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### Improving Patient Engagement and Adherence Utilizing Home Blood Pressure Monitoring Equipment: A Quality Improvement Project

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**Improving Patient Engagement and Adherence Utilizing Home Blood Pressure Monitoring**

**Equipment: A Quality Improvement Project**

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Date of Submission: August 19, 2022

**Table of Contents**

Abstract .....	4
Introduction .....	5
Problem Description .....	5
Available Knowledge .....	8
Introduction .....	8
Critical Appraisal of the Evidence .....	8
Evidence Synthesis .....	12
Implications .....	14
Rationale .....	14
Specific Aims .....	16
Methods .....	17
Context .....	17
Description of the Intervention .....	18
Study of the Intervention .....	19
Measures .....	19
Analysis .....	20
Ethical Considerations .....	20
Results .....	21
Discussion .....	24
Summary .....	24
Interpretation .....	25
Limitations .....	27
Conclusion .....	27

References ..... 29

List of Figures

Figure 1 ..... 6

Figure 2 ..... 6

Figure 3 ..... 23

Table 1 ..... 22

Table 2 ..... 22

### Abstract

To combat uncontrolled hypertension, a quality improvement project was designed that aimed to increase patient recorded self-care measures such as maintenance, management, and monitoring. By increasing both education and supplying volunteers with a free electronic home blood pressure monitor (HBPM) it was predicted that positive changed behaviors surrounding self-care would occur and subsequently, a reduction in average blood pressure. To examine this, results from Dickson's Self-Care of High Blood Pressure Inventory (SC-HI V3) and blood pressure measurements were recorded and analyzed for average trends. Results from the improvement proved effective as self-care values well surpassed the 10% goal that was originally placed. Additionally, average systolic changes decreased 11.6% while average diastolic decreased 8.9%. Average ending pressures noted reductions of 16 mm Hg systolic and a 7 mm Hg diastolic. The results of this quality improvement project support further work in chronic illness management, in respect to patient self-care and education. Additionally, providing patients with the tools necessary to monitor their health suggests an increase in a patient's own advocacy skills. With more cases of chronic illnesses becoming prevalent, it is up to healthcare and especially the clinical nurse leader (CNL) to increase basic education and access to monitoring tools to reduce the risk for serious health concerns and improve quality of life.

**Keywords:** Home blood pressure monitoring, blood pressure, self-care, electronic

## Introduction

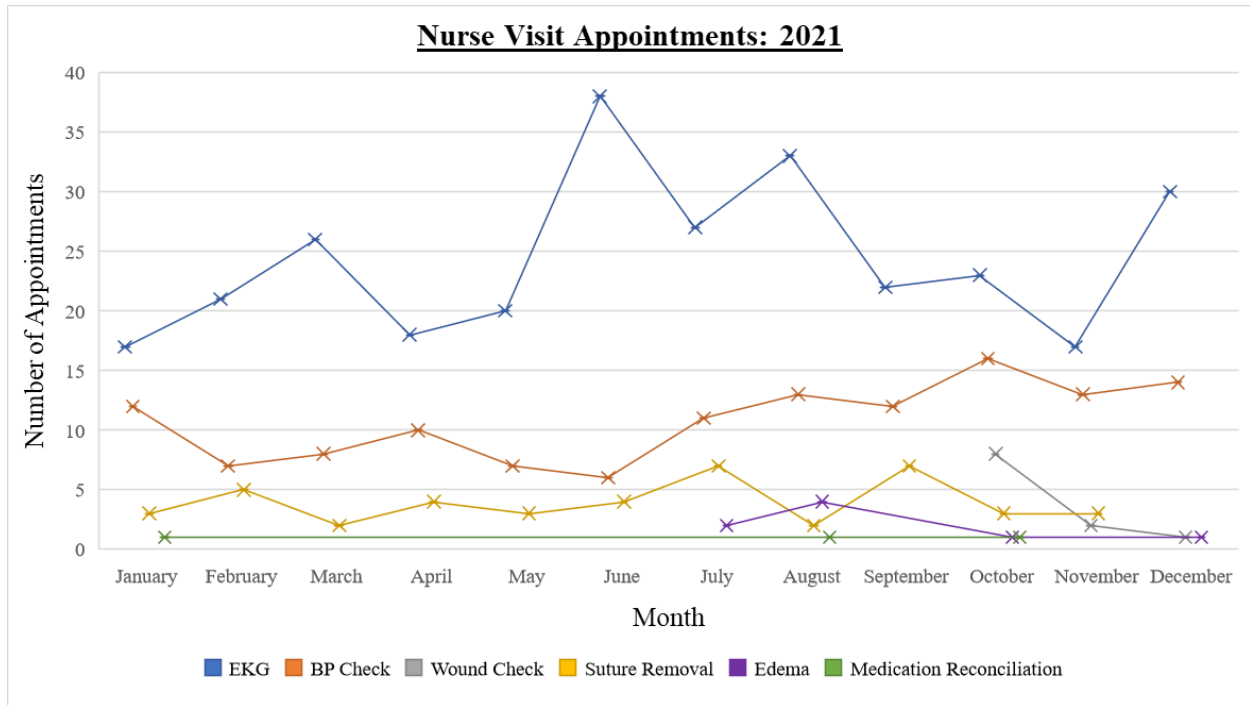
### Problem Description

Around 121.5 million adults in the United States have high blood pressure, with only half having their blood pressure controlled (American Heart Association, 2022). Major health conditions associated with high blood pressure include heart attacks, aneurysms, heart failure, strokes, kidney failure, and vision damage (American Heart Association, 2022). In the last 20 years, there has been an increase in the use of home blood pressure monitoring (HBPM) to assist care teams in observing readings within the home setting over long periods of time (Kario, 2021). Ideally, HBPM allows patients to be involved in their care by performing their own blood pressure (BP) measurements when it suits them (Kario, 2021). Advantages include its “relatively widespread availability, the ability to take multiple daily readings over a long period of time, avoidance of white-coat reactions, the ability to detect masked hypertension and BP variability, improved management of hypertension due to immediate feedback, improved patient involvement, and relatively low cost” (Kario, 2021, p. 738). Disadvantages encompass “the requirement for patient education and training, measurement errors, and lack of funding in some healthcare settings” (Kario, 2021, p. 738). At a large cardiovascular specialty office, a quality improvement project was planned to support increased use of HBPM by improving availability of blood pressure cuffs and education pertaining to self-care.

