INCREASING HOME BLOOD PRESSURE MONITORING

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Abstract

Problem: Uncontrolled blood pressure (BP) increases the risk of cardiovascular disease and mortality. Home Blood Pressure Monitoring (HBPM) is an effective strategy for controlling BP; however, only 38.7% of patients with high BP engage in HBPM. In primary care settings, the lack of measures that support HBPM is a critical barrier to performing HBPM. This project was implemented at an urban primary care clinic; approximately 90% of patients have high BP, 40% have uncontrolled BP, and only 10% perform HBPM. Patients are encouraged to practice HBPM to control BP, but the clinic does not implement measures to support HBPM. **Purpose:** This is a quality improvement project aimed to increase HBPM performance among patients diagnosed with high blood pressure. **Method:** An HBPM performance incentive policy was implemented at an urban primary care clinic. The policy required all patients diagnosed with high BP to receive a physician's prescription for a home BP device and a list of recommended home BP devices and costs. In addition, patients with insurance qualified at a local pharmacy had their prescriptions sent to the pharmacy to purchase new devices. Patients were also requested to bring their home BP devices to the clinic for validation, either new or currently used. Weekly data audits included the number of home BP devices purchased and the number of validated home BP devices. HBPM performance was measured by the percentage of the number of home BP devices purchased over the total number of patients without devices. **Results:** The baseline HBPM performance improved from 10% to 27.3%. There were eighteen participants, seven with used devices, eleven without devices and four with eligible insurance at the local pharmacy. Eleven patients without a device received a prescription and a list of recommended devices and costs. Four patients with eligible insurance had their prescriptions sent to the local pharmacy. Three patients received new devices. Ten patients with new and used devices received callbacks. Five devices were validated. **Conclusion:** The findings of this project are consistent with previous research claiming that HBPM-friendly programs and policies promote HBPM performance in hypertensive patients.

Increasing Home Blood Pressure Monitoring

Hypertension is a persistent health and financial burden in the United States. About half of the United States adult population (47 percent) are diagnosed with hypertension or are taking medication for hypertension (CDC, 2021). Hypertension was the primary cause of death for 516,955 people in the United States in 2019, and it persists as the most prevalent high-risk factor for cardiovascular disease (CDC, 2021; Egan, 2021). Hypertension is also the most common reason for primary care visits and dependence on chronic prescription medication in the United States and has an annual cost of $131 billion (Basile et al., 2021; CDC, 2021; Gondi et al., 2020). Treatment for hypertension is very effective; however, many adults with hypertension do not have it under control because of suboptimal adherence to antihypertensive therapy (Egan, 2022; Hawkins et al., 2021). Out of the 47 percent adult population diagnosed with hypertension in the United States, only 24 percent have their hypertension under control (CDC,2021). The United States Preventive Services Task Force (2021) recommends Home Blood Pressure Monitoring (HBPM) for optimal blood pressure control (Basile & Bloch, 2021; Stergiou et al., 2018). HBPM improves hypertension control by increasing drug adherence and encouraging patient adoption of antihypertensive lifestyle changes (Stergiou et al., 2018). However, only 38.7 percent of patients with hypertension are engaged in HBPM, and though 96.8 percent of providers report encouraging the use of HBPM with their patients, few have measures in place to promote the use of HBPM (Jackson et al., 2019; Ostchega et al., 2018). In primary care settings, the lack of measures/systems to support HBPM is a critical barrier to performing HBPM (Liyanage-Don et al., 2019). Data audits of the urban primary clinic show that approximately 240 patients, 90% , have hypertension, 108 patients, 40 percent, have uncontrolled BP, and only 10 percent perform HBPM. Patients are encouraged to practice HBPM to control blood pressure, but the clinic does not implement measures to support HBPM. The purpose of this quality improvement project was

to assist patients at the urban primary clinic with high BP achieve BP control by improving their HBPM performance. To achieve this goal, an HBPM performance incentive policy was implemented at the urban primary clinic.

Available Knowledge

The use of HBPM in hypertension care is supported by four high-quality and level 1 evidence-practice guidelines by Shimbo et al., (2020), Townsend & Cohen (2021), Karnjanapiboonwong et al. (2020), and Basile & Bloch (2021). Shimbo et al., 2020 and Karnjanapiboonwong et al. (2020) argue that HBPM provides superior blood pressure control to in-office BP monitoring and is associated with a reduction in mean systolic BP and diastolic BP at six months by 3.9 mm Hg and 2.4mm Hg, respectively. Shimbo et al., 2020 add that HBPM is highly acceptable among patients and clinicians; however, few patients practice HBPM because of a lack of HBPM training. Townsend & Cohen, 2021, showed that HBPM is a more accurate reflection of patients' actual BP than in-office BP measurements; therefore, it must be used to manage and guide antihypertension therapy. Furthermore, Shimbo et al., 2020, and Townsend & Cohen, 2021, also emphasize the need to provide adequate HBPM education to encourage patient engagement in HBPM. Basile & Bloch, 2021, also asserts that HBPM should be used interchangeably with in-office BP monitoring to manage antihypertensive therapy because of its high diagnostic capacity and ability to help lower BP over time. Expert opinion by Stergiou et al., (2018) also argues that HBPM should be used to manage antihypertensive therapy and implementing policies and education that boost HBPM performance is crucial.

