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Stakeholder perspectives on barriers and facilitators to hypertension control in urban Haiti: a qualitative study to inform a community-based hypertension management intervention

Reichling St Sauveur[1], Rodney Sufra[1], Marie Christine Jean Pierre[1], Joseph Inddy[1], Mirline Jean[1], Nour Mourra[2,3], Radhika Sundararajan[2,4], Margaret L. McNairy[2,3], Jean W. Pape[1,2], Vanessa Rouzier[1,2], Jessy Devieux[5] and Lily D. Yan[2,3*]

Abstract

Background Uncontrolled hypertension is the leading modifiable risk factor for cardiovascular disease mortality and remains high in low-middle income countries like Haiti. Barriers and facilitators to achieving hypertension control in urban Haiti remain poorly understood. Elucidating these factors could lead to development of successful interventions.

Methods We conducted semi-structured interviews with healthcare providers (10) and patients with hypertension (10) from the Haiti Cardiovascular Disease Cohort, using guides developed using the Consolidated Framework for Implementation Research. Participants were recruited using purposive sampling, and thematic content analysis was conducted in NVIVO software.

Results At the individual level, barriers to hypertension control included hypertension is asymptomatic, hypertension is due to stress, difficulty changing behaviors within shared households, and fear of becoming dependent on medications. Facilitators included spiritual faith in doctors, high awareness of diet and exercise, belief in medication effectiveness, and family as motivation to treat hypertension. At the inner setting clinic level, barriers included limited physician–patient time during visits, residual stigma around cardiovascular services located on same campus as HIV care, and patient preference for physician guidance. Facilitators included patients treated with respect at clinic, and strong provider-patient rapport. At the outer setting societal level, only barriers were mentioned, including extreme poverty, civil insecurity, and stress making hypertension worse.

Conclusions These findings can inform the development of future efforts to design interventions to improve hypertension control in Haiti.

Keywords Global health, Noncommunicable diseases, Cardiovascular risk factors, Consolidated framework for implementation research

*Correspondence:
Lily D. Yan
liy9032@med.cornell.edu
Full list of author information is available at the end of the article

Background

One out of three adults globally has hypertension [1]. Untreated and uncontrolled hypertension is the leading modifiable risk factor for cardiovascular disease mortality worldwide, and remains disproportionately high in low-middle income countries (LMIC) compared to high income countries (HIC) [2–4]. Of all people with hypertension in LMICs, only 7.7% have controlled blood pressure, compared to 28% of people with hypertension in HICs [4]. In Haiti, the lowest income country in the Western hemisphere, in the Haiti Cardiovascular Disease Cohort we have found that despite access to free clinic-based care through GHESKIO clinics, only 45% of people with hypertension are on treatment and only 13% have controlled blood pressure [5]. The Groupe Haitien d'Etude du Sarcome de Kaposi et des Infections Opportunistes (GHESKIO) Centers are a medical non-profit organization that has operated continuously over four decades in Haiti to provide clinical care for residents living in the slums of Port-au-Prince, Haiti. Medical care in Haiti is provided through clinics and hospitals operated by the government, non-governmental organizations, and private physician groups, with the first two operators largely providing care for free including free visits and medications.

Understanding the barriers and facilitators to achieving hypertension control is crucial to the development and design of effective interventions to treat and prevent cardiovascular disease. Using the socio-ecological model, barriers and facilitators can be organized at the individual, provider, and societal or healthcare system levels [6], which would subsequently be best addressed by different types of interventions at each level. Prior research has suggested multiple barriers to hypertension control in LMICs. At the individual level, these may include difficulty of sustained behavior change, pill burden, or disinterest in taking medications to treat asymptomatic diseases [7]. At the healthcare provider level, lack of sufficiently trained doctors, competing demands for limited clinic visits, and lack of knowledge with managing chronic diseases may contribute to poor blood pressure control [7–9]. Lastly, at the societal level, systemic poverty, political instability, and food insecurity may impede hypertension control [8, 10]. However, while barriers to hypertension have been examined in other LMICs most commonly in sub-Saharan Africa, barriers and facilitators specific to urban Haiti—which has a greater severity and breadth of natural disasters, political and social turbulence— are underexplored [7, 9, 11].

To address this gap, we conducted a qualitative study to 1) understand significant barriers and facilitators to hypertension control in urban Haiti with perspectives from healthcare providers, community health workers (CHWs), and patients with hypertension and 2) inform a future pilot study on community hypertension management.

Methods

Study setting and design

We used an exploratory sequential design, where qualitative data collection and analysis are conducted first and then used to inform a potential intervention and later quantitative data collection and analysis. Data presented here are from pre-implementation qualitative interviews for a pilot study on community management of hypertension, conducted among participants of the Haiti Cardiovascular Disease Cohort (clinicaltrials.gov NCT03892265) with uncontrolled hypertension. The proposed pilot study involves task-shifting with CHWs to decentralize hypertension care from the clinic into the community, specifically blood pressure screening, medication delivery, and lifestyle counseling. These interviews were used in the design of the pilot study.

