participants' medical records.
f. The providers used the formulary-based medication algorithm to determine medication management based on comorbidities. The provider documented medication management, adherence, and lifestyle education provided to the participants in the EMR.
g. At discharge, the nurses instructed the participants on the HTN wallet cards to record BP and return them on subsequent visits. The nurses documented provision and education in the EHR.
h. The participants met the care coordinator in the classroom to receive, learn, and demonstrate how to use the BP machines and their phones to report BP daily. The care coordinator documented in the EHR including the provision of contact information and materials to all participants.

i. The DNP student observed the execution phase during week two of implementation. The clinic leadership also provided support during the course of the QI project to ensure that the frontline team was following the processes.

j. The DNP student scheduled meetings every week with the core team and stakeholders for feedback, determined any barriers, and provided solutions to mitigate risks to the project during the eight weeks.

4. Monitoring Phase

   a. At the end of each week of the project, the DNP student used the Tableau dashboard to evaluate the progress of the QI project and followed this process to week nine.

   b. The DNP student collected and utilized the data in the EHR to determine documentation of BP rechecks, clinicians' HBPM referrals, medication management, and patients' recording and reporting of BPs. Each participant's pre-HBPM bundle of systolic and diastolic BPs was collected as identified.

   c. During the QI project, clinicians accessed individual scores as trained during education at the end of each month.

   d. The triad leadership was able to access the entire clinic's performance at the end of each month.

Statistical Analysis

The national benchmark for adequately controlled BP at the 75th percentile was 76%, and the clinic's current performance was 56% (A. Russell, personal communications, May 5, 2022). The DNP student, assisted by a statistician, used the Statistical Package for the Social Sciences (SPSS) V. 29 for the DNP project. BP readings, the outcome variable, were measured for

participants diagnosed with uncontrolled HTN with BP >140/90 mm Hg. An average of two uncontrolled HTN readings represented the baseline. Next was the implementation of the HBPM bundle: HBPM, formulary-based medication algorithm, education, and HTN wallet card. Then, the same group of participants' BP readings were measured again to determine if uncontrolled BP outcomes improved over eight weeks. As a result, the single group of participants experienced the pretest, intervention, and posttest to serve as their control (Grove & Cipher, 2020). The project lead applied descriptive statistics to the outcome variables and for the sample characteristics such as age and gender to determine frequencies and percentages (Grove & Cipher, 2020).

The DNP student project leader, assisted by a statistician, used the paired sample *t*-test statistical procedure for data analysis. Test and retest terminology computed the variations between two sets of data repeated using a single group (Grove & Cipher, 2020). The paired sample *t*-test is a statistical approach used commonly in healthcare research (Jankowski et al., 2018; Liang et al., 2019). Included for the DNP project paired t-test measurements were the participants, baseline BP scores or pretest scores for systolic and diastolic, postintervention BP scores or posttest scores for systolic and diastolic, and the differences (see Appendix P). A *p*-value of less than 0.05 applied to the difference determined the significance of the intervention on the outcome. The initial BP scores were collected in September 2023 and then repeated at the end of each week for eight weeks during implementation.

Ethical Considerations

An essential component of the proposal was the ethical considerations for human subjects. The DNP student completed Human Subject Protection training (see Appendix Q). In addition, the DNP student obtained approval to implement the project from the Graduate Nursing

Review Committee (GNRC), authorized by the University Institutional Review Board (IRB) for protecting human subjects. The DNP project was implemented once the GNRC gave approval (see Appendix R). Likewise, the project facility IRB supported the protection of human subjects and reviewed the DNP student's project, determining the project proposal was not human subjects research (see Appendix S). The organization Quality Programs approved the project proposal as a QI project (see Appendix T).

Results

Project Outcomes

There were 20 participants, 15 females (75%) and five males, with a mean age of 54.6 years (see Appendix U). Almost two-thirds (70%) were between 45 – 69 years. All enrolled participants (100%) had documentation of adherence to medication management and anti-hypertension medications. These participants (100%) had completed enrollment documented in the EMR. Most participants (90%) had their medications adjusted during the implementation phase. Participants who did not have documented medications adjusted were two (10%). Education on lifestyle was 100%, and the HTN wallet card returned BP readings at 95%. Only one (5%) participant had no documentation that they shared their home BP readings with their clinicians. The attrition rate was 5%, with one participant having no documented home BP readings in the EMR, while the participation rate was 95%. Participants in the DNP bundle project had their pre- and post-BP rechecked was 20 (100%).

The statistician Dr. Kao conducted a paired sample *t*-test statistical analysis (SPSS V.29) (see Appendix V). The mean systolic blood pressure of the project participants was 154.30 mm Hg (*SD* =7.892) pre-HBPM bundle. The mean diastolic blood pressure of the project participants was 86.45 mm Hg (*SD* = 6.977) pre-HBPM bundle. The difference between the pre-HBPM SBP

and post-HBPM SBP was p <.001. The mean diastolic blood pressure of the project participants was 135.05 (*SD* = 9.976) post-HBPM bundle, and the mean diastolic blood pressure of the project participants was 82.58 mm Hg (*SD* = 7.990). At the same time, the difference between the pre-HBPM DBP and post-HBPM DBP was p <.027. The level of significance was set at alpha = 0.05 for the DNP project.

Discussion

The project provided support that HBPM bundled with medication adjustment, using an antihypertensive algorithm, education on lifestyle, and HTN wallet cards with BP readings available to the clinicians had statistical significance. Therefore, HBPM improved BP outcomes for participants in the project. Put another way, the HBPM bundle project, from a quality management perspective, improved systolic and diastolic BP outcomes in adult participants in the primary public clinic (see Appendix W). Participants' systolic blood pressures were significantly more controlled post-HBPM bundle (*p* <.001) than pre-HBPM. Participants' diastolic blood pressures were significantly more controlled post-HBPM bundle (*p* <.027) compared with diastolic blood pressure pre-HBPM. The findings agreed with studies in the literature review that an HBPM bundle intervention improves BP outcomes for adult patients diagnosed with HTN.

The HBPM bundle project participants' races that emerged were African Americans (60%) and Hispanic (40%) over the eight-week intervention course. Due to the three weeks enrollment, low percentages of whites and Asian accessing the project site, and the small project sample size of the first 20 enrolled participants, they were no whites and Asians in the sample (see Appendix X). The organization decided to expand the project after the outcome of the pilot. Funding was available to offer HBPM to patients who met the criteria to participate. Patients

who had two blood pressure readings > 140/90 mm Hg were referred to the HBPM program. The care management team enrolled participants in the HBPM and the clinical team adopted the program in practice.

Summary

Key Findings

Several strengths were identified for the project. The HBPM bundle project had leadership support at both the executive and local clinics. Furthermore, the population health team supplied blood pressure equipment for the participants to support HBPM. All participants had two visits with the primary care clinicians, established patients, and not previously on HBPM. Finally, the project included a multidisciplinary team that combined local and system. Nursing staff and clinicians, including physicians and advanced practice nurses, received education and training regarding project expectations. In addition, the clinic had adequate staffing to engage safely in the HBPM bundle project. The organization continued the HBPM bundle with a plan to grow throughout the ambulatory primary care clinics based on funding. While the DNP project pilot measured only the participants who enrolled in the program during the first three weeks, it did not address patients who refused to enroll. Strategies should be developed based on the root causes of refusal, such as lack of transportation and limited time for participation. In addition, one clinician did not think there was value in the program and, therefore, did not refer their patients to participate. Future implications for the project require the engagement of participants and clinicians for those who refuse to participate.

Limitations

One limitation was the DNP lead had eight weeks to conduct the project. While there were significant improvements based on the *p-value* in both systolic and diastolic blood

pressures, a more extended period would be required to determine the sustainability of the BP outcome over time.

Another limitation was inconsistency in the number of home BP readings documented by the participants. Further analysis might provide the answer if participants with three or more documented home BP readings available to clinicians had better outcomes compared to those who had two or fewer readings.

A third limitation was that the clinic participants' community was primarily African American and Hispanic and may only generalize for part of the population. Finally, the project pilot consisted of twenty participants to test the change in the HBPM project. The clinic had 1800 patients who were diagnosed with uncontrolled HTN.

Conclusion

Uncontrolled HTN can lead to heart disease, stroke, and chronic kidney disease. The HBPM bundle quality improvement project provided value-added information about integrating the HBPM bundle into the practice. From a quality management perspective, the QI project answered the QI question that the HBPM bundle improved BP control in adult participants 18 years and older diagnosed with HTN. There was a statistically significant improvement in blood pressure control within eight weeks. However, sustainability, after eight weeks, still needs to be determined, and it will require an extended project in the future. The implications for the practice include the importance of educating the patients about monitoring their blood pressure at home and using the HBPM bundle in HTN management to improve outcomes. Furthermore, the project findings could potentially be useful in practices with African American and Hispanic populations diagnosed with HTN.