All five studies show that HBPM is very effective in treating and managing hypertension and that implementing measures such as HBPM education or policies that support HBPM in primary care settings will improve HBPM performance. (Appendix A).

Rationale

The project used the Knowledge to Action framework to guide the implementation process. The framework acknowledges that challenges are associated with adopting new practices and that evidence and guidelines alone do not change existing health practices and policies (Hawkins et al., 2021). Hence, it focuses on reducing external and internal barriers to adoption and identifying ways to make evidence-based practices more implementable (Hawkins et al., 2021). Two parts comprise the framework, the Knowledge Creation process, and the Action Cycle. Since this was a quality improvement project, knowledge was not created; available knowledge was used to address the identified problem (Hawkins et al., 2021). The QI project, therefore, primarily relied on the Action Cycle for execution; to identify the problem at the urban primary care clinic and select the best knowledge to address the problem, assess barriers and facilitators during the implementation process, select the best strategies and tactics for optimal implementation and to evaluate outcomes as well as develop ideas for sustainability (Hawkins et al., 2021).

Methods

The urban primary clinic did not have any policies/measures in place to encourage HBPM performance. The team at the clinic included one provider, two medical assistants, and one billing/insurance personnel. When patients walked into the clinic for their scheduled appointments, they were checked in by the medical assistants. The medical assistants collected the patients' demographics and vital signs excluding the blood pressure (BP). The information was then documented on a standardized patient visit template and given to the doctor to proceed with the patient visit. The doctor measured the patient's BP and documented the BP reading on the patient visit template. If the patient had uncontrolled BP (systolic BP>130 and diastolic BP> 80), the doctor recommended that the patient perform HBPM. However, the provider didn't

investigate whether the patient had access to a home BP device or locations outside the clinic that perform BP monitoring. If the patient performed HBPM, the provider asked the patient for the latest BP reading but did not document the BP reading in either the patient's Electronic Medical Record (EMR) or on the patient visit template. At the end of the visit, the doctor gave the patient visit template to the medical assistant to transcribe the measured BP reading into the patient's EMR. Figure 1 depicts the desired process map.

An HBPM performance incentive policy was implemented at the clinic for a 14-week period from September 2022 – December 2022. The policy required all patients diagnosed with hypertension to receive a physician's prescription for a home BP device and a list of recommended home BP devices and costs. In addition, patients with insurance qualified at a local pharmacy had their prescriptions sent to the pharmacy to purchase new devices. Patients were also requested to bring their devices to the clinic for validation, either new or currently used devices. For the first stage of the intervention all patients with a diagnosis of hypertension were provided with a physician's prescription for a home BP device and a list of recommended home BP devices and costs. The DNP student or medical assistant explained the policy, prescription, and information regarding the recommended home BP devices and costs to the patients. Patients with insurance coverage that qualified at the local pharmacy had their insurance information, prescription, name, phone, date of birth, weight, height, and address faxed to the pharmacy by the student to facilitate home deliveries. For the second stage of the intervention the student made weekly calls to the patients and to the local pharmacy to track newly purchased home BP devices, investigate reasons for delayed/ declined purchases from the local pharmacy and to remind patients with upcoming visits to bring their devices to their next clinic visit for device validation by the student or medical assistant. A couple of strategies were utilized to facilitate the project’s implementation which included education and obtaining a formal commitment from the

CSR in support of the project. Education was provided to the staff regarding the project's background, goal, and implementation process. Other implementation strategies included weekly meetings/discussions held with the project champion to identify barriers to implementation, provide feedback, and revise and edit the implementation process where necessary. New and old home BP device purchases were stored in the EHR to increase project's sustainability. A pizza party was also held mid project to acknowledge staff participation and also to encourage future project participation.

The measures to assess and track the progress of the implementation process for the intervention included the number of patients that participated in the project, the number of patients that received home BP prescriptions, the number of patients that received home BP device recommendations and costs, number of patients whose information was faxed to the local pharmacy, number of patients that received call backs, number of patients with current home BP devices, number of patients with new home BP devices and the number of devices validated. The data was collected weekly and recorded in RedCap for evaluation. The outcome goal for the intervention was to increase the number of patients with hypertension that perform HBPM. HBPM performance was measured by the percentage of the number of devices purchased over the total number of patients without devices.

