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Is Home Blood Pressure Monitoring Effective at Controlling Hypertension in African American Patients? A Clin-IQ

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Abstract

African Americans are disproportionately affected by hypertension, a modifiable contributor to multiple chronic diseases and premature death. Primary care physicians play an important role in hypertension control. Home blood pressure monitoring (HBPM) is an evidence-based method for confirming diagnosis and monitoring hypertension over time. Some studies have found that HBPM may lead to clinically relevant reductions in blood pressure when combined with additional interventions, but few studies have focused specifically on African American populations. Evidence of effectiveness could increase clinical recommendation of HBPM. This clinical inquiry examined whether HBPM improves blood pressure control in African Americans with uncontrolled hypertension. Reviewed studies included 4 randomized controlled trials and 2 comparative research studies. Because these studies often were coupled with various co-interventions, ascertaining the independent effects of HBPM was difficult. When examining reviews of HBPM without a co-intervention and conducted independent of race, HBPM alone was insufficient to achieve long-term changes in hypertension control. More research focused on African Americans, with use of control groups, is needed to determine the true role for HBPM in controlling hypertension in this at-risk patient population. (*J Patient Cent Res Rev.* 2022;9:185-190.)

Keywords

home blood pressure monitoring; hypertension; African American; primary care; racial inequity; health care disparities; social determinants of health

Clinical Question

Among African American patients with poorly controlled hypertension within a primary care clinic, is home blood pressure monitoring (HBPM) effective at reducing blood pressure?

Brief Answer

Uncertain. A handful of studies have examined HBPM within African American populations, but they were coupled with various co-interventions that make it difficult to ascertain the independent effects of HBPM. Nearly all studies found improved systolic blood pressures (SBP) among both their usual care and intervention groups, without significant differences between them. Independent of race, investigations of HBPM without a co-intervention have concluded that HBPM alone is

insufficient to achieve long-term changes in diagnosed hypertension. Thus, to more completely answer this clinical question, additional research using a randomized controlled trial in African American patients comparing an intervention group utilizing HBPM to a usual care group, without additional co-interventions, is needed.

Level of Evidence for Answer: B.

Date Answer Was Determined: November 20, 2021.

Literature Search

Databases: MEDLINE, PubMed, CINAHL, and Google Scholar.

Date Search Conducted: March 2021.

Exclusion Criteria: Non-English language, articles published before 2000, article titles already included in meta-analyses or systematic reviews that were analyzed for this clinical inquiry (Clin-IQ).

Inclusion Criteria: Systematic reviews, meta-analyses, randomized controlled/comparative trials, cohort studies, and consensus guidelines published in the English language within the date range of January 2000–February 2021.

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Search Terms: African American, home blood pressure monitoring, uncontrolled hypertension, vulnerable, underserved, social determinants of health.

Summary of the Issues

African American patients are disproportionately affected by hypertension. Non-Hispanic Black adults have the highest prevalence of hypertension at 57.1%, compared to 43.6% of non-Hispanic White and 43.7% of Hispanic adults.¹ Nearly one-third of African American young adults (ie, 18–44 years of age) have hypertension according to a race-stratified analysis of National Health and Nutrition Examination Survey (NHANES) data from 2005 to 2016. The relatively high prevalence of hypertension in African American patients is multifactorial and may be attributed to racism-induced stress, socioeconomic status, inadequate therapy, medication-adherence challenges, health care visit frequency, and genetic polymorphisms, among other influences.^{2,3} African Americans have higher rates of heart failure, cerebrovascular disease (including ischemic stroke, transient ischemic attack, and intracerebral hemorrhage), peripheral vascular disease, sudden cardiac arrest, and sudden cardiac death. Despite its associated risk profile, hypertension is modifiable and effective treatment that helps control blood pressure can lower risk for the aforementioned adverse events.⁴ Controlling hypertension is paramount to preserving cardiovascular health and preventing disease and death.

Primary care physicians play a vital role in controlling and mitigating the effects of chronic disease on patients.⁵ HBPM is an evidence-based method for confirming hypertension diagnosis and monitoring hypertension over time. When combined with additional interventions, it may result in clinically relevant reductions in blood pressure.^{6,7} The use of HBPM within a primary care setting also can lead to an enhanced physician-patient therapeutic relationship.⁸

According to NHANES data from 2011 to 2014, 19% of non-Hispanic Blacks utilized HBPM monthly or more frequently and had the most frequent use compared to other racial groups.⁹ Despite the high rates of hypertension and rates of HBPM usage among African Americans, most studies on HBPM have not specifically targeted this at-risk population. Social determinants of health, including health care access and health literacy, may impact the use of HBPM among African American patients. Understanding the role and benefits of HBPM among African American patients with poorly controlled hypertension may increase recommendation of HBPM for these at-risk patients by primary care clinicians.