In 2021, there were 486 nurse visit appointments at the office of which 129 pertained to uncontrolled blood pressure checks (See Figure 1). Additionally, of all 129 appointments, the average uncontrolled blood pressure measurements revealed, Females: 164/81 and Males: 146/78 (See Figure 2).

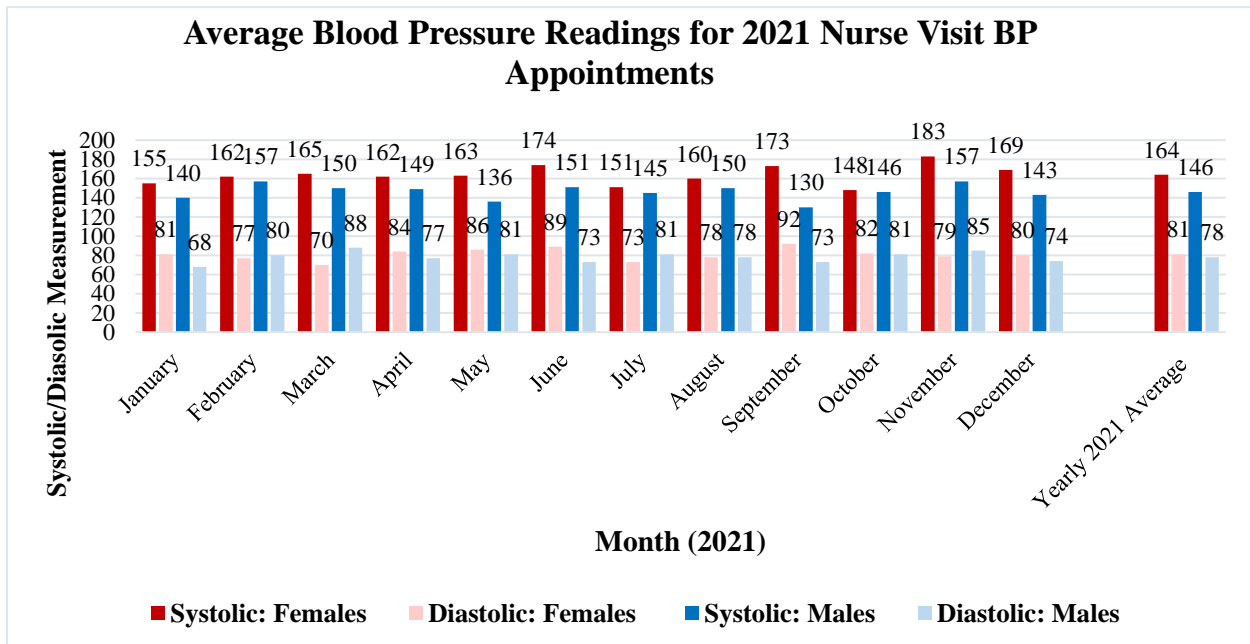
**Figure 1**

*2021 Nurse Visit Appointments*



**Figure 2**

*Blood Pressure Appointment Nurse Visit – Average Readings (Male and Female)*



Currently at the office, the nurse triage desks are inundated with patients and their families calling with concerns involving blood pressure and associated symptoms. In one week, there were 27 individual calls pertaining to blood pressure. Triage nurses must quickly perform the role as historian, filling in gaps and gathering important information pertaining to each personalized call. Not having a clear picture of the patients' blood pressure can lead to unnecessary office and emergency room visits. Currently, each call or visit pertaining to blood pressure is typically followed up with a new appointment being scheduled. This action further prolongs the interference of uncontrolled patient blood pressures on staff by taking nurses away from the triage line to reevaluate and check blood pressures in the office. Further, this can take time away from other members in the community who need to be urgently seen in both acute and ambulatory settings. Additionally, almost all cardiac conditions treated in the office become chronic illnesses that patients must learn to adapt and grow with. Outpatient healthcare offices and nurse leaders must recognize the “physical challenges of a chronic illness and the burden of treatment, which is challenging for many patients to follow” (Larsen et al., 2019, p. 159). Adherence, according to the World Health Organization (WHO, 2003), is defined as “the extent to which a person’s behavior—taking medication, following a diet, and/or executing lifestyle changes—corresponds with agreed recommendations from a healthcare provider” (Larsen et al., 2019, p. 159). The important part of this definition is that patients agree to partner with the provider for the plan of care, instead of passively following recommendations (Larsen et al., 2019, p. 159). Developing a personalized treatment plan for each patient and providing the tools necessary to manage new or old conditions is key to acceptance and adequate monitoring of the patient’s current health status within the home setting. If patients are actively involved in their health, better health outcomes are expected (Larsen et al., 2019). “It is up to healthcare



professionals to more effectively assess whether patients can do what we suggest, and then to evaluate the outcomes” (Larsen et al, 2019, p. 182). By supplying a population of patients, a necessary tool in monitoring their health, improved behaviors surrounding self-care maintenance, self-care monitoring, and self-care management are expected through early implementation of monitoring tools that support health promotion and education.