Ethical considerations were vital to maintain throughout the project's design and implementation stages. Patients were advised that their participation in the project was entirely voluntary, and their data was deidentified to guarantee confidentiality and HIPAA compliance. Furthermore, all data was captured and kept in RedCap, a highly secure and HIPAA-compliant database. There was also a consistent collaboration with the CSR and DNP faculty throughout the project's implementation to ensure that the project satisfied ethical standards. Additionally, non-human Subject's Research determination from the Human Research Protections Office

(HRPO) of the UMSOM Institutional Review Board (IRB) were obtained prior to project implementation.

Results

A total of twenty-two patients were approached to participate in the project. Eighteen patients opted to participate in the project. Seven patients out of the eighteen had current/used home BP devices. Eleven patients had no home BP devices, and four had eligible insurance at the local pharmacy. All process goals were met 100 percent:

- All patients (n=11) without an HBPM device received a physician's prescription for an HBPM device and a list of recommended devices and costs.
- All patients (n=4) with eligible insurance had their prescriptions sent to the local pharmacy to purchase a new device.
- All patients (n=10) with new and current/used HBPM devices received callbacks to bring their devices to the clinic for validation.

The outcome goals were to increase the number of patients that own a home BP device and the number of validated devices. Three new home BP devices were purchased through the local pharmacy, which raised the total number of home BP devices new (n=3) and used/current (n=7) to ten. Five out of the ten (new and used) home BP devices were validated. The bar graph (Figure 2) shows the number of new and used devices that were validated per month. Two home BP devices were validated in October and November, one in December, and no device was validated in September. The new HBPM performance was calculated by the number of new devices over the total number of patients without devices (3/11x 100%). The new HBPM performance was 27.3%. The Run chart (Figure 3) shows HBPM performance over 14 weeks. The HBPM performance increased at weeks 5, 12, and 13. new home BP devices were purchased at weeks 5, 12, and 13. During the flat trends, no new devices

were purchased. There was a direct relationship between the new HBPM performance incentive policy and improved HBPM performance since all three new devices were purchased from the local pharmacy. A summary of the process and outcome goal results was completed in Table 2. During the implementation phase, there were no unintended consequences such as unexpected benefits, facilitators, problems, or costs. The implementation process was heavily reliant on callbacks, which was an unexpected barrier that the project lead had not anticipated during the project planning phase.

Discussion.

As a result of the project, the baseline HBPM performance improved from 10% to 27.3%, and five home blood pressure monitors were validated. The project had a significant impact on patients who received new home blood pressure monitors; the patients reported using the new devices to monitor their daily home blood pressure. Furthermore, patients who had their used/current devices validated expressed a desire to continue performing HBPM. The project also impacted the clinic; the clinic can now use the local pharmacy to purchase future home BP devices for the patients' convenience. Unfortunately, most patients at the clinic relied on Medicare, but the local pharmacy did not accept it for device purchases, which limited the project's ability to financially benefit the clinic or the patients.

The key findings of the QI project emphasize that HBPM-friendly policies encourage patients to monitor their blood pressure. These findings are consistent with previous research claiming that HBPM programs and policies promote HBPM performance in hypertensive patients, For instance, Stergiou et al., 2018 & Shimbo et al., 2020 argued that HBPM should be used to manage BP, and it is critical to implement policies and education to improve HBPM performance.

There were several barriers to the project's success:

- The project was conducted in a small private clinic with limited staff, which limited patient participation.

- A few patients canceled appointments, limiting patient participation and the number of devices validated.
- Most patients at the clinic are on Medicare, which was not accepted at the local pharmacy to purchase devices.
- There were long gaps between patient visits (3 months), which hampered device validation.
- The local pharmacy took 2 to 4 weeks to process the devices, which negatively impacted equipment procurement.

Using a single local pharmacy to purchase home BP devices reduced the project's internal validity. The project leader attempted to locate other pharmacies, but none accepted insurance for device purchases.

Conclusion

Overall, the project successfully implemented an HBPM incentive policy in a population that needed it and proved that HBPM-friendly policies encourage patients to keep a close eye on their blood pressure by increasing HBPM performance. When patients monitor their blood pressure over time, they are more likely to have controlled blood pressure, lowering their risk of cardiovascular disease. Home blood pressure monitoring also makes it easier for practitioners to titrate blood pressure medications properly, which guides safe drug prescriptions and improves patient outcomes (Shimbo et al., 2020). The project findings are not generalizable because of the small sample size and setting; however, the project is substantial. The project is substantial because its key findings are consistent with several previous studies, and there is a direct relationship between the intervention and project outcomes. Suggestions for project sustainability include: recording home BP devices in the EHR and patients entering their home BPs in the portal for easier HBPM performance tracking. Furthermore, to avoid additional workload for the practitioner, the staff should monitor the patients' HBPM performance. The provider should only be accountable for assessing the patient's blood pressure.