The Haiti Cardiovascular Disease Cohort is a longitudinal cohort of 3,005 adults living in Port au Prince, selected using a multistage random sampling strategy to evaluate the prevalence and incidence of cardiovascular risk factors and diseases and their association with social and environmental determinants of health [12]. The Haiti Cardiovascular Disease Cohort is conducted by the Groupe Haitien d'Etude du Sarcome de Kaposi et des Infections Opportunistes (GHESKIO) in Haiti. The GHESKIO Centers is a medical non-profit organization that has operated continuously over four decades in Haiti to provide clinical care and conduct research on infectious and, in recent years, on chronic diseases.

For this qualitative study, inclusion criteria included any participant in the Haiti Cardiovascular Disease Cohort with uncontrolled hypertension, defined as 1) one systolic blood pressure (SBP) measurement $\geq$ 160 mmHg or diastolic blood pressure (DBP) measurement $\geq$ 100 mmHg, or 2) two measurements on different days with SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg in line with the World Health Organization (WHO) definitions of hypertension and stage II hypertension [13]. Participants have BP measured at all clinic visits, which occur at least yearly, following American Heart Association (AHA) and WHO guidelines [14, 15] using semi-automated oscillometric research-grade sphygmomanometers (Omron HEM 907). Participants sat in a quiet room for five minutes with both feet flat on the floor, and then had three BPs measured, separated by one-minute intervals. The average of the last two BPs was used as the clinic visit BP. Inclusion criteria also included any GHESKIO CVD clinic staff who take care

of participants with hypertension, including doctors, nurses, and community health workers.

Study population

Our study population for this qualitative analysis included providers, community health workers (CHWs), and patients all selected using purposive sampling. Three physicians and one nurse working in the GHESKIO CVD Clinic were chosen for their expertise and direct involvement in managing patients with cardiovascular diseases. Six community health workers (CHWs) were selected based on having seniority at GHESKIO and close community ties, as recommended by the physicians. Additionally, ten patients diagnosed with hypertension who were already enrolled in the Haiti CVD Cohort were selected using purposive sampling to be representative of age and gender. This approach allowed us to capture a broad range of experiences and perspectives on hypertension care from the health system, community, and patient levels.

Data collection

We employed different qualitative research methods to collect data. 1) In-depth interviews were conducted with three physicians, one nurse, five patients with hypertension, and one CHW. These interviews provided a detailed understanding of individual experiences, clinical perspectives, and community-level challenges. 2) Two focus groups were also organized, one with five CHWs and another with five patients with hypertension. Focus groups further explored concepts from the interviews and facilitated discussions among participants, allowing for the exploration of shared experiences, differing viewpoints, and group dynamics.

Semi-structured in-depth interviews and focus group discussions were conducted between February and March 2022 by two bilingual Haitian interviewers with training in qualitative data collection (JD, WD). Interviews and focus groups were conducted in Haitian Creole with CHWs and patients, and in English with health care providers (LY). All interviews were recorded, and de-identified, and transcribed verbatim. Creole transcripts were translated to English for analysis by bilingual Creole-English speakers. All translated interviews were checked for accuracy by randomly selecting portions, back translating to Creole, and comparing with the original audio transcript (WD, JD).

Data analyses

We used the Consolidated Framework for Implementation Research (CFIR) to inform interview guide development and data analysis. CFIR is commonly used in pre-implementation, mid-implementation, and post-implementation of new interventions to guide adaptation, data collection, and analysis [16, 17]. CFIR includes 5 main domains (Outer Setting, Inner Setting, Characteristics of Individuals, Process, Intervention Characteristics) each with multiple constructs.

We adapted CFIR to our local context (Table 1) and developed semi-structured interview guides for in depth interviews and focus group discussions around the major domains and selected constructs within CFIR. In this manuscript, we focus on domains of outer setting, inner setting, and characteristics of individuals, as previous research has demonstrated these aspects of the healthcare context are the most pertinent drivers of hypertension care, with emerging themes organized on whether they are barriers or facilitators to achieving hypertension control in the urban Haitian context.

Thematic content analysis of interview transcripts was conducted by four coders in iterative steps (JD, WD, LY, SS) [18, 19]. After preliminary transcript review, a set of codes representing similar ideas or themes were developed, with input from all four coders. Using NVIVO, transcripts were coded using the initial set of codes by two coders with periodic comparisons; any coding conflicts were resolved through discussion. During each round, any new concepts or emerging themes were created into new codes or subcodes and applied to all transcripts. The transcripts, codes, and subcodes were then reviewed by the other two coders, with disagreements resolved through discussion. All transcripts were recoded using the final codebook.

Ethics

This study was approved by the GHESKIO and Weill Cornell Medicine Institutional Review Boards. Participants provided informed consent. All research was performed in accordance with relevant regulations, including the Declaration of Helsinki.