## **Available Knowledge**

### ***Introduction***

To assess HBPM’s effectiveness in decreasing patient blood pressures three systematic reviews and meta-analysis were examined to determine credibility of such an intervention. Upon examination, a significant decrease in systolic and diastolic pressures were noted in all three reviews suggesting that utilizing this monitoring technique can be beneficial in supporting self-care of hypertension within the home setting.

### ***Critical Appraisal of Evidence***

Tucker et al (2017) conducted a systematic review and meta-analysis that examined self-monitoring of blood pressure in patients who were diagnosed with hypertension. The study was completed to understand the effectiveness of blood pressure self-monitoring on lowering blood pressure readings and long-term control of hypertension. Results from the aggregate study stated, “self-monitoring was associated with reduced systolic blood pressures (SBP) compared to usual care at 12 months ( $-3.2$  mmHg, [95% CI  $-4.9, -1.6$  mmHg])” (Tucker et al., 2017, p. 2). Additionally, the study revealed increased therapeutic effects when self-monitoring was paired with interventions such as education (Tucker et al., 2017). Importantly authors of this systematic review examined individual patient data (IPD). studies that had at least 6 months of follow up data and at least 100 participants. This data was then compared to the original data before self-

monitoring was implemented to determine if a significant difference was noted. Using IPD allowed for “standardized adjustments of outcomes and sufficient power to detect differences between subgroups” (Tucker et al., 2017, p.19). Although, even with IPD and subgroup division, there was significant heterogeneity (Tucker et al., 2017). Since the study encompassed many research results, different protocols, inclusion criteria, self-monitoring regimens, and target BPs this could have been the source of heterogeneity which occurred (Tucker et al., 2017). The authors state this made it difficult to complete the meta-analysis albeit this did not negate the finding of increased BP reduction with self-monitoring use (Tucker et al., 2017). Limitations in the main analysis are contributed to IPD’s infancy in dealing with missing data or differential follow up (Tucker et al., 2017). Although, this did not contribute to affecting results. All outcomes in this review pertained to blood pressure, but the authors bring attention to the risks of stroke and coronary heart disease related to uncontrolled BP. Across the data, the effects of self-monitoring appear to be independent of age, sex, and comorbidities (Tucker et al, 2017). This shined light on the equal beneficial results that can be attained from taking part in self BP monitoring. Data also was compiled from North America, Europe, and Australia which showed an international comparison between results (Tucker et al., 2017). Over time, future studies should be aimed to follow patient data for two to five years to gain a better idea of how BP is being managed within the home setting. Additional work can be completed off this data to include economic outcomes and quality of life measures in relation to improved BP management (Tucker et al., 2017). In conclusion, self-monitoring of BP’s should be recommended as part of routine clinical practice internationally (Tucker et al., 2017). To implement this, research can determine the most cost-effective way of supporting a program that supplies monitoring tools to patients to take part in their care (Tucker et al., 2017).

Sheppard et al (2020) completed another systematic review and meta-analysis that looked at home self-monitoring along with co-interventions to decrease BP readings in hypertensive patients. This review utilized the same team as the Tucker et al (2017) review, but incorporated data from their two year follow up to examine longevity of results. Here randomized control trials of self-monitoring and IPD were analyzed to determine if implementation of home involvement had any effect on BP reduction (Sheppard et al., 2020). Similar results were recorded in comparison to the Tucker et al., 2017 review. Sheppard and his colleagues found that, “self-monitoring was associated with reduced systolic BP compared to usual care at a 12-month follow-up, regardless of the number of hypertension-related co-morbidities ( $-3.12$  mm Hg, [95% confidence intervals  $-4.78, -1.46$  mm Hg]” (Sheppard et al., 2020, p. 243). The authors stated that this IPD meta-analysis was the largest, most comprehensive review examining the efficacy of self-monitoring (Sheppard et al., 2020). IPD allowed the team to assess multiple comorbidities of increased BP, which is not usually possible with a standard meta-analysis (Sheppard et al, 2020). While the review aimed to be entirely comprehensive, the authors note it is impossible to attain original data from all authors whose studies were examined. Fortunately, sensitivity studies suggested that the missing data would have had little to no effect on the overall conclusion of the study (Sheppard et al., 2020). Implications for continued practice bring light to the fact that patients rarely present to appointments with one morbidity. Instead, multiple diagnoses are usually present, and the intervention of self-monitoring must support the whole patient (Sheppard et al., 2020). This review specifically suggests, self-monitoring should be recommended as part of a “multifaceted approach” to treating hypertension (Sheppard et al., 2020, p. 250). The study also points to the cost effectiveness of self-monitoring as patients that are diagnosed with hypertension typically are at risk for greater cardiovascular accidents.

Implementation of a blood pressure cuff for home use is much more cost effective than the cost of a stroke (Sheppard et al., 2020). Importantly, a clinical significance is present in reducing blood pressure by utilizing patient home involvement (Sheppard et al., 2020). Inclusion of medication titration, pharmacist support, and tailored education should be combined to reach health goals for patients which calls for increased interprofessional work moving forward (Sheppard et al., 2020). Future research is suggested to focus on the effects of other outcomes instead of blood pressure and how this intervention affects related health conditions (Sheppard et al., 2020).

