HHS Public Access

Author manuscript

Am Heart J Plus. Author manuscript; available in PMC 2023 September 14.

Published in final edited form as:

Am Heart J Plus. 2023 February ; 26: . doi:10.1016/j.ahjo.2023.100253.

TEXT MY BP MEDS NOLA: A pilot study of text-messaging and social support to increase hypertension medication adherence☆

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Abstract

Study objective: Non-Hispanic Black (NHB) adults have high hypertension (HTN) and cardiovascular disease (CVD) burden. Medication nonadherence limits control and self-measured blood pressure (SMBP) improves diagnosis and adherence. This predominantly NHB cohort pilot, via community-clinical linkages, with uncontrolled HTN and low adherence, utilized bidirectional electronic messaging (BEM) with team-care, to assess medication adherence, quality of life, and BP.

Setting: Academic clinic and community sources.

Design: Recruitment included: uncontrolled HTN (BP ≥130/80 mm Hg), low adherence (Krousel-Wood Medication Adherence Scale (K-Wood-MAS-4) ≥1 score), and smartphone access.

Participants and interventions: Participants (N = 36) received validated Bluetooth-enabled BP devices, synced to smartphones, via a secured cloud-based application.

☆The initial findings of this pilot study paper were presented at the American Heart Association's 2022 Annual Scientific Sessions in Chicago, Illinois.

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Conflicts of interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Keith C. Ferdinand is a consultant for Amgen, Novartis, Pfizer, Medtronic, Boehringer-Ingelheim, Janssen and principal investigator of HHCPP. Daphne P. Ferdinand is the executive director of HHCPP.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ahjo.2023.100253.

Main outcome measures: Demographics, adherence scores, Centers for Disease Control and Prevention (CDC) health-related quality of life (HRQOL-14), BP, body mass index (BMI), 8 weeks daily BEM, SMBP and text responses were obtained.

Results: Age was 58.7 ± 12.8 years; BMI 34.8 ± 7.9; 63.9 % female; 88.9 % self-identified NHB adults; 72.2 % with obesity; 74.3 % with diabetes. K-Wood-MAS-4 adherence composite score improved: 2.19 to 1.58 (median −0.5, p = 0.0001). Systolic BP decreased by 10.5 ± 20.0 mm Hg (median −11.0, p = 0.0027). QOL did not significantly change. Mean 7-day average SBP/DBP differences were −4.94 ± 16.82 (median −3.5, p = 0.0285) and −0.17 ± 7.42 (median 0, p = 0.7001), respectively. Social support with taking BP medication was: “yes” (n = 19); 143.8 mm Hg to 131.5 mm Hg (median −12.5, p = 0.0198) and “no” (n = 14); 142.32 mm Hg to 130.25 mm Hg (median −4.0, p = 0.0771).

Conclusions: Community-clinical linkages and SMBP with BEM significantly improved medication adherence and SBP without modifying pharmacotherapy.

Keywords

Hypertension; Disparities; Text-messaging; Medication adherence; Community-clinical linkages; Social determinants of health

1. Introduction

Hypertension (HTN) is the leading cause of morbidity and mortality worldwide. Presently, the 2017 American College of Cardiology/American Heart Association (ACC/AHA) Multisociety high blood pressure (HBP) guideline defines HTN as systolic blood pressure (SBP) ≥130 mm Hg or diastolic blood pressure (DBP) ≥80 mm Hg. The prevalence of HTN among non-Hispanic Black (NHB) adults or African Americans (AA) in the United States (US) is among the highest in the world [1,2]. Furthermore, NHB persons have higher death rates compared to other US racial and ethnic populations from cardiovascular disease (CVD) linked to HBP. In 2019, age-adjusted death rates attributable to HBP was 25.7 and 20.6 in non-Hispanic White (NHW), 56.7 and 38.7 in NHB, 23.1 and 17.4 in Hispanic/Latinx, 17.4 and 14.5 in NH Asian/Pacific Islander (API), and 31.9 and 22.4 in American Indian/Alaska Native (AI/AN) male and female adults, respectively [2]. Age-adjusted HTN prevalence was higher among NHB men (57.2 %) and women (56.7 %) than NHW men (50.2 %) and women (36.2 %) and Hispanic/Latinx men (50.1 %) and women (36.8 %) [3].

An analysis of 18,262 adults with HTN (defined as 140/90 mm Hg) demonstrated that controlled HBP (<130/<80 mm Hg) rates decreased from 53.8 % in 2013–2014 to 43.7 % in 2017–2018 [2]. Therefore, of the 116 million with HTN in the US, approximately 91.7 million do not have their BP under control [4]. Uncontrolled HTN is the primary cause of disparate CVD, stroke, chronic kidney disease (CKD), and end-stage renal disease (ESRD) burden in NHB adults [5,6]. Despite available treatments and unacceptably high CVD burden in NHB adults, BP control is higher among NHW (32 %) adults than NHB (25 %), non-Hispanic Asian (19 %) and Hispanic/Latinx (25 %) adults [7]. Moreover, uncontrolled HTN-associated disparate morbidity and mortality accounts for $316.6 to $329.7 billion in health care costs every year [8].