Results

A total of 10 participants with hypertension from the Haiti CVD Cohort were interviewed, 5 with in-depth interviews and 5 in one focus group. These participants had a mean age of 49 years (SD 8), 80% were female, and 70% worked as merchants (Table 2). A majority of participants had comorbidities in addition to hypertension, most commonly diabetes (50%) and obesity (40%). Six CHWs were interviewed, including 1 female. Most GHESKIO CHWs are male in the CVD Clinic. Four healthcare staff were interviewed, including 3 physicians (all male) and 1 nurse (female).

We identified themes relating to barriers and facilitators to hypertension control and have organized these according to various CFIR domains below (Individual,

Table 1 Mapping CFIR Domains, Constructs and Sources to inform semi-structured interview guides

Domain	Provider	CHW	Patient	
Individuals	• Provider and Patient Knowledge & Beliefs on Hypertension • Evidence Strength & Quality for antihypertensive medications • Self-efficacy in changing health outcomes for patients with hypertension	• CHW and Patient Knowledge & Beliefs on Hypertension • Evidence Strength & Quality for antihypertensive medications • Self-efficacy in changing health outcomes for patients with hypertension	• Patient Knowledge & Beliefs on Hypertension • Evidence Strength & Quality for antihypertensive medications • Self-efficacy in changing health outcomes for themselves	Barriers & Facilitators 
Inner Setting	• CVD Clinic Team characteristics • CVD Clinic team efficacy	• CVD Clinic Team characteristics • CVD Clinic team efficacy	• CVD Clinic characteristics	
Outer Setting	• Systems architecture: societal context • Resource source: antihypertensive medications • Socioeconomic factors: poverty, education • Community characteristics	• Systems architecture: societal context • Socioeconomic factors: poverty, education • Community characteristics	• Systems architecture: societal context • Socioeconomic factors: poverty, education • Community characteristics	

Table 2 Demographics

	Patients *N* = 10	**Community Health Workers *N* = 6**	**Healthcare Staff *N* = 4**
Age			
< 30	0	1	0
30–39	0	5	4
40–49	6	0	0
50–59	3	0	0
60 +	1	0	0
Female	8	1	1
Occupation	7 Merchant 2 Unemployed 1 Construction	6 Community Health Workers	3 Physicians 1 Nurse
Comorbidities, in addition to hypertension	2 Obesity 1 Dyslipidemia 2 Diabetes, Obesity 3 Diabetes, Dyslipidemia 2 None	–	–

Inner Setting, Outer Setting), and showcase selected illustrative quotations.

Individual patient barriers

Hypertension is asymptomatic therefore leading to low perceived need for daily medication

The physicians and CHWs expressed concern that many patients with hypertension did not consider it a "real disease" because the patient was asymptomatic and did not believe they had hypertension or that hypertension was something that needed to be treated with medication.

> *"They think hypertension, it's like an acute disease. I got hypertension and take my meds for two weeks and I'm okay. It's difficult for them to understand you have to continue to take it." (physician 1, IDI).*

> *"They think hypertension is not a disease, and so it's not important to take medications without any symptoms." (CHW 4, FGD).*

Hypertension is due to stress and can be eliminated by reducing stress in one's life

While some patients did acknowledge hypertension was a lifelong medical condition and expressed understanding that they needed continued treatment, others described high blood pressure as due to stress or external factors and emphasized that as long as a person avoided being angry or stressed, they could avoid having hypertension. Stress could either be related to the current civil unrest in Port-au-Prince, or from interpersonal conflict at home.

> *"Yes, stress and worry can provoke hypertension. Anger can do it too. You may not be stressed nor worried, but an angry situation can rise your blood pressure to a level that can lead to stroke… For example, if my mother tells me something that I don't like it goes to my heart, to my brain and I feel different and I don't feel good." (patient 2, IDI).*

> *"Well, the tension itself, sometimes you can receive a news, or you see something happening in front of you that can allow the tension to either go up or down. Events that occur in front of you can cause your tension to either go up or down and most often we are also told stress can make you tense. If you are a person who is never at peace, you are always under pressure, the tension allows you to get a disease called hypertension." (patient 1, IDI).*

Difficulty changing behaviors within context of shared household

Both CHWs and patients reported it was difficult to change diet and exercise habits to improve hypertension control in the context of a shared household, particularly related to decreasing salt intake. While everyone reported knowing too much salt could cause hypertension or make it worse, many also reported not knowing how to reduce salt when the entire family ate a single, shared meal and not everyone wanted to decrease their salt intake.

> *"Often when they cook, they add the salt and prepare the meal for everyone in the house. This is a difficulty that we are going to encounter in patients' homes because of the advice we are giving them for [limiting] the amount of salt." (CHW 5, FGD).*

> *"When I cook my own food, I don't put Maggi cubes [stock cubes high in sodium]. When I cook for her [my daughter], I put something in it. She doesn't have hypertension, I can't lower her blood pressure [by not putting salt in her food] (patient 5, IDI).*

Fear of becoming dependent on medications drives reluctance for daily medication

For those patients who agree to take medications, there were additional barriers, most notably a fear of becoming dependent on the medications.