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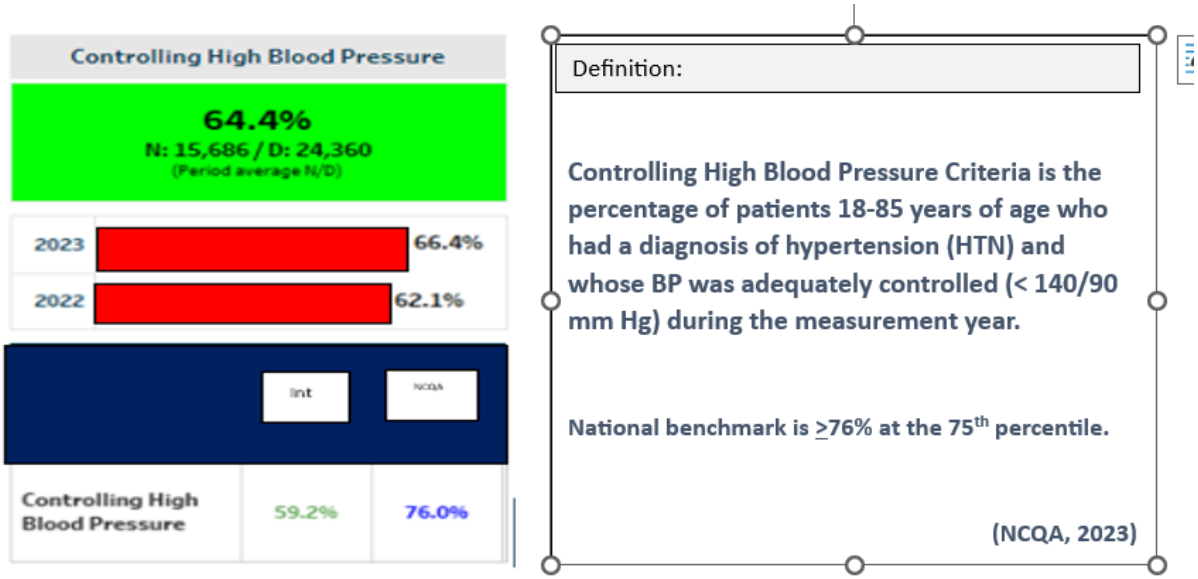
Appendix A

Controlling High Blood Pressure



Note: Adapted from Compass Quality Benchmark and Compare Quality Data, by the National Committee for Healthcare Quality [NCQA], 2023 (https://www.ncqa.org/grams/data-and-Information-technology/data-purchase-and-licensing/quality-compass/)

Appendix B

Evidence Table for Home Blood Pressure Monitoring Bundle

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
1	Aekplakorn et al. (2016)	RCT & to examine the effectiveness of (SMBP) in a randomized controlled trial with 12 months FU visit in CH Variables- DV: changes in BP & efficacy. IV: SMBP	Adult with HTN <35 years & in primary care setting & *n*=224	SMBP, PL MM, LC, NLE	Omron model HEM-7117, Kyoto, Japan BP records	Homogenous intervention & UC group. Decreased BP SMBP by 2.5 mm Hg and UC by 1.2 mm Hg, respectively. ≥60 years SMBP group decreased by 8.9 mm Hg	Strengths: RCT, homogenous groups, reduction of BP in both SMBP/UC. Findings explained. Limitations: Small sample, unavailable medication details at FU. Low adherence completion (Aekplakorn et al., 2016).	Evidence Level I & Quality Rating A	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
2	Bryant et al. (2020)	RCT & aim to estimate the probability of antihypertensive intensification at 12 months for usual care versus SMBP. Variables- DV: increased antihypertensive intensification & BP control. IV: SMBP with or without TM or SM	Adult with average age 66.6 years with HTN in primary care setting & *n*=2,590	SMBP, TM or SM (self-titration of meds)	BP Control Model (BPCM)	Increased intensification simulated (IS) BP control 12 months and 5 years in phase 1 & 2. SMBP achieved 33.9% IS & SMBP with TM or SM achieved 39.0% 12 months. To 5 years 52.4% and 72.1%, respectively	Strengths: RCT, multiple trials, predicted to 5 years, intervention increased with phases. BPCM was a good predictor of clinical inertia. Limitations: to hypertension processes that may be simulated in BPCM. Manual calibration of adherence in BPCM. BPCM assumes process of HTN are independent of each other. Limited long-term data are available (Bryant et al., 2020).	Evidence Level I & Quality Rating A	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
3	Dymek et al. (2019)	RCT & aim to assess pharmacy led education Variables: DV-pharmacy-led education IV: Knowledge and HBPM skills	Adults 29-86 (59) & healthcare facility pharmacy & *n* =14	Pharmacist-led education	Semi-automated BP monitors. Tests (3)	An average 7.36 points increase in knowledge and 5.14 points increase in skills. A significant increase between test 1 and 2 (<0.001) after education	Strengths: Planned education, interviews, and observation provided by one educator. Thus, increasing reliability. Compliant with health education forms. Setting provided privacy and discretion Limitations: Small sample size of 14 patients with attrition of one ending the study with 13.	Evidence Level I & Quality rating is B- high quality	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
4	Egan et al. (2018)	Quasi experimental & pre- versus poststudy design Variables: DV – BP control IV: measure accurately, act rapidly, SMBP	Adults 18-85 years with HTN with at least one OV & 16 diverse community - based Family medicine clinics setting & *n* =16,787	MAP	Monthly dashboard report for physicians & staff on their performance with BP control	Hypertension control increased from 64.4% to 74.3% (P<0.0001 in 16, 787 patients with HTN) Recommendation: Future MAP studies will aim to further enhance hypertension control from 6 to 12 months and beyond (Egan et al., 2017)	Strengths: Cost effective, improved control rate sustained at 6 & 12 months. MAP was adaptable by AHA/AMA Limitations: Mainly White adults in study; 20% did not have a visit in 6 months, baseline BP was done in clinic rather than AOBP. LTF.	Evidence Level II & Quality ratings is A – high quality.	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
5	Hanlin et al. (2018)	Quasi-experimental pre vs post study design & aimed to improve HTN control in clinic of underserved patients & variables: DV: HTN control IV: MAP	Adults 18-85 with diagnosed HTN & single site OP clinic for underserved patients Sample size *n*=908 eligible patients	MAP	Omron HEM-907XL – AOBP Score card for resident	Clinical & statistical improvement with BP control improved from 61.2% to 89.9% (P < .0001) in 714 HTN patients in 6 months. Recommendation to assess both short & long-term effective of MAP in diverse population clinic	Strengths: Evidenced-based framework, objectively measured outcomes using automated BP, appropriate statistical tests, compared results with other QI for HTN. Limitations: Single site, non-protocol BP as baseline, most likely black with diabetes, & clinical inertia was already low <50 (Hanlin, et al., 2018).	Evidence Level II & Quality rating is B – high quality.	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
6	Margolis et al. (2018)	RCT & Aim to examine intervention durability from implementation to 54 months to compare with other research and clinical UC & Variables: DV: BP control on SBP and DBP IV: HBPM/TM; 54 months	Adults with uncontrolled HTN & PCC setting & sample size *n* = 450	HBPM, TM-EHR, CPL & AMP, LC, N	Automated blood pressure machines	The mean differences in SBP change between the TI group and the UC group were −10.7 mm Hg (95% CI, −14.3 to −7.3 mm Hg) from baseline to 6 months ($p <$ .001), −9.7 mm Hg (95% CI, −13.4 to −6.0 mm Hg) from baseline to 12 months ($p <$ .001), and −6.6 mm Hg (95% CI, −10.7 to −2.5 mm Hg) from baseline to 18 months ($p =$ .004) (Margolis et al., 2018).	Strengths: Random sampling and assigned to T1 or UC. Significant difference of improvement in SBP and DBP at 6 & 18 months Limitations: Patients from T1 and UC did not complete 54-month f/u. No significant improvement in SBP/DBP at 54 months. Recommendations: More work is needed to determine the content, intensity, and duration of reinforcement over a longer period (Margolis et al., 2018)	Evidence Level I & Quality rating is B- high quality	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
7	McManus et al. (2018)	RCT & aimed to assess the efficacy of self-monitored blood pressure, with or without telemonitoring, for antihypertensive titration in primary care, compared with usual care McManus et al. (2018). & Variables: DV: BP control on SBP & antihypertensive titration IV: SMBP; TM	Adults >35 years with uncontrolled HTN >140/90 & general practice setting & sample size *n* = 1182	SMBP, SMBP with TM, MM	Omron M10-IT; Omron Healthcare Europe, Hoofddorp, Netherlands	After 12 months, mean systolic blood pressure (measured independently in a clinic setting) was lower in both intervention groups: self-monitoring (137·0 [SD 16·7] mm Hg) and telemonitoring (136·0 [16·1] mm Hg) compared with clinic monitoring (140·4 [16·5] mm Hg) p=0.0029 & p<0.001, respectively (McManus et al., 2018). Long-term study follow-up recommended.	Strengths: RCT, equal male to female, accurately powered, sensitivity analysis to lower biases results. Limitations: Unmasked RCT; White male, limit generalization; increased participants withdrawal over time, (McManus et al., 2018).	Evidence Level I & Quality rating is B- high quality	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
8	Meador et al. (2021)	Qualitative & aimed to increase the use of SMBP through the coordinated action of health department leaders, community organizations and clinical providers (Meador et al., 2021). Variables: DV – increase SMBP IV: Collaborative Care model SMBP	Adults 18 and older years with uncontrolled HTN & community health centers & *n* = 9 with	Collaborative care models SMBP	BP monitors, blue-toothed BP app monitors	Nine health centers developed SMBP programs, eight were collaborative; 1421 patients with uncontrolled HTN enrolled; 795 successfully completed; 308 referrals to additional community programs. National support to increase SMBP, reimbursement, & EHR integration (Meador et al., 2021)	Strengths: Clinical, community, & public health collaborative. Quantitative and qualitative data collected. Limitations: Different collaborative SMBP approaches	Evidence level: III & Quality Rating: C	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
9	Sheppard et al. (2020)	Systematic with meta-analysis & aimed is study examined whether self-monitoring could reduce clinic BP in patients with HTN-related co-morbidity. (Sheppard et al., 2020). Variables: DV – decrease BP IV: SMBP; low/high intensity co-interventions	Adults 18 and older years with uncontrolled HTN & community health centers & n = 6,522 in 16 studies	SMBP; SM, CPL, PE, LC	Data synthesis/analysis	On an average: self-monitoring reduced clinic BP by 3.11/1.49 mm Hg (SBP/DBP). There was a significant interaction between the effect of SM & intervention intensity in pts. s with obesity (p= <0.001) Recommendation: Interpret results with caution. More studies to measure intensity of co-interventions on individual comorbidity (Sheppard et al., 2020).	Strengths: Largest study with IPD with related co-morbidity; powered; sensitivity analysis for missing data. Minor impact of variation in overall results due to randomization of the studies Limitations: Not all studies included comorbidities – underrepresented, one study showed increased BP on SMBP. Absolute results variation	Evidence level: I & Quality Rating: A	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
10	Tsuyuki et al. (2015)	RCT & aimed to study the impact of pharmacist prescribing on blood pressure (BP) control in community-dwelling patients & variables: DV: BP control meeting CHEP guidelines IV: CPL, AMP, WC for BPR, WE, LC	Adult patients OP with uncontrolled HTN > 140/90 & Community pharmacies, OP clinics, & PCC settings & Sample size *n*=248 eligible patients enrolled	CPL, AMP, WC for BPR, WE, LC	Automated BpTRU & Life Source UA-787 home BP monitor	The proportion of patients achieving CHEP-recommended target BP was also significantly higher in the intervention than in the usual care group (crude rate, 58% in the intervention group versus 37% in the usual care group; P=0.02) with an adjusted odds ratio of 2.32 (95% confidence interval, 1.17–4.15) Recommendation was ongoing evaluation of these programs is encouraged. (Tsuyuki et al., 2015).	Strengths: RCT, Objectively measured outcomes using automated BP, setting included community increasing generalization. Internal/external validity addressed. Limitations: Patients and pharmacists were not blinded. Pharmacist with authorization to prescribed may impact generalization. PCP may have adjusted meds. Target sample of 340 was not met. Tsuyuki, et al., 2015).	Evidence Level I & Quality rating is C – low quality	

