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Self-Blood Pressure Monitoring in the Adults with Hypertension

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Abstract

Hypertension, especially in the initial stages, is a silent disease that fails to show symptoms until complications arise [1]. Many times, this leads to untimely diagnosis and can contribute to non-adherence of healthcare practitioners' advice [1]. Only 54% of those diagnosed with hypertension have adequate control per national guidelines with a mere 9% having resistant hypertension [2, 3]. Self-blood pressure monitoring has been used as a tool assisting individuals and clinicians in managing hypertension due to convenience, ease of use, and affordability [4]. However, consensus among national and international authorities on its use has been lacking [4]. Despite this, many healthcare practitioners continue to advise individuals to include self-blood pressure monitoring into their self-care regimen [4].

Problem

Hypertension is the leading cardiovascular disease in developed countries worldwide and the leading cause of death in the United States [1, 3]. With approximately 1,000 deaths in the United States daily, hypertension crosses every socioeconomic class and ethnic group [3]. In American adults, one in three have hypertension with another one in five being unaware that they have the condition [3]. The yearly expenditures are approximately $46 billion including the cost of lost productivity in workplace [3]. Hypertension is more prevalent in non-white Hispanics and African Americans, increasing the disparities in these populations. In African Americans, hypertension tends to occur at a younger age, with greater severity than other ethnicities, and result in earlier complications. Traditional cuisines high in sodium compounded by a high prevalence of obesity leads to elevated blood pressure in these groups. Little is known how to target these specific populations to reduce these disparities as many randomized clinical trials lack diversity. Finding ways to positively impact, reduce the incidence of complications arising from this modifiable condition, and reduce health disparities that are associated with it are imperative to the health of those in our communities.

Hypertension Goals

An effort to reduce blood pressure to improve overall health and reduce complications is the combined effort of the individual and the healthcare team. Evidence based research concludes that a threshold of >130/80 mm Hg be made for adults with ASCVD (atherosclerotic cardiovascular disease) risk of 10% or higher or clinical CVD (cardiovascular disease) [5]. With adults that have ASCVD risk less than 10%, the recommended threshold is > 140/90. It is imperative that frequent candid discussions with individuals are made regarding blood pressure goals and treatment options to encourage compliance, engagement, and overall success.

Prevention

Prevention is the key to reduce the incidence of hypertension and reduce complications. Primary prevention efforts aim to prevent the occurrence of hypertension by encouraging a healthy lifestyle [6]. A healthy diet with fresh produce, low in fat, low in salt, and high in potassium in conjunction with 150 minutes of moderate intensity weekly exercise can assist in helping maintain an ideal body weight [2]. Practitioners should encourage smoking cessation, limiting alcohol intake to two or less drinks daily for men, and one or less drinks daily for women [2].

According to the US Preventative Services Task Force [USPSTF], secondary prevention efforts in adults 18 to 39 years old with normal blood pressure and without risk factorsshould include screening every three to five years [7]. USPSTF also recommends annual screening for those who are 40 years and older [7]. Tertiary prevention activities are those aimed at treating hypertension and reducing the complications of hypertension [6]. Examples would be pharmacologic treatment of hypertension to minimize end organ damage inthe heart, kidneys, and eyes [6].

Hypertension is the leading cause of many comorbid conditions including heart failure, myocardial infarction, cerebrovascular disease, and renal disease [3]. Prevention and treatment are the key to reverse the poor outcomes.

Blood Pressure Control and Adherence Barriers

Factors preventing hypertension control include non-adherence to lifestyle modifications, medication compliance, and failure to follow advice of the medical practitioner [1]. Adherence to medications is roughly 50-70 % and failure may be due to educational barriers, feeling no symptoms related to hypertension, adverse drug reactions, or financial barriers [1]. Around 25% of newly diagnosed individuals fail to fill their first antihypertensive prescription. Of those who do start therapy, only about 50% are still compliant with treatment at one year [8, 9]. Adherence rates to medication regimen are particularly low in young men [10]. Delayed diagnosis or denial of the diagnosis may occur as many of these men who are under the age of 40 and are not accustomed to yearly screening appointments or routine follow ups [10]. Medication side effects could impair mood and cause impotence in men further contributing to non-adherence [10].

