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Controlling Hypertension: A Self Blood Pressure Monitoring Program plus Health Coaching compared to Health Coaching Alone

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Introduction

Hypertension is currently one of the most common diseases worldwide and can lead to highly morbid cardiovascular or cerebrovascular complications such as coronary heart disease, stroke, and heart failure (Alismail et al., 2020). The Centers for Disease Control and Prevention (CDC) define hypertension as a systolic blood pressure ≥ 130 mm Hg, a diastolic blood pressure ≥ 80 mm Hg, or taking prescription medication to control hypertension. While nearly half of adults in the United States (45%) have hypertension, only about one quarter of those adults (24%) have adequately controlled hypertension (CDC, 2020). Due to the increased risk of heart disease and stroke, nearly half a million deaths in the United States yearly can be directly or indirectly attributed to hypertension (CDC, 2020). Furthermore, hypertension is also a significant risk factor for chronic kidney disease, retinopathy, type 2 diabetes, and more (Abegaz, Tefera, & Abebe, 2017).

The newly updated American College of Cardiology and American Heart Association hypertension guidelines recommend home blood pressure monitoring (HBPM). According to Shimbo et al. (2020), evidence shows that self-measured blood pressure monitoring is associated with an overall reduction in blood pressure as well as improved blood pressure control. However, when cointerventions are performed in conjunction with self-measured blood pressure monitoring, the benefits are shown to be greater (Shimbo et al., 2020). Providing a nurse-led coaching program in combination with home blood pressure monitoring (HBPM) aims to close educational gaps regarding hypertension, thereby increasing patient HBPM compliance while ultimately improving blood pressure control in patients diagnosed with hypertension.

Literature Review

Despite the current recommendation for the management of hypertension with HBPM, some studies demonstrate a lack of effectiveness of the intervention. For instance, HBPM alone without cointerventions such as one-to-one counseling, remote telemonitoring, and educational classes is associated with lower blood pressures at six months, but not at 12 months (Kario et al., 2019). This may suggest the notion of HBPM alone is an ineffective long-term intervention in the sustained reduction of blood pressure. Another study performed in a poor, medically underserved, ethnically diverse population in which 450 participants were provided with a home blood pressure monitor and training in the use of the device yet again showed no benefit for HBPM alone for management of hypertension (Yi et al., 2015). However, such populations have not been thoroughly studied indicating there may be additional meaningful barriers to achieving blood pressure goals in poor, uninsured settings (Yi et al., 2015).

Many studies show a positive impact of HBPM. Jacob et al. (2017) performed a 22-study meta-analysis demonstrating that HBPM along with a cointervention led to blood pressure reductions sustained until 12 months but smaller in magnitude than earlier readings. HBPM has also been shown to more accurately reflect the risk of cardiovascular events compared to office blood pressure monitoring (OBPM) (Liyanage-Don et al., 2019). A meta-analysis of 25 studies by Tucker et al. (2019) concluded that while HBPM without cointervention was not effective at controlling blood pressure, when performed with a cointervention HBPM is associated with better blood pressure control. Furthermore, there was a strong level of evidence suggesting that the degree of blood pressure decrease is related to the intensity of the co-intervention (Tucker et al., 2019). Examples of cointerventions include additional support, one-to-one counseling, remote telemonitoring, educational class, and coaching provided by a healthcare professional

such as a physician, nurse, or pharmacist (Kario et al., 2019). A randomized controlled trial by Muhammad et al. (2017) had similar findings. It was found that short-term HBPM increased medication adherence while also significantly reducing office blood pressure readings. Engenti et al. (2020) performed a trial that also supports these findings, demonstrating that providing community health worker support, education, and follow-up resulted in the greatest reduction in systolic blood pressure at the end of the 4-week trial (Engenti et al., 2020). Additionally, Jacob et al. (2017) found that meaningful blood pressure reductions were sustained at 12 months when HBPM was performed with cointerventions. The cause of such blood pressure reductions may include lifestyle changes, increased medication adherence, or increased prescription of medications (Tucker et al., 2019).