Factors affecting inadequate BP control include: inappropriate drug choice, therapeutic inertia by physicians or other clinicians, limited access to or use of health care, and nonadherence to medications or lifestyle recommendations [9]. The social determinants of health (SDOH) are a main driver of suboptimal HTN control. Specifically, individuals living in communities with inadequate levels of health insurance or low socioeconomic status are less likely to have controlled BP [10]. In a meta-analysis of 20 observational studies (N = 376,172), an estimated 50 % of patients were nonadherent to antihypertensive medications [11]. Although HTN control reduces the risk for CVD, CKD, and cerebrovascular disease, significant persistent barriers to HTN control remain. Main SDOH barriers include: lack of access to health care providers, transportation to and from appointments, and available and affordable environmental and nutritional resources.

Patients with social support from friends, family, or healthcare provides are more likely to demonstrate strong medication adherence, have a positive attitude towards treatment, and be motivated and reminded to adhere the treatment plan [12]. A meta-analysis (N = 33 studies) in patients with HTN found that functional social support, defined as emotional, instrumental, and informational support provided by a persons' social network, is significantly correlated with adherence to treatment [13]. Therefore, community-clinical linkages can strengthen social support systems, increase trust in treatment to improve medication adherence, and may be beneficial to support clinical management of HTN beyond the clinic and/or hospital setting. In NHB communities, this linkage may assist patients where they live, reduce burdens of access to care, and utilize trusted community relationships to spread disease awareness. Prior successful models have incorporated barbers, pastors, and community leaders [5]. In the Los Angeles Barbershop Blood Pressure Study, a randomized cluster trial, the intervention group demonstrated after 6 months the mean SBP decreased by 27.0 mm Hg (to 125.8 mm Hg) as compared to 9.3 mm Hg (to 145.4 mm Hg) in the control group [14]. The Faith-Based Approaches in the Treatment of Hypertension (FAITH) trial in New York City, NY, incorporated therapeutic lifestyle change (TLC) and motivational interviewing sessions. The intervention cohort at religious centers had a significantly greater SBP reduction compared to the health education group at 6 months [5].

Although the previous trials utilized community-clinical linkages to address BP control, they did not specifically address medication adherence and overall health care quality of life (QOL). Adherence, QOL, and BP control, beyond changes in pharmacotherapy, may be improved by empowering patients to participate in shared decision making and to utilize self-measured blood pressure (SMBP). Numerous prior interventions to reduce medication nonadherence include: (1) patient education and counseling, (2) medication regimen management, (3) reminders, monitoring and feedback, and (4) incentives [9].

The Text MY Meds BP NOLA (ClinicalTrials.gov Identifier: NCT05074173) is a pilot clinical trial designed to evaluate QOL, medication adherence, and BP lowering, and made no effort to assess or change antihypertensive medication regimens. Furthermore, this clinical trial utilizes access to text-messaging and social support to improve medication adherence and routine BP measurement. This study is designed to test the benefits of collaboration between a community-based nonprofit organization, Healthy Heart

Community Prevention Project (HHCPP), and an academic center. HHCPP, initially formed as a National Institute of Health (NIH) pilot program in 1994, is a 501c3 organization based in New Orleans, LA, focused on providing accessible health education and screening for AA communities in an effort to reduce excessive CVD morbidity and mortality [15]. This pilot study was funded through the NIH by a consortium known as the Louisiana Clinical & Translational Science Center (LA CaTS). The LA CaTS center methodology encourages, supports, and expands research through partnerships among researchers and communities to address health disparities and improve health outcomes in communities [16].

2. Methods

A retrospective chart review of 364 patients was conducted from electronic medical records at an academic cardiology clinic with scheduled appointments during the period of January 1, 2020 to July 31, 2021 (Fig. 1). Participants were also recruited and screened (N = 25) from community-based organizations, community events, and partnering organizations with the HHCPP (Fig. 1). Tulane University School of Medicine (SOM) Institutional Review Board (IRB) approved flyers describing the study, which were posted on academic and community partner social media sites and additionally disseminated at the cardiology clinic, community events, and partner sites to enhance recruitment.

The Krousel-Wood Medication Adherence Scale (K-Wood-MAS-4) is a self-reported 4-item questionnaire, developed to assess adherence behaviors, and includes questions on self-efficacy, intentional medication-taking, forgetfulness, and physical function. In a study with an older adult cohort with HTN (N = 1532), low medication adherence on K-Wood-MAS-4 predicted incident CVD. [17]. The Centers for Disease Control health-related quality of life (CDC HRQOL-14) is a 14-question survey to assess an individual's perceived physical and mental health over time. Unhealthy days are an estimate of the number of days a respondent noted that his/her/their medical health was not good in the past 30 days [18].

Participants were provided validated Bluetooth-enabled BP devices to transmit SMBPs synced to smartphones and stored in a Health Insurance Portability and Accountability Act (HIPAA) compliant secured cloud via the Sphygmo™ app, a remote patient monitoring platform interacting with a patient-facing smartphone/tablet and a clinician web portal [19]. Mosio, a bi-directional text messaging platform company, configured and transmitted daily text reminders to refill and take prescribed BP medications and weekly lifestyle behavior tips [20]. Text messages were stored on a secured cloud for review. Wireless A&D upper arm BP monitors (SKU: UA-651BLE) were used, with cuffs in small (9.0–14.6″), medium (9.0–14.6″) and large (12.2–17.7″) sizes. A&D BP devices are clinically validated according to common validation protocols against the gold standard of trained healthcare professionals, ISO 81060-2 currently endorsed by the US Food and Drug Administration (FDA) [21,22]. These particular devices have capability to automatically record and track measurements via a mobile app to allow for trending of data and sharing with clinicians.

