

Stakeholder Perspectives to Inform Adaptation of a Hypertension Treatment Program in Primary Healthcare Centers in the Federal Capital Territory, Nigeria: A Qualitative Study

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Research

Keywords: hypertension, implementation, qualitative, evidence-based, primary care, non-communicable diseases

Posted Date: December 17th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-127903/v1>

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1 **Stakeholder Perspectives to Inform Adaptation of a Hypertension Treatment Program**
2 **in Primary Healthcare Centers in the Federal Capital Territory, Nigeria:**
3 **A Qualitative Study**
4

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14 **Word Count:** 3,544 (not including abstract)
15

16 **Tables:** 2
17

18 **Figures:** 2
19

20 **Keywords:** hypertension, implementation, qualitative, evidence-based, primary care, non-
21 communicable diseases
22

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47 **Abstract**

48 **Background**

49 Implementing an evidence-based hypertension program in primary healthcare centers
50 (PHCs) in the Federal Capital Territory, Nigeria is an opportunity to improve hypertension
51 diagnosis, treatment, and control and reduce deaths from cardiovascular diseases. This
52 qualitative research study was conducted in Nigerian PHCs with patients, non-physician
53 health workers, administrators and primary care physicians to inform contextual adaptations
54 of Kaiser Permanente Northern California's hypertension model and the World Health
55 Organization's HEARTS technical package for the system-level, Hypertension Treatment in
56 Nigeria (HTN) Program.

57 **Methods**

58 Purposive sampling in 8 PHCs identified patients (n=8), non-physician health workers
59 (n= 12), administrators (n=3), and primary care physicians (n=6) for focus group discussions
60 and interviews. The Primary Health Care Performance Initiative (PHCPI) conceptual
61 framework and Consolidated Framework for Implementation Research (CFIR) domains were
62 used to develop semi-structured interviews (Appendix 1, Supplemental Materials) and coding
63 guides. Content analysis identified multilevel factors that would influence program
64 implementation.

65 **Results**

66 Participants perceived the need to strengthen four major health system inputs across
67 CFIR domains for successful adaptation of the HTN Program components: (1) reliable drug
68 supply and blood pressure measurement equipment; (2) expansion of team-based care with
69 additional training; (3) information systems to track patients and medication supply chain;
70 and (4) a primary healthcare system that could offer a broader package of health services to

71 meet patient needs. Specific features of the PHCPI framework considered important included:
72 first contact accessibility, provider availability and competence, coordination of care, and
73 proactive community outreach. Participants also identified patient-level factors, such as
74 knowledge and beliefs about hypertension, and financial and transportation barriers that could
75 limit effectiveness of the HTN Program. Participants recommended using existing
76 community structures, such as village health committees and popular opinion leaders, to raise
77 awareness about the HTN Program and to train community members in blood pressure
78 measurement.

79 **Conclusions**

80 These results provide information on specific primary care and community contextual
81 factors that can support or hinder implementation and sustainability of an evidence-based,
82 system-level hypertension program in the Federal Capital Territory, Nigeria with the ultimate
83 aim of scaling it to other parts of the country.

84 **Contributions to the literature**

- 85 • Hypertension is a major threat to the well-being of people in Nigeria, and
86 hypertension control is a priority of Nigeria's National Multisectoral Action Plan on
87 noncommunicable diseases. Health system-wide interventions, developed in higher-
88 income countries, can improve hypertension treatment and control, but must be
89 adapted for the Nigerian context.
- 90 • Interviews with patients and health professionals provided new insights into health
91 system and community-level strengths and challenges to implementation of
92 hypertension programs in primary health centers in Federal Capital Territory, Nigeria.

- 93 • These findings contribute new knowledge to accelerate adoption and implementation
94 of evidence-based blood pressure interventions in high-burden, lower resource
95 settings.