> *"We have so many participants with uncontrolled hypertension, because they really think if you continue to take the medication, you will be… It's, like, you will be sensitized to the medication and you will have to increase the doses, increase the number of medications" (physician 1, IDI).*

In response to this fear, many patients conducted self-experiments, where they stopped taking medication to see what would happen to their blood pressure.

> *"Sometimes I stop the medication to see if [my blood pressure] would go down normally" (patient 3, FGD).*

Other themes related to medication usage

A few other themes related to medications emerged. Physicians reported some patients had difficulty swallowing pills and would ask for medication in liquid form. Side effects were only mentioned by one patient with hypertension. Herbal remedies were mentioned including bitter tea, almond leaves, and garlic, but patients often mentioned trying these in addition to taking medications as an adjunctive, rather than taking herbal remedies alone.

Individual patient facilitators

Spiritual faith leads to trusting physicians' advice on hypertension

Many patients positively viewed the clinic and doctors as agents of God. Their spiritual beliefs in God extended to also believing in and trusting doctors.

"God has placed the doctors to take care of us. We have to pray to stay alive and follow the doctor's rules." (patient 2, IDI).

"God puts GHESKIO on my way. I was outside my home recharging my phone and I met the community health workers who work to save life. GHESKIO invests a lot of money to save the patients. At GHESKIO, the patient is like a king." (patient 5, FGD).

High awareness of how diet and exercise affect blood pressure

Patients and CHWs articulated clear understanding that diet and exercise affected blood pressure, in particular all participants reported excessive salt intake led to hypertension.

"Especially in my home, often people always like foods that contain more salt, compared to the amount of salt your body should have that should not exceed 10 g." (CHW 1, FGD).

"Your salt, your fat, your uncontrolled spice, and maggi cubes too, too many maggi cubes, a series of uncontrolled things that you're consuming they can, all that too can lead to hypertension." (patient 1, IDI).

"[The doctors] say we need to practice sport too, some things we need to do to keep the blood pressure from getting too high." (patient 2, FGD).

Belief in effectiveness of medication

Most patients acknowledged medication as an important part of their care.

"I started taking my medication, and then my blood pressure started to drop." (Patient 3, FGD).

One nuance of medication uptake was the relationship between symptoms and taking medication. While providers thought many patients did not take medications because they were asymptomatic, two patients reported taking medication because they felt better while taking it. Thus, avoiding symptoms could be seen as a motivating factor.

"Yeah, because it [taking hypertension medication] makes me feel good, I think this is something that I like." (patient 5, IDI).

Family and community as motivation to treat hypertension

Patients reported staying healthy to take care of their family as one factor that motivated them to keep taking their medication and prevent their hypertension from becoming more serious. In addition, some patients started receiving hypertension care because they accompanied a family member to the clinic and ended up having their own blood pressure measured.

"I have a child, it is because of her I hold on and I get here [to attend clinic]; I will continue to take the medicines to move forward." (patient 5, IDI).

"I just accompanied my mother, and after he examined her, I didn't resist and got it checked. My blood pressure was so high that day I was surprised too." (patient 1, FGD).

Relatedly, some patients reported that their friends and families regularly lent each other money when someone was short of funds to pay for their medical care, although this was not always a reliable option as everyone had limited resources.

"Sometimes [patients] know other people have hypertension, sometimes they don't know but people may have lightheadedness or headache and think it is symptoms of hypertension so they share medicine" (physician 3, IDI).

Inner setting clinic barriers

Limited doctor-patient time during visit

One common barrier reported by both doctors and patients was the lack of time during clinic visits for in-depth counseling on hypertension causes, treatments, and how medications work. Doctors often had competing demands and many tasks they needed to accomplish in a short time frame.

"But if you don't take time to talk with the doctor you may be afraid to take the medication." (patient 2, IDI).

"We have to have more time to explain to the patient about hypertension, why it's so important to take your medication… I think it's a really a big issue, but sometimes we don't have enough time." (physician 1, IDI).

Residual stigma around cardiovascular services located on same campus as HIV care

Historically, the GHESKIO centers have provided care for HIV/AIDS with expansion to related conditions like tuberculosis, and only more recently have they expanded into cardiovascular disease care. One patient reported that GHESKIO's reputation in the community is still primarily as an HIV treatment center.

"Because when you tell someone you are coming [to the clinic] they always think it's for people who have HIV. This is where people who get tuberculosis [go], which means when they see you coming in, hmm, you don't have friends anymore because you're going to the wrong place." (patient 5, IDI):

Patient preference for physician guidance over other healthcare providers

When presented with the proposed pilot study that uses task-shifting with CHWs to deliver community based hypertension care, both physicians and CHWs expressed hesitation that patients may prefer guidance from physicians only, and may not be as accepting of CHW-delivered counseling.