Among screened patients, 36 individuals were enrolled in this single cohort intervention pilot study who met eligibility criteria, which included: diagnosis of stage 1 (130–139 mm Hg/80–89 mm Hg) or stage 2 HTN (140 mm Hg or higher/>90 mm Hg); age of

18 years or older; low K-Wood-MAS-4 adherence score (≥1); ability to speak and read English; currently taking medication for BP; and internet and smartphone access with two-way texting capacity. Exclusions included: patients who were hospitalized, as documented in electronic health records or by self-report, within the past 6 months for heart failure (HF), end stage renal disease (ESRD), acute coronary syndrome (ACS) and/or stroke. Additionally, individuals who had plans to cancel phone plans in 3 months were also excluded.

Participants received daily text-messages asking if they have taken their BP medication, with a response of “yes” or “no.” Participants also received weekly text-messages with evidence-based culturally appropriate educational tips through the text-messaging system on adopting the Dietary Approaches to Stop Hypertension (DASH) diet to control HTN, engaging in regular physical activity, limiting alcohol consumption, and smoking cessation to reduce risk factors and management. Weekly text-messages also asked about satisfaction with receiving text messages and if someone (family or friend) assisted the participant with BP medication to which participants will respond “yes” or “no”. Weekly messages also inquired if participants refilled their BP medication.

Participants were given BP devices with the appropriate cuff size and educated on how to use the device and proper blood pressure technique to conduct SMBP. Participants were asked to take two BP measurements, 60 s apart twice daily, once in the morning and once in the evening. The Sphygmo™ app also demonstrates how to take blood pressures appropriately with an automatic 60 second timer in between measurements as another source of guidance for participants. During enrollment visits, participants also received a folder with infographics of proper blood pressure techniques by Target: BP™ and evidence-based educational handouts on BP management and control [23].

Part of the assessment was the presence or absence of previous diagnosis of diabetes mellitus (DM), with higher prevalence documented in NHB adults. Adults with DM are assumed to have a 10-year atherosclerotic cardiovascular (ASCVD) risk greater than >10 %. Therefore, the participants with DM had an even greater need to ensure BP is accurately measured and controlled. The study methods entailed adherence strategies, team-based care, and the use of telehealth, which is defined as the use of electronic information and telecommunication technologies to support clinical care and patient health education [24].

Demographic information included: age, self-identified race, sex/gender, and previous diagnosis of diabetes. Pre- and post-study K-Wood-MAS-4 adherence scores, the CDC HRQOL surveys, BMI, and BP were obtained at first and last visit. Participants were followed with BEM for 8 weeks with SMBP and daily text reminders.

Primary outcomes included changes in adherence to HTN medication; improved quality of life and social support systems; and daily blood pressure response. Although not a prespecified secondary endpoint, to better assess mean BP lowering, pre- and post-7-day BP reading averages were also recorded.

2.1. Statistical analysis

Age is summarized with means and standard deviations. All categorical participant characteristics are summarized with counts and percentages. Baseline, follow-up and differences in outcome variables are summarized with means and standard deviations. In addition, differences in outcome variables from baseline to follow-up are summarized with medians and interquartile range. Statistically significant differences from baseline to follow up were assessed using the Wilcoxon Signed Rank Test at the 5 % significance level. p-Values are reported for each comparison. Statistical analyses were performed using SAS9.4.

3. Results

3.1. Participant characteristics

Patients were enrolled from both an academic cardiology clinic and community sources. Mean age was 58.7 ± 12.8 years; mean BMI was 34.8 ± 7.9; 63.9 % were female. 88.9 % self-identified as NHB participants, 74.3 % with previous diagnosis of DM and 72.2 % with obesity (Table 1). Participants' self-reported medication adherence using the K-Wood-MAS-4 score, with a score ≥1 indicating low adherence and a score <1 indicating high adherence.

3.2. Analysis of clinical outcomes

All 36 participants completed their conclusion visits. SBP, DBP, QOL, K-Wood-MAS-4, and weight measurements were recorded at enrollment, as well as at final visit. Nonadherence significantly improved with mean K-Wood-MAS-4 adherence composite score change from 2.19 ± 0.86 at enrollment, to 1.58 ± 0.87 at the final visit (median −0.50, p = 0.0001). Baseline SBP, which was on average of two seated BP and using validated approaches, decreased significantly by −10.5 mm Hg ± 10.02 (median −11.00, p = 0.0027). There was no significant change in DBP (−1.71 mm Hg ± 13.87; median −3.75 mm Hg, p = 0.1337). CDC QOL had a nonsignificant trend with an average summary index of health days perceived from 9.1 to 6.8 days, change −2.3 ± 10.7 (median 0, p = 0.21) (Table 2, Fig. 2).

A statistical analysis, although limited by sample size, demonstrated a significant Spearman correlation (p = 0.025) in office SBP and self-reported adherence as measured by the KW total score at entry. This perhaps suggests that in a larger sample, those patients who use a similar tool with a higher degree of adherence would have the more significant SBP lowering as measured by office BP (Table 3).