Patient factors play a significant role as barriers to HBPM. Many adults that check their blood pressure at home often lack proper technique and knowledge needed to accurately obtain a blood pressure (Mondal et al., 2018). The American Heart Association (AHA) guidelines for HBPM state to avoid smoking, caffeine, and exercise 30 minutes prior to taking a blood pressure, empty the bladder beforehand, and allow at least five minutes of rest before taking a measurement (AHA, 2017). The guidelines also recommend appropriate posture, arm support and placement, and cuff placement as well as taking 2-3 readings at least one minute apart and documenting them (AHA, 2017). Mondal et al. (2018) found that common areas of discordance with recommendations include inappropriate arm and body positioning, improper frequency or timing of measurements, inadequate duration of rest prior to measurement, improper cuff size or placement, failure to void prior to measurement, and continuing other activities while obtaining blood pressure readings (Mondal et al., 2018). Performing HBPM without following guidelines

increases the likelihood of obtaining invalid readings subsequently leading to inaccurate diagnosis and treatment (Milot et al., 2015).

Methods

This goal of this study was to determine whether, in a low-income, ethnically diverse population served by a federally qualified health care center, HBPM in combination with a nurse-led health coaching program would improve blood pressure control compared to traditional OBPM. The project was submitted to the Institutional Review Board at Southern Illinois University Edwardsville and approved as a Clinical Trial Protocol on May 20th, 2021.

The study was implemented at a rural family practice clinic in the Illinois Metro East area from September 6th, 2021 through December 10th, 2021. In total, 18 participants with in-office blood pressure readings greater than 140 over 90 consented and were enrolled in the study. Patients were randomly assigned into a group to receive either (a) health coaching only; or (b) both health coaching and a home blood pressure monitor. Each patient's blood pressure, BMI, Personal Well-Being (PWB) score, and Morisky Medication Adherence Scale (MMAS) scores were gathered at the initiation and completion of the intervention. Patients were provided telemedicine health coaching sessions weekly for the first four weeks, then every two weeks for three months.

Evaluation

There was an improvement in the average systolic and diastolic blood pressure measurements at the 4-week measurement for both the control and intervention group. When comparing the overall sample without regard to participant dropout, the intervention group's average systolic pressure decreased by 11 points and diastolic decreased by 10 points. The control group's average systolic measurement decreased by 18 points and diastolic decreased by

16 points. When evaluating blood pressures of only those that completed the entire study, at 4-weeks the intervention group's average systolic blood pressure decreased by 10 points, but diastolic increased by 4 points. The control group's systolic average decreased by 32 points, while their diastolic average decreased by 18 points.

At the 12-week mark, the control group's average blood pressures were similar to pre-intervention measurements and had increased from the 4-week timepoint. However, the intervention group's blood pressure measurements had further decreased from the 4-week mark. Participant dropout was high and undoubtedly affected results. While nine patients were lost by the 4-week time point, five additional patients either stopped participating in education or did not return to the clinic for their blood pressure check at the final point. All but one patient's systolic and diastolic blood pressure measurements had decreased from the beginning of the study. When evaluating 12-week individual blood pressures, all measurements decreased from the initial to the 12-week point, but 1 out of the 4 patients that completed the entirety of the study remained uncontrolled (>140/90) despite a decrease in blood pressure.

Several patients were lost to attrition. By the 1-month mark, nine patients had either never answered the phone or stopped answering. At the 3-month mark, five patients had stopped participation. Additionally, some patients completed the education calls but did not show up to their office appointment for their 1-month or 3-month blood pressure check, leaving only four patients that completed the entirety of the study. Additionally, at least two patients had phone numbers that were changed or disconnected during the study and did not provide the office with a new phone number. Those patients were thus unable to be reached for education.

Impact on Practice

This project was seamlessly integrated into routine practice. Providers found it easy to recognize patients with uncontrolled hypertension and add them to a list of possible participants. A nurse then called the patients requesting their participation and set up the initial appointment to obtain consent, BP, and BMI. Because this was a student-led intervention, there was not a significant change in practice for the providers. The practice is currently continuing the study to obtain a more significant sample size. With the continued use of nurse-led hypertension management coaching, further results are aimed to demonstrate a statistically significant reduction in blood pressure among patients. If this is found to be the case, this will support Chestnut Health Systems in seeking grant funding for home blood pressure cuffs. If approved, Chestnut will have the ability to provide more low-income patients with home pressure cuffs that do not have the means or access to one, aiding in controlled hypertension among a low-income population and decreasing risks of comorbidities and complications associated with hypertension.

Conclusion

Hypertension management education is essential to reduce and maintain a patient's long term blood pressure control. Both the intervention and control group received hypertension management education and a decrease in the average blood pressure of both groups was found. It may be concluded that providing a nurse-led coaching aids in decreasing blood pressure, but unfortunately providing a home-blood pressure cuff alone does not have a significant effect.