#	Author Citation	Design & aim or hypothesis & Major Variables	Population & Setting & Sample Size	Intervention	Measurements (e.g., tool to assess outcome)	Results &/OR Recommendations	Strengths & Limitations	Evidence Level & Quality Rating	
11	Tucker et al. (2017)	Systematic review design & the aim use (IPD) from relevant trials to assess the effectiveness of SMBP on BP reduction and HTN control, evaluating best use of SMBP to determine which subpopulation is most likely to benefit & DV: HTN Control, IV: IDP of relevant trials; SMBP; co-interventions	Adults with uncontrolled HTN & outpatient/primary care/community care & Sample size *n* =1,478 patients	HBPM, SMBP, TM; MP, PL, CPL, NL, PE, LC, PBR; HTS & FS	Automated blood pressure machines in the clinic	Self-monitoring with intensive co-interventions reduced clinic BP systolic −3.2 mm Hg, 95% CI −4.9 to −1.6 mm Hg & diastolic −1.5 mm Hg, 95% CI −2.2 to −0.8 mm Hg & level 4 (personal support throughout the trial) −6.1 mm Hg, [95% CI −9.0 to −3.2 mm Hg] (Tucker et al., 2017).	Strengths: Large databases with IDP, adequate randomization, appropriate concealment, & analysis (Tucker et al., 2017). Sensitivity analysis and automated BP decreased biases. Comparison was with blood pressure done in the clinical setting Limitations: Sparse study > 1 year; antihypertensive dosage was not pre-specified and should be interpreted with caution. Heterogeneity that limited meta-analysis (Tucker et al., 2017).	Evidence Level = I & Quality Rating is A	

							Recommendation: Further consideration of self-monitoring in the presence of comorbidities seems warranted (Tucker et al., 2017).		

Note. Evidence table review of literature for home blood pressure monitoring and bundled co-interventions (medication algorithm, patient education, and wallet cards). RCT = randomized clinical trial; SMBP = self-monitoring blood pressure; FU = follow-up visit; CH = community hospital; DV = dependent variable; IV = independent variable; BP = blood pressure; HTN = hypertension; PL = physician led; MM = medication management; LC= lifestyle counseling; NLE = nurse-led education; UC = usual care; TM= telemonitoring; SM= self-management; BPCM = blood pressure control model; IS = intensification simulated; OV = office visit; MAP = measure accurately, act rapidly, partner with patients to self-monitor; AHA= American Heart Association; AMA = American Medical Association; AOBP = automated office blood pressure; IPD = individual patient data; PCC = primary care clinic; TM = Telemedicine; EHR = electronic health record; AMP = antihypertensive medication protocol; MP = medication protocol; PE = patient education; N = nutrition; SBP = systolic blood pressure; TI = treatment intervention; CI = confidence interval; DBP = diastolic blood pressure; WC = wallet card; BPR= blood pressure recording; WE= written education, CHEP= Canada hypertension education program protocol; PBR = pill box reminder; HCS= healthcare team support; FS = family support; CPL = clinical pharmacist led; NL = nurse led