Lastly, Magid et al (2013) composed a pharmacist led initiative of home blood pressure monitoring (HBPM) using the American Heart Association's Heart360 Program. Results were compared to patients who followed usual care (UC) of blood pressure monitoring. This pragmatic randomized control trial used patients from 10 Colorado clinics and found that at 6 months, the number of patients reaching target BP goals was "significantly higher (54.1%) in the HBPM group when compared with UC" (Magid et al., 2013, p. 157). Specifically, the "HBPM group experienced a -12.4-mmHg larger (95% confidence interval, -16.3 to -8.6) reduction in systolic BP and a -5.7-mmHg larger (95% confidence interval, -7.8 to -3.6) reduction in diastolic BP" (Magid et al., 2017, p. 157). Additional findings suggested the HBPM group expressed greater communication and medication adherence when compared to UC patients (Magid et al., 2013). Importantly, this study expressed the need for more refined ways to keep patients out of the office by offering more convenient methods for patients to still be involved in their care. A simple home monitoring protocol (Heart360) was used where patients were able to upload home measurements (Magid et al., 2013). This eliminated the barrier of obtaining expensive software that does the same job (Magid et al., 2013). Once data was logged into the

Heart360 program, summary reports of individuals, groups, and averages were automatically created and the software was able to label whether patients were controlled or uncontrolled in relation to their BP (Magid et al., 2013.) Having software that worked for patients and clinical staff streamlined home BP care while improving efficiency (Magid et al., 2013). Suddenly, providers had more time to create care plans and speak with patients rather than making sense of raw data (Magid et al., 2013). A flaw noted within the study was that the UC patients were treated by the same providers that saw HBPM patients. Although, the only difference is that the UC patients were not allowed to assess the Heart360 software (Magid et al., 2013). It was suggested that providers may have been more “aggressive in their treatment with UC patients knowing that this study was being conducted” (Magid et al., 2013, p. 162). Additionally, to use the Heart360 software internet was needed. Inability to log measures was reported among some patients, although by the end of the study all measurements were accounted for. Lastly, this study was conducted within a single healthcare system. A much larger scale is needed to compare the results to determine if the findings were truly significant (Magid et al., 2013). Moving forward, suggestions on cost effectiveness and extended studies are suggested that examine how HBPM can be designed and run long-term (Magid et al., 2013).

### ***Evidence Synthesis***

When compiling data to determine if home self-monitoring use for blood pressure is effective it has been reflective to see the years of work that has gone into this research and the various methods used to offer this level of care to patients. Studies note various ways to provide monitoring tools such as donations, loaners, free insurance gifts, etc. to use within the home setting. Due to the extensive amount of data, many systematic reviews and meta-analysis are available that shed light into the idea of offering such an intervention. Controlling blood pressure

is imperative in maintaining and restoring one's health. Currently, around 121.5 million adults in the United States have high blood pressure, with only half having their blood pressure controlled (American Heart Association, 2022). The American Heart Association has been influential in the advocacy of blood pressure relevance and importance not only nationally, but internationally as well. Home blood pressure monitoring is cited throughout their website and within many research reviews as an effective way to support self-care which may then decrease BP readings. Importantly, this method supports monitoring without the need to come into the office. With a new remote world post pandemic, rallying around methods where patients can carry out home self-monitoring to improve their health is a significant draw for many. A strength among all these studies was the ability for patients to transmit/transcribe their data via a phone call for review. This is seamless process which in turn benefitted the patient's health and the clinical staff's time. All reviews were able to depict actual changes in blood pressure measurements, both systolic and diastolic. These changes in data were also able to be obtained within short time frames, (6 months), which for patients can be a driving force to attain healthier lifestyles and medication adherence to assist with lowering BP. The idea that home monitoring improves BP is valid and proven statistically significant by review of the studies above. Many critiques are still present within the literature that suggest more time is needed to evaluate the effects. Does home involvement slow over time, decreasing results back to baseline? Many questions remain unclear, but with a society that is moving into a greater telehealth era, having home monitoring equipment available allows patients to stay connected to their health anywhere and anytime. Additionally, more definitive work is currently being completed through clinical trials that look for differences in improvements based off different medication therapies and comorbidities of

patients. Determining if one group of patients is more likely to benefit from home monitoring use would be an easier starting point during the implementation of such a process in the future.

### ***Implications***

With the increase in urbanization, telehealth, and chronic conditions moving into healthcare, greater methods are needed to keep patients connected to their health and responsible for their own personal illness experience. At the cardiac specialty office, uncontrolled blood pressure checks are the second leading nurse visit appointment diagnosis. Exploring ways to initiate home blood pressure monitoring to improve self-care can help reduce strain on nurses and clinical staff while eliminating unnecessary appointments that could have been preventable with remote monitoring use. Additionally, average starting and ending blood pressures will be collected to help note any quantitative difference. Increased interprofessional care, medication adherence, and improved staff/patient communication are all effects that are predicted to be possible with long term use of this intervention. Most importantly, patients will be offered the opportunity to take part in a program regardless of their age, sex, ethnicity, or morbidity status that has been proven to lead to lower BP readings as a result of behavior modifications in their self-care.

### **Rationale**

The Plan, Do, Study, Act (PDSA) framework will be the basis by which this quality improvement project will be planned and implemented. By interviewing patients, current blood pressure monitoring status and current self-care measures can be collected to help determine the extent to which home monitoring is used and the level of education patients have in caring for their hypertension diagnoses. An additional questionnaire will be distributed which narrows in on specific self-care properties (SC – HI). This data will then be collected again after patients are

provided with a blood pressure cuff, education, and support over a one-month period. Results will be compared to assess for an improvement in home self-care. Data collected will also be compared to prior studies that were completed that assessed the impacts of increased home involvement in managing chronic cardiac conditions. With over 121.5 million adults in the United States having high blood pressure, it is imperative that health professionals recognize the importance of continued health monitoring within the home setting. Achieving controlled blood pressure can help sustain each patient's quality of life and minimize the impact of further damage (American Heart Association, 2022).