Implications for practice suggest that verbal encouragement to monitor home blood pressure is insufficient for optimal blood pressure control. Patients with high BP must be constantly encouraged by HBPM-supportive incentives to improve HBPM performance and achieve BP control. Future QI initiatives should expand this project to other primary care settings to improve its generalizability. Future QI initiatives should also include HBPM training for patients. Studies show that HBPM training also increases HBPM performance (Townsend & Cohen, 2021). In addition, the clinic should apply for grants and use them to provide free devices to patients.

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Appendix A

Evidence Review Table

Citation: Shimbo, D., Artinian, N. T., Basile, J. N., Krakoff, L. R., Margolis, K. L., Rakotz, M. K., Wozniak, G., & American Heart Association and the American Medical Association (2020). Self-Measured Blood Pressure Monitoring at Home: A Joint Policy Statement from the American Heart Association and American Medical Association. *Circulation*, *142*(4), e42–e63. https://doi.org/10.1161/CIR.0000000000000803					Level 1
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
Provide support for the use of self-measured BP monitoring for the diagnosis and management of hypertension over in office measured BP. Provide up-to-date information on the use, efficacy and cost-effectiveness of self-measured BP monitoring for the diagnosis and management of hypertension.	Clinical statement and practice guideline	Purposive Sampling Sample size: Fourteen US and international hypertension guidelines, scientific statements, and position papers that support the use of self-measured BP monitoring for the diagnosis and management of high BP published between 2008 - 2019. Nine meta-analyses published after 2008 that compared BP outcomes for self-measured BP monitoring compared to regular in office BP monitoring.	Analysis/comparison of the benefits of self-measured BP monitoring over in office blood pressure monitoring for the diagnosis and management of hypertension.	Self -measured BP monitoring provides superior diagnostic and managerial hypertension capabilities compared to in-office BP monitoring. For instance, self- BP monitoring is the best at diagnosing masked, white coat hypertension and drug resistant hypertension. Self-measured BP monitoring Was also associated with a statistically significant greater reduction in mean systolic BP and diastolic BP at 6 months by 3.9 mm Hg and 2.4mm Hg, respectively.	Self-measured BP monitoring is a highly acceptable practice among providers and patients; however, an implementation gap persists because of a lack of supporting infrast

		Sample homogeneity was present; all guidelines, statements, and position papers used endorsed self-measured BP monitoring to diagnose and manage hypertension.			ructure. For example, lack of training for patients on how to self-measure and monitor BP at home.
Citation: Sheppard, J. P., Tucker, K. L., Davison, W. J., Stevens, R., Aekplakorn, W., Bosworth, H. B., Bove, A., Earle, K., Godwin, M., Green, B. B., Hebert, P., Heneghan, C., Hill, N., Hobbs, F., Kantola, I., Kerry, S. M., Leiva, A., Magid, D. J., Mant, J., Margolis, K. L., … McManus, R. J. (2020). Self-monitoring of Blood Pressure in Patients With Hypertension-Related Multi-morbidity: Systematic Review and Individual Patient Data Meta-analysis. *American journal of hypertension*, *33*(3), 243–251. https://doi.org/10.1093/ajh/hpz182					Level 1
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
"Examine whether self-monitoring can reduce clinic BP in patients with hypertension-related comorbidity."	A systematic review of randomized controlled trials (RCTs)	Randomized controlled trials. Eligible: 22 trials of 7360 participants Accepted: 16 trials of 6522 participants. # Control: Hypertensive patients without hypertension-related comorbidities. # Intervention: Hypertension patients with hypertensive-	Comparing the effectiveness of self BP monitoring among hypertensive patients without comorbidities and hypertensive patients with hypertension-related comorbidities.	On average, self-monitoring reduced clinic BP by 3.11/1.49 mm Hg (systolic/diastolic) at 12 months, although there was significant heterogeneity across studies (I2 = 59.6–75.4%, P <0.001) Self-monitoring was associated with reduced clinic systolic BP compared to in office BP	Self-monitoring is very effective at lowering regardless of the number of hypertension-related co-morbidities

		related comorbidities. Power analysis: Not provided. Group Homogeneity was present. All participants had hypertension and one to six other hypertension comorbidities. For all participants hypertension was treated as outpatient, and self-measured BPs were performed without professional assistance.		monitoring at 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]; P value for interaction with number of morbidities = 0.260).	present.
Citation: Karnjanapiboonwong, A., Anothaisintawee, T., Chaikledkaew, U., Dejthevaporn, C., Attia, J., & Thakkinstian, A. (2020). Diagnostic performance of clinic and home blood pressure measurements compared with ambulatory blood pressure: a systematic review and meta-analysis. *BMC cardiovascular disorders*, *20*(1), 491. https://doi.org/10.1186/s12872-020-01736-2					Level 1
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
To compare the diagnostic performances of CBPM (clinic blood pressure monitoring) and HBPM (home blood pressure monitoring) using ABPM (Ambulatory blood pressure monitoring) as the standard test."	A systematic review and meta-analysis	Random sampling. # Eligible: 58 studies # Accepted: 58 studies # Control: Diagnostic performance of ABPM #Intervention: 58 studies. Diagnostic performance	The diagnostic accuracy of HBPM and CBPM were compared using ABPM as the standard reference.	The sensitivity, specificity, and diagnostic odds ratios of CBPM were 74%, 79%, and 11.11, respectively. The sensitivity, specificity, and diagnostic odds ratios of HBPM were 71%, 82%, and 11.60 (respectively).	HBPM had slightly higher diagnostic accuracy compared to CBPM.