Social support was defined by a participant response, "yes" by 50 % or more of the time to the text question: "Did anyone support you (family or friend) with reminders to refill or take your medications"? Over 50 % of the participants indicated that they received social support (n = 19) or not (n = 14) with taking their BP medications. There was a similar reduction in both groups for social support with taking BP medication in SBP at final visit: those who responded "yes" (143.8 mm Hg to 131.5 mm Hg, median −12.5, p = 0.0198) and "no" (142.32 mm Hg to 130.25 mm Hg, median −4.0 mm Hg, p = 0.0771). In addition, there was a significant difference in K-Wood-MAS-4 adherence score in those with social support (p = 0.0027) (Tables 4, 5; Fig. 3).

Based on expert opinion, several guidelines have recommended a preferred period of 7 days average BP [41]. Furthermore, because of increased accuracy of obtaining 7-day average SBP and DBP measurements to assess blood pressure lowering, these measurements were obtained during the first and last week of the study. From the pre 7-day BP (mean of 5.88 days among participants) to post 7-day BP (mean of 4.11 days among participants), SBP decreased from 133.19 mm Hg to 128.25 mm Hg (median −3.5 mm Hg, p = 0.0285). DBP did not have a significant change from 78.833 mm Hg to 78.67 mm Hg (median 0 mm Hg, p = 0.7001) (Table 2).

4. Discussion

The purpose of this pilot study was to evaluate, via community-clinical linkages, an automated text-messaging system to improve BP adherence with team-based care and to initiate evidence-based patient education on HTN risk reduction and daily BP measurement. Additionally, this study also examined the role of social support in helping patients adhere to their medications and increase health-seeking behaviors. Overall, medication nonadherence rates decreased significantly. Furthermore, overall SBP decreased and increased BP lowering was observed from pre-7-day average BP to post 7-day BP. Finally, social support positively influenced antihypertensive medication adherence among study participants.

4.1. Telehealth approaches

The novelty of this pilot study lies in utilizing modern technological advances to facilitate team-based care, decrease access gaps, improve patient education, and increase care coordination. Furthermore, text messaging patients with daily reminders may increase adherence and potentially lead to improved BP lowering and control even without mandated changes in pharmacotherapy regimen. Similar telehealth approaches utilized in this pilot study have been noted to increase equity by increasing material accessibility, utilizing inclusive language, encouraging staff members to learn equitable practices, and encouraging patients to provide feedback on telehealth approaches [26]. Significant to this study, a meta-analysis of 16 randomized trials found that text message reminders resulted in a moderately large improvement of medication adherence [9]. Another study (n = 20) in Black patients with Medicare or Medicaid insurance demonstrated higher uptake and satisfaction with a text-messaging program versus an online patient portal for home BP monitoring [25,26].

Several commercial efforts, such as Kindly Reminders®, promise to improve patient health parameters, including BP management. Kindly Reminders® offers to inform clinicians regularly, with seamless process integration and potentially increase revenue for clinical practices among patients with insurance [43].

4.2. Medication adherence

There are multiple factors that affect adherence with cardiovascular medications including: cost and access to medications, high copayments, and restricted formularies. This particular study addresses clinician-patient relationships, communications skills, patients' health beliefs, positive reinforcement through text-messaging, increasing patient's knowledge, and giving patient appropriate information regardless of their health [11].

Improving medication adherence is an important component of addressing disparities in CV and cardiometabolic disease. Less than half of patients with chronic CVD conditions take their prescriptions on a regular basis. Therefore, creating an effective and generalizable adherence strategy is pivotal and must be multifaceted, with inclusion of academic, community and government organizations and must consider the social determinants of health [11]. While not focusing on a pharmacological intervention, there is evidence that HTN can be controlled in an out of office setting, particularly through SMBP approaches [14].

4.3. Ongoing efforts supporting expanded SMBP utilization

In addition to the improvements in medication adherence, the utilization of SMBP also contributed to increased BP evaluation and overall BP decreases. SMBP utilization is increasingly advocated for by multiple broad-based national programs, including the Million Hearts Initiative, a partnership between National Association of Community Health Centers (NACHC) and CDC. [29]. Similarly, the AHA supports SMBP via its National Hypertensive Control Initiative (NHCI) [30].

As noted in the recent 2017 ACC/AHA HBP guideline, out of office or self-monitored BP has great benefit as a Class I-A level to confirm the diagnosis, assist with titration of BP-lowering medication, and can be utilized for telehealth counseling and clinical interventions [27]. Furthermore, SMBP is an evidence-based strategy recommended to confirm a new HTN diagnosis and reveal masked and white coat HTN [28]. SMBP may demonstrate improved HTN control, potentially by reducing therapeutic inertia and empowering patients to take proud ownership of their health.

4.4. Community-clinical linkages

In addition to validated SMBP approaches, community-clinical linkages are an effective approach to prevent and control chronic diseases. Clinical and community sectors engaging synergistically can ameliorate care gaps and support patients better than working alone. The Community Preventive Services Task Force (CPSTF) recommends that SMBP monitoring interventions be paired with additional support to improve BP outcomes in patients with HBP [31]. A similar model of six-month health education and community risk reduction intervention in Detroit, Michigan, demonstrated increased patient heart health knowledge and perception of personal risk factors. However, the increased knowledge did not lead to significant changes in SBP. A systematic review of SMBP interventions showed effectiveness and lower cost was achieved by combining interactive technologies with providers to only interact with patients as needed [32]. This pilot study demonstrates that mobile phone text messaging interventions may be used successfully in resource limited communities [33].