Appendix C

Evidence Themes for Improving Uncontrolled High Blood Pressure in Adults

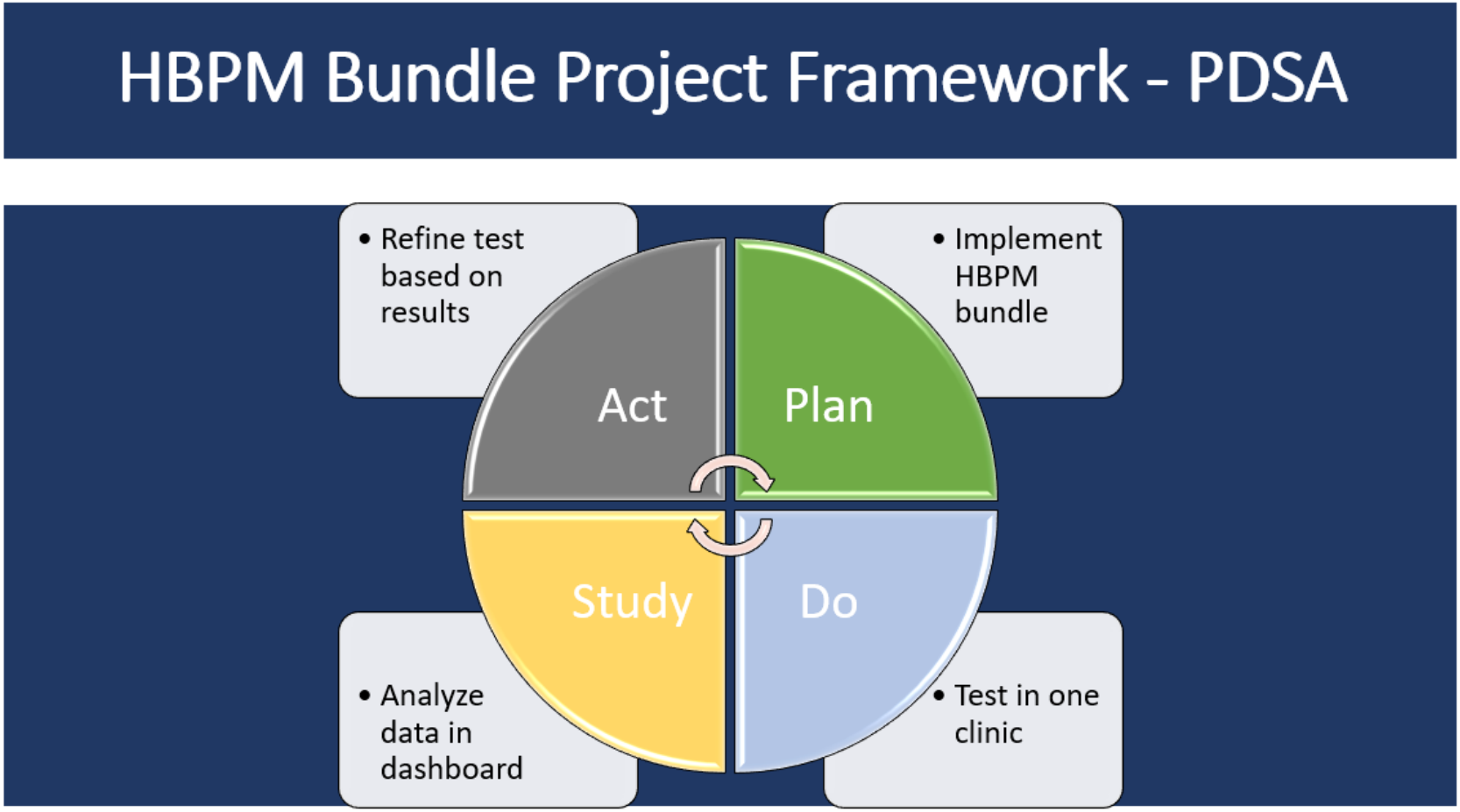
#	Author (s)	HBPM/Self-Monitoring	Framework/Guide	Telemonitor	Medication Management	Education	Wallet Card
1	Aekplakorn et al. (2016)	SMBP;			Physician led medication management	Nurse-led lifestyle education	
2	Bryant et al. (2020)	SMBP;		Telemonitoring	Self-management		
4	Dymek et al. (2019)	SBPM				Pharmacist-led	
5	Egan et al. (2018)	SMBP by the patients outside the clinical setting	Me1asure accurately, act quickly, partner with patients (MAP)		Pharmacist led medication management using protocol	Educate providers/pharmacy or staff on accurately measuring BP	
6	Hanlin et al. (2018)		Measure accurately, act quickly, partner with patients (MAP)		Medication management-monthly staff resident scorecard	Educate on accurately measuring BP	
7	Margolis et al. (2018)	HBPM;		Telemedicine-EHR	Pharmacist led anti-hypertensive medication protocol	Lifestyle counseling and nutrition education for patient	
8	McManus et al. (2018	SMBP;		Telemonitoring	Physician led medication management	Patient trained on accurate monitoring BP, lifestyle.	

#	Author (s)	HBPM/Self-Monitoring	Framework	Telemonitor	Medication Management	Education	Wallet Card
8	Meador et al. (2020)	SMBP	Care Model		Physician led medication management	Community or health center lifestyle program. training on SMBP. community coaching & training	
9	Sheppard et al. (2017)	SMBP			Physician led medication management		
10	Tsuyuki et al. (2015)				Pharmacist led anti-hypertensive medication protocol	Written education for patient about BP monitoring, and lifestyle,	Wallet card for BP recording and information about medication, physical activities, and diet
11	Tucker et al. (2017)	HBPM/SMBP; telemedicine			Physician, pharmacy, and nursing led medication protocol	Patient education, lifestyle counseling	

Note. Synthesis of the review of literature themes for improving uncontrolled high blood pressure using home blood pressure monitoring and other co-interventions that included medication management, education, and wallet card. SMBP = self-monitoring blood pressure; HBPM = home blood pressure monitoring; EHR = electronic health record; MAP = Measure accurately, act quickly, partner with patients; BP = blood pressure.

Appendix D

PDSA Framework



Appendix E

SWOT Analysis: Improving Blood Pressure Outcomes Using HBPM Bundle

Strengths	**Weaknesses**
-Ambulatory Care Services (ACS) Executive leadership support. -Facility triad leadership, clinical team support. -Approved budget for remote monitoring -Clinical Quality Analytics support -Collaborative multidisciplinary team	-Clinic participants community is predominantly the vulnerable population. -Participants not recording and reporting blood pressures. -Impact on operations with staff pulled out of production for one-hour long education training. -Blood pressures not measured accurately.
Opportunities	**Threats**
- Improve the health and well-being of the community -Incorporate evidence-based research into practice for staff -Educate clinical team in MAP for Blood Pressure measuring, medication management, and partnering with patient -Increase access for patients to remote self-monitoring of blood pressure based on AMA/AHA recommendations -Align with organization strategic goal for quality and patient safety	-Receiving external funds from foundation for hypertension wallet cards -Implementation of project on time due to potential IT delay with the remote monitoring to start in August - Meet with that team every other week -Low clinician engagement and referrals to remote HBPM

Note. SWOT analysis for the organization's Doctor of Nursing (DNP) Quality Improvement project displaying the identified four strengths, four weaknesses, two opportunities, and two threats. Conducted by the core project team. MAP =measure accurately, act rapidly, partner with patients; AMA/AHA=American Medical Association and American Heart Association; IT=information technology; HBPM=home blood pressure monitoring

Appendix F

Risk Management – DNP Blood Pressure Project

Risk	Probability	Impact	Contingency Plan to Address Threat
Clinic participants' community is predominantly the vulnerable population	Likely	Minor	Educate participants on hypertension, lifestyle changes, medication adherence by clinical team during each visit
Participants not recording and reporting blood pressures daily	Likely	Significant	Clinical team and population health educate on recording and reporting blood pressure. Navigators contact participants with reminders to record and report.
Impact on operations with staff pulled out of production for one-hour long training.	Occasional	Minimal	Two educational training offerings to allow for operational coverage and consider adding another session if necessary.
Blood pressures not measured accurately by clinical team	Occasional	Significant	Nursing leadership to incorporate role playing for staff demonstration of accurate measurement of blood pressures
Receipt of internal funds for HTN wallet cards	Seldom	Minor	Develop customized cards by facility
Potential implementation delay for June due to IT build in EHR for remote monitoring	Occasional	Significant	Meet bi-weekly with team on build progress. Engage sponsor and sponsors early if issue
Low clinician engagement and referral rate to remote monitoring	Likely	Significant	Doctor of nursing practice student, clinic triad, and population health team monitor progress during the implementation phase and medical director engage/coach to offer support.

Appendix G

Organizational Change Readiness Assessment for Clinic Setting

Organizational Change Readiness Assessment

This assessment is designed to reveal your organization's ability to change when change is needed. Read the following questions and indicate your level of agreement with each statement using the following scale.

5 We are excellent at this. I am confident we would succeed.
4 We are good at this. I believe we can manage.
3 We are okay at this. I believe we could manage.
2 We need help with this. I don't think we would manage very well.
1 We have problems with this. I don't think we can do this.