"I know sometimes Haitian patient want to see the doctor. It's like a paternal follow-up for them." (physician 1, IDI).

"Interviewer: Ok. Another factor that you introduce is that the person may believe that the drugs don't go well with them, so they don't take it. In such a case, what can you say to the person? What do you think?

CHW2: I refer them to the doctor because when you talk to them, it's the same thing in their head that they will always keep. I usually prefer to refer them to the doctor." (CHW2, FGD).

However, patients themselves did not express a preference for physician based counseling, and were accepting of a CHW led pilot for community hypertension care, especially because of the convenience of location.

"Yeah, [the pilot] would be better for me. Because where GHESKIO is located, I come but I don't like the area, if I had the chance that someone come to my house later, interview me, talk to me at home, I think it would be better." (patient 1, IDI).

Inner setting clinic facilitators

Patients treated with respect at clinic by staff, motivating clinic attendance and treatment adherence

All participants spoke gratefully and highly of the care they received at GHESKIO. Not only did they report being treated with respect by the medical staff, they also reported having their socioeconomic needs addressed, including transportation reimbursement and being fed a warm meal. This motivated them to come into clinic, and more likely to adhere to treatment recommendations.

"Because my blood pressure was really high, we received education. The doctors are very patient with us. This is the greatest gift we have ever received" (patient 1, FGD).

"Because when I come, they welcome me, they take care of me. Sometimes, I come without eating, they give me food and they invite me to the appointment" (patient 3, IDI).

"Sometimes they give us money for transportation. Sometimes, they even give us food because sometimes we come in the morning [and] we will return home at 4 o'clock." (patient 2, FGD).

The importance of providing a welcoming atmosphere was also noted by the CHWs, as a way to help patients accept medical advice, like reducing salt or increasing exercise, or taking antihypertensive medication.

"The other motivation is welcoming, as you show the person that you care about them in relation to their health." (CHW 3, FGD).

Strong provider-patient rapport strengthening patient acceptance of medical counseling

Many patients reported trusting the clinic physicians and CHWs and saw them as highly skilled. This trust motivated patients to follow medical advice, to make lifestyle changes to control blood pressure.

"Because the doctors spend years studying and want to save lives. I missed my calling to be a doctor. It's not about the money. When they choose this profession, there's a part in their hearts that is no longer theirs. It's for the patients. So, when they ask you to do something, they know that it's for your best. For example, doctors told me not to eat rice, not to do some other things because I have diabetes and hypertension. I don't do it." (patient 2, IDI).

"The GHESKIO community health workers on the street are really effective. One day, they were passing by my house as I was sitting outside. I explained that I have diabetes and I wasn't feeling good. And that's it! That was the solution!" (patient 2, IDI).

Outer setting barriers

Extreme poverty

The most commonly mentioned barrier to hypertension control was extreme poverty, which limited patients' ability to make healthy lifestyle changes, to pay for antihypertensive medications, or even to travel to the clinic for care. In particular, adherence to dietary recommendations from clinical providers was difficult as fresh fruits and vegetables were mentioned repeatedly as being more expensive than unhealthy alternatives.

"Many patients have low income, they don't get enough money to buy food, and they often buy food on the street. Most of the food is not well prepared, contains high salt, high fat. So that is one of many examples we can take [of difficulty with controlling blood pressure]. Some patients have no time to do exercise, or a fear to leave [their home] to go exercise." (physician 3, IDI).

"Sometimes, they tell me not to eat something when this is exactly what I can afford. I'm obliged to eat it. This is the problem … It's not because I don't have the knowledge [about a healthy diet]; that means, it's my life's circumstances that led me to eat what I know is not good for me." (patient 4, IDI).

Poverty also impacted patients' ability to purchase their antihypertensive medications. Patients reported not having enough money to buy medications, and also not having enough money to physically get to GHESKIO clinic, where medications are provided for free.

"Sometimes, if I miss an appointment, it's because of lack of money for public transport because I'm not working and it's difficult to find money. When I come here, they give me medication. The day before yesterday, I came, I didn't find medication at all because they told me that they didn't have for this moment. I haven't found money to buy them….I haven't bought [medications] because I don't have money." (patient 4, IDI).

"Because it's difficult for me to find it [medications], I don't have the money." (patient 5, FGD).

"I'm not working and would not have money to buy the medicines like metoprolol which costs 200 or 1500 Haitian Gourdes ($2–15 USD). Sometimes, I wake up with no money." (patient 2, IDI).

"Because sometimes I don't have money to buy medication. I'm not working, my husband is not working. Sometimes, things are difficult and when it's time for my appointment, I don't even have money for public transport to come here." (patient 4), IDI.

The physicians also mentioned a lack of accessible and affordable antihypertensive medications as a main barrier to patients achieving hypertension control. Outside of GHESKIO clinic, only 5% of pharmacies in Haiti are state pharmacies, or pharmacies that provide free medication. At GHESKIO, medications are provided to patients for free, but funding limitations can lead to limited supplies and drug shortages.