		of HBPM and CBPM. Power analysis: Not provided. Group homogeneity was present; the selected studies included participants from e hospital or community settings, and they represented the general population.			
Citation: Townsend, R. R., & Cohen, J. (2021). *Out-of-office blood pressure measurement: Ambulatory and self-measured blood pressure monitoring*. UpToDate. Retrieved from https://www-uptodate-com.proxy-hs.researchport.umd.edu/contents/out-of-office-blood-pressure-measurement-ambulatory-and-self-measured-blood-pressure-monitoring/print?search=hypertension+diagnosis+and+treatment&topicRef=3852&source=see_link.					Level 1
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
To discuss/explain the indications, technique, and interpretations of types of out of the office blood pressure measurements.	Systematic review/ practice guideline.	Purposive sampling 102 studies were used for the review.	General analysis of the indications, techniques, and interpretations of types of out of office blood pressure measurements; Ambulatory blood pressure monitoring (ABPM) and Self-measured blood pressure (SMBP).	Out-of-office blood pressure evaluation includes ambulatory blood pressure monitoring (ABPM) or self-measured blood pressure (SMBP). With SMBP patients obtain multiple BP readings over a limited time, which are then shared with the clinician.	Office-based blood pressure readings do not always accurately represent an individual's blood pressure,

				The patient should be provided with adequate training in the BP device use, and the device should be checked for accuracy approximately once yearly. The frequency of blood pressure measurements depend upon the reason (e.g., establishing the diagnosis of hypertension, monitoring the effect of therapeutic changes, monitoring of well controlled hypertension, confirming resistant hypertension).	out-of office blood pressure measurement is appropriate to confirm the diagnosis of hypertension and to monitor patients on therapy.
Citation: Basile, J., & Bloch, M. j. (2021). *Overview of hypertension in adults*. UpToDate. Retrieved September 24, 2021, from https://www-uptodate-com.proxy-hs.researchport.umd.edu/contents/overview-of-hypertension-in-adults?sectionName=Who+should+be+treated+with+pharmacologic+therapy%3F&search=hypertension+diagnosis+and+treatment&topicRef=3849&anchor=H3639365205&source=see_link#H3639365205					Level 1
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
Provides a broad overview of the definitions, pathogenesis, complications, diagnosis, evaluation, and management of hypertension.	Systematic review/practice guideline.	Purposive sampling. 67 studies	Explanation on how to perform and use home blood pressure monitoring (HBPM) in the diagnosis and management of hypertension	Hypertension is diagnosed if the mean home blood pressure is ≥130 mmHg systolic or ≥80 mmHg diastolic.	Home readings should be used to complement

			alongside in office blood pressure measurements.	Appropriate training and equipment are vital for obtaining accurate results. HBPM should be performed with a validated, automated oscillometric device that measures blood pressure in the brachial artery (upper arm), measurements must be done in a seated position and legs uncrossed, 12 to 14 measurements should be obtained, with both morning and evening measurements taken, over a period of one week each month.	office readings to determine whether a patient's blood pressure is under control.
Citation: Stergiou, G. S., Kario, K., Kollias, A., McManus, R. J., Ohkubo, T., Parati, G., & Imai, Y. (2018). Home blood pressure monitoring in the 21st century. *Journal of clinical hypertension (Greenwich, Conn.)*, *20*(7), 1116–1121. https://doi.org/10.1111/jch.13284					Level V
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcomes**	**Results**
Provides an overview of the benefits, limitations, indications of home blood pressure monitoring and	Expert opinion.	Purposive sampling. Sample of 27 studies.	Explanation on how to perform and use home blood pressure monitoring (HBPM) in the diagnosis and management of hypertension	Automated electronic (oscillometric) upper arm cuff devices are recommended for HBPM.	In office Bp monitoring and self-home blood

recommendations for practical application of self-home blood pressure monitoring.			alongside in office blood pressure measurements.	HBPM should be monitored for seven days before each office visit, with duplicate morning and evening measurements (before drug intake). Calculate average BP of all readings (at least 12 after discarding readings of the first day) for evaluation of home BP. Interpretation of home BP readings: Home hypertension: ≥135/85 mm Hg; normal home BP: <130/80 mm Hg. One or two duplicate measurements per week for long-term monitoring.	pressure monitoring should be regarded as complementary in the treatment and management of hypertension.