Sponsorship regularly comes from a senior level such as the President.	5
Leadership is provided from the highest senior levels that have direct responsibility for change.	5
There is a strong sense of urgency for change from the senior staff.	5
The organization has a culture that emphasizes continues improvement.	4
Any planned change initiative has clear objectives that are consistently communicated.	4
Management strongly believe the future should look different from the past.	5
Management has a clear vision of the future and can mobilize the necessary resources.	4
The change effort connects to other major initiatives underway or being planned within the organization.	4
Management is willing to change critical business processes.	4
All employees are supported when taking risks, being innovative and looking for new solutions.	4
The organization has successfully implemented major changes in the past 12 months.	4
Employees enjoy working in the organization and the level of individual responsibility and team spirit is high.	3
The organization is always experimenting and new ideas are easily implemented.	4
Organizational decisions use a participatory process, are made quickly and it's clear when the decision is made.	4
Employees have been extensively cross trained and have a good understanding of each others role in the organization	4
Employees view change as an opportunity	4
Employees work across boundaries with little trouble	4
Total Points	71

www.abarisconsulting.com

Appendix H

Project Budget

Financial Impact- DNP QI Project Budget		
Revenue	***Annual***	***Balance***
Population Health	$1,521	$1,521
City Education Funds	$100	$100
Foundation	$25	$25
Clinic Facility		$0
		$1,646.00
Expenses	***Cost X Quantity***	***Project Cost***
Remote Monitoring Program	$300	$300
Supplies	$83	$83
Salary & wages	$1,138	$1,138
Hypertension wallet cards	25 (25)	$25
Staff Education	$16	$16
Display - print shop	$15	$15
Total		$1,576.70

Appendix I

Project Timeframe

Project Activity	Person Responsible	Start	End	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
AIM: Improve adequately controlled blood pressure <140/90 mmHg compliance HBPM bundle in 8 weeks																
Facility approval, clinic leader commitment, IRB, secure onsite conference room, assemble multidisciplinary team, schedule training, communicate with sponsor, finalize dashboard, timeline	DNP Student	9/5/2023	9/6/2023		x											
Educational material review/final - Project	DNP Student	9/5/2023	9/6/2023		x											
1. Education Phase	DNP Student	9/6/2023	9/8/2023													
Triad Leadership/Multidisciplinary team education	DNP Student	9/6/2023	9/6/2023		x											
Finalized all training material	DNP Student/Triad/Care Coordina	9/5/2023	9/6/2023		x											
Clinical Providers Training	DNP Student/Triad	9/7/2023	9/8/2023		x											
Formulary Medication Management Protocol training	DNP Student/Pharmacy	9/7/2023	9/8/2023		x											
HEDIS - HTN Metric, dashboard, MAP	DNP Student	9/7/2023	9/8/2023		x											
Clinical Nursing Training - MAP	DNP Student/Nx. Mgr	9/7/2023	9/8/2023													
HBPM Education	DNP Student/Care Coordination	9/7/2023	9/8/2023		x											
2.Execution Phase	DNP Student	9/11/2023	11/5/2023													
Coordinate/facilitate wkly meetings, track progress, resolve issues	DNP Student	9/11/2023	11/5/2023			x	x	x	x	x	x	x	x			
Initial Data Collection - Pretest BP Systolic/Diastolic BP >140/90 - Sample	DNP Student					x	x	x								
Nursing AMA/AHA MAP - document BP in flowsheet	DNP Student/Triad/Care Coordination					x	x	x	x	x	x	x	x			
Algorithm/HBPM referrals						x	x	x	x	x	x	x	x			
Educate/attest-Patient Adherence						x	x	x	x	x	x	x	x			
Educate lifestyle changes						x	x	x	x	x	x	x	x			
Nursing/educate HTN wallet cards						x	x	x	x	x	x	x	x			
Participants/HBPM/BP Cuff/material & contacts						x	x	x	x	x	x	x	x			
3. Monitoring Phase	DNP Student	9/18/2023	11/19/2023									x	x	x	x	
Data management/EHR/Tableau Dashboard	DNP Student						x					x	x	x	x	
Post test BP systolic/Diastolic BP <140/90	DNP Student													x	x	
Data collection for analyzes	DNP Student						x	x	x	x	x	x	x	x	x	
Stakeholder progress update	DNP Student						x	x	x	x	x	x	x	x		
Practicum II																

Appendix J

Dashboard

DNP Project HTN- Uncontrolled >140/90 Database

Participations	Responses	Age 18-44=1; 45-59 =2; 60-69 =3; 70-79 = 4; >/=80 = 5	Male=1 Female=2	Race: AA=1, H=2, W=3, O=4	Pre BP >140/90; Systolic	Pre BP >140/90; Diastolic	Post BP <140/90 Systolic	Post BP <140/90 Diastolic	Patient Adherence Dcoumented	M: Re-check Blood pressure	A: On 1 or More Antihypertensive Medication/Documented Adjustment or No Adjustment	P: Remote HBPM/SMBP	P: Remote HBPM/SMBP	S: HTN BP Cards Provided & Documented	Education-Documented
	Responses	1,2,3,4, or 5	1 or 2	1,2, 3 or 4	% >140	% >90	% <140	% < 90	Y/N	Documented in EHR/Not documented in EHR	% provider utilized algorithm	% of referral completed	patient particpation	% return with visit	% documented
MAP 1															
MAP 2															
MAP 3															
MAP 4															
MAP 5															
MAP 6															
MAP 7															
MAP 8															
MAP 9															
MAP 10															
MAP 11															
MAP 12															
MAP 13															
MAP 14															
MAP 15															
MAP 16															
MAP 17															
MAP 18															
MAP 19															
MAP 20															

Legend
Y = Yes or 1
N = No or 0

Appendix K

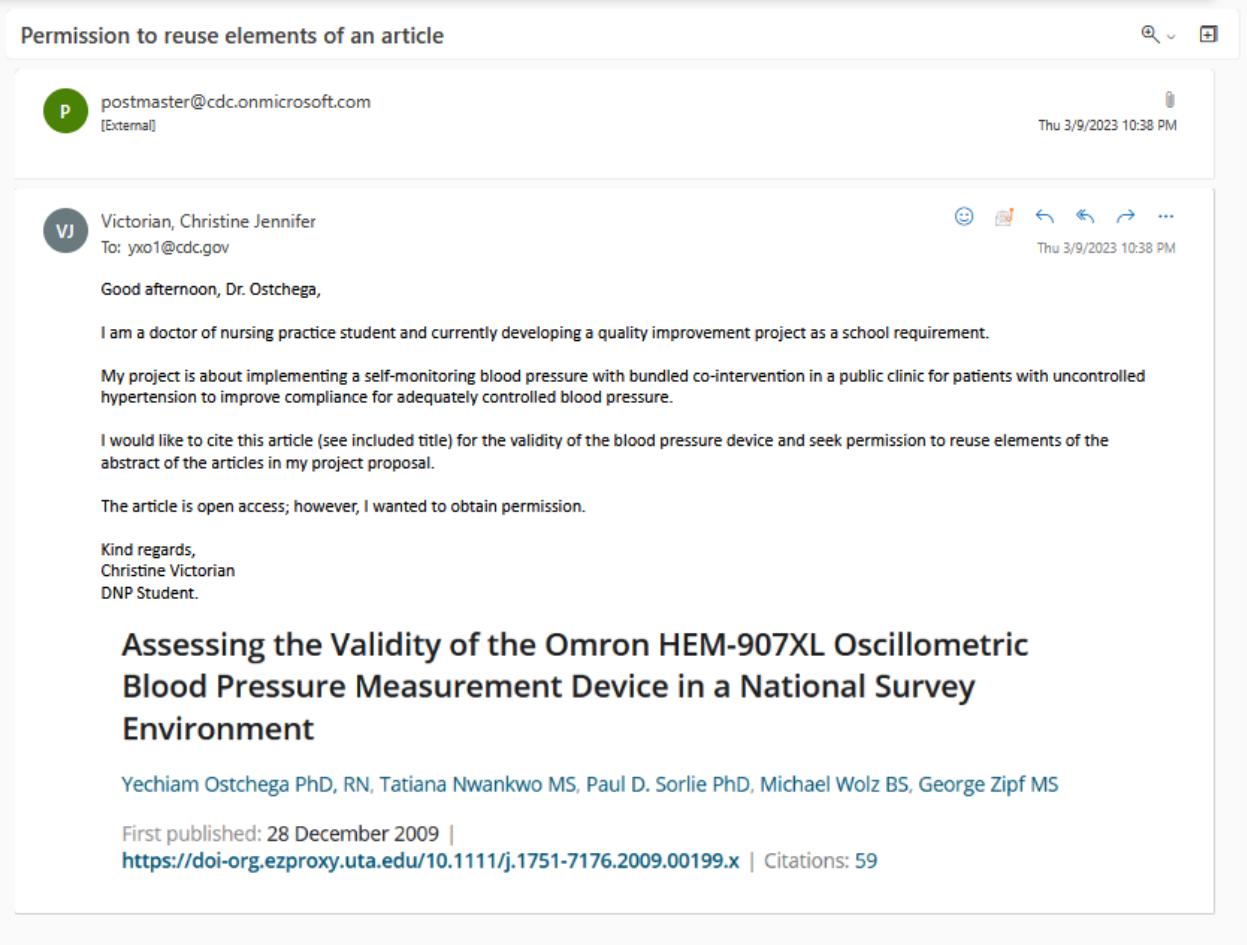
Master code list for DNP project

Participant -coded initials	Plus Codes	BP >140/90 (systolic or diastolic) (Y/N)
	MAP 1	
	MAP 2	
	MAP 3	
	MAP 4	
	MAP 5	
	MAP 6	
	MAP 7	
	MAP 8	
	MAP 9	
	MAP 10	
	MAP 11	
	MAP 12	
	MAP 13	
	MAP 14	
	MAP 15	
	MAP 16	
	MAP 17	
	MAP 18	
	MAP and so on	

Note: Master code list to ensure de-identification of participants. Y=yes, N=No

Appendix L

Permission



Permission to reuse elements of an article

P postmaster@cdc.onmicrosoft.com
[External]
Thu 3/9/2023 10:38 PM

VJ Victorian, Christine Jennifer
To: yxo1@cdc.gov
Thu 3/9/2023 10:38 PM

Good afternoon, Dr. Ostchega,

I am a doctor of nursing practice student and currently developing a quality improvement project as a school requirement.