"I think that in all the centers in Haiti, that is the big challenge, is supply chain to make sure that when the physician prescribes a medication, we are sure that the patient can find this medication in the pharmacy." (physician 2, IDI).

"Sometimes the participant says, I have to move to the countryside, and we can't find any pharmacist or any medication." (physician 1, IDI). Patients often have competing priorities for their scarce resources. Sometimes they do not have money for both food and medication.

"Because many times they don't take it [antihypertensive medication]. They may say that if they have 100 Haitian Gourdes, they will buy food [instead of medication] as they don't feel any discomfort." (CHW 3, FGD).

In addition, many patients reported medications were not safe to take without eating food, and if there were days they did not have food to eat, then they also did not take their medications. Patients also reported rationing their medications if they were running out, like taking them every other day instead of daily as recommended.

CHWs reported that for many of their patients, given the limited resources, seeking medical care or paying for medication was not a priority. One CHW gave the example of a patient who was a merchant and had to spend a significant amount of time each day to try and sell their wares, leaving no time to travel to the clinic. Another CHW relayed that patients often prioritize spending money on their children or family, instead of themselves.

Civil insecurity and stress impede blood pressure control

Patients, CHWs, and doctors reported the civil insecurity in Port-au-Prince during the study period impacted patients' hypertension in multiple ways. First, the stress itself from political unrest was perceived as a cause of elevated blood pressure. The doctors reported that for some patients who had previously achieved controlled blood pressure, during periods of high insecurity, their blood pressure became high again. Patients reported feeling a loss of control and stress, leading to higher blood pressure.

"People['s lives] are not respected, people are dying everywhere. All these are the same problems. Sometimes the person may take the [hypertension] medicines, and the problems in their life make them useless." (patient 5, IDI).

Second, civil insecurity also impeded patients' ability to access medical care or medications including instances

where people may move from the city to the countryside for many months where there is less violence.

> *"Sometimes I can't come, you know, there's demonstration in the area [where GHESKIO is located] and I am scared [to come pick up my medicines]." (patient 4, IDI).*

> *"Sometimes the problems of the country force you to leave your place of residence and go to another place. Sometimes, we forget the medication as we are running away." (patient 2, FGD).*

Third, the civil insecurity also prevented people from earning money, especially merchants, when streets were closed, or people were staying indoors. This issue, in turn, contributed to poverty, as discussed above.

Discussion

We found numerous barriers to hypertension control at multiple levels. These included the belief that hypertension is asymptomatic and thus low perceived need for daily medication, hypertension is due to stress and can be eliminated by reducing stress, difficulty changing behaviors within a shared household, limited doctor-patient time during clinic visits, patient preference for physician guidance over other healthcare providers, extreme poverty, civil insecurity and stress. We found some facilitators of hypertension control as well which included faith in doctors, knowledge of how diet and exercise affect blood pressure, belief in medication, family as motivation to seek treatment, trust in the clinic, and strong provider-patient rapport strengthening patient acceptance of medical counseling. Figure 1 summarizes the themes mapped to CFIR domains, with barriers and facilitators delineated.

Barriers

Hypertension as an asymptomatic disease, and patient beliefs that it results from negative emotions (rather than a primarily physical condition) is a barrier to hypertension control commonly mentioned in other qualitative studies. Patients with hypertension report they do not have symptoms, and thus do not think they need to take daily medications [20, 21]. In South Africa, two studies showed patients believed hypertension resulted from anger, and thus treatment for hypertension should center around emotional management [22, 23]. The primacy of stress reduction was mentioned in another study in Israel among patients with hypertension, who described hypertension as a reaction to stressful events and not a

