Mobile Health Interventions: A Synthesis of the Evidence for Future Implementation Among Black Hypertensive Populations

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Background

Hypertension (high blood pressure, HBP): a condition in which the measurement of blood pressures in one's arteries is higher than normal (systolic <120 mm Hg, diastolic <80 mm Hg); the diagnosis of hypertension is defined as at or above 130/80 mm Hg[1]. It increases the risk for heart disease and stroke and can be a primary or contributing cause of death.

Current recommendations to control high BP prior to medication use include weight loss, regular exercise, healthy diets, smoking cessation, and reduced stress[2]. Monitoring one's BP with regular visits to one's doctor can also help reduce rising blood pressure readings and maintain a healthy lifestyle.

Mobile Health Interventions provide cost-effective and convenient technological platforms to wirelessly monitor conditions and deliver health services[3]. Examples are mobile- and web-based applications, text messaging, cellular-connected medication devices, remote biomonitoring, online patient portals, and many more.

Introduction

Almost half of adults in the United States have been diagnosed and/or are taking medication for hypertension[4]. African Americans (AA) are especially affected with high prevalence rates of hypertension morbidity and mortality[5]. Economic and social conditions play a large factor in their high prevalence rates and perpetuate the health disparity. Recommended self-care activities and modifications are only so feasible for certain populations as they encounter barriers that impact their affordability of health insurance coverage, access to clinical medications or therapies, and adoption of lifestyle changes.

Mobile interventions may provide a mode for hypertension interventions for Black populations to overcome barriers to health management and to improve overall health outcomes, especially as mobile technology is generally widely used and can be adapted for a broad range of services.

Objectives:

- Synthesize evidence of mobile hypertension interventions
- Suggest effective practices for future hypertension programs with a special focus on Black populations.

Methods

The NCBI PubMed database was used to conduct a qualitative systematic literature search of free-to-access articles reporting mobile hypertension interventions conducted within the past five years (2015 to the present). Key search terms were "hypertension disparities", "hypertension digital health", "hypertension mobile app", "African American digital intervention", "mHealth hypertension".

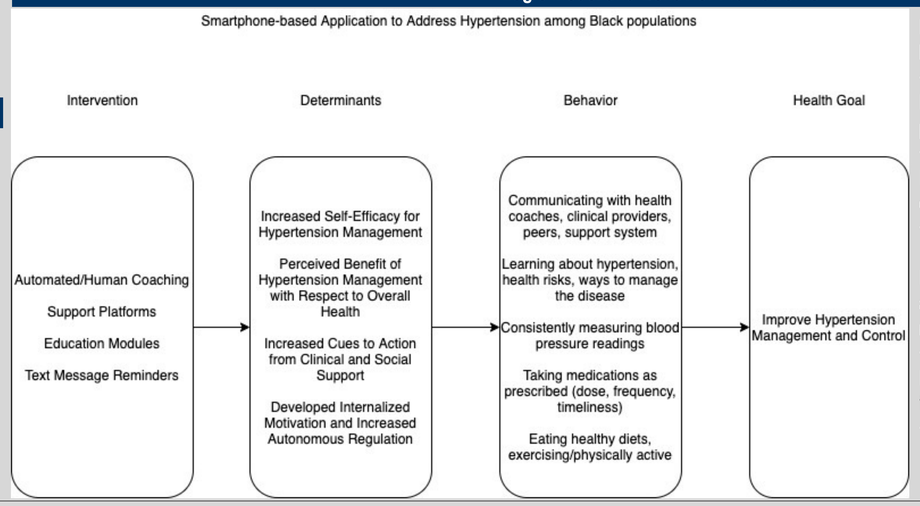
Inclusion criteria: primary publications from 2015 to the present, interventions conducted in the United States, mobile app-based interventions for hypertension, English-language publications, and studies with a focus on hypertension management.

Exclusion criteria: secondary publications interventions targeting youth or minors younger than 18 years old; and studies for outcomes that do not include hypertension.

Results

Program	Healthy Circles[6]	Smart Hypertension Control[7]	DASH[8]	MediSAFE-BP[9]	BPMED[10]	FAITH![11]	SMASH[12]	COACHMAN[13]
First Author	Ju Young Kim	Stephen Persell	Himali Weerahandi	Kyle Morawski	Lorraine Buis	LaPrincess Brewer	Tatiana Davidson	Carolyn Still
Year Published	2016	2020	2020	2018	2017	2019	2015	2020
Setting	San Diego, CA	Chicago, IL	Boston, MA	USA	Detroit and Southfield, MI	Rochester, MN	Charleston, SC	Cleveland, OH
Target Population	General hypertensive	General hypertensive	General hypertensive	General hypertensive	Black/AA hypertensive	Black/AA hypertensive	Black/AA hypertensive	Black/AA hypertensive
Mobile Intervention's Components	BP Measurement Reminders Medication Reminders Education Health Coaches Social Platform	BP Measurement Reminders Medication Reminders Education Health Coaches	BP Measurement Reminders Medication Reminders Education Health Coaches	BP Measurement Reminders Medication Reminders Social Platform	Medication Reminders Education	BP Measurement Reminders Education Health Coaches Social Platform	BP Measurement Reminders Medication Reminders	BP Measurement Reminders Medication Reminders Education Health Coaches
Primary Outcome	Positive change in health management activities Decrease in BP	Positive change in health management activities Mild decrease in BP Increase in self-efficacy	Positive change in health management activities	Significant increase in medication adherence	Nonsignificant increase in medication adherence Nonsignificant decrease in BP	Positive change in health management activities Decrease in BP	Increase in medication adherence Significant decrease in BP	Modest decrease in BP Modest increase in self-efficacy
Efficacy Results	Strengthened individuals' management of blood pressure, though not generalizable to all populations	Limited differences between intervention and controls for BP change, yet potential for differences in secondary outcomes that can improve hypertension management	Feasible and engaging, but underpowered to identify differences in physiological outcomes to signify better hypertension management	Improvements in medication adherence for better hypertension management and outcomes	Text message reminders can improve medication adherence, which contribute to improved hypertension management	Cultural relevancy and community base measured improvements in outcomes that show potential for hypertension management	Validated mobile intervention acceptability and usability to help manage hypertension.	Clinically relevant scores presented the potential for mobile interventions in hypertension management.

Logic Model and Behavior Frameworks



Digital support coaching for self-management and healthy behaviors

- **Cognitive Behavioral Theory**

Promotion of cues to action in the decision-making process to execute health actions

- **Health Belief Model**

Foster social relationships and community connections to promote health behaviors

- **Social Cognitive Theory, Community Mobilization Model**

Engage participants in fostering competence and autonomous regulation through personalized motivation and feedback

- **Self Determination Theory**

Patient-centered approach within contextual factors

- **Individual and Family Self-Management Theory**

Limitations

- Technological challenges prevail throughout the mobile intervention
  - Troubleshooting to pair remote BP monitoring devices with smartphone applications: connectivity issues, software updates
  - Difficulty for older adults to navigate technological devices: simplifying application components may not be fully effective
- Variable levels of health literacy and ability to engage with mobile intervention components
- Alignment of participants' availabilities with clinical providers or health coaches (resource-intensive, cuts clinical efficiency)
- Limited application to complex health statuses
  - More hypertensive populations: not appropriate for people with extremely high BP and may need more immediate medical attention
  - Multiple comorbidities: must consider and accommodate other health concerns alongside hypertension

Implications/Conclusions

Cultural specificity and community engagement should be emphasized in the intervention, accomplished by a community-based participatory research approach (CBPR) and initiated at AA organizations, such as faith-based establishments (churches) and local AA-owned and frequented businesses (barbershops and salons)[14]. The mobile-based application can provide care that is individualized and catered to users' diverse backgrounds.

The mobile application should be scalable to participants' varied health conditions with comorbidities, diagnosed hypertensive stage, desired engagement in the program components (health literacy, technological dexterity, learning styles). Self-assessments can improve self-efficacy and provide continual evaluation for the program's' effectiveness.

The interactive components are important: mobile interventions should provide platforms for clinical service and social networking to keep users accountable and reinforce health improvement efforts. The portal must be innovative in its message delivery to sustain behaviors in the long process of chronic disease management. Similarly, automatic upload of BP measurements and/or medication adherence from wireless and Bluetooth-connected devices can facilitate the remote monitoring of participants' hypertension.

Concerns with hypertension control can be attributed to high non-medication adherence rates and barriers to accessible health care. Mobile health interventions may mitigate the disproportionate heath burden and improve feasibility with the tools for wirelessly delivered therapy and support platforms.

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