***P (Plan)***

The planning period for this quality improvement project will start and end between January 25, 2022 – May 18, 2022. Within this time frame, a quality improvement proposal will be completed which will encompass a problem description, global and specific aims, methods, as well as a review of literature pertaining to HBPM interventions that have been successful in the past. Patient perceptions of their self-care including monitoring of BP will be gathered. Additionally, donation of free blood pressure monitors will be sought through the American Heart Association. Selected patients for the improvement will be identified by the May 23, 2022 start date using the cardiac rehabilitation population within the office. Patients who partake in the improvement will do so on a volunteer basis. By May 18, 2022 a full proposal will be submitted for review by University of New Hampshire (UNH) for a Quality Improvement Determination Letter.

***D (Do)***

The intervention process period will take place from May 23, 2022 – June 30, 2022. During this time frame patients will be educated on how to use the electronic blood pressure cuff



and demonstrate proper technique for home readings utilizing an existing local hospital's *Home Blood Pressure Monitoring* brochure. Additionally, baseline blood pressure readings will be collected that will be computed to an average to determine a starting point for the improvement.

Pre and post self-care behaviors will be addressed

### ***S (Study)***

After collection of the results, data will be studied from July 1, 2022 – July 29, 2022. The recorded BP readings and self-care behaviors will be compared to understand the impacts of this Quality Improvement project.

### ***A (Act)***

Additionally, between the July 1, 2022 – July 29, 2022 results will guide discussion on future implications for practice and patient engagement when given the opportunity to implement home blood pressure monitoring paired with education. Impacts, usefulness, limitations, and relevance will be discussed and disseminated.

### **Specific Aims**

The purpose of this improvement project is support self-monitoring of blood pressure and increase education which may over time lead to changed behaviors that support decreased blood pressure. Cardiac patients at the office will be supplied with a free (OMRON®) blood pressure monitor through the assistance of outside funding. The goal is to alleviate the financial and educational disadvantages of utilizing HBPM and track its success in a population of 10 (ten) selected patients who currently do not have access to a home monitoring device. Expected outcomes include increased adherence with HBPM which will be demonstrated by daily recorded measurements by patients, self-care measurements, and possible decreased average pressures at the conclusion of the study. The increase in active home involvement may support

improved medication adherence, education, and patient involvement within their health. Stakeholders that will be positively affected by this change include patients, nurses, providers, office staff, families, and the community. Long term success of home monitoring may eventually lead to decreased urgent and emergency room visits and lessen the severity of exacerbations through the implementation of more consistent screening and timely intervention. Long term goals of improving readings hope to benefit all interprofessional members of healthcare such as providers, pharmacists, outpatient services, support staff, insurance, etc. By the completion of this project on June 30, 2022 self-care monitoring will improve by 10% from the baseline through the implementation of increased education and access to home monitoring tools.

## **Methods**

### **Context**

Implementation of home blood pressure monitoring has proven to be effective at reducing systolic and diastolic measurements in hypertensive patients, but also significantly helps cut costs for both patients and health care institutions long term. Each year, \$79 billion US dollars is spent on high blood pressure associated costs and currently there are roughly 92 million patients who are struggling with uncontrolled high blood pressure (Center for Disease Control, 2021). Due to the magnitude of affected individuals, this diagnosis is the nation's costliest health condition with known complications such as heart disease and strokes (Center for Disease Control, 2021). In fact, Sheppard et al., 2020 stated that the cost effectiveness of home blood pressure monitors is significant due to the risk for cardiovascular accidents stemming from hypertension diagnoses. These accidents, such as a stroke, lead to greater health care associated costs than a simple store-bought monitoring device. In a cost benefit analysis study, it found that patients who carry a hypertensive diagnosis have an "additional \$2,500-dollar annual increase in

healthcare spending” (Center for Disease Control, 2021, p. 1). Additionally, “29 billion dollars is spent in hypertensive medication prescriptions annually, of which 3.4 billion is paid for directly from patients” (Center for Disease Control, 2021, p. 1). The Centers for Disease Control (CDC) states that with self-monitoring of blood pressure Medicare alone could save \$900 million dollars annually by implementing an early and affordable detection treatment for hypertension, such as home monitoring (Center for Disease Control, 2021). By uncovering high blood pressure trends at home, patients can stay involved in their care while reducing costs of appointments which include travel, copayments, follow ups, emergency visits, etc. Instead, triage can be completed over the phone and the first steps of controlling blood pressures can be initiated like medication titration, screening, data collection, trend analysis, and interprofessional care.

### **Description of the Intervention**

To examine home blood pressure monitoring improvement effects, a quality improvement project will be completed that provides a population of ten hypertensive patients a free Omron® blood pressure monitoring device that they will use within the home setting to monitor readings for one month. Patients of any age, gender, or ethnicity will be selected for the improvement and education on proper blood pressure reading techniques, as well as lifestyle modifications that support self-care will be discussed prior to start of home monitoring utilizing a premade *Home Blood Pressure Monitoring* brochure. Patients must demonstrate the ability to use the home blood pressure cuff successfully prior to implementation within the home setting. A blood pressure reading will be collected by patients using their provided free blood pressure monitor before home use. Another measurement will then be collected one month following use of the home monitor. The team involved in this improvement will encompass patients, providers,

medical assistants, nurses, project leader, and any informal caregivers who help perform self-care to a spouse or other partner.

### **Study of the Intervention**

To assess the impact of this intervention, baseline blood pressure and self-care behaviors will be assessed prior to and following the intervention and the results will be compared to appreciate any differences. Results from the survey will be computed using direction from the Self Care Measures website under Computing Standardized Scores.