96
97

98 **Introduction**

99 Hypertension, or high blood pressure, is a global public health problem which largely
100 affects adults. It is a major risk factor for cardiovascular disease (CVD) [1, 2] and the third
101 leading cause of global deaths [3], despite high-quality evidence demonstrating the efficacy
102 and safety of blood pressure lowering medicines [2, 4]. An estimated 1.4 billion people
103 worldwide have high blood pressure, but fewer than 15% of adults with hypertension
104 worldwide have their blood pressure controlled to 140/90 or lower [5]. The burden of high
105 blood pressure is higher in low- and middle-income countries (LMICs) where healthcare
106 systems are often weaker than in high-income countries, leading to delays in diagnosis and
107 low treatment and control rates [4, 6, 7]. Studies in sub-Saharan Africa have shown the rising
108 prevalence and burden of hypertension in the sub-continent [1, 8]. In Nigeria, hypertension
109 prevalence among adults ranges from 29% (95% CI: 25%-33%) to 45% (95% CI: 44%-
110 46%)[1], yet awareness (14-30%), treatment (<20%), and control (9%) rates among
111 individuals with hypertension are estimated to be very low [1, 9, 10].

112 Multi-level, system-based interventions have been shown to significantly improve the
113 prevention, detection, and control of hypertension [11, 12]. Such interventions include:
114 1) behavioral changes, such as promoting healthy diets, active lifestyles, less alcohol
115 consumption, and regular medication adherence at the individual level, 2) people-centred,
116 accessible, and affordable primary care, and 3) a multi-disciplinary, multi-sectoral
117 collaboration between governments and civil society organizations [11, 13, 14]. Effective
118 health system strategies for improving hypertension management, such as those developed by
119 Kaiser Permanente Northern California and the World Health Organization through its
120 HEARTS technical package include: 1) patient registration with site-level audit and feedback,
121 2) automated blood pressure measurement, 3) simplified treatment protocols, including fixed-

122 dose combination therapy, 4) team-based care that supports self-management, and 5) a
123 reliable supply of quality, affordable medicines [12, 15]. These models and intervention
124 components could be adapted to Nigerian primary healthcare centres (PHCs) to improve
125 hypertension diagnosis, treatment, and control rates as recommended as a priority area within
126 the National Multisectoral Action Plan for the Prevention and Control of Noncommunicable
127 Diseases [16]. Successful adaptation of evidence-based programs for a new context requires
128 stakeholder engagement, including with patients, providers, and administrators, to understand
129 and incorporate local perspectives on facilitators and barriers to implementation pathways
130 and program components.

131 We conducted this qualitative, formative study as part of the Hypertension Treatment
132 in Nigeria (HTN) Program, which aims to improve early detection, treatment, and control of
133 hypertension in PHCs in the Federal Capital Territory through a multilevel strategy that
134 includes adapting the Kaiser Permanente Northern California model and World Health
135 Organization (WHO) HEARTS package for use within PHCs. During this formative phase,
136 we conducted focused group discussions (FGDs) and in-depth interviews (IDI) with patients,
137 non-physician health workers, PHC administrators and primary care physicians to
138 understand: 1) their perspectives on multilevel factors influencing blood pressure control and
139 2) how to adapt aspects of the Kaiser Permanente Northern California model and WHO
140 HEARTS package for the primary healthcare system in the Federal Capital Territory, Nigeria.

141

142 **Methods**

143 The HTN Program is evaluating the effectiveness and implementation of a multilevel,
144 system-based intervention to improve hypertension, treatment, and control (NCT04158154).
145 Details of the HTN Program and intervention design have been published (*in press*,

146 *anticipate it will be published by the time this paper is accepted*). The study team collected
147 qualitative data from stakeholders between April 2019 and August 2019, prior to HTN
148 program implementation.

149

150 Study Setting and Design

151 This formative study was conducted in 8 PHCs located in the Federal Capital
152 Territory, Nigeria. The study design was cross-sectional qualitative that used a combination
153 of FGDs (n=10) and IDIs (n=9).

154

155 Sampling

156 A purposive sample of participants was chosen based on their availability, experience,
157 and knowledge of hypertension and their potential to provide perspectives needed to adapt
158 the KPNC model and WHO HEARTS package to the target setting. Patients with high blood
159 pressure (n = 8) and community health extension workers and nurses (n=12) were selected for
160 inclusion in the focus groups (3-4 participants from each of the 8 selected PHCs). PHC staff
161 invited potential patients to participate in FGDs at their respective healthcare facilities. Each
162 FGD lasted approximately 2 hours, including the consent processes. IDIs were conducted
163 with primary care physicians (n=6) from 6 facilities and PHC administrators (n=3) who were
164 chosen from 3 of the 8 facilities and lasted 30 to 60 minutes. Demographic characteristics
165 were obtained from all participants.