My project is about implementing a self-monitoring blood pressure with bundled co-intervention in a public clinic for patients with uncontrolled hypertension to improve compliance for adequately controlled blood pressure.

I would like to cite this article (see included title) for the validity of the blood pressure device and seek permission to reuse elements of the abstract of the articles in my project proposal.

The article is open access; however, I wanted to obtain permission.

Kind regards,
Christine Victorian
DNP Student.

Assessing the Validity of the Omron HEM-907XL Oscillometric Blood Pressure Measurement Device in a National Survey Environment

Yechiam Ostchega PhD, RN, Tatiana Nwankwo MS, Paul D. Sorlie PhD, Michael Wolz BS, George Zipf MS

First published: 28 December 2009 |
https://doi-org.ezproxy.uta.edu/10.1111/j.1751-7176.2009.00199.x | Citations: 59

Appendix M

Reliability and Validity

Model Number	Reference Number	ESH-IP European Society of Hypertension International Protocol	AAMI Association for the Advancement of Medical Instrumentation	BSH British Hypertension Society	Validation
BP4350	HEM-6232T-Z	✓	✓		22
BP5100	HEM-7122-Z	✓	✓		6, 21
BP5250	HEM-7151T-Z	✓	✓		8, 9, 21
BP5350	HEM-7341T-Z	✓	✓		6, 21
BP5450	HEM-7343T-Z	✓	✓		6, 21
BP6100	HEM-6180-Z	✓	✓		22
BP629	HEM-6200-Z	✓	✓		1
BP629N	HEM-6130-Z	✓	✓		3
BP6350	HEM-6231T-Z	✓	✓		22
BP652	HEM-6052-CA; HEM-6052-Z; HEM-6052-ZCD6	✓	✓		2
BP652N	HEM-6300-Z	✓	✓		3
BP653	HEM-6320T-Z	✓	✓		3
BP654	HEM-6320T-Z	✓	✓		3
BP7000	HEM-7600T-Z	✓			19
BP765CAN	HEM-7311-CACS	✓			6
BP785	HEM-7222-Z	✓	✓		7
BP785N	HEM-7321-Z	✓			8
BP786	HEM-7321T-Z	✓			8
BP786N	HEM-7321T-Z	✓			8
BP786CAN	HEM-7321T-CA	✓			8
BP786CANN	HEM-7321T-CA	✓			8
BP7900	HEM-7530T-Z	✓	✓		6, 21
BP791IT	HEM-7222-ITZ	✓	✓		7
BP792IT	HEM-7080-Z(V); HEM-7081-ITZ; HEM-7080-ITZ2; HEM-7080-ITCAN	✓	✓	✓	14
BP8000-M	HEM-6410T-ZM		✓		20
HBP-1300	HBP-1300-Z	✓			15
HEM-705CPN	HEM-759P-Z; HEM-759P-CAN; HEM-759P-B(C)	✓	✓	✓	16
HEM-712CLCN2	HEM-7051-ZL	✓			17
HEM-907XL	HEM-907-Z2	✓	✓	✓	18
HEM-9210T	HEM-9210T	✓			23

Appendix N

Facility Approval Letter

HARRISHEALTH SYSTEM

Harris Health System
P.O. Box 66769, Houston, Texas 77266-6769

Approval Letter for Project

Date: 11/16/2022

Re: Christine Victorian, RN
Doctor of Nursing Practice Student

I want to inform you as Chief Nursing Officer for Harris Health System Ambulatory Care Services, I support Christine Victorian in completing the University of Texas, Arlington required Quality Improvement Project. Her proposed topic of interest is Improving Outcomes for Hypertension in the Primary Care Setting using Hypertension Intervention Bundle.

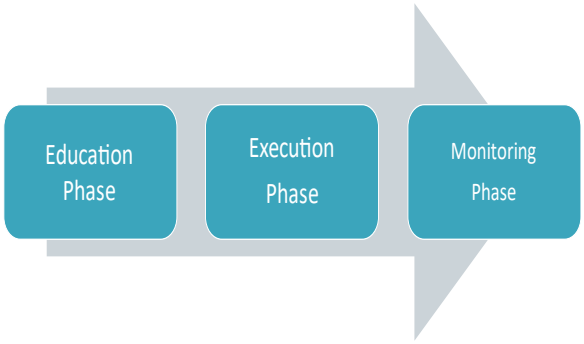
Yours Sincerely,

Matthew Schlueter, PhD, MBA, RN, NE-BC, PHN
Chief Nursing Officer

Appendix O

Project Plan Phases

Three Phases Project Plan Weeks 1- 8



Education Phase – Week 1

DNP student will lead the education session with leadership and core team members and facilitate 2 sessions- I hour each with clinical team and will also co-present

- **Center Leadership Triad education**
- **Clinical Providers Training– Onsite 2 sessions**
  - HEDIS
  - HBPM Bundle
    - HBPM, Medication Algorithm, HTN wallet cards, and education (MAPs)
  - Dashboard
- **Clinical Nursing Training – Onsite 2 sessions**
  - HEDIS
  - Education (MAPs)
  - HTN Wallet Cards
- **Remote Monitoring**
  - Clinical Staff
  - Patients

Education and Training Materials

- Power Point Presentations - HBPM Bundle
- Hand-outs
  - MAPS (AMA Target BP)
  - HTN Wallet Cards education
- Demo

Execution Phase – Weeks 2- 9

DNP Student

- Coordinate and facility weekly meeting with the multidisciplinary team to discuss project progress, barriers, and provide resolutions

Nursing

- Accurately Measure
  - After check-in – Prepare patient to obtain blood pressure following MAP guide
  - Recheck BP is > 140/90 and document in the vital sign flowsheet

Providers

- Act Rapidly – MAP guide
  - Formulary-based medication algorithm
  - Referral to remote monitoring
  - Educate on medication adherence and lifestyle
  - Document in the EMR using HTN Smartform

Partner with patients

Nursing

- Partner with patients
  - Provide and educate patients on the HTN Wallet Cards upon discharge

Remote Monitoring Care Coordinator

- Educate patients on the program
- Measure for accurate BP cuff size
- Provide material and contact number for questions

DNP Student

- Ensure ongoing progression of the project – HBPM bundle
- EHR documentation – Nursing, providers, patients
- Tableau dashboard review

Monitoring Phase – Week 2-9

Tableau Dashboard

- Blood Pressure must be documented in the EMR
- Individual providers can access the dashboard
- Monthly refreshed
- Report reviews monthly with the Triad, core team, and sponsor

Appendix P

Differences

DNP Project Paired Sample *t* -test			
Participants	Pretest Scores	Posttest Scores	Differences
MAP 1			
MAP 2			
MAP 3			
MAP 4			
MAP 5			
MAP 6			
MAP 7			
MAP 8			
MAP 9			
MAP 10			
MAP 11			
MAP 12			
MAP 13			
MAP 14			
MAP 15			
MAP 16			
MAP 17			
MAP 18			
MAP 19			
MAP 20			

Appendix Q

Human Subjects Protection Training

The University of Texas ARLINGTON™

Human Subjects Protection Training (HSP) Training Complete

This document certifies that Christine Jennifer Victorian started the training entitled "Human Subjects Protection Training (HSP)" on February 26th, 2023 at 01:54 PM , and completed the training in its entirety on February 26th, 2023 at 04:08 PM.

Certificate ID 67462a2a57a126afd8c29836c5f32bd6 was generated by Electronic Research Administration on behalf of The University of Texas at Arlington.