### **Measures**

To measure the effectiveness of home blood pressure monitoring, The Self Care of High Blood Pressure (SCI – HI) questionnaire will be used which was obtained from the Self Care Measures website (Dickson et al., 2017). This tool will be used to assess self-care measures that are important in the plan of care for hypertensive patients. Due to the chronicity of cardiovascular conditions, patient support and involvement in their care is essential for the greatest outcome to be achieved. Supplying patients with the necessary education and devices to monitor their health is the first step in guiding patients through their own personal illness experience. This tool specifically allows patients to self-score themselves within three areas of self-care which include maintenance, monitoring, and management. There are 24 item measures found within the Likert scale that correspond to the three areas of self-care (Dickson et al., 2017). To assess for reliability, Cronbach's alpha and factor determinacy scores were used which proved sufficient ( $\alpha = 0.83$ ) (Dickson et al., 2017). Validity was tested using the Medical Outcomes Study General Adherence Scale and the Decision-Making Competency Inventory which was calculated to be 0.96 (Dickson et al., 2017).

To evaluate blood pressure differences, before and after measurements will be recorded by patients on predetermined days when patients attend cardiac rehabilitation at a local area hospital. Differences between these measurements will be calculated, and an average will be computed to determine if any quantitative effect is seen after a month of home monitoring use.

### **Analysis**

Descriptive statistical analysis will be used to analyze data from the (SCI- HI) questionnaire and blood pressure recordings. Each section of the questionnaire (self-care maintenance, self-care monitoring, and self-care management) will be assessed at the start of the project and following the conclusion including before and after blood pressure readings. The mean, standard deviation, and range from each category (self-care maintenance, self-care monitoring, and self-care management) will infer where success and failures are distributed most among the selected patient population. Index scores will be calculated from each Likert item by first computing the raw score for each self-care behavior section. Then transformation will be performed according to the instrument directions by dividing the actual raw score by the possible raw score. Finally, this score will be multiplied by 100 to transform the raw score to an index score for interpretation (Self-Care Scoring Algorithm, n.d.).

### **Ethical Considerations**

Ethical considerations of this improvement involve complete confidentiality of questionnaire results and blood pressure readings of patients who give their informed consent to take part in the improvement. Protection of the Health Insurance Portability and Accountability (HIPAA) Act will also be upheld. It is important to note, the ten OMRON® brand blood pressure cuffs have been donated from the American Heart Association, although no source of potential

bias is expected. There is no conflict of interest pertaining to this proposal. This submission was reviewed by the UNH Department of Nursing Quality Review Committee to determine that this intervention meets Quality Improvement standards and is exempt from further institutional review board (IRB) review.

## **Results**

### **Results**

Upon initiation of this quality improvement project, many modifications were made which altered the initial timeline for which this improvement was projected to follow. The initial start date for the intervention was set to begin May 23, 2022. Due to the need for successful determination of quality improvement exempt from IRB review, the start date was pushed until June 8, 2022 to allow sufficient time for the facilities HIC (Human Investigation Committee) approval. Secondly, volunteers who took part in the improvement were predicted to have just over 30 days with the blood pressure cuffs within the home setting. Scheduling needs pushed the end date to June 29, 2022, which provided patients 21 days to make use of the free blood pressure cuffs. Thirdly, of the 10 free blood pressure cuffs that were allotted for this project, only 3 cardiac rehab patients were willing to participate in the improvement. This significantly reduced the group number for which the improvement was set to support.

Mean self-care index scores increased following the intervention (Table 1). All areas including management, maintenance, and monitoring showed substantial increases after the introduction of additional education and access to monitoring devices. Specifically, index scores for maintenance increased from 64.3 to 92.6, monitoring from 45.3 to 92.6, and management from 64 to 93.3. Areas within the SC – HI survey that scored low following the intervention included incorporating stress relieving activities, recognizing that blood pressure was high, and

knowing that certain activities assisted in bringing blood pressure down (Table 2). Mean scores from after intervention SC-HI surveys for these items scored respectively – *Incorporating Stress Relieving Activity*: mean 2.6 (*SD 1.5*, Range 0-5) to a mean of 3.3 (*SD 0.6*, Range 0-5), *Recognizing Hypertension*: mean 1 (*SD 1*, Range 0-5) to a mean of 1.3 (*SD 1.5*, Range 0-5), and *Recognizing Helpful Actions*: mean 1.3 (*SD 0.6*, Range 0-5) to a mean of 2.3 (*SD 1.5*, Range 0-5). These items highlight areas for continued quality improvement work to be designed that will further increase improved self-care behaviors in patients with hypertension.

**Table 1***SC-HI Survey Results*

Self-Care of Hypertension Blood Pressure Inventory (SC-HI V3) Survey Results					
	Mean Index Scores		Standard Deviation		Range
	Start	End	Start	End	
<b>Self-Care Maintenance Index Score</b>	64.3	92.6	4.041	21.385	0 - 100
<b>Self-Care Monitoring Index Score</b>	45.3	92.6	6.35	36.226	0 - 100
<b>Self-Care Management Index Score</b>	64	93.3	4.618	15.716	0 - 100
<b>Timeliness of Recognition</b>	1	3	1	1.732	0 - 5
<b>Symptom Treatment Effectiveness</b>	1.3	2.6	0.577	1.527	0 - 5