166

167 Interview Procedures and Conceptual Framework

168 We used a semi-structured interview guide for both FGDs and IDIs, which were
169 developed using the Primary Health Care Performance Initiative (PHCPI) conceptual

170 framework and mapped onto Consolidated Framework for Implementation Research (CFIR)
171 main domains (**Figure 1**). [17]

172 The IDIs and FGDs were performed on different days in the PHCs. We had two teams
173 that engaged different groups in the respective PHCs. Written informed consent was obtained
174 from each participant. Interviews were conducted by study investigators (NRK, RO, BA, GS,
175 LRH, IO, NE) mainly in English language and colloquial English language (Pidgin),
176 according to participants' preferences. One patient FGD was conducted in Hausa (one of
177 Nigeria's three major languages). All FGDs and IDIs were audio recorded and professionally
178 transcribed verbatim. The FGD in Hausa was translated and transcribed into English by a
179 professional translator. All data and transcripts were anonymized and stored in a secured
180 database at Northwestern University. The study was reviewed and approved by the Ethics
181 Committee at the University of Abuja and the Institutional Review Board at Northwestern
182 University.

183

184 Data Management and Analysis

185 Dedoose qualitative software program (Version 8.0. 35, SocioCultural Research
186 Consultants, LLC, Los Angeles, USA) was utilized, with coding and data analysis following
187 a content analytic approach that was guided by the PHCPI mapped onto the CFIR matrix [17,
188 18] . Two team members with qualitative research training and experience (RO, NRK) used
189 an iterative process to code and analyze the transcripts to identify multilevel factors that
190 participants perceived would influence program implementation. The reporting of this study
191 adheres to the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines
192 [19].

193

194 **Results**

195 Characteristics of patients and non-physician health professionals are reported in
196 **Table 1**. All patients had a diagnosis of hypertension, and the majority had a primary school
197 education or less. Non-physician health workers and administrators had a college education
198 or more and most were middle-aged. Data were organized into three major domains of the
199 PHCPI and CFIR frameworks, and each domain contained several themes and subthemes
200 (**Figure 1, Table 2**). Several themes also overlapped with components of the World Health
201 Organization HEARTS Technical Package, which are marked as red in **Figure 1**. Two other
202 dominant themes that emerged during interviews were about actors and process, i.e., patients,
203 families, and healthcare providers, and the communication between them (**Figure 2**).

204

205 System (Outer Setting)

206 Few participants spoke about system-level factors that might influence
207 implementation of the HTN Program.

208

209 Inputs (Intervention Characteristics and Individuals)

210 The most common themes related to intervention characteristics among patients,
211 families, and providers were access to a reliable supply of quality and affordable blood
212 pressure lowering drugs, workforce capacity and training, appropriate space and equipment to
213 measure blood pressure, and funds to implement the HTN Program to address patient
214 barriers.

215

216 *Drugs and Supplies*

217 Both patients and healthcare workers agreed that affordability and accessibility to
218 blood pressure lowering medicines would be essential to implementing and sustaining the
219 HTN Program in the Federal Capital Territory public PHCs. For patients, issues focused
220 largely on affordability and being able to obtain medication at the PHC, rather than a
221 community pharmacy (**Table 2**). Participants also suggested using the Drug Revolving Fund
222 (DRF) model to address affordability wherein initial governmental funding for drug costs are
223 used to subsidize reduced cost payments by patients, which in turn, helps to sustain the fund
224 for subsequent drug purchasing. For example, one healthcare worker said,

225 *“The number one thing is that err, let the program be progressive, not saying that*
226 *when at the end, when we have started the program, then maybe the availability, the*
227 *supply of the drugs will be there frequently, but later on, it will not be there, you know*
228 *it will discourage us. When patient comes, and discover they have high blood*
229 *pressure and the drug is not there, so, like we the provider, in fact, I will not be more*
230 *serious about it.”*

231

232 *Information Systems*

233 Most healthcare workers described some type of tracking system, which they viewed
234 as helpful to empanel and track patients with a specific condition. One healthcare worker
235 said:

236 *“It’s also good to have a register. In terms of, any patient we see, we record it, it’s*
237 *also good for us to have. That’s for only hypertensive patients.”*