Appendix R

IRB Project Approval

Doctor of Nursing Practice Program
College of Nursing and Health Innovation
Box 19407
411 S. Nedderman Drive
Arlington, Texas, 76019-0407

Dear Christine Victorian,

The UT Arlington Office of Regulatory Services and the UTA IRB have empowered the Graduate Nursing Review Committee to make preliminary determinations as to whether DNP projects submitted to the GNRC may include aspects of Human Subjects Research under 45 CFR 46.102(d). **For all projects that fit the federal definition of "Research with Human Subjects," IRB review and approval is required before any research activities begin per UT Arlington's policy 5-705.**

The following is the decision by the Graduate Nursing Review Committee regarding your project:

1. The results will be disseminated, but they are not generalizable knowledge. The results will include use of the most current research to translate the knowledge into practice, thus it is not new generalizable knowledge.
2. This project is a quality improvement project that will translate existing knowledge into the clinical setting. The intention of the project is to implement local, setting-specific improvements to the quality or processes of patient care, not to discover or test new ways to improve processes and patient care with the intention of sharing scientific findings. Therefore, this project is not considered Human Subjects Research and does not require IRB review.
3. This quality improvement project did not satisfy the *definition of research* under 45 CFR 46.102(d). Therefore, it was not subject to the Health and Human Services regulations for the protection of human subjects in research (45 CFR part 46), UT Arlington's policy 5-705, *Statement of Principles and Policies Regarding Human Subjects in Research*, or require Institutional Review Board approval.

The Graduate Nursing Review Committee recommends approving this project with Conditions as indicated on the GNRC Review Form : Home Blood Pressure Monitoring Bundle for Hypertension Outcomes in Adult Patients Receiving Care in Public Health Centers.

Cynthia Plonien, DNP, RN, CENP. GNRC Chair

Appendix S

HARRISHEALTH SYSTEM

Research & Sponsored Programs
Email: research@harrishealth.org

August 7, 2023

Niny Philip, MHA, BSN, CPHQ
Outcomes Program Manager, Quality Programs
Harris Health System

RE: **"Home Blood Pressure Monitoring with Co-Intervention Bundle for Hypertension Outcomes in Adult Patients Receiving Care in a Public Health Clinic"**

Project Lead: Christine Victorian, RN, DNP Graduate Student, University of Texas at Arlington

Dear Ms. Niny Philip:

The above captioned project summary was submitted to the Harris Health Research & Sponsored Program Department for review. After a thorough review of the summary submitted, the Harris Health System Institutional Review Board (IRB) has determined that this activity is not human subjects research and falls under the purview of quality/performance improvement, not the IRB. Per Harris Health System Policy 3.05, "Projects conducted for quality improvement processes will be reviewed by Harris Health Quality Programs."

Ms. Victorian will be instructed to contact Harris Health Quality Programs for assistance with the required review of this quality project. If I can be of further assistance to you, please email me at julia.thompson@harrishealth.org. Thank you.

Sincerely,

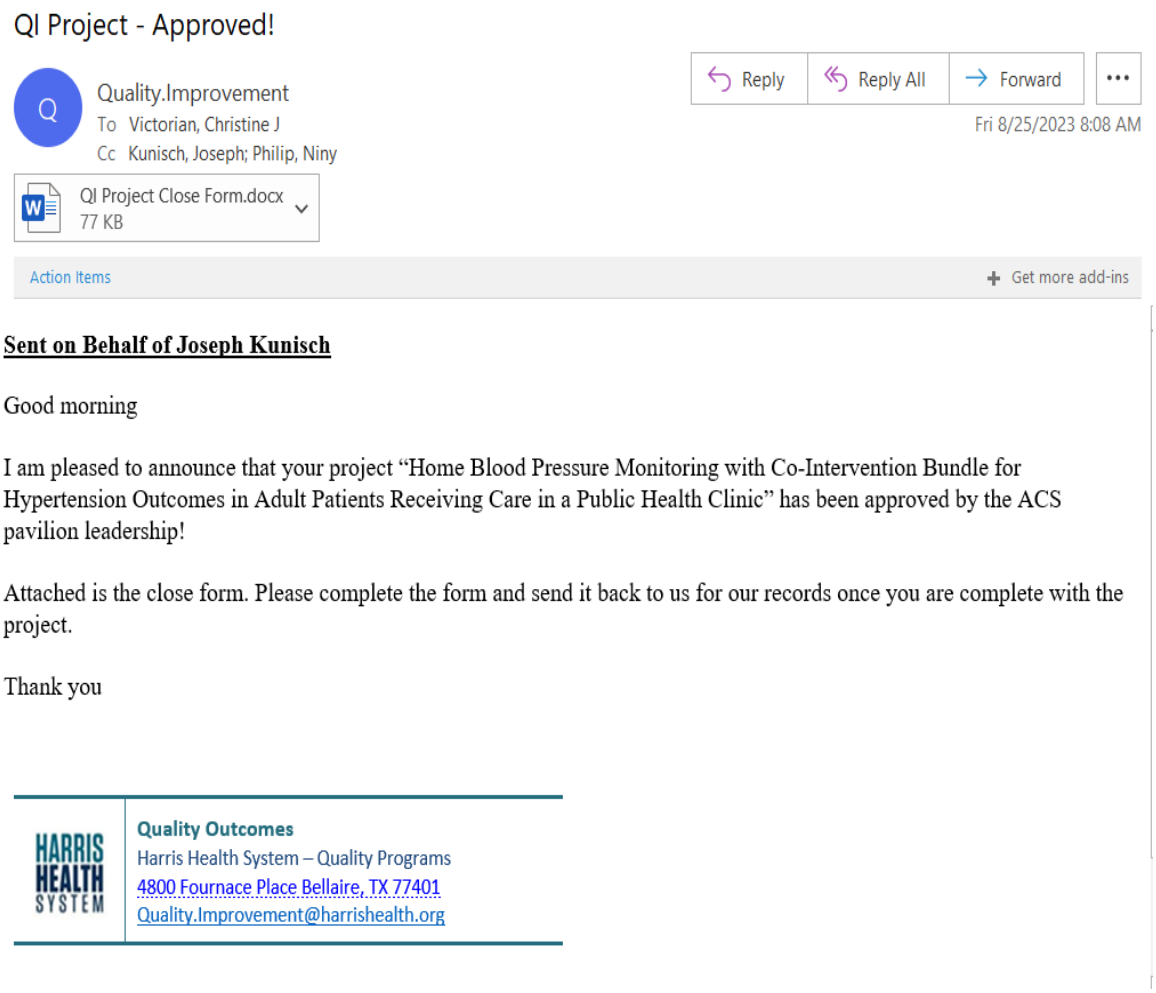
Julia A. Thompson

Julia A. Thompson, PhD, APRN, CNOR, CIP
Administrative Director, Research & Sponsored Programs
Chair, Harris Health Institutional Review Board

CC: Christine Victorian, RN, DNP Graduate Student, UTA

Appendix T

Facility Qualitive Improvement Project Approval



QI Project - Approved!

Reply | Reply All | Forward | ...

Q Quality.Improvement
To Victorian, Christine J
Cc Kunisch, Joseph; Philip, Niny

Fri 8/25/2023 8:08 AM

QI Project Close Form.docx
77 KB

Action Items | Get more add-ins

Sent on Behalf of Joseph Kunisch

Good morning

I am pleased to announce that your project "Home Blood Pressure Monitoring with Co-Intervention Bundle for Hypertension Outcomes in Adult Patients Receiving Care in a Public Health Clinic" has been approved by the ACS pavilion leadership!

Attached is the close form. Please complete the form and send it back to us for our records once you are complete with the project.

Thank you

HARRIS HEALTH SYSTEM

Quality Outcomes
Harris Health System – Quality Programs
4800 Fournace Place Bellaire, TX 77401
Quality.Improvement@harrishealth.org

Appendix U

Participants Demographic and Clinical Characteristics

Table 1

Participant Demographic and Clinical Characteristics (N =20)

Participant Characteristics	*n*	(%)
Age (years)		
18-44	4	(20)
44-59	9	(45)
60-69	5	(25)
70-79	1	(5)
≥ 89	1	(5)
Mean 54.6 years		
Race		
African American	12	(60)
Hispanic	8	(40)
Gender		
Male	5	(25)
Female	15	(75)
Patient Adherence	20	(100)
Documented BP Rechecked	20	(100)
Referral Completed	20	(100)
Medication Algorithm		
Adjusted	18	(90)
No Adjustment	2	(10)
Participation after enrolled		
Participation	19	(95)
No Participation	1	(5)
HTN Wallet Card		
BP readings provided	19	(95)
No BP readings provided	1	(5)
Lifestyle Education	20	(100)

Note. BP = blood pressure. HTN = hypertension.