4.5. Importance of SDOH in eliminating HTN disparities

The SDOH may account for as much as 80 % of chronic disease burden [34]. On the other hand, race is a social construct. It is not an inherited or genetic/biologic factor, and many of the characteristics described in epidemiologic data that NHB individuals have higher levels of BP, may be related to structural inadequacies and health care delivery that were

targeted to be addressed in the techniques utilized in this study. One of the benefits of this approach is to demonstrate that, outside of using race as a genetic or biologic variable, having a positive and accessible means of increasing adherence and quality of life may have an impact on a patient volunteer cohort that predominantly self-identifies as NHB adults.

4.6. The presence of social support as a positive predictor of health

Social support in this pilot study has been shown to improve medication adherence. Improved medication adherence can have profound impact of achieving BP lowering and subsequent long-term control. An analysis of NHB adults in the Jackson Heart Study noted that the presence of high level functional social support was associated with lower risk of incident HTN [35]. While social support may be a strong mediator of medication adherence and BP measurement behaviors, it may not be the sole factor in achieving adequate BP lowering and control. A cohort study from Baltimore that examined the role of social support in mediating HTN outcomes in an urban and low-income NHB community found that social support was not a strong enough mediator to overcome the environmental and structural barriers, suggesting that certain SDOH may be stronger than social support and contribute to suboptimal HTN outcomes [36]. Nevertheless, social support can be integral in promoting patterns of healthy behaviors, active participation in tracking one's BP, and reinforcing the importance of risk factor management for individuals and their communities. Therefore, social support must be emphasized in long-term BP management and medication adherence.

4.7. Community-clinical linkages and potential impact on QOL

Blood pressure lowering may improve quality of life. One study (n = 1525) examining adherence and HRQOL data, revealed low levels of self-reported medication adherence have been associated with reduced mental HRQOL ($p = 0.008$) [37]. In a review paper describing specific methods to enhance medication adherence, telehealth has been indicated as a useful medium through which to improve patient understanding and thus adherence to their shared medical plan, including medication schedule and compliance [11]. In a meta-analysis (N = 20 studies), it was found that improved pharmacologic adherence to antihypertensives positively affects both mental and physical aspects of patients' lives as well as their overall HRQOL, with an average increase of 9.24 points ($p < 0.00001$) in patients adhering to pharmacologic treatment [38,39]. Therefore, telehealth and related modalities such as BEM might be an underutilized avenue through which to improve medication adherence and HRQOL [11]. As SMBP and BEM has demonstrated statistically significant levels of BP control, it should follow that HRQOL might also improve in our patients.

4.8. Limitations

There are several limitations that should be noted related to this study. This was a pilot study with a small sample size (n = 36). Additionally, after determination of the intervention, no further attempt was initiated for long-term follow-up. We did not have a randomized control to compare patients who may have received the device without text-messaging. Although the population was over 85 % self-identified NHB adults, this actually was not a limitation, but one of the goals. In view of the selective nature of the population of 364 patients originally screened at entry, the results although positive, may have limitation in the application in

an unselected, “real-world” population in patients seeking care for HTN. For wider use, especially among disadvantaged populations or under resourced populations, the ability to access valid BP devices will be a difficulty to overcome. The price of each validated device was $69.99. Smartphone access is an additional cost barrier. Although a potential barrier, approximately 85 % of Americans own a smartphone [40]. Smartphone ownership drops off as age ranges increase: 30–49 years old (95 %), 50–64 years old (83 %) and 65+ (61 %) [40]. The mean age of our study was 58.7 with a variation of 12.8 years. Moreover, 65 % of NHB adults own smartphones compared to NHW (85 %) and Hispanic/Latinx adults (85 %) [40].

Furthermore, especially in older patients, ability to use the internet and mobile applications in order to navigate communication with their clinicians may be a source of concern. There were some difficulties in patients needing to reconnect their Bluetooth devices. However, this was not a major concern and was easily overcome with telephonic and in two cases, in-person, reconfiguration. With regard to the endpoint of social support and improved BP lowering, measurement of patient support was based on 50 % or greater which to a large extent varied in the number of responses and consistency of responses. Also, although there was a statistical significance between social support and SBP, the small sample size may impact this finding. Clinicians should recognize using out-of-office BP measurements in clinical practice may be affected by familiarity with the tool at baseline, which may be different from that noted over longer use such as 7-day averages.

Finally, given that the pilot study was completed during the COVID-19 pandemic, participant safety and community concerns regarding COVID-19 were observed and prioritized. Despite the pandemic concerns, research assistants and volunteers were properly masked and observed CDC guidelines for social distancing. Each person received a valid device that was new and had not been used by another person.

This study did not use an alert system and the information was not transferred into the electronic medical records. This may be a limitation in that if patients had unusually high or low blood pressures, there was no direct communication with their clinician. In order to ensure patient safety, the application was monitored by the research team on a regular basis. Of note, clinically significant BP lowering with SMBP may not be enhanced if there is no linkage to providers, which may be a key element to consider [42].