238

239 Another healthcare workers stated:

240 *“Just like it is with TB (tuberculosis), we have a register for TB, that one is different.*
241 *So if something like that could be brought into this issue, I think it will also assist.”*

242

243 Registries for hypertension generally have not existed in Nigeria and need to be
244 created for the HTN Program.

245

246 *Workforce*

247 Some participants felt that staff numbers in certain clinics were adequate, but patients
248 and some healthcare workers described low staffing as a major barrier to a successful
249 implementation of the HTN Program. For example, one patient described several situations of
250 low workforce availability:

251 *“Well, as for me, first of all, if it is possible, they should increase the number of*
252 *personnel here, who would continue to manage this hospital. Because sometimes if*
253 *you come you will see no one else but these [security] men here, and someone will*
254 *say, ‘They have all gone home, until tomorrow’. Now the [blood] pressure has risen*
255 *and you are told to go and come back tomorrow.”*

256

257 From non-physician health care worker perspectives, they were willing to take on
258 additional responsibilities to diagnose and manage hypertension, if they could receive
259 additional trainings focused on diagnosing and managing hypertension. These trainings
260 would also increase their motivation and confidence:

261 *“We are very confident if there is good training.”*

262 *“There must be training so that everybody knows what is expected of him.”*

263

264 Physicians thought that task-shifting was an appropriate solution to increase
265 workforce capacity, and they stressed that non-physician healthcare workers needed ongoing
266 training and supervision in hypertension management.

267 Service Delivery (Outer Setting, Inner Setting, and Processes)

268 The strongest themes in this domain were about the importance of access to care, in
269 terms of affordability, location, and timeliness (**Table 2**). Patients described long clinic waits,
270 not being able to afford their medicines, and travelling long distances to reach the clinic.
271 Participants agreed that if the clinics could supply drugs for free or at reduced cost, then this
272 would increase the reach and effectiveness of the HTN Program.

273

274 The research team was also interested in understanding how quality improvement
275 projects were integrated into current systems, and most participants used examples of how
276 their clinic implemented quality improvement for communicable diseases or preventive
277 services, and that this could be a model for non-communicable diseases, including
278 hypertension (**Table 2**).

279

280 High-quality Primary Care

281 Both providers and patients said that high quality primary care was demonstrated by
282 being person-centered, and that providers needed more training and resources to address
283 patient needs beyond HTN. According to one healthcare worker:

284 *“I had two patients today for BP. One was, she doesn’t have anything to eat. So what*
285 *I did, you know me ma, I don’t have much money. [Laughs]. You know, sometimes,*
286 *it’s not sickness, but you need to give a helping hand... ..It’s not every day, but at*

287 *least, you know someone that doesn't have, even by mere looking at them, they don't*
288 *have, you support them."*

289

290 Coordination of care for more complex hypertension cases was also a concern for
291 both patients and providers. Participants said it would be important to strengthen referral
292 networks and communication between patients and providers when referrals happen. For
293 example, a nurse manager said:

294 *"Because it is not easy for the person to come here and you are now telling him you*
295 *are referring him to another place, so you really need to do a lot of talking, meaning*
296 *that the person needs to be educated on why he needs to go that place, because it is*
297 *expected that when they come here, everything here, should be done to them here."*

298

299 Physicians were particularly worried about blood pressure lowering medication side
300 effects and complex cases. Some reported that communication between different team
301 members and a referral process for complex cases would need to be created if the HTN
302 Program were implemented in PHCs with non-physician healthcare workers.

303

304 Availability of Effective Primary Healthcare Services

305 In addition to availability of providers and competence in diagnosing and treating
306 hypertension, both patients and healthcare workers agreed that communication and trust were
307 foundations of effective PHC services. In particular, participants noted that a key barrier was
308 differences between patients and providers in explanatory models about hypertension and the
309 treatment, but that these differences could be bridged through effective communication.

310 According to one health care worker:

311 *“The belief system of the people, most time when they come here, you know,*
312 *sometimes we just don’t shut them up and say no it is not. So what we normally do, is*
313 *okay, even if you believe that there’s ... it is good to just try the medication and see*
314 *how it goes. Let’s do it for two, three days, and then you’ll come back and let’s check.*
315 *And some of them, you’ll find out that when they come back within that period, they’ll*
316 *say ‘Ah nurse that your medicine really work, and then you can now continue with*
317 *that. But most times, if you just shut them up and say ‘no there is nothing like that’,*
318 *once they leave they don’t come back.”*

319

320 Both non-physician healthcare workers and patients said that patient-healthcare
321 worker communication should be improved as part of the HTN Program because it would
322 help facilitate more effective hypertension management and control.