Literature Review

In a pragmatic study by Angell et al. [11], the researchers examined the use of self-blood pressure monitoring in a medically underserved

area in New York with predominately African American and Hispanic subjects. The health centers and physicians taking part in the study enrolled their own subjects and were able to make treatment decisions based on their own preferences to resemble real-life practices [11]. Study subjects were given a blood pressure monitor, instructed on use, and were to follow the directions of their provider on frequency of monitoring [11]. Of the 767 subjects that completed this study, the researchers found a significant reduction in blood pressure between seven to nine months with 52.5% of subjects having controlled hypertension per national standards [11] Lacking a control group in this study, the researchers used regression to the mean (RTTM) method to justify significance of the findings [11]. This study is one of few that had a high percentage of medically underserved and high-risk subjects however lack of a control group, failure to randomize subjects, and lack of controlled intervention decreases the usefulness and applicability of the results broadly. In addition, more information on what provider interventions resulted in the increase in self-care abilities and health improvement would improve results of this study.

In a study by Hebert et al. [12], researchers recruited 416 African American and Hispanic subjects in the East and Central Harlem area of New York with uncontrolled hypertension. This study was a randomized controlled study and included three separate groups of subjects:Home blood pressure monitoring only, home blood pressure monitoring with ninephone calls by nurses, and usual hypertensive management by medical providers. Hebert et al. [12] found a statistically significant reduction in blood pressure in the nurse-managed group at nine months and no significant changes in prescribing practice in the other two groups. Though short-term results were realized, long term results measured at 18 months showed no statistical difference in blood pressure between the threegroups [12]. Blood pressure monitoring alone may not decrease blood pressure over the long term but lead to short-term improvement when additional healthcare guidance was given.

As discovered in a prospective randomized by Souza, Jardim, Brito, Araújo, & Sousa [13], statistically significant short-term improvement was seen in subjects who were given specific self-care interventions in conjunction with self-blood pressure monitoring. The researchers found that those in the intervention group achieved greater blood pressure control at six months, but by 12 months, both intervention and control groups had evenly reached blood pressure goals. Not only was the intervention group found to be more compliant with medication administration, but Souza et al. also found that the control group had to take more medications for blood pressure control. Comparable results were found in a similar study by Fung, Wong, Wong, Lee, & Lam [14] who found significant blood pressure control in the intervention group at three months, but both intervention and control groups had reached similar percentages of goal blood pressure at six months. The evidence from these studies suggest that subjects given specific guidance on parameters, self-blood pressure monitoring, and individualized care interventions may be more compliant with medication therapy and achieve goals faster there by reducing the risk of disease related consequences.

A study by Bosworth et al. [15], researchers examined if self-blood pressure monitoring would result in blood pressure control over 24 months as compared to nurse tele-monitoring with lifestyle coaching, a combination of both interventions, and usual provider care. This study was unique as it examined a longer period of time than other studies. The researchers found that though all groups did have a decline in systolic blood pressure, only those with the combined intervention had a statistically significant change [15].

This study suggested that there may be a greater long-term benefit when a combination of techniques is used to engage the individual in self-care management of hypertension.

In a randomized control trial that sought whether lifestyle counselling and self-blood pressure monitoring would optimize blood pressure control, researchers Niiranen et al. [9] found no statistical difference between intervention and control group at 12 months. The researchers attempted intense individual counselling, group lifestyle counselling, and coaching for the intervention subjects as well as having subjects check and send blood pressure results to providers every three months by mail [9]. This study was limited by a small sample size of 220 compared to the other larger university and corporate studies. In addition to a homogenous Caucasian sample, participation in the group and individual counselling sessions were only 45.5% and 72.3% respectively [9]. Limitations of this study include that no self-care guidance to the intervention group for frequency of self-monitoring between the 3-month end points, lack of instruction on individual target blood pressure measurements, or any other therapeutic interventions between the end points. Due to no measurements at intervals prior to 12 months, this study is difficult to compare to other studies of similar construct to see if short term improvements were realized within the intervention group.

In a study by Kerry et al. [16], subjects with hypertension who suffered a transient ischemic attack or stroke in the previous nine months were examined to see if self-blood pressure monitoring with nurse led telephone support at one week, three months, six months, and nine months would lead to improved blood pressure control as compared to the control group with no self-monitoring. Though researchers found increased medication use in the intervention group, but both intervention and control groups had similar rates of blood pressure control at the end of the study [16]. This is one of few studies to include subjects exhibiting complications related to hypertension.

Discussion

Individuals with hypertension, especially new onset, have struggle with self-care deficit in awareness of the health problem, medical regimen, difficulty in adjustment, and knowledge deficit of the disease process. Without purposeful self-intervention or intervention by the healthcare providers, these individuals may neglect to care for their disease and fail to see positive outcomes [17]. The studies by Fung et al. [14] and Souza et al. [13] support self-blood pressure monitoring with guided intervention and education may improve blood pressure control. As seen in the studies by Hebert et al. [12] and Angell et al [11], the intervention groups saw statistically greater reduction in blood pressure at the 9-month mark with the nurse managed group having a greater decrease in blood pressure. Hebert et al. [12] concluded that nurse led telephonic support combined with self-blood pressure monitoring led to improvement in blood pressure outcomes. Health coaching along with self-blood pressure monitoring by Bosworth et al. [15] found favorable short and long-term benefits. Niiranen et al. [4] reported that limited provider direction on how to perform self-care procedures can result in lack of improvement. Kerry et al. [16] demonstrated in her study that those individuals with status post stroke may not demonstrate blood pressure benefit from self-monitoring.