5. Conclusion

The prevalence of HTN among NHB adults is among the highest globally. A recently published scoping review of the peer-reviewed literature from 2017 to 2021, noted that utilizing mHealth tools and trained personnel may improve BP and medication adherence, although only a few studies were adequate in inclusion of diversity by race/ethnicity [44]. The authors concluded that more research is needed, including more racially/ethnically diverse cohorts, to clarify how various approaches may ameliorate racial disparities in HTN-related outcomes [44].

Clinical approaches should routinely assess and address SDOH, implement team-based care, monitor SMBP, strengthen community-clinical linkages, and utilize evidence-based guidelines in order to improve BP control. Simple text-messaging reminders for BP monitoring may increase patient adherence to their daily anti-hypertensive medication regimen. Increased adherence may subsequently improve their BPs and potentially decrease CV morbidity and mortality longitudinally. Furthermore, robust public health strategies implementing community-driven health education, incorporating secondary and tertiary care members, and collaborating with mobile health networks and healthcare systems can augment current efforts to increase patient understanding of their condition, enhance BP measurement and monitoring and eventually improve adherence and control. This pilot study on text-messaging and social support observed success in management of HTN among traditionally underserved, high-risk patients. In the future, a more formal, properly-powered, controlled follow-up trial may confirm the benefits of the approaches as described in Text MY BP Meds NOLA.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding source

The TEXTMYMEDS NOLA pilot study was funded in part by U54 GM104940 from the National Institute of General Medical Sciences of the NIH, which funds the LA CaTS.

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What is new

1. This study assesses the benefits of SMBP with daily text message reminders on medication adherence, quality of life, and blood pressure lowering.
2. The feasibility of implementation of community-clinical linkage in an urban, predominantly NHB cohort was evaluated, included the use of SMBP devices, educational materials, quality of life assessments, and 60 days of text messages with reminders and health information.
3. A community-based and academic center collaboration may improve access and acceptance of enhanced BP lowering modalities.

Clinical implications

1. This study indicates that daily text messages significantly improve medication adherence and SBP lowering.
2. Text message systems are a low-cost and minimally invasive intervention that may be used as a strategy to assist with BP lowering.
3. Further studies should assess the application of text messaging on a greater scale, with a larger cohort, and compare outcomes with text messaging and the degree of social support, especially to address disparities in HTN control.

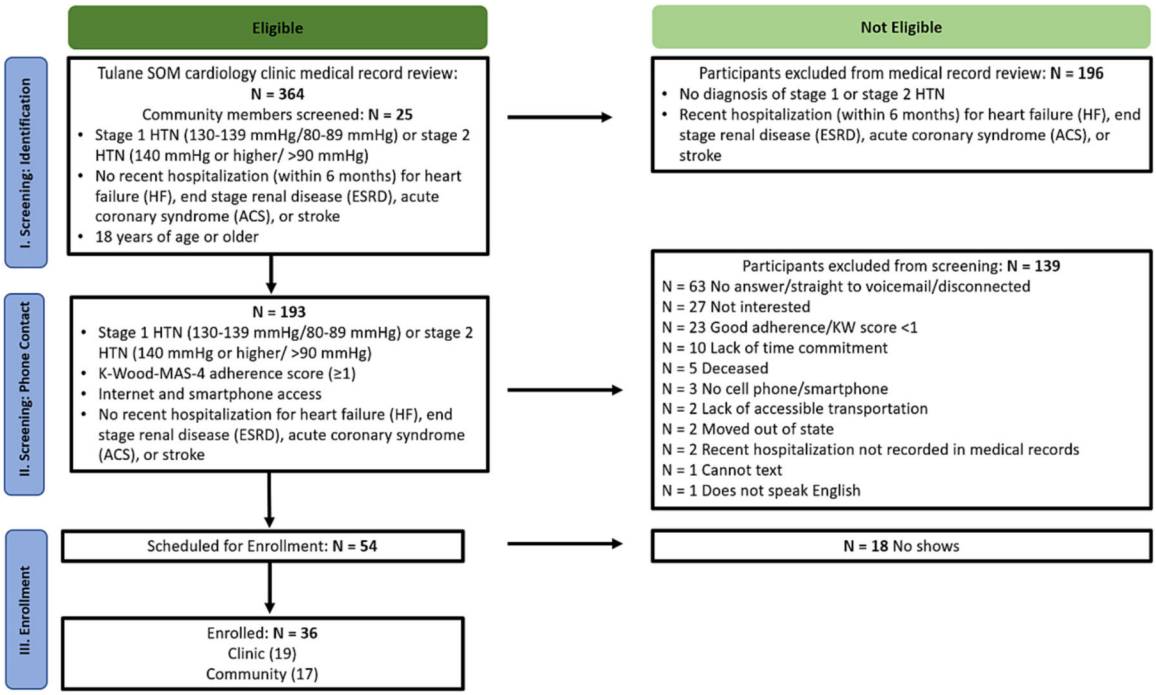

Fig. 1.

Screening and recruitment protocol for prospective participants.