323

324 Proactive Population Outreach and Community Engagement

325 Health care workers felt that it was important for hypertension management and
326 treatment to be community-centered by using active outreach and leveraging community
327 structures to educate the public about hypertension, to create awareness of its risks and
328 treatment options, and to increase demand for treatment. Proactive outreach was also viewed
329 as important for blood pressure management and follow-up. For some clinics, this was
330 already part of their strategy, as stated by one healthcare worker:

331 *“And we go out a lot. There is no case we don’t visit them at home, to find out how*
332 *they are doing, how they are coping, what are their issues. So, with this I don’t think*
333 *it is going to be an issue.”*

334

335 Healthcare workers identified community leaders as important allies in implementing
336 the HTN Program:

337 *“We have to go to the community leaders to inform them that this is what we are*
338 *doing here. They will now give approval; they will help us to even talk to the people.*
339 *We normally go, we have meetings with them.”*

340

341 Led by health promoters, community area councils have existing structures where
342 health education commonly takes place, and participants recommended that these could also
343 be used as a place for people to measure their blood pressure (**Table 2**). This was perceived
344 as an important, potential facilitator that could be implemented through the HTN program

345

346 **Discussion**

347 Interventions to detect and treat hypertension are urgently needed to curb the high
348 incidence, prevalence, and burden of fatal and non-fatal cardiovascular disease and other
349 hypertension-related conditions in Nigeria. Our study revealed that both patients and non-
350 physician healthcare workers agreed that hypertension diagnosis and management should be
351 a priority in PHCs in the Federal Capital Territory, and participants provided specific
352 feedback on how to adapt and implement the HTN Program at the PHC level. First, the
353 blood pressure lowering medication supply must be improved, and costs for drugs need to be
354 lowered. Potential strategies included using a Drug Revolving Fund model [14] to lower costs
355 and to strengthen the blood pressure lowering medicine supply chain to avoid stock outs.
356 Second, physicians and healthcare workers found it acceptable to have non-physician
357 healthcare workers (specifically community health extension workers) diagnose and manage
358 hypertension; but for this to occur, they said that healthcare workers would need additional

359 training and ongoing support to effectively diagnose and manage hypertension. Healthcare
360 workers recommended a standardized protocol and order set for hypertension, similar to what
361 they use in the treatment of other conditions, such as HIV.

362 While patients and healthcare workers agreed that team-based care was acceptable
363 and feasible, they said that care needed to be more person-centered and accessible, and that
364 communication between healthcare workers, referral networks, and patients could be
365 improved. Participants said that that trust between healthcare workers and patients could be
366 developed if they could address patients' social needs as part of the HTN Program, and by
367 working with the patient's beliefs and attitudes about hypertension. Finally, healthcare
368 workers recommended providing community-centered care, with home visits for monitoring
369 and follow-up and utilizing community health committees already in existence in the area
370 councils to provide hypertension education and screening.

371 Our study is one of the first to use both the PHCPI and CFIR frameworks to
372 conceptualize how a multilevel, system-based intervention needs to be adapted and
373 implemented for hypertension control in a LMIC setting. Because this intervention is being
374 implemented in PHCs, there was an emphasis on how to strengthen the primary healthcare
375 system for effective hypertension control. Healthcare workers and patients focused on
376 strengthening the primary care system by improving first contact accessibility, provider
377 availability and competence, coordination of care, and proactive community outreach. A
378 narrative review of health system factors influencing hypertension care in sub-Saharan Africa
379 also found that longer waiting times at health centres, limited capacity for adequate
380 diagnosing and prescribing, and poor follow-up on non-adherent patients limited the capacity
381 of some countries to manage and control hypertension [8]. Healthcare workers in our study
382 suggested that there were already models in place for HIV and TB treatment that could be

383 used to inform how PHCs manage hypertension. Healthcare workers were familiar with
384 infectious disease-specific registries and suggested a similar approach for hypertension.
385 However, registries for hypertension and other chronic diseases have not existed in Nigeria,
386 and need to be created for the HTN Program.