The literature review implies that there is a modest short-term blood pressure improvement when individuals are taught the skill of self-blood pressure monitoring in the home. The clinicians has a duty to support, educate, and guide treatment of the individual during the entirety of the disease process [17]. In addition to guiding treatment, educating in lifestyle choices, and assisting in goal setting, the healthcare provider may see better outcomes in hypertensive management with a team-based support from the office. As the individual learns and takes more self-action and control in their disease process, the balance of this support changes. The healthcare provider will always have a role in the promoting the health and wellness of the individual whether through primary, secondary, or tertiary preventative actions [17].

This modest improvement has led to recommendations of self-blood pressure monitoring by the Community Preventive Services

Task Force, The American College of Cardiology, and the American Heart Association Task Force [18]. Experts from the American Heart Association, European Hypertension Society, and British Hypertension Society recommend patients take two to three successive readings at least twice a day, one in the morning and once in the evening [18]. In addition, there is strong support to implement additional interventions in conjunction with self-blood pressure monitoring [18].

Financial barriers may exist for either the individual or the practitioner when attempting to establish a hypertension disease regimen. Currently, blood pressure monitors are considered inexpensive to many individuals with ranges of $50 to $100 [19]. Despite a call to action by the American Heart Association, American Society of Hypertension, and Preventive Cardiovascular Nurses Association [20] recommending reimbursement for home blood pressure monitoring devices, little results have been achieved.

Cost of the monitors only assist with one element of the necessary evidence-based resources. To implement more robust educational and supportive resources for lifestyle modifications, additional expense may be involved. The Community Preventive Services Task Force [19] estimated a yearly cost of $732 per person per year using an in-office team approach. Though seen as cost effective and shown to increase quality of life over 20 years, many medical offices may not be able to support this practice with continuous low reimbursement for the increased utilization of office visits [19].

Intervention

Healthcare providers should include encouraging self-blood pressure monitoring twice daily as recommended by national and international guidelines in hypertensive patient management [19]. Hypertensive individuals should be instructed on best practices in taking blood pressure, taught to record measurements, and encouraged to bring their recordings to each office visit. Prescribing medications with easy dosing schedules and lower side effect profiles may improve compliance [19]. Clinicians should inquire about missed doses and encourage medications to be brought in for review at each patient encounter visit [19]. These discussions will continue to build rapport between the patients and the medical practitioners, as well as allow the practitioners to see continued deficits that need modification of interventions.

In addition to and as resources are available, having a staff member setup periodic calls to newly established hypertensive individuals to inquire about blood pressure status, questions, or concerns may help bridge some gaps, especially in the newly diagnosed patients [18]. This may also assist in building a therapeutic relationship between the clinician's office and the patients, with encouragement to seek assistance when there are questions or concerns regarding blood pressure medications.

Education about the disease and the disease process should start at the office visit. Other multidisciplinary options to consider are third party telehealth services, community-based education classes, nutritionist referral, and home health services [18]. Tele-health services are picking up ground to allow communication of information between the individual and the practitioner, or use of third-party telehealth services, but are not largely covered by insurances at this time [19].

Outcomes of the intervention can be measured by obtaining mean goal blood pressure from office visits, home blood pressure log, or ambulatory blood pressure monitoring [18]. Goal is a reduction in blood pressure while reducing risk and occurrence of comorbid conditions [18]. Self-blood pressure monitoring can assist individuals in becoming more aware of their condition and increase their ability to care for themselves. Also, monitoring can assist clinicians in the management of hypertension and provide a guide for individualized treatment. This intervention, coupled with healthcare provider's guidance and support, contributes to individuals correcting self-care deficits by making them more aware of their disease, learning lifestyle modification behaviors, becoming more knowledgeable about effects of their medication, creates more awareness of potential complications, and ultimately transforms how individuals care for their health.

Future Implication

Future considerations for research include establishing the best way to implement lifestyle guidance interventions within the outpatient setting in conjunction with self-blood pressure monitoring. Options may include instruction from clinicians, outpatient health coaching, and community education classes. The use of tele-health services and smart phone application services, in conjunction with self-blood pressure monitoring, should also be considered as adjunctive approaches to reach goals.

Conflict of interests: The authors declare no conflict of interest.

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