Appendix V

Paired Sample *t*-test Analysis

Paired Samples T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BP & gt; 140/90; Systolic	152.30	20	7.582	1.695
	Post BP & lt; 140/90. Systolic	135.05	20	9.976	2.231
Pair 2	Pre BP & gt; 140/90. Diastolic	86.45	20	6.977	1.560
	Post BP & lt; 140/90; Diastolic	82.55	20	7.990	1.787

Paired Samples Correlations

				Significance	
		N	Correlations	One-Sided *p*	Two-Sided *p*
Pair 1	Pre BP & gt; 140/90; Systolic Post BP & lt; 140/90; Systolic	20	.407	.038	.075
Pair 2	Pre BP & gt; 140/90; Diastolic Post BP & lt; 140/90; Diastolic	20	.534	.008	.015

Paired Samples Tests

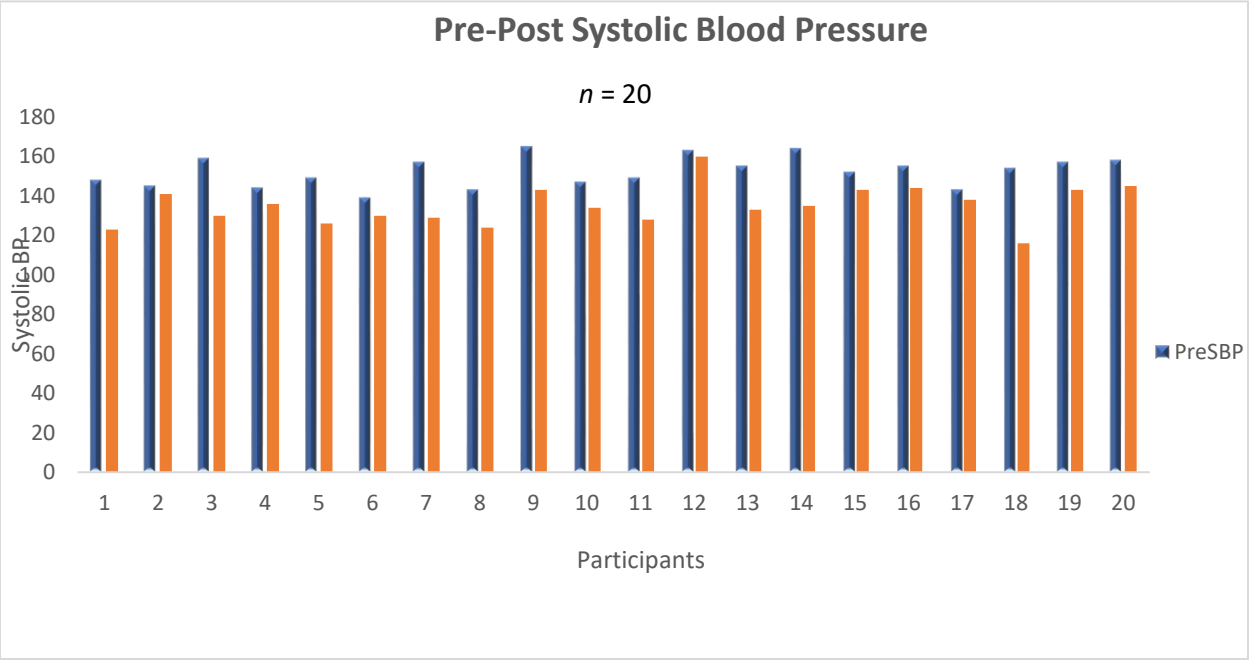
Paired Differences

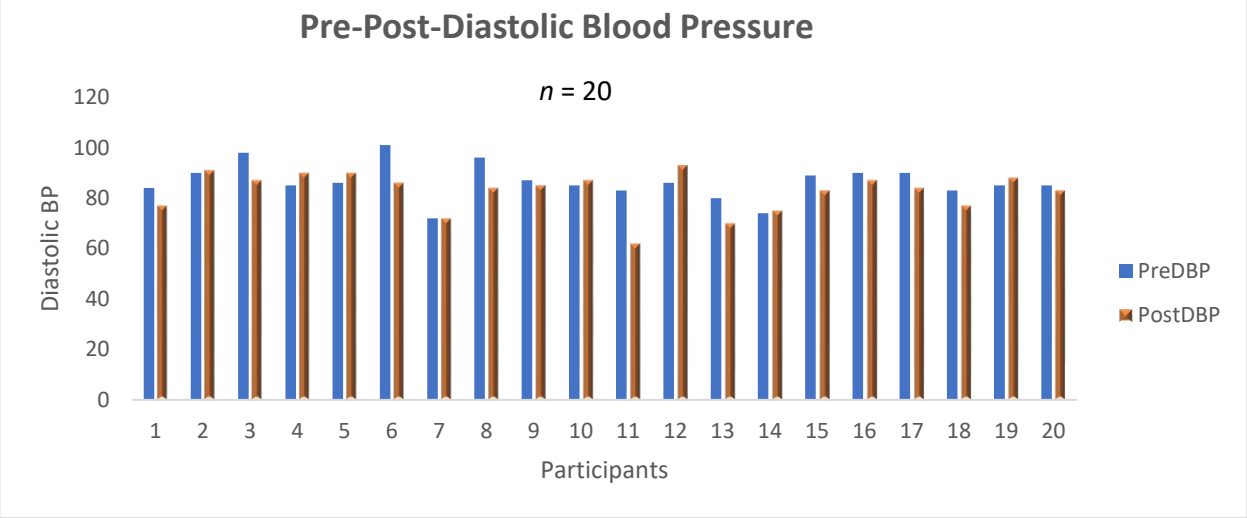
					95% Confidence Interval of the Differences				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	*t*	*df*	Sig. (2-tailed)
Pair 1	Pre BP & gt; 140/90; Systolic Post BP & lt; 140/90; Systolic	17.250	9.770	2.185	12.677	21.823	7.896	19	<.001
Pair 2	Pre BP & gt; 140/90; Diastolic Post BP & lt; 140/90; Diastolic	3.900	7.276	1.627	.495	7.305	2.398	19	.027

Note: BP = blood pressure, gt = greater than, lt = lesser than, N = number, df = degrees of freedom, std = standard

Appendix W

Improved Systolic and Diastolic Results



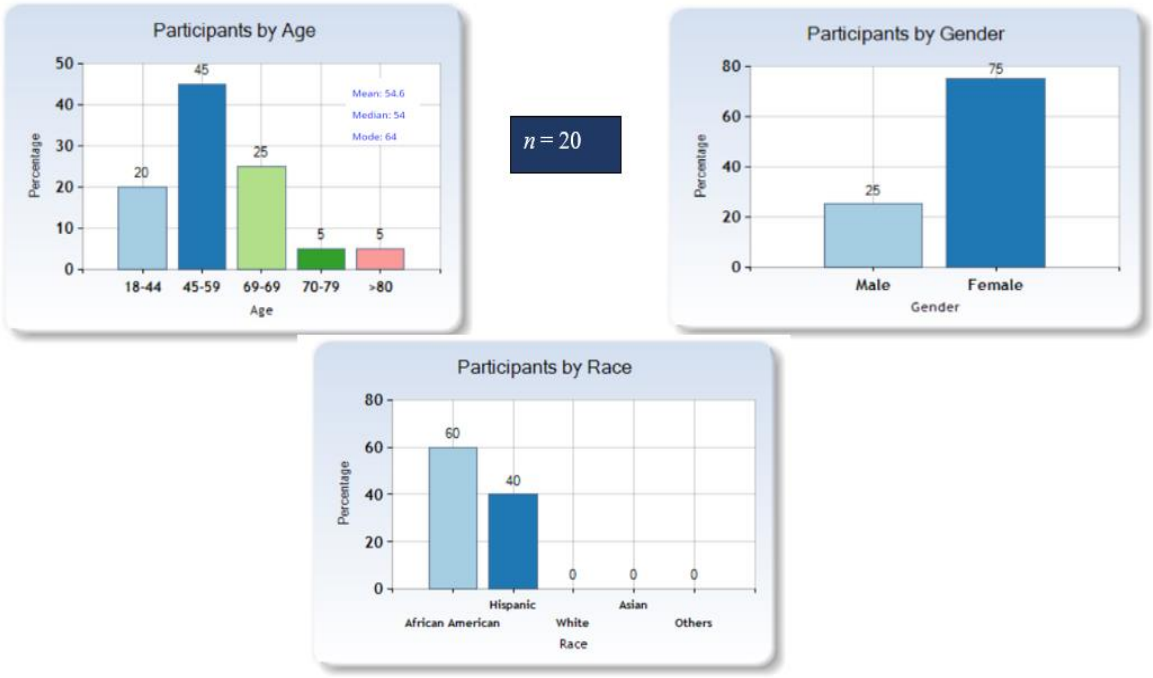


Appendix X

Participants by Age, Gender, and Race

Figure 1

Sample Characteristics for Age, Gender, and Race



Note: Sample Characteristics of the participants for the HBPM bundle to include age, gender, and race. Figure 1 shows the results by percentages for the *n* = 20 displayed in bar graphs.