387 Almost all participants in the present study felt comfortable with supporting non-
388 physician healthcare workers (including community health extension workers) to diagnose
389 and manage most patients with hypertension with physician supervision, which is a core
390 component of the HTN Program intervention and part of both the Kaiser Permanente and
391 WHO HEARTS models [15, 20]. For the HTN Program to succeed, participants noted the
392 need for adequate training and supervision of healthcare workers, which have not been
393 previously provided but are integrated into the HTN Program. Healthcare workers in the
394 current study also said that having clinical practice guidelines and additional training on
395 hypertension care would be beneficial, but that meeting quality goals would require
396 additional support, such as standardized order sets and incentives to follow-up patients and
397 conduct home visits. Our findings provide more evidence on specific health system setting,
398 inputs, and processes that must be strengthened to successfully implement evidence-based
399 care for hypertension in Nigeria for the HTN Program and can inform health systems in other
400 settings.

401 There was agreement among healthcare workers and patients in our study that outer
402 setting and inner setting factors, such as financial barriers and stock outs of drugs, are major
403 barriers to hypertension control. This is similar to what has been reported in other studies in
404 Nigeria and many other settings [21-24]. Healthcare workers in our study suggested using a
405 Drug Revolving Fund to mitigate cost barriers [25]. In a qualitative study with PHC workers
406 and health insurance managers in western Nigeria, Kwara State, government-supported health

407 insurance was perceived as an important facilitator for implementing high-quality
408 hypertension care because it covered costs of care for patients and provided essential
409 resources and incentives to implement high-quality hypertension care [26]. Our findings
410 support the need for private-public partnerships and health system financing strategies to
411 support HTN Program implementation because this would reduce the financial burden of
412 hypertension management on individual clinics and patients.

413 Our study also found that the external environment or community-centered care, both
414 in the form of home visits and provision of education and blood pressure monitoring in the
415 community, were perceived to be important for improving hypertension control in the Federal
416 Capital Territory. Several other studies suggest that leveraging the environment outside the
417 clinic, through home visitations from non-physician healthcare workers and self-monitoring
418 of blood pressure can lead to more effective hypertension management [27, 28]. In the
419 Federal Capital Territory, Nigeria, implementing home and self-monitoring of blood pressure
420 may require further context-specific adaptations. For example, participants in the current
421 study noted that it may be more feasible to use community outreach locations as a centralized
422 place to provide blood pressure monitoring and education, rather than people's homes.

423 In a study of PHC healthcare workers and patients, Akinlua et al. found that there
424 were differences in the knowledge and beliefs of health care workers and patients about the
425 aetiology and consequences of hypertension [29]. Similar to our study, patients held multiple
426 beliefs about the causes of hypertension, many of them with cultural salience, and healthcare
427 workers recognized the need to incorporate these cultural understandings into treatment
428 plans. While our study was not designed to focus on healthcare worker and patient-level
429 knowledge and beliefs, themes around patient-centered communication and respecting patient

430 beliefs did emerge as important issues to address when implementing an evidence-based
431 hypertension intervention in the PHC setting in the Federal Capital Territory, Nigeria.

432 Our findings have a number of limitations. First, the sampling was purposive and
433 while we may not have captured the full diversity of patient and healthcare worker
434 perspectives on hypertension, these data are broadly relevant to the sites of intervention
435 within the HTN Program. Second, this is also a relatively small study conducted in the
436 Federal Capital Territory, Nigeria, which does not necessarily reflect the PHC systems across
437 the country, and it is unknown if the findings could be applied in other parts of Nigeria.
438 However, we did conduct interviews and focus group discussions in 8 PHCs to understand
439 multilevel factors across the system, and used the PHCPI and CFIR frameworks to provide a
440 common set of themes and characteristics that could be considered when undertaking similar
441 efforts in new settings.