Summary of the Evidence

The literature search yielded 7 articles with 6 unique datasets reporting on the effectiveness of HBPM among African American patients.¹⁰⁻¹⁶ These included 4 randomized controlled trials and 3 comparative research studies. While all 7 articles focused on HBPM as an intervention to improve blood pressure control, the presence of co-interventions, type of co-intervention, and patient populations studied varied.¹⁰⁻¹⁶

In a 2011 cluster-randomized controlled trial titled “Improving blood pressure control: results of home-based post-acute care interventions,” Pezzin et al conducted a 3-arm study of African American patients already receiving home health care in New York.¹⁰ All patients received their usual home care and were randomly assigned to 1 of 3 intervention groups: 1) no additional intervention; 2) a basic intervention consisting of a blood pressure reduction education guide and a HBPM with a log; 3) an augmented intervention consisting of the basic intervention plus a hypertension support nurse and health educator who provided hypertension medication assessment, monitoring, education, and self-management support. After 3 months, there was no significant improvement in blood pressure with the basic intervention. In the augmented intervention, patients with stage 2 hypertension had significantly improved outcomes — blood pressure control was increased by 8.7 percentage points compared to usual care (8.9% vs 17.6%; $P=0.01$). Patients with stage 2 hypertension receiving the augmented intervention also had an 8.3 mmHg relative reduction in systolic blood pressure ($P=0.01$), and the proportion with a ≥ 20 mmHg reduction in SBP increased by 16.4 percentage points ($P=0.01$). Study design limitations included nurse-level randomization to a study group based on patient geographic location and the nurse’s case load.¹⁰

In a 2016 follow-up to the Pezzin et al study,¹⁰ Feldman and colleagues reported results from a prospective comparative effectiveness study titled “Home-based interventions for black patients with uncontrolled hypertension: a cluster randomized controlled trial.”¹⁴ At 12 months, no significant differences in blood pressure control rates (25% for usual care, 26% for basic intervention, and 22% for augmented intervention), mean SBP (143.8 mmHg, 146.9 mmHg, and 143.9 mmHg, respectively), medication intensification (47%, 43%, and 54%, respectively), or self-management score (18.7, 18.7, and 17.9, respectively) were seen. Adjusted SBP dropped more than 10 mmHg from baseline to 12 months among all study participants. The augmented and basic interventions were not more effective than usual care in increasing blood pressure control, lowering

SBP, or improving medication intensification or patient self-management. On average, SBP declined by 10.1 mmHg (from 155.5 to 145.4) across the 3 study arms from baseline to 12 months. Because usual home care led to significant improvements, the lack of differences between groups created a high comparative effectiveness threshold. This study was further limited by differential attrition, with augmented patients more likely to decline 12-month follow-up.¹⁴

In a 2012 randomized comparison trial titled “Nurse-led disease management for hypertension control in a diverse urban community: a randomized trial,” Hebert et al studied African American or Hispanic patients from the Harlem neighborhood in New York City who had uncontrolled hypertension.¹¹ Patients were randomized to receive a HBPM plus one in-person counseling session and 9 months of phone follow-up with a registered nurse or usual care, which included a pamphlet on controlling blood pressure. During the trial a third arm was added, the HBPM-alone group, which did not receive the nurse counseling but did receive the pamphlet. After 9 months, a -7.0 mmHg difference in SBP was noted for the nurse intervention group as compared to the usual care group. For the HBPM-only group, there was a +1.1 mmHg change as compared to usual care, thus it was not more effective than usual care. At 18 months, there were no statistically significant differences in SBP among groups, which authors attributed to improved hypertension control in the usual care group. There also were no statistically significant improvements between treatment groups at 9 or 18 months for diastolic blood pressure (DBP). This study was limited by an irregular recruitment process, substantial loss to follow-up, and demographically dissimilar patients depending on study enrollment time.¹¹