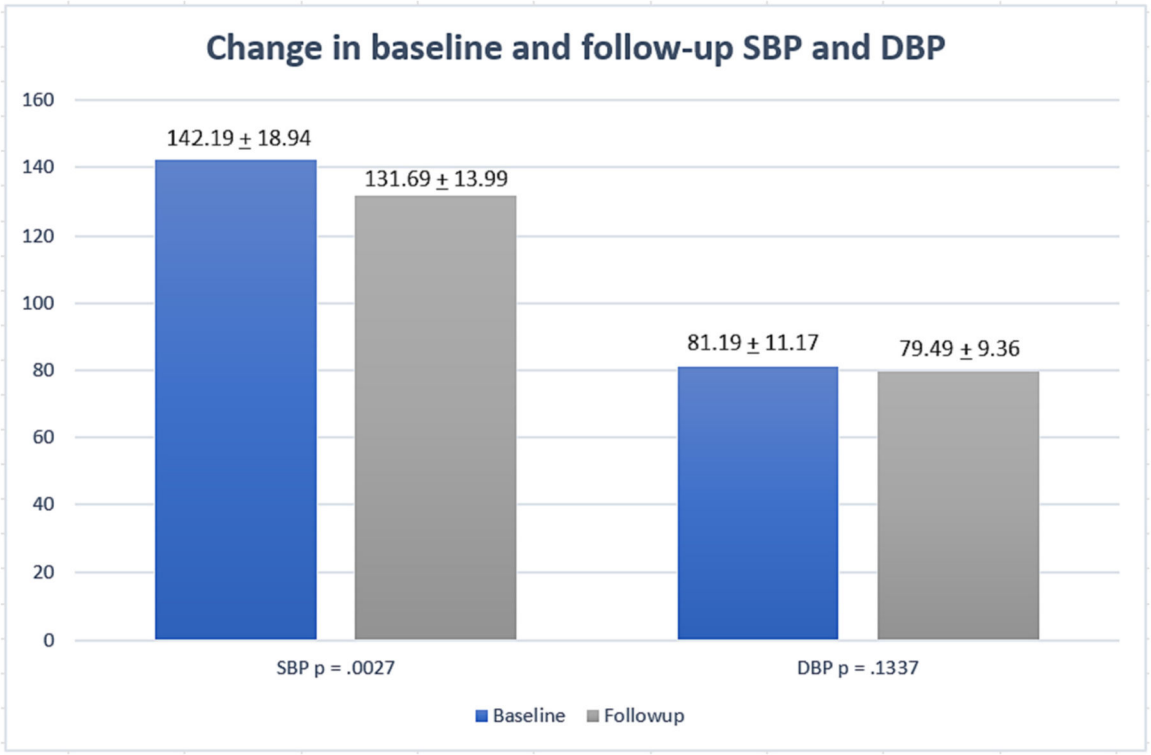

Fig. 2.
Change in baseline and follow-up SBP and DBP.

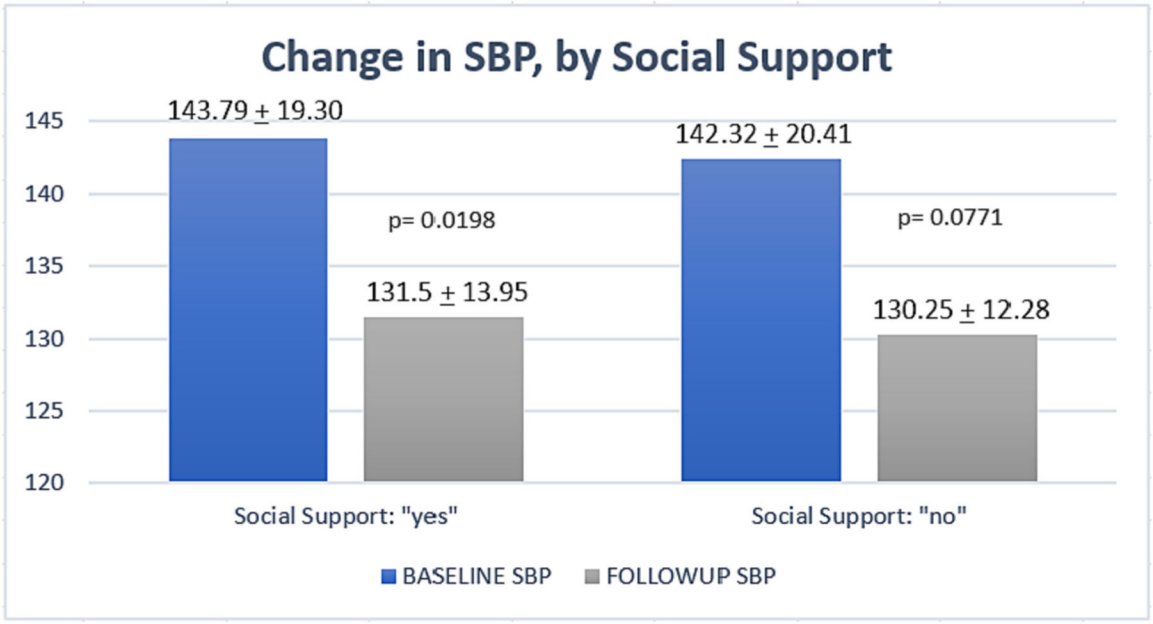

Fig. 3.
Change in SBP by social support.