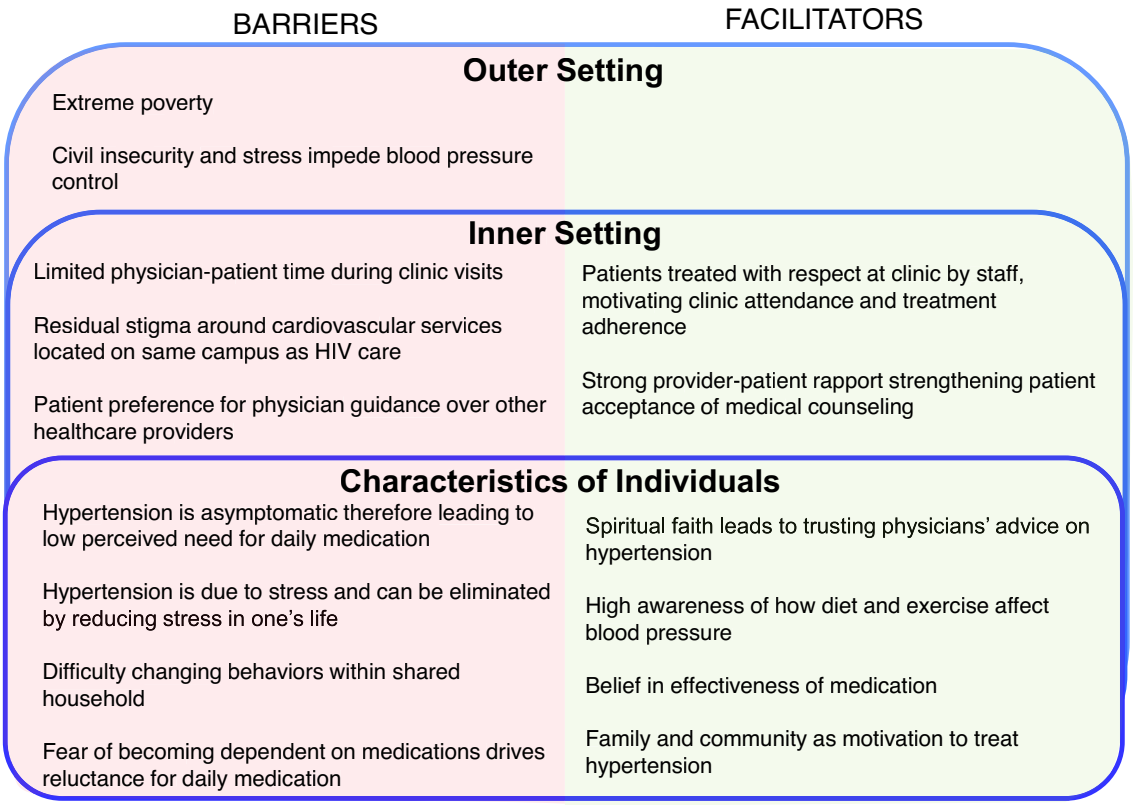

Fig. 1 Mapping themes to consolidated framework of implementation research

chronic disease [24]. While stress is not the main pathophysiological driver of hypertension, high levels of persistent stress have been associated with higher levels of incident hypertension in the Jackson Heart Study [25]. In Haiti, where there are many sources of chronic stress including poverty, political instability, and gang violence, patients and providers all believe stress is an integral reason for high rates of hypertension. This structural violence makes individual-level interventions to reduce stress challenging, but this belief that chronic stress is the principal etiology of hypertension should be addressed through education and by incorporating stress reduction counseling.

In terms of the clinic environment, patients and providers both reported limited time during the clinical encounter, and described how this could result in medication nonadherence or difficulty following lifestyle changes. The lack of time with physicians, or too many patients presenting to clinic, is common in LMIC settings [26, 27]. Task-shifting with training of nurses and CHWs to provide more in-depth counseling to patients in the waiting room or in support group settings could help alleviate the burden on physicians and provide needed patient education and support [28]. On the other hand, some patients reported stigma for attending a CVD clinic located on the same campus as an HIV clinic. This underscores the importance of integrating CVD services like hypertension care in settings that the local community views as neutral and not potentially stigmatizing. One theme which was not mentioned in our interviews was physical resource limitations in the clinic setting, including long wait times for appointments, lack of functioning equipment, limited space, and inadequate availability of guidelines [11, 23, 26]. This is likely due to the fact that significant upfront investment was put into setting up the GHESKIO CVD Clinic prior to the initiation of the Haiti Cardiovascular Disease Cohort, including ensuring availability of equipment (BP machines, scales), diagnostic options (electrocardiogram, echocardiogram) and treatment guidelines.

There is a complex and interconnected relationship between poverty and achieving hypertension control, mentioned repeatedly by patients, CHWs, and providers. The built neighborhood environment may be too dangerous for outdoor, free physical activity [29, 30]. GHESKSIO is located in the densely populated slums of Port-au-Prince, where it may not be safe to stay outside after dark and where there are limited green spaces for exercise. Due to the higher cost of fresh fruits and vegetables compared to fried snacks from street vendors, patients may not be able to follow clinician-recommended diets [31]. In LMICs where appointment times are not standardized and a clinic visit could take a half day or entire day, there is also an opportunity cost of missing work to attend the clinic [22]. Some of the merchants in our Cohort have shared that they cannot afford to miss a day's wage to attend the clinic for an asymptomatic disease like hypertension.

Lastly, poverty can also limit medication access both on the supply and demand side [8]. Unaffordable drug prices were found to be a major cause of patients not achieving BP control in Ghana, with 96% of patients in one clinic reporting this as the primary reason for not taking their medications daily [32]. In another study in Nigerian health facilities, 73% of patients with hypertension had to pay out of pocket for medications [33]. Even in the US or the UK which are relatively more resourced, patients often state the high cost of medications as a barrier to care [21, 34, 35]. Medication rationing is also reported in other studies such as taking smaller doses than prescribed, or not taking them every day [21]. Poverty can also result in unstable supply chains, with common stockouts at health facilities [36]. Only 25% of health centers and dispensaries on the primary care level in one survey in Tanzania had first line hypertension medications available [11].