In 2014, Ogedegbe et al¹² examined the CAATCH dataset¹⁷ in “Counseling African Americans to Control Hypertension [CAATCH]: cluster randomized clinical trial main effects,” which randomized 30 low-resource community health centers in New York City to intervention or usual care. The patient intervention included multiple self-paced computer-based education sessions focused on hypertension causes, complications, and treatment, group and individual counseling sessions on lifestyle modifications, and free automated HBPM. Patients were encouraged to record their blood pressure twice a day, 3 times per week, and bring their recorded measurements to each study visit. Patients receiving usual care were given printed hypertension education information and vitamin and mineral supplements. There also was a physician intervention that included monthly case rounds and review with time for feedback

on patients’ HBPM.¹⁷ Ultimately, there was no significant intervention effect in comparison to usual care on blood pressure control at 12 months.¹² Subgroup analysis revealed improved blood pressure control in patients who received the intervention in smaller-sized community health centers, in patients without diabetes at 12 months, and in patients with moderate to good health literacy status. Overall, the multicomponent intervention was not better than usual care. The authors suggested that their study outcomes may be secondary to “poor patient compliance given the complexity of adhering to multiple intervention components and adopting more than one lifestyle change.”¹² Limitations included a 30% attrition rate and low patient adherence to intervention components.¹²

In 2015, Yi and colleagues published “Self-blood pressure monitoring in an urban, ethnically diverse population: a randomized clinical trial utilizing the electronic health record,” which centered on “medically underserved” individuals from New York.¹³ The patient population was 62% Hispanic, 28% Black, and 10% White. Half of the patients were randomized to usual care, and the other half were randomized to an intervention that involved receiving a HBPM, training on its use, and hypertension education materials. The usual care participants received a blood pressure monitor as an “incentive” at the end of the 9-month follow-up. After 9 months, SBP decreased similarly in both the intervention and control groups (by 14.7 mmHg for intervention and by 14.1 mmHg for control; $P=0.70$). Blood pressure control was reached in 38.9% of intervention and 39.1% of control participants at 9 months. The “time-to-event experience” of reaching blood pressure control was similar in the two groups.¹³ In this predominantly minority urban population, HBPM was not shown to improve blood pressure control better than usual care. Limitations included possible bias at the largest study site, which was concomitantly undertaking other blood pressure-related quality improvement efforts, and the study’s inability to assess whether patients understood their blood pressure readings and how frequently they engaged in HBPM.¹³

A 2020 trial by Boulware et al titled “Hypertension self-management in socially disadvantaged African Americans: the Achieving Blood Pressure Control Together (ACT) randomized comparative effectiveness trial” centered on African American patients in a community-based primary care clinic.¹⁵ All patients were assigned to a community health worker and received a HBPM followed by random assignment to 1 of 3 intervention groups: 1) no additional intervention; 2) shared decision-making training related to hypertension self-management; or 3) 9 weeks of “problem-solving

behavioral self-management training.”¹⁵ Blood pressure control rates improved in all patients from baseline, where rates were noted to be 36%, 51%, and 52% (based on Joint National Committee [JNC 7] criteria) and 50%, 65%, and 69% (based on JNC 8 criteria) at baseline, 4 months, and 12 months, respectively, with no significant differences between intervention groups. There were high rates of HBPM use among all 3 groups (between 74% and 87%). Neither of the more elaborate interventions had better hypertension control than those who received only the community health worker and HBPM intervention, though learning to engage in their hypertension-related care may still benefit vulnerable African American patients. Regular contact between community health workers, patients, and providing blood pressure monitors “may have helped overcome important social support, logistical and material resource barriers for socially disadvantaged individuals.”¹⁵ Limitations included lack of a control group and limited generalizability in the setting of a single urban primary care clinic.

Also published in 2020 was Still and colleagues’ pilot randomized controlled trial titled “A community and technology-based approach for hypertension self-management (COACHMAN) to improve blood pressure control in African Americans: results from a pilot study,” which randomly assigned African American patients to the COACHMAN intervention or enhanced usual care.¹⁶ The COACHMAN intervention consisted of 4 components: 1) 6 weekly web-based hypertension education modules; 2) HBPM for 3 months; 3) medication management using a smartphone application; and 4) up to 4 nurse counseling visits with members of the National Black Nurses Association. Enhanced usual care consisted of printed hypertension management education materials, one web-based education session on HBPM, and a blood pressure cuff with no requirement to monitor over the 3-month period. After 3 months there were no significant differences in terms of significant SBP reduction or blood pressure control. The only difference noted was that the COACHMAN intervention group had increased antihypertensive medication adherence versus the control group. The lack of difference between the groups may have been due to increased self-monitoring of blood pressure, as both groups received a home blood pressure cuff. This study was limited by small sample size, short time frame, and the provision of a HBPM for all participants.¹⁶