Appendix B

Evidence synthesis Table

Evidence Based Practice Question (PICO): At a local clinic, does in-office Home Blood Pressure Monitoring training improve BP control among patients diagnosed with hypertension?			
Category (Level Type)	**Total Number of Sources/Level**	**Overall Quality Rating**	**Synthesis of Findings**
Level 1 - Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	6	**Grade B: Strengths**: Strong background and framework. Use of Prospective studies that allow for real-time data collection, limiting recall error and yielding high-level evidence. Group homogeneity is present, which provides consistency in results. Results are also consistent with similar studies. **Weaknesses:** The use of retrospective studies involves analyzing pre-existing data which offers low evidence. Purposive sampling is also open to selection bias and error. **Grade C: Strengths:** Strong background and framework. A large sample size increases external validity. Randomized sampling offers an equal chance of selection and reduces biases and error. In addition, the presence of group homogeneity favors reliable and consistent results. **Weaknesses:** High p-value of 0.260, which suggests that self BP	**Shimbo et al. (2020).** Argues that Home Blood Pressure Monitoring (HBPM) has superior diagnostic and prognostic capabilities than in-office BP monitoring. For instance, HBPM is a better detector for masked and white coat hypertension. HBPM also offers better BP control and is associated with a statistically significant greater reduction in mean systolic BP and diastolic BP at six months by 3.9 mm Hg and 2.4mm Hg, respectively. HBPM is also highly acceptable among patients and clinicians; however, there is limited infrastructure for HBPM implementation, such as no HBPM training for patients. **Sheppard et al. (2020).** Found that even in the presence of various hypertension-related comorbidities, Self-

		monitoring might have little effect on the blood pressure of patients with hypertension-related comorbidities. **Grade B: Strengths:** The topic is well introduced and described, which gives the reader an understanding of why the research problem exists. Random sampling is used, which decreases selection bias and increases data reliability and external validity. Results are solid and consistent, with high confidence intervals at 95. Results and findings are also compatible with other similar reviews. **Weaknesses:** Small sample size, which increases bias and reduces external validity. **Grade A: Strengths:** Strong background and framework. Use of both retro and prospective studies. Prospective studies provide real-time data collection, which minimizes error and bias—use of a large sample size, which increases external validity. Results and findings are also like other studies that cover similar topics. Retrieved from UpToDate, whose reviews are subject to continuous modification, thus offer real-time evidence. **Weaknesses:** Purposive sampling is subject to selection bias and errors. **Grade A: Strengths**: Strong background and framework. It is an UPToDate review thus subject to continuous modification, thus	monitoring is associated with reduced clinic systolic BP compared to in-office BP monitoring at 12-month follow-up (−3.12 mm Hg, [95% confidence intervals −4.78, −1.46 mm Hg]; P value for interaction with number of morbidities = 0.260). **Karnjanapiboonwong et al. (2020).** Showed that HBPM has slightly higher diagnostic accuracy compared to clinic BP monitoring. The sensitivity, specificity, and diagnostic odds ratios of CBPM were 74%, 79%, and 11.11, respectively. The sensitivity, specificity, and diagnostic odds ratios of HBPM were 71%, 82%, and 11.60 (respectively). **Townsend & Cohen (2021).** Argued that HBPM is a more accurate reflection of patients' actual BP than in-office BP measurements. Therefore, HBPM should be used to confirm diagnosis and hypertension therapy. And adds that the patients should be provided with adequate training in the BP device use, and the device should be checked

		offering real-time evidence. Uses both retro and prospective studies, prospective studies provide real-time data collection, minimizing error and bias. Large sample size is used, which increases external validity. Results and findings are also similar to other studies that cover similar topics. Weaknesses: Purposive sampling is subject to selection bias and errors.	for accuracy approximately once yearly. **Basile & Bloch (2021).** Argue that HBPM should be used interchangeably with in-office BP monitoring to diagnose and manage hypertension. It also asserts that HBPM training is vital for patients. Teaching should include recommended s automated oscillometric devices that measure blood pressure in the brachial artery.
Level V · Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence	1	**Grade B. Strengths:** Strong background and frame provide the topic of discussion a great introduction. In addition, the use of national and international guidelines increases external validity. Results are also consistent with other reviews that examine the same topic. **Weaknesses:** Use of purposive sampling subject to selection bias and errors. Furthermore, the use of a small sample size minimizes external validity.	**Stergiou et al.** Like Basile & Bloch (2021). He also argues that HBPM and in-office BP measurements should complement each other. Moreover, automated oscillometric devices that measure blood pressure in the brachial artery are the best devices for monitoring HBPM**.**
Recommendations Based on Evidence Synthesis: HBPM has superior diagnostic capabilities and better BP control than in-office BP monitoring; however, complementing the two is best. Patients should be provided with HBPM training for optimal HBPM, and the best home BP devices are automated oscillometric devices that measure blood pressure in the brachial artery, and these should be checked for accuracy once a year.			