Table 1

Demographics of enrolled participants in the study.

	n	Mean ± standard deviation
Age, years	36	58.68 ± 12.78
BMI	36	34.81 ± 7.78
	n	**Count (%)**
Sex	36	
Male		13 (36.11)
Female		23 (63.89)
Race/ethnicity	36	
NHB		32 (88.89)
NHW		4 (0.11)
Diabetes	35	
Yes		26 (74.29)
No		9 (35.71)
Obese	36	
Yes		26 (72.22)
No		10 (27.78)

Table 2

Eight-week change in medication adherence, QOL, average reading BP measurements, and 7-day average BP.

	n	Baseline	Follow-up	Difference	Difference	p-Value
		Mean ± standard deviation	Mean ± standard deviation	Mean ± standard deviation	Median (interquartile range)	
Krousel-Wood Score	36	2.19 ± 0.86	1.58 ± 0.87	−0.62 ± 0.93	−0.50 (−1.0, 0)	**0.0001**
Unhealthy days (in last 30)	36	9.11 ± 10.36	6.81 ± 9.89	−2.31 ± 10.75	0.00 (−7.00, 2.00)	**0.2145**
SBP (average reading)	36	142.19 ± 18.94	131.69 ± 13.99	−10.50 ± 20.03	−11.00 (−17.00, 0.5)	**0.0027**
DBP (average reading)	36	81.19 ± 11.17	79.49 ± 9.36	−1.71 ± 13.87	−3.75 (−21.00, 3.25)	**0.1337**
SBP (7-day average)	36	133.19 ± 15.65	128.25 ± 12.46	−4.94 ± 16.82	−3.50 (−11.00, 2.0)	**0.0285**
DBP (7-day average)	36	78.83 ± 6.82	78.67 ± 8.98	−0.17 ± 7.42	0.00 (−6.00, 3.50)	**0.7001**

p-Values are based on the Wilcoxon Signed Rank Test. P < 0.05 indicates significance.

Table 3

Demographics by social support.

	Social support	
	"Yes" (n = 19)	**"No" (n = 14)**
	Mean ± standard deviation	**Mean ± standard deviation**
Age, years	57.62 ± 12.62	59.72 ± 14.63
BMI	36.96 ± 7.93	33.40 ± 6.94
	Social support	
	"Yes" (n = 19)	**"No" (n = 14)**
	Count (%)	**Count (%)**
Sex		
Male	7 (36.84)	6 (42.86)
Female	12 (63.16)	8 (57.14)
Diabetes		
Yes	11 (61.11)	12 (85.71)
No	7 (38.89)	2 (14.29)
Obese		
Yes	16 (84.21)	9 (64.29)
No	3 (15.79)	5 (35.71)

Table 4

Eight-week change - social support = “yes” (n = 19).

	Baseline	Follow up	Difference	Difference	p-Value
	Mean ± standard deviation	Mean ± standard deviation	Mean ± standard deviation	Median (interquartile range)	
Krousel-Wood Score	2.36 ± 0.76	1.63 ± 0.68	−0.74 ± 0.81	−1.00 (−1.00, 0.00)	**0.0027**
Unhealthy days (in last 30)	10.21 ± 11.02	6.26 ± 9.31	−3.95 ± 13.39	0.00 (−15.00, 2.00)	**0.2742**
SBP (average reading)	143.79 ± 19.30	131.50 ± 13.95	−12.29 ± 18.89	−12.50 (−19.00, −5.00)	**0.0198**
DBP (average reading)	82.71 ± 9.78	80.69 ± 8.68	−1.84 ± 13.17	−3.50 (−12.50, 6.50)	**0.3790**
SBP (7-day average)	134.58 ± 18.95	127.68 ± 11.57	−6.89 ± 19.71	−4.00 (−13.00, 2.00)	**0.0891**
DBP (7-day average)	79.32 ± 7.50	78.95 ± 9.05	−0.37 ± 8.08	0.00 (−6.00, 4.00)	**0.7030**

p-Values are based on the Wilcoxon Signed Rank Test. P < 0.05 indicates significance.

Table 5

Eight-week change - social support = “no” (n = 14).

	Baseline	Follow up	Difference	Difference	p-Value
	Mean ± standard deviation	Mean ± standard deviation	Mean ± standard deviation	Median (interquartile range)	
Krousel-Wood Score	1.86 ± 0.77	1.29 ± 0.83	−0.57 ± 1.16	0.00 (−1.0, 0.00)	**0.1250**
Unhealthy days (in last 30)	7.79 ± 10.41	5.64 ± 9.74	−2.14 ± 4.64	0.00 (−6.00, 1.00)	**0.1133**
SBP (average reading)	142.32 ± 20.41	130.25 ± 12.28	−12.076 ± 20.18	−4.00 (−29.5, 1.00)	**0.0771**
DBP (average reading)	82.11 ± 11.31	75.89 ± 7.42	−6.21 ± 7.94	−5.50 (−12.00, 0.00)	**0.0144**
SBP (7-day average)	131.21 ± 12.34	127.00 ± 11.54	−4.21 ± 11.16	−3.00 (−8.00, 2.00)	**0.1298**
DBP (7-day average)	78.07 ± 6.45	77.00 ± 8.77	−1.07 ± 6.68	−1.50 (−5.00, 2.00)	**0.5313**

p-Values are based on the Wilcoxon Signed Rank Test. P < 0.05 indicates significance.