When studies of HBPM plus additional supportive interventions (eg, counseling on treatment adherence, virtual pharmacist counseling, telemonitoring with self-titration of antihypertensive medications, telemonitoring with

virtual nurse visits, and medication-behavioral management) were compared to usual care, a 2013 meta-analysis found there was consistent benefit of HBPM with co-intervention at 12 months, with reduction in either SBP (maximum decrease of 8.3 mmHg) or DBP (maximum decrease of 4.4 mmHg).⁷ Also, HBPM alone was found to be ineffective in one study focused solely on African Americans.¹¹ It is important to note that the impact of HBPM use among African American patients may be no different than that determined by reviews of the general population. Primary care providers should encourage use of HBPM among all patients, particularly in conjunction with additional supportive interventions.

Limitations of Clin-IQ Analysis

There is a paucity of studies centered on African Americans and HBPM. Most of those that exist are limited by use of comparative effectiveness design and report no differences between the usual care and intervention arms (Table 1¹⁰⁻¹⁶). Two studies found a statistically significant difference in SBP between intervention and usual care,^{10,11} though in the first study this was true only among patients with stage 2 hypertension,¹⁰ and in the second study the significant difference noted at 9 months disappeared by the 18-month follow-up.¹¹ Nearly all other studies found clinically relevant improved SBP among both their usual care and intervention groups, without significant difference between them. Studies typically provided all participants with a HBPM, so there was often no true control group. Additionally, the Hawthorne effect, which occurs when individuals alter their behavior because they are being observed,¹⁸ may have contributed to the lack of statistically significant difference in SBP between the usual care and intervention groups in many of the studies conducted.

Conclusions

Given the findings of this Clin-IQ, it is important to highlight the known advantages of home blood pressure monitoring in the general population to guide primary care physician decisions for African American patients. Benefits of HBPM include reduction in clinical inertia,¹⁹ improved patient engagement,²⁰ and increased medication adherence.²¹ One systematic review of broader populations with uncontrolled hypertension found that HBPM alone can reduce systolic blood pressure by 3.9 mmHg and diastolic blood pressure by 2.4 mmHg over a period of 6 months, though any difference at 12 months was no longer statistically significant. General benefits aside, more research focused on African American patients with use of control groups is needed to determine the true role for HBPM in reducing blood pressure in this at-higher-risk population.

Table 1. Clinical Relevance and Intervention Effect Among Studies on Home Blood Pressure Monitoring in African American Patients

Published study	Clinically relevant difference ^a	Time frame	Intervention effect compared to usual care
Pezzin et al (2011) ^h	Yes	3 months	Significant change ^b
Hebert et al (2012) ¹¹	Yes	9 and 18 months	Significant change ^c
Ogedegbe et al (2014) ¹²	Yes	12 months	No difference
Yi et al (2015) ¹³	Yes	9 months	No difference
Feldman et al (2016) ¹⁴	Yes	12 months	No difference
Boulware et al (2020) ¹⁵	Yes	12 months	No difference ^d
Still et al (2020) ¹⁶	No	3 months	No difference

^aSignificant pre-post difference seen in systolic blood pressure for usual care group and intervention group, or intervention group alone.

^bOnly for stage 2 hypertension at 3 months.

^cOnly at end of intervention (9 months); no significant difference at 18-month follow-up following study completion.

^dNo usual care group; no difference between all three arms.

Patient-Friendly Recap

- Devices that record patients' blood pressure at home, or HBPM, help clinicians monitor the health of those diagnosed with hypertension.
- Authors reviewed the literature to determine if the benefits of HBPM seen when used in conjunction with other interventions to lower high blood pressure (adjusting medication, health counseling, etc) also applied specifically to African Americans, a patient population with higher rates of hypertension.
- In most reports, use of HBPM alone failed to reduce blood pressure long term. While combining HBPM with additional clinical support has proved modestly effective in the general population, racially focused studies are needed to confirm whether such outcomes hold true for African Americans.

Author Contributions

Study design: Lehmann, Simpson. Data acquisition or analysis: Nye, Simpson. Manuscript drafting: Nye, Simpson. Critical revision: Lehmann, Simpson.

Conflicts of Interest

None.

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