442

443 **Conclusions**

444 The Pan-African Society of Cardiology Hypertension Roadmap [30] recommends
445 team-based care using simplified treatment guidelines, integration with existing services, and
446 information systems to treat hypertension. We found evidence to facilitate implementation of
447 these effective, proven strategies within the primary care system of the Federal Capital
448 Territory, Nigeria. Improvements in drug financing and availability, work force capacity, and
449 communication and coordination between health professionals and patients will be essential
450 to implement and sustain the HTN program. These formative study results provide
451 information on specific primary care and community contextual factors that can support or
452 hinder the implementation of evidence-based interventions for patients with hypertension in

453 Nigeria and are directly aligned with the strategic priority areas within Nigeria’s National
454 Multisectoral Action Plan for the prevention and control of noncommunicable diseases [16].

455 **List of Figures**

456

457 Figure 1. The PHCPI conceptual framework

458

459 Figure 2. Word Cloud of Dominant Themes in Interviews

460

461

462 **Declarations**

463 **Ethics approval and consent to participate**

464 The study was reviewed and approved by the Ethics Committee at the University of Abuja
465 and the Institutional Review Board at Northwestern University.

466 **Consent for publication**

467 At the start of the focus groups and interviews, participants provided written, informed
468 consent. There are no personally identifying details, images, or videos included in this
469 manuscript.

470 **Availability of data and materials**

471 The datasets analyzed during the current study are not publicly available because the data
472 collection as approved by the IRB did not include having them become publically available.
473 The data can be made available to other researchers by contacting the corresponding author.

474 **Competing interests**

475 In the past 3 years, MDH received funding from the World Heart Federation to serve as its
476 senior program advisor for the Emerging Leaders program, which is supported by Boehringer
477 Ingelheim and Novartis with previous support from BUPA and AstraZeneca. MDH also
478 received support from the American Heart Association, Verily, and AstraZeneca and

479 American Medical Association for work unrelated to this research. The George Institute for
480 Global Health's wholly owned enterprise, George Health Enterprises, has received
481 investment funds to develop fixed-dose combination products containing aspirin, statin and
482 blood pressure lowering drugs. MDH plans to submit patents for heart failure polypills.

483

484 **Contributions**

485 NRK, RO, MDH, and DO designed the study, implemented the study, and directed the
486 analysis. NRK and RO wrote the first draft of the manuscript. NRK and RO analyzed and
487 interpreted data. MDH, LRH, DO provided critical feedback on the manuscript. GS, IAO,
488 TMO, NE, KO, BA, and ABS read, provided feedback and edits, developed figures and
489 tables, and approved the final manuscript.

490

491 **Funding**

492 This study was supported by National Heart Lung and Blood Institutes grant #R01HL144708.

493

494 **Acknowledgement**

495 We are very appreciative to Regina Asuku, Dr. Helen Eze, Dr. Okpetu Emmanuel, Dr.
496 Douglas Okoye, Dr. Dorothy Ihegazie, Mr. Mohammed Sani and Mianzhao Guo for
497 assistance.

498

499

500

Table 1. Focus Group Discussion & Interview Participants' Characteristics.

Participant ID	Age	Highest Level of Education	Current Occupation	Diagnosed with hypertension	Takes Medicine for Hypertension
Patients					
1	58	None	Self employed	Yes	Yes
2	53	None	Self employed	Yes	Yes
3	65	None	Business	Yes	Yes
4	69	Primary	Farmer	Yes	Yes
5	54	College	Skilled labor	Yes	Yes
6	75	None	Farmer	Yes	Yes
7	69	Primary	Unemployed	Yes	Yes
8	50	Secondary	Farmer	Yes	Yes
Healthcare Workers					
9	37	College	CHEW	No	No
10	38	College	Nurse	No	No
11	33	College	CHEW	No	No
12	44	College	CHEW	Yes	Yes
13	51	College	CHEW	No	No
14	35	College	CHEW	No	No
15	58	College	Nurse	Yes	Yes
16	47	College	CHO	No	No
17	48	College	CHEW	No	No
18	46	College	CHEW	No	No
19	50	College	CHEW	No	No
20	45	College	CHEW	No	No
Administrators					
21	59	College	CHO	Yes	Yes
22	55	College	Nurse	Yes	Yes
23	59	Postgraduate	Primary care physician	Yes	Yes
Physicians					
24	43	Postgraduate	Primary care physician	NA	NA
25	44	Postgraduate	Primary care physician	NA	NA
26	51	Postgraduate	Primary care physician	NA	NA
27	33	Postgraduate	Primary care physician	NA	NA
28	46	Postgraduate	Primary care physician	NