English and Spanish-Speaking Patient Preferences on Home Blood Pressure Monitors: A Qualitative Study in an Urban Safety Net Setting

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Abstract

Background: Self-measured blood pressure monitoring (SMBP) is necessary for successful management of hypertension (HTN). However, disparities in blood pressure (BP) control persist, with low-income patients and racial/ethnic minorities more likely to have uncontrolled HTN. These patients are also at increased risk for digital exclusion. Several validated BP monitors for SMBP are available, but little is known on patient preferences between different device traits. Studies have shown that poor usability or design of technology can lead to barriers in adoption.

Objective: We investigated patient-reported barriers, preferences, and facilitators to SMBP from a diverse population at an urban safety-net hospital.

Methods: This qualitative study included English and Spanish-speaking patients with HTN. Participants completed a survey about sociodemographic traits, SMBP practices and training, and experience with technology. Semi-structured interviews were conducted to elicit preferences about BP devices, the accompanying mobile apps, and their experience sharing BP measurements with their providers. Interviews included participant demonstration of home BP measurement to evaluate baseline SMBP technique. Two home BP monitoring devices were presented: a Bluetooth-enabled device and a cellular-enabled device that syncs data directly. Surveys and interviews were conducted in participants' preferred language. Rapid qualitative data analysis was applied to analyze qualitative data.

Results: Fifteen participants (8 English-speaking; 7 Spanish-speaking) were enrolled. Eight identified as Latine, four as Black or African American, one as American Indian or Native American, one as Asian or Pacific Islander, and one as multi-ethnic. Educational attainment varied: five less than high school, five high school or GED, and five college. Eight exhibited some form of digital inaccessibility: lacking internet access, not activating their patient portal, or having difficulty connecting a device to Wi-Fi. Most required assistance with Bluetooth pairing and navigating app features. Overall, participants valued tracking their BP, are motivated to engage in SMBP practices, and desired training. Nearly all participants demonstrated inconsistencies in BP education, displayed incorrect BP measurement technique, and had not received formal training on SMBP. Spanish-speaking participants reported that using apps was challenging because they were presented in English and wanted translated apps and resources. Cost of features was a key factor in device preference.

Conclusions: Patient-reported barriers to successful SMBP adoption include cost, insufficient training, digital inaccessibility, and language discordance. Addressing these challenges may enhance SMBP adoption in safety-net populations. Providers should evaluate patients' preferences and develop tailored interventions when recommending SMBP. Cellular SMBP devices

that automatically transmit BP readings may reduce digital complexity and promote sharing results with providers, though future studies are needed to evaluate usability and implementation.

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Abstract

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Results
Fifteen participants (8 English-speaking; 7 Spanish-speaking) were enrolled. Eight identified as Latine, four as Black or African American, one as American Indian or Native American, one as Asian or Pacific Islander, and one as multi-ethnic. Educational attainment varied: five less than high school, five high school or GED, and five college. Eight exhibited some form of digital inaccessibility: lacking internet access, not activating their patient portal, or having difficulty connecting a device to Wi-Fi. Most required assistance with Bluetooth pairing and navigating app features. Overall, participants valued tracking their BP, are motivated to engage in SMBP practices, and desired training. Nearly all participants demonstrated inconsistencies in BP education, displayed incorrect BP measurement technique, and had not received formal training on SMBP. Spanish-speaking participants reported that using apps was challenging because they were presented in English and wanted translated apps and resources. Cost of features was a key factor in device preference.

Conclusions
Patient-reported barriers to successful SMBP adoption include cost, insufficient training, digital inaccessibility, and language discordance. Addressing these challenges may enhance SMBP adoption in safety-net populations. Providers should evaluate patients' preferences and develop tailored interventions when recommending SMBP. Cellular SMBP devices that automatically transmit BP readings may reduce digital complexity and promote sharing results with providers, though future studies are needed to evaluate usability and implementation.

Keywords
Telemedicine; Telehealth; Monitoring, Physiologic; Blood Pressure Monitoring, Ambulatory; Hypertension; Patient Preference; Healthcare Disparities; Safety-net Providers

Introduction

Hypertension (HTN) is highly prevalent resulting in significant cardiovascular disease morbidity and mortality.[1–3] Self-measured blood pressure monitoring (SMBP) is an evidence-based guideline to improved HTN management,[4–6] which has shown promising results in populations with worse HTN outcomes, such as individuals with low income or from racial/ethnic minority backgrounds.[7–11]

Despite its potential impact, SBMP faces implementation challenges, especially in populations and health centers where HTN disparities are most pronounced. These populations, including Black, Latine/Hispanic, and Asian adults; those with limited insurance; individuals with lower educational attainment; and those with limited English proficiency have worse BP control.[8,9,12,13]

Few studies have investigated patient perspectives on challenges to and preferences for SMBP monitoring, especially in safety net populations. These perspectives are crucial for designing effective SMBP interventions tailored to communities experiencing disparities in BP control. To address this gap in knowledge, we conducted a qualitative, observational study of English and Spanish-speaking patients with HTN receiving care at an urban safety net hospital. In this study, we aimed to capture patient-reported barriers to SMBP, preferences for different types of BP monitors, and facilitators that would support SMBP in a racially diverse, low-income population.

Methods

Study Sample

English and Spanish-speaking patients with HTN receiving care from an urban academic safety net system were recruited from August 2022 through October 2023. Participants received a gift card for participation. This study was approved by the UCSF Institutional Review Board (#21-33711).

Survey and Interview Administration

Participants completed a survey and semi-structured interview in their preferred language. Researchers followed an interview guide, which was updated based on iterative review and feedback from the study team, and included participant demonstration of home BP measurement to evaluate baseline SMBP technique. The survey included close-ended questions about sociodemographic traits, SMBP practices and training, and experience with technology. Interviews asked open-ended questions about BP device preferences, experience with BP device mobile apps, and current practices around tracking and sharing BP measurements with their clinicians. During the interviews, two home BP monitoring devices were presented: a Bluetooth-enabled device (Device 1) and a cellular-enabled device that syncs data directly (Device 2).

Analysis

Rapid qualitative data analysis (RQDA) was used to analyze qualitative data.[14] RQDA steps include developing a codebook of domains from interviews, summarizing interviews based on domains, and validating across study team for consistency.

Results

Participant Demographics and Baseline Experience with Technology and Self-Measured Blood Pressure

Table 1 displays the characteristics from 15 total participants. Eleven participants were assessed for their SMBP technique against a rubric using the updated interview guide. Median age of participants was 57 years, with a range of 37 to 71.

From survey responses, all participants had a smartphone, most used mobile apps several times a day, and most reported no difficulty using their smartphone or installing apps without assistance. Eight participants either: did not have internet service at home other than via smartphone, did not know how to connect a device to wi-fi, or had not activated their patient portal account.

In the past 12 months, five participants measured their BP outside of the clinic, all at home using their own BP monitor. Three measured their BP less than once a month; two measured at least once a month, and two shared BP these measurements with their clinical team. Four participants reported that measuring BP at home and sharing results with their clinician was “extremely helpful.”

Table 1. Participant demographics and experience with technology

PARTICIPANT DEMOGRAPHICS	(N = 15)

Female	9
Race/ Ethnicity	
American Indian/ Native American	1
Asian or Pacific Islander	1
Black or African American	4
Hispanic/ Latine	8
Two or more	1
Highest educational attainment	
Less than high school	5
High school graduate or GED	5
College graduate or more	5
Preferred language	
English	8
Spanish	7
EXPERIENCE WITH TECHNOLOGY	
Frequency of using apps for any purpose on phone	(N = 15)
Several times a day	10
At least once a day	3
Once a week	2
Difficulty installing apps on phone	
Not difficult	10
Somewhat/Very difficult	5
Has internet service at home other than via smartphone	13
Activated patient portal account	8
Difficulty using phone without someone else's help	
Not difficult	12
Somewhat/Very difficult	3
Knows how to connect device to wi-fi	6 (N = 11)*

*This question was later added to the survey

All themes with notable quotes are provided in Table 2.

Table 2. Themes and notable quotes from interviews

Theme with description	Notable quotes
Theme 1: Patient Knowledge about SMBP	
Inconsistencies and Gaps Exist in Patient Education: Few patients received adequate education on home BP monitoring techniques	*"Drawings and pictures help people understand faster…People never really go through books [of instructions], something simpler would be better."*
Patients Desire Training and Education: All patients desired more in-person training and education, and in particular take home materials that were easy to understand and language concordant	*"It's impossible to get accurate reading at home."*

Incorrect Technique and Missing Considerations in Home BP Measurement: Few patients engaged in all recommended practices for accurate home measurement	
Theme 2: Patterns and Challenges in Self-Monitoring Blood Pressure	
Participants Like the Idea of Tracking BP: While most participants did not track their BP, they thought it was important and liked the apps' ability to do so	*"Really the main thing I liked [about the apps] is … how you can go on the app and you can get to your blood pressure feed. Just that fast... [You don't have to] go through a whole bunch of stuff. It's just right there. That's what I like about it."*
Participants Do Not Share their BP with Providers: Most participants did not currently share their BP. Some tracked BP, but did not with their provider due to misplaced logs	*"[Logging in the app is] really good because every time I write it down, I always forget where I put it. I'm always losing it. It's great that my [BP recordings] stay [in the app]. I can just show it. I'd love that."* *"You meet your doctor once every 3 months, so if I take a reading now, I forget it after two weeks."*
Theme 3: Varied Patient Preferences on Home Blood Pressure Monitoring Device Features	
Device Features Did Not Impact Overall Device Preference: Participants differed on preferences for BP cuff type and device size, but these features did not impact device preference	*"I don't want anything gigantic. I want it to be perfectly small, where I can take it if I need be, to be able to take it with me if I'm traveling."*
Cost as a Deciding Factor in Device Preference: While participants preferred BP results to be automatically shared with their provider, they would not pay for this feature and also had concerns related to cost of batteries	*"Just sending a message – if it's going to cost you money – that's a rip off."* *"[Paying for remote patient monitoring] is a turn off. If I had to pay more money, I'd rather no.t"* *"If it can be sent to my [doctor] without me knowing, that'd be great… [But I don't want to be] paying for [that]."* *"People don't have access to batteries, like you or the manufacturer think. You think an old man of 70-80 [years of age] would go out to buy a battery?"*

Theme 1: Patient Knowledge About SMBP

Inconsistencies and Gaps Exist in Patient Education

Many reported no formal training on using their BP monitor or normal BP range. Instead, many learned by observing providers in clinic, reading the manual, or watching online video tutorials. A few received demonstrations or were told about BP at clinic visits but do not remember what they learned and were not given additional materials.

Existing knowledge about BP was incomplete and varied. Few participants reported understanding the idea of normal BP range. Some participants noted the importance of taking repeated measurements, staying calm before a reading, and the importance of weight and diet for BP management.

Patients Desire Training and Education

Nearly all participants wanted more training about BP devices and at-home measurement, preferring in-person demonstrations. Some said written instructions or video tutorials may suffice. In addition to training on BP device usage, some participants wanted information about BP ranges. Nearly all participants expected clinic support if they encountered an issue when measuring BP. Some participants also mentioned troubleshooting with family.

Participants valued having additional written and video resources. They preferred written resources that were easy to read and understand; larger with large and bolded font; and contained concise, numbered steps to follow. Some participants also thought visual illustrations would be helpful. Participants noted that the instruction manuals included with the BP monitoring devices were detailed and had a lot of information, which some felt was overwhelming. Spanish-speaking participants wanted to have Spanish materials.

Incorrect Technique and Missing Considerations in Home BP Measurement

Most participants did not follow all guidelines set forth by the American Heart Association (AHA) and American Medical Association (AMA) for accurately measuring blood pressure at home.[15] When demonstrating an at-home BP measurement, most participants displayed incorrect technique (Figure 1). Of the 11 participants who were asked to demonstrate how they would measure their BP at home, only four were consistent with all guidelines set forth by the AMA and AHA. The most common missed techniques in BP measurement were: placing cuff on the bare arm, above the elbow at mid-arm; ensuring the arm is supported, with palm up and muscles relaxed; positioning the arm at heart level; and ensuring back is supported. All participants properly uncrossed their legs, rested their feet flatly on the floor, and sat quietly without distractions (though we provided the environment).

When asked about considerations when measuring BP at home, nearly all participants did not consider the time of day or the timing of medications, eating meals, smoking, drinking alcohol, or using the restroom in relation to their readings. Most participants, however, did report resting or relaxing prior to taking a measurement.

Theme 2: Patterns and Challenges in Self-Monitoring Blood Pressure

Participants Like the Idea of Tracking BP

Most participants did not currently track their BP but cited it as important or wanted to do so. Some would track BP only under particular circumstances, such as when their BP is unusually higher.

Participants liked that the apps linked and tracked their BP results from the device. Nearly all appreciated visual aids (e.g. graphs) that show their BP history. Many liked immediately seeing their results when opening the app; some participants specified that Device 2's app was more simple and straight-forward to use. Some also appreciated additional features of Device 1's app, such as the option of keeping a diary to write notes. Participants appreciated visuals, a straightforward interface that enables easy app usage and BP tracking, and personalized tracking capabilities.

Participants Experienced Difficulty with Using the Apps

Difficulty in app usage varied. When surveyed, all participants who reported difficulty either with using a smartphone without assistance or with installing apps also had difficulty with navigating app features or required assistance upon observation. Some who reported no difficulty in these two survey questions also had difficulty or required assistance upon demonstration. Nearly all who had trouble navigating the apps were Spanish-speaking and expressed that translating apps entirely into Spanish would enhance ease of use.

Participants Do Not Share their BP with Providers

Furthermore, most participants did not currently share their BP with their provider. Most who track their BP often misplace their measurement logs. Two shared if they remembered where they kept their readings.

Theme 3: Varied Patient Preferences on Home Blood Pressure Monitoring Device Features

Device Features Did Not Impact Overall Device Preference

Participants prioritize comfort and ease of use when evaluating two different BP cuffs, but this preference was split between hard and soft cuffs. Preferences also differed between the smaller size of Device 2 and the larger display of Device 1. However, cuff type and portability of the devices did not impact overall device preference.

Participants Require Assistance with Bluetooth Pairing

Many participants did not view Bluetooth pairing, a feature of Device 1, as a deterrent to measuring BP, with half of them citing familiarity with Bluetooth. We also observed these participants successfully connected the device with Bluetooth. Nearly all other participants required help from study staff to pair the Bluetooth device. A few explicitly cited not wanting to deal with pairing or re-pairing Bluetooth. Some preferred Device 2 because it did not require Bluetooth or said that Device 1 was more difficult to use for this reason.

Cost as a Deciding Factor in Device Preference

Moreover, while approximately half of participants value having their BP results automatically shared with their provider (such as would occur in a cellular-enabled monitor like Device 2), nearly all would not pay for this feature. One was open to having results automatically sent if in poor health. A few would pay $5 to $15 a month if required, but they were strongly opposed. If this feature were free, three participants would prefer Device 2. Most strongly preferred having a plug-in charging option for the battery-operated devices because of concerns related to accessing or purchasing future batteries.

Discussion

Principal Findings

In our qualitative study of safety net patients with HTN, cost of device features, gaps in existing BP knowledge, and lack of training and resources presented challenges to SMBP adoption. Our findings highlight the need to provide affordable, language-concordant resources and comprehensive training to leverage SMBP for HTN management in safety net patients.

Consistent with prior studies, our participants valued tracking their BP and are motivated to engage in SMBP practices and share results with their providers.[11] Moreover, participants preferred having their readings automatically shared with their provider without requiring pairing to their own device, citing it as extremely helpful. However, nearly all were not willing to pay for this feature. Plug-in devices were also strongly preferred to avoid the cost of batteries. These findings suggest that SMBP adoption in lower-income and uninsured/Medicaid populations is impacted by affordability or payor coverage of SMBP devices that meet patients' needs. Additionally, nearly all patients demonstrated inconsistencies in BP education, displayed incorrect BP measurement technique, and had not received formal training. These findings reinforce the notion that barriers to successful SMBP adoption stem from external care factors, such as cost and gaps in available training and resources, rather than patient motivation. Providers should evaluate patients' barriers and preferences when recommending SMBP.

In addition to cost, digital accessibility and literacy should be assessed as contributors of SMBP non-adoption. Aligned with studies that demonstrate socioeconomic status and Medicaid insurance as risk factors for digital exclusion,[16] eight of 15 participants exhibited some form of digital inaccessibility: lacking internet access, not activating their patient portal, or having difficulty connecting a device to Wi-Fi. Furthermore, most participants required assistance with pairing Bluetooth to Device 1 and with navigating app features on both devices, potentially indicating limited digital literacy. SMBP interventions should be complemented with patient training and resources. Importantly, it appears that cellular SMBP devices that automatically transmit BP readings to reduce digital complexity may promote sharing results with providers, and this should be considered as a focus of future research and implementation.

Moreover, Spanish-speaking participants reported that using apps was challenging because they were presented in English. This further supports the existing need to have user-friendly, language concordant digital SMBP tools.[11,17] Spanish-speaking participants also wanted manuals and training to be delivered in Spanish. Addressing language non-concordance in training and resources for other prominent but less prevalent languages (e.g., Arabic)[18] in addition to Spanish may further promote widespread SMBP adoption. Notably, patients who face barriers in digital literacy and language discordance may be especially vulnerable to SMBP adoption challenges.

Our study addresses several gaps in literature. To our knowledge, this study was the first to assess patient preferences on SMBP devices, particularly in a multilingual population. Our results add to knowledge about patient preferences for communication modality of their BP results with their care team.

Limitations

Our study was limited by a small, convenient sample. Participants were only assessed at a single time point; SMBP skills and preferences may differ in real care scenarios. Future studies can explore how support systems (e.g. family, caregivers) could impact SMBP adoption. An ongoing randomized controlled trial will longitudinally assess device implementation and BP outcomes.[19]

Conclusions

Patients' values and barriers can inform solutions that facilitate and improve patient self-management of HTN. Our findings reinforce the importance of affordability, accessibility, and providing robust resources when implementing SMBP in diverse, safety net populations. Effectiveness of cellular-enabled SMBP devices should be further evaluated.

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Authors' Contributions

Conceptualization: JJS, VEK, MM, ECK; data curation: JJS, VEK, IL, CHK, FG, CG; analysis: JJS, VEK; drafting manuscript: JJS, VEK; reviewing and editing manuscript: all authors.

Conflicts of Interest

None declared.

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References

1. Park B, Budzynska K, Almasri N, et al. Tight versus standard blood pressure control on the incidence of myocardial infarction and stroke: an observational retrospective cohort study in the general ambulatory setting. *BMC Fam Pract*. 2020;21(1):91. doi:10.1186/s12875-020-01163-4

2. Tsao CW, Aday AW, Almarzooq ZI, et al. Heart Disease and Stroke Statistics-2023 Update: A Report From the American Heart Association. *Circulation*. 2023;147(8):e93-e621. doi:10.1161/CIR.0000000000001123

3. Fuchs FD, Whelton PK. High Blood Pressure and Cardiovascular Disease. *Hypertens Dallas Tex 1979*. 2020;75(2):285-292. doi:10.1161/HYPERTENSIONAHA.119.14240

4. Uhlig K, Patel K, Ip S, Kitsios GD, Balk EM. Self-measured blood pressure monitoring in the management of hypertension: a systematic review and meta-analysis. *Ann Intern Med*. 2013;159(3):185-194. doi:10.7326/0003-4819-159-3-201308060-00008

5. Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring: meta-analysis of randomised trials. *BMJ*. 2004;329(7458):145.

doi:10.1136/bmj.38121.684410.AE

6. Shimbo D, Artinian NT, Basile JN, et al. Self-Measured Blood Pressure Monitoring at Home: A Joint Policy Statement From the American Heart Association and American Medical Association. *Circulation*. 2020;142(4):e42-e63. doi:10.1161/CIR.0000000000000803

7. Angell S, Guthartz S, Dalal M, et al. Integrating self blood pressure monitoring into the routine management of uncontrolled hypertension: translating evidence to practice. *J Clin Hypertens Greenwich Conn*. 2013;15(3):180-185. doi:10.1111/jch.12046

8. Muntner P, Hardy ST, Fine LJ, et al. Trends in Blood Pressure Control Among US Adults With Hypertension, 1999-2000 to 2017-2018. *JAMA*. 2020;324(12):1190-1200. doi:10.1001/jama.2020.14545

9. Shahu A, Herrin J, Dhruva SS, et al. Disparities in Socioeconomic Context and Association With Blood Pressure Control and Cardiovascular Outcomes in ALLHAT. *J Am Heart Assoc*. 2019;8(15):e012277. doi:10.1161/JAHA.119.012277

10. Boulware LE, Ephraim PL, Hill-Briggs F, et al. Hypertension Self-management in Socially Disadvantaged African Americans: the Achieving Blood Pressure Control Together (ACT) Randomized Comparative Effectiveness Trial. *J Gen Intern Med*. 2020;35(1):142-152. doi:10.1007/s11606-019-05396-7

11. Khoong EC, Commodore-Mensah Y, Lyles CR, Fontil V. Use of Self-Measured Blood Pressure Monitoring to Improve Hypertension Equity. *Curr Hypertens Rep*. 2022;24(11):599-613. doi:10.1007/s11906-022-01218-0

12. Fang J, Yang Q, Ayala C, Loustalot F. Disparities in access to care among US adults with self-reported hypertension. *Am J Hypertens*. 2014;27(11):1377-1386. doi:10.1093/ajh/hpu061

13. Kim EJ, Kim T, Paasche-Orlow MK, Rose AJ, Hanchate AD. Disparities in Hypertension Associated with Limited English Proficiency. *J Gen Intern Med*. 2017;32(6):632-639. doi:10.1007/s11606-017-3999-9

14. Neal JW, Neal ZP, VanDyke E, Kornbluh M. Expediting the Analysis of Qualitative Data in Evaluation: A Procedure for the Rapid Identification of Themes From Audio Recordings (RITA). *Am J Eval*. 2015;36(1):118-132. doi:10.1177/1098214014536601

15. American Medical Association, American Heart Association. How to Measure Your Blood Pressure at Home. Published online 2020.

16. Lyles CR, Nguyen OK, Khoong EC, Aguilera A, Sarkar U. Multilevel Determinants of Digital Health Equity: A Literature Synthesis to Advance the Field. *Annu Rev Public Health*. 2023;44:383-405. doi:10.1146/annurev-publhealth-071521-023913

17. Sarkar U, Lisker S, Lyles CR. How to Narrow the Digital Divide in U.S. Health Care. https://hbr.org/2021/05/how-to-narrow-the-digital-divide-in-u-s-health-care

18. Dietrich S, Hernandez E. What Languages Do We Speak in the United States? Published online December 6, 2022. https://www.census.gov/library/stories/2022/12/languages-we-speak-in-united-states.html

19. Fontil V, Khoong EC, Green BB, et al. Randomized trial protocol for remote monitoring for equity in advancing the control of hypertension in safety net systems (REACH-SNS) study. *Contemp Clin Trials*. 2023;126:107112. doi:10.1016/j.cct.2023.107112

Abbreviations

SMBP = self-measured blood pressure monitoring
HTN = blood pressure
RQDA = rapid qualitative data analysis
AHA = American Heart Association
AMA = American Heart Association

Supplementary Files

Figures

Demonstration of BP measurement technique evaluated by AMA and AHA guidelines.