Figure 1

Desired Process Map before the intervention.

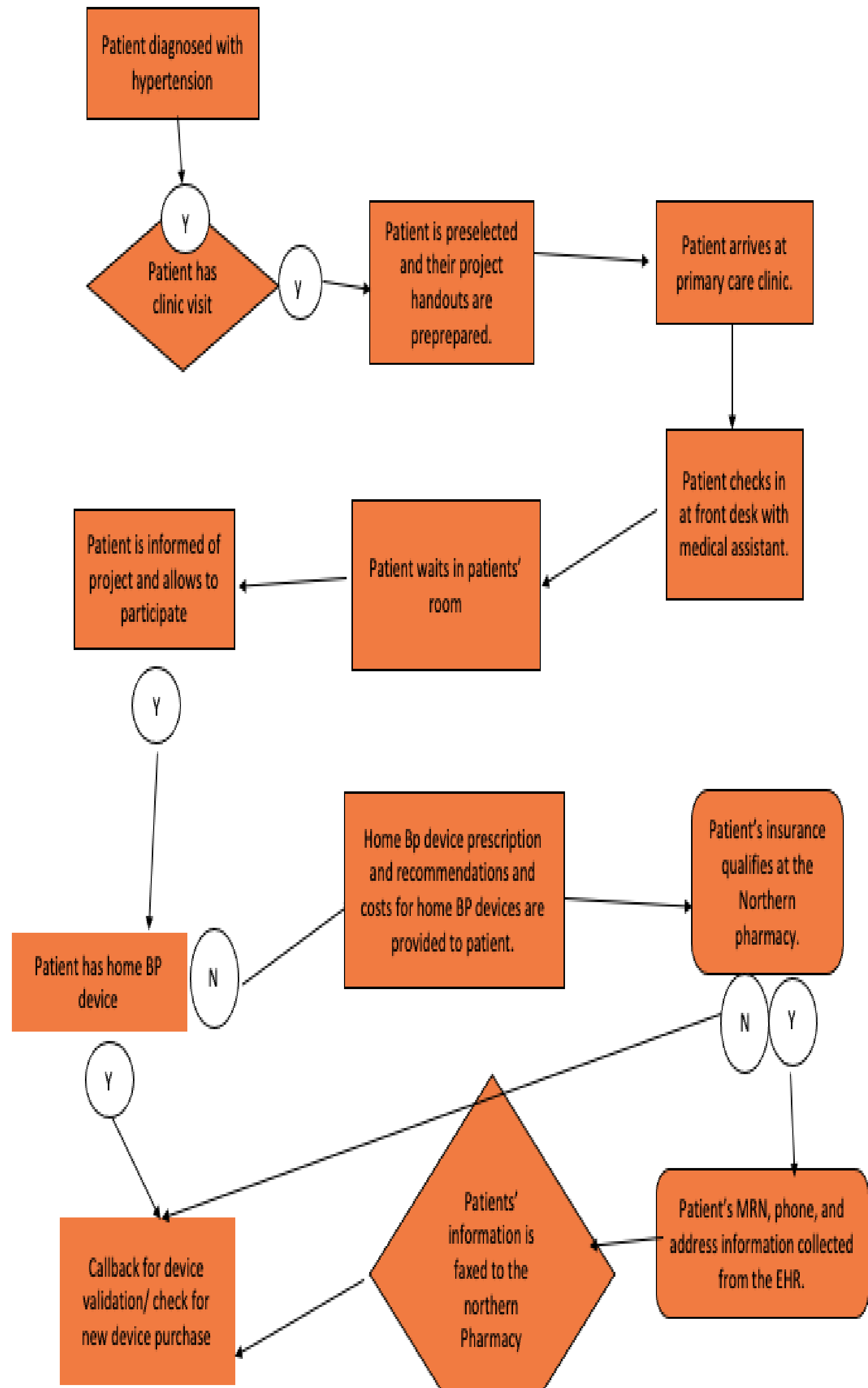
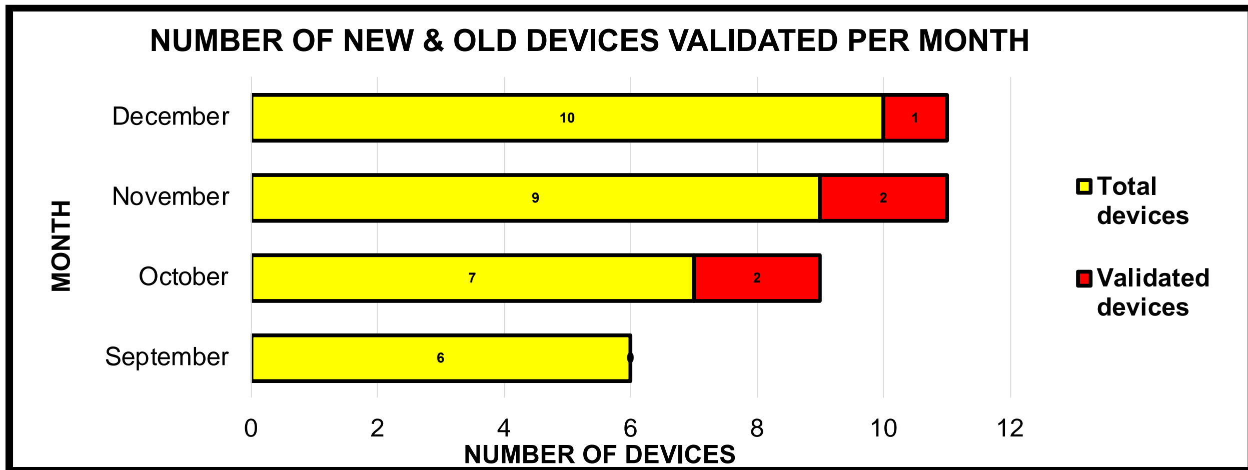


Figure 2

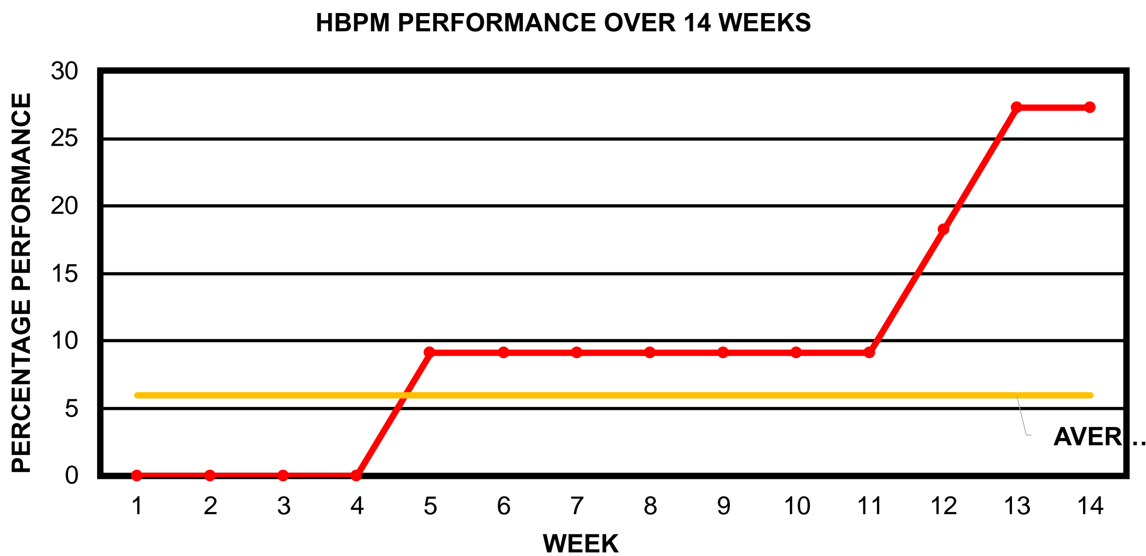
Bar graph



Note: The graph depicts the total number of devices per month (yellow) and the number of validated devices per month (red) (Sept-Dec). In September, 0 out of 6 devices were validated, 2 out of 7 devices were validated in October, 2 out of 9 devices were validated in November, and 1 out of 10 devices were validated in December.

Figure 3

Run Chart



Note: The chart depicts the total and number of validated devices over a 14-week period (Sept-Dec). In September, 0 out of 6 devices were validated, 2 out of 7 devices were validated in October, 2 out of 9 devices were validated in November, and 1 out of 10 devices were validated in December.

Table 2

Results: Process and outcome goals.

Total participants: 18 out of 22. 3 patients declined to participate.
Patients with current/used HBPM devices: 7
Patients without HBPM devices: 11
Patients with eligible insurance at the local pharmacy: 4
Patients with new HBPM devices after intervention: 3
Number of devices used & new validated: 5

Process goals

- 100% (n=11) patients without a HBPM device received a physician's prescription for a HBPM device and a list of recommended devices and costs.
- 100% (n=4) patients with eligible insurance, had their prescription sent to the local pharmacy to purchase a new device.
- 100% (n=10) patients with new and current/used HBPM devices received callbacks to bring their devices to the clinic for validation.

Outcome goals

- Number of new HBPM devices: 3
- New HBPM performance: 27.3%
- Number of devices validated: 5

Note: All process goals (100%) were met. Outcome goals: 3 new devices were acquired and 5 out of 10 new & used devices were validated. HBPM performance was calculated by 3/11x 100% (# of new devices / # of patients without devices) X 100%).