**Table 2***Post-Intervention Low Scoring SC-HI Results*

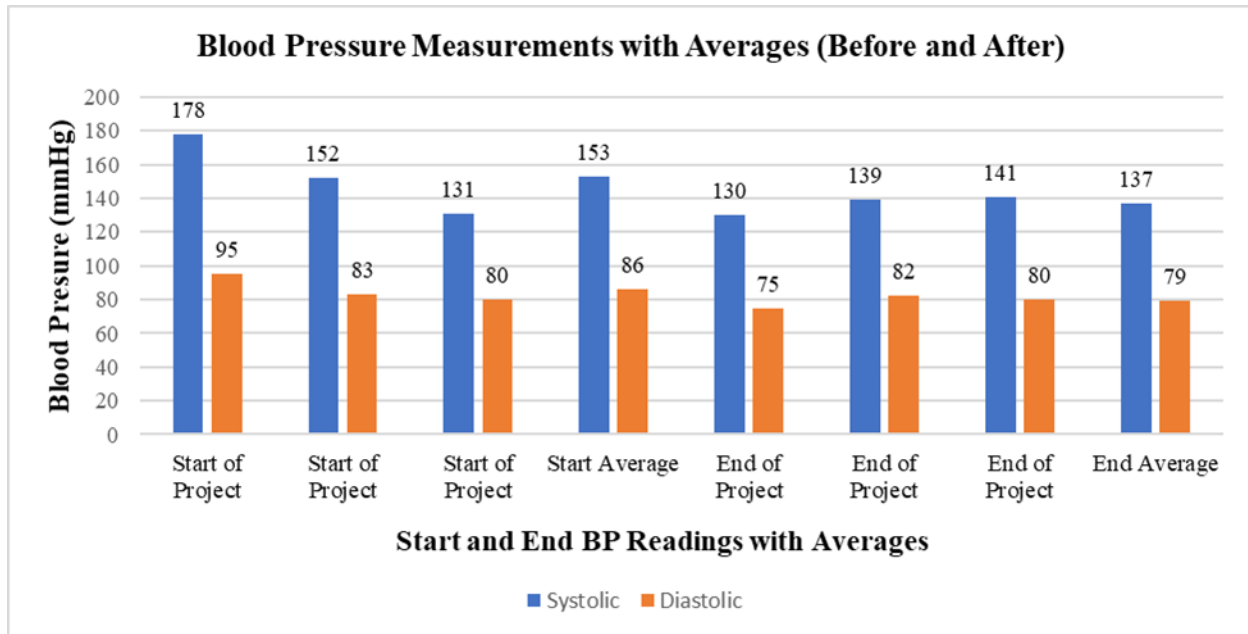
Lowest Scoring SC-HI V3 Items Post-Intervention					
	Mean Scores		Standard Deviation		Range
	Start	End	Start	End	
<b>Item 3: Incorporating Stress Relieving Activity</b>	2.6	3.3	1.5	0.6	0 - 5
<b>Item 17: Recognizing Hypertension</b>	1	1.3	1	1.5	0 - 5
<b>Item 24: Recognizing Helpful Actions</b>	1.3	2.3	0.6	1.5	0 - 5

Decreased blood pressure was an expected benefit of this quality improvement initiative that was successful in revealing following the conclusion of this project. The starting average BP

was 153/86, and by the conclusion of the project average pressures were 137/79. Systolic changes were ~ 11% and diastolic ~ 8% (Figure 3).

**Figure 3**

*Blood Pressure Averages*



Although qualitative measures were not a part of this improvement proposal, all individuals self-imposed a debriefing upon handing in their final SC-HI survey. Attitudes surrounding the improvement were positive, with all three patients in agreement that having a tool available to help monitor their blood pressure was helpful in changing behaviors that support a lifestyle of improved hypertension care. Some specific quotes from patients included, *“I feel more at ease now knowing I can monitor my blood pressure at home.”* and *“With the blood pressure cuff in my living room, I found myself taking my measurements multiple times a day. I became more involved at home with the ability to track my progress.”* and finally, *“The blood pressure cuff was easy to use and made it simple to monitor my care at home.”* Even more so, the ability to have the blood pressure cuff for free was a key factor in the volunteers choice to



participate, as the cost of obtaining a cuff on their own was not possible. These debriefing conversations were an unexpected benefit which improved my understanding of the impact of the project and solidified the importance of continued home use for patient's long term.

Survey results were successful, as there were no missing data points during collection. Additionally, all blood pressure measurements were also able to be collected by each volunteer. The 7 extra blood pressure cuffs posed one issue that was quickly resolved, as they were donated to the cardiac rehab department in hope, they can reach future patients who might find themselves needing supportive tools to help manage hypertension at home.

## **Discussion**

### **Summary**

Key findings of this improvement project include a reduction in BP readings and an increase in SC-HI Index Score indicative of improved self-care maintenance, monitoring and management. In relation to the specific aim, a 10% increase in SC-HI index scores for self-care management, maintenance, and monitoring was predicted to occur due availability of home monitoring tools and increases in education surrounding hypertension care. This corresponded to improvements in overall self-care awareness and increased responsiveness in management of hypertension diagnoses. Of the three main self-care measures within the SC-HI, substantial increases were found which solidified the positive outcome home monitoring has on improving individual self-care. Percent changes included Self-Care Maintenance = 44% Increase, Self-Care Monitoring = 104.4% Increase, and Self-Care Management = 45.8% Increase. Additionally, factors pertaining to timeliness of recognition and symptom treatment effectiveness were assessed. Similar results were gathered, Recognition = 200% Increase and Symptom Treatment =

100% Increase. (Table 1). These results are supportive of the proposal consisting of increased education and access to home monitoring tools to support improved self-care in patients.

Blood pressure decreases were also found, which was an expected benefit from improving overall self-care in patients. Average systolic changes decreased 11.6% while average diastolic decreased 8.9%. Average ending pressures noted reductions of 16 mm Hg systolic and a 7 mm Hg diastolic. (Figure 3).

Strengths of this project include the use of the SC-HI survey which proved to be a reliable assessment of self-care with psychometric testing for reliability ( $\alpha = 0.83$ ) and validity (0.96) (Dickson et al., 2017). Additionally, patient adherence surrounding blood pressure measurements and continued home care post implementation seemed to be a strength that contributed to the success of the improvement. Recruitment of cardiac rehab patients also likely was a strength as these patients were enrolled in nutrition classes, exercise, and heart monitoring in addition to the other educational topics beyond the scope of this QI project.

### **Interpretation**

Utilizing education paired with a free home blood pressure cuff supported improved behaviors of self-care maintenance, management, and monitoring. The association of both the intervention and outcome are positive in that patients were able to improve their health by learning to advocate for themselves within the home setting utilizing tools and education that had been provided to support hypertension diagnoses. Debriefing conversations following the improvement uncovered a sense of reassurance and improved awareness pertaining to the intervention. A common theme between discussions was the immediate feedback that was able to be obtained utilizing the home blood pressure cuff. Patients felt more eager to make strides to

improve behaviors knowing they would be able to routinely check the results without having to make a trip to the doctor's office.

The results that were gathered from this quality improvement project are consistent with its successors. Tucker et al (2017) found reductions in blood pressure of 3.2 mm Hg following conclusion of their study on the use of home monitoring devices. Additionally, Sheppard et al (2020) found a similar reduction of 3.12 mm Hg and Magid et al (2013) noted a systolic reduction of 12.4 mm Hg and diastolic of 5.7 mm Hg. Reductions in uncontrolled high blood pressure significantly reduce the risk for heart attacks, aneurysms, heart failure, strokes, kidney failure, and vision damage (American Heart Association, 2022). Reducing the risk of these health conditions also promotes wellbeing and improved health while avoiding the high costs for treatment during and after, of which could leave many patients struggling financially for years. Impacts also can reach care takers, providers, pharmacists, nurses, support staff, insurance, etc. as the patient is better able to advocate for themselves following changed behaviors from education and necessary equipment needed to manage their diagnoses. Providing monitoring tools to help manage specific health conditions should be the first step in health planning and assists in involving the patient past the time spent in the office. Gaining support from the patient and initiating treatment plans that offer high levels of resources set the tone for the level of management that is expected, and hopefully reduce the risk of health conditions becoming uncontrollable. To implement such a task, funding or donations would be needed to gain access to blood pressure cuffs that could be dispersed to patients. If donations were unable to be found or insurance was unwilling to cover the cost, money from the facility would need to be used to fund this type of initiative. Fortunately, short term benefits have been noticeable in this quality improvement project and may support long term behavioral changes in the future.

**Limitations**

A limitation of this project was the small number of participants willing to be involved in the improvement. During planning, the goal was to increase education around hypertension care to 10 individuals. Upon implementation, three volunteers were willing to take part. The reasoning for this was unclear, with many individuals refusing to take part or not interested. This significantly impacted the number of results collected and average trends. Secondly, patients involved within this improvement were also given education regarding exercise and healthy eating habits due to being a part of the Cardiac Rehab program. Some of these additional lifestyle and diet changes could have contributed to increases in the SC-HI index scores and subsequent decreases in blood pressure. Future work could focus on selecting patients not enrolled within a cardiac rehab program or those who have already completed the program.

In general, the ability to carry out such an improvement did not pose any limits, although the improvement was only carried out by the project leader and did not involve nurses who ran the Cardiac Rehab program. Buy in from staff on continuing education focused on the importance of self-care is a factor that could result in a greater likelihood of sustained use of BP cuffs and self-monitoring in the future. Additionally, the ability to carry out an identical project with the same population might be difficult as many variables exist between each cardiac rehab program and home blood pressure monitoring protocols/instruction.

**Conclusion**

Within the United States, roughly 50% of the population is now burdened with the impacts of chronic diseases, creating an epidemic for all levels and scopes of healthcare (Holman, 2020). In fact, Holman states that of all healthcare costs 86% can be contributed to dealing with chronic illnesses. With the personalization that comes with each chronic illness, and

the various modes of treatment/progression more work is pushed onto unprepared healthcare professionals which negatively impacts patients, staff, families, etc. Adequately treating, educating, and supporting patients in adapting and changing behaviors must be done urgently through evidenced based practice (EBP) and a clear understanding on the magnitude chronic illnesses affect quality and duration of life. This type of education is a task best suited for the Clinical Nurse Leader (CNL) to undertake by utilizing skills such as care coordination, quality improvement, EBP, outcome measurements, risk assessments, and interprofessional leadership (AACN, 2022). By doing so the hope is illnesses, like hypertension, can be better controlled which ultimately will lessen adverse health events, increase quality of life, promote well-being of the patient, and support healthcare in all contexts in responsibility dealing with the epidemic of chronic illnesses.

To carry out such a task, institutions nationwide must be willing to look beyond the “medication to treat” mentality, and instead pair it when appropriate with an understanding of Maslow’s hierarchy of needs. Supporting the whole patient in their own personal illness experience and creating care plans that involve patient ideas, concerns, and thoughts is imperative in building awareness and patient support around diagnoses. CNLs must be hired into and allowed to practice to their full scope in identifying areas where improved patient engagement can be increased. As seen with this quality improvement project, education around hypertension paired home blood pressure cuffs produced decreases in overall blood pressure measurements, but also increased patient’s confidence in their own self-care measures. Sustainability of such an intervention is promising and overtime might support larger scale changes such as covered blood pressure cuffs by insurance companies to promote self-care long term, as is done with other conditions, such as diabetes.

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