Facilitators

The importance of family and community as motivation to treat hypertension was mentioned in other qualitative studies on facilitators to hypertension control. In Nigeria and among African Americans in the US, high compliance with antihypertensive medications was associated with having family and social support [20, 37]. On the other hand, a lack of family support to change eating or exercise habits [29], and the burden of cooking differently for oneself (with less salt or oil) from the rest of the family was mentioned as a barrier across locations including South Africa and the US [26, 29, 31, 38]. Prioritizing one's health over family or work was difficult, and many participants reported forgetting to take medications due to many competing demands on their attention [29, 38]. Families are complex social systems with shared physical and behavioral environments that lead directly to concepts like food availability, physical activity opportunities, self-efficacy, and self-regulation which in turn influence healthy diet and physical activity behaviors that promote or hinder cardiovascular health [39, 40]. Intervening at the family level can have a positive impact on hypertension control and reducing CVD risk [41].

We found a positive and strong provider-patient relationship in multiple themes, including patient beliefs that doctors were agents of God, that the clinic was a welcoming and calm place to receive medical care, and that the doctors were highly skilled and trustworthy. This is in contrast to what patients usually report in the

literature, such as distrust in the medical system [30, 38, 42], and feeling a lack of respect from the providers [43]. In one study in rural South Africa examining treatment adherence to medications for hypertension and diabetes, patients reported an authoritarian relationship between clinic staff and patients, and health care provided as mechanical rather than empathic [22]. However, those patients who felt more supported by clinic staff were more likely to take medications [22].

Strengths of this study include obtaining a wide range of perspectives from patients and healthcare workers (CHWs, nurse, doctors), and use of the CFIR framework to develop the semi-structured interview guide to ensure a thorough assessment of pre-implementation barriers and facilitators. Our study has certain limitations that should be kept in mind. The participants included only individuals with uncontrolled hypertension who were recruited from one site and enrolled in the Haiti Cardiovascular Cohort. Therefore, we may have missed some key experiences related to barriers and facilitators to hypertension control in Haiti that are not well-represented in individuals with hypertension and not engaged in care. This fact may limit the generalizability of the study findings. The study was conducted exclusively in Port-au-Prince, Haiti's capital city. Thus, we cannot confirm whether the results generalize to other parts of the country. It is possible that conceptualizations of hypertension control differ in other locations and small villages with less access to health education and care. We also have low numbers of physician participants, although we interviewed all physicians in the GHESKIO CVD Clinic.

In conclusion, in this qualitative study we found multilevel barriers and facilitators to hypertension control in urban Haiti. Future interventions can harness facilitators like family as motivation to treat hypertension, trust in doctors, and belief in medication effectiveness. Barriers including belief that hypertension is due to stress, difficulty changing behaviors within a shared household, extreme poverty, and civil insecurity will need to be addressed. This data is critical to inform recommendations to the Ministry of Health for designing locally relevant interventions that address these factors.

Abbreviations

CFIR	Consolidated Framework for Implementation Research
CHW	Community health workers
CVD	Cardiovascular disease
FGD	Focus group discussion
HIC	High income country
IDI	In depth interview
LMIC	Low middle income country

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Authors' contributions

Conceptualization: LDY, JD, MLM. Data Curation: RSS, RS, JI, NM, JD, LDY. Formal analysis: JD, LDY, RSS. Funding acquisition: MLM, LDY. Investigation: RSS, RS, MCJP, JD, LDY. Methodology: JD, LDY. Project administration: JWP, VR, MLM. Resources: JWP, MLM. Software: LDY. Supervision: JD, MLM, RS. Validation: JD, LDY. Visualization: LDY. Writing original draft: LDY, JD. Writing, review and editing: all authors

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Data availability

Researchers who provide a methodologically sound proposal may have access to a subset of deidentified participant data, with specific variables based on the proposal. Proposals should be directed to the principal investigator at liy9032@med.cornell.edu. To gain access, data requestors will need to sign a data access agreement. Data are available following publications through 3 years after publication and will be provided directly from the PI.

Declarations

Ethics approval and consent to participate

This study was approved by the GHESKIO and Weill Cornell Medicine Institutional Review Boards (1803019037). Participants provided informed consent. All research was performed in accordance with relevant regulations, including the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

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Author details

[1]Haitian Group for the Study of Kaposi's Sarcoma and Opportunistic Infections (GHESKIO), Port-Au-Prince, Haiti. [2]Center for Global Health, Weill Cornell Medicine, 402 East 67 Street, 2 Floor, New York, NY 10065, USA. [3]Division of General Internal Medicine, Weill Cornell Medicine, New York, NY, USA. [4]Department of Emergency Medicine, Weill Cornell Medicine, New York, NY, USA. [5]Department of Health Promotion and Disease Prevention, Robert Stempel College of Public Health and Social Work, Florida International University, Miami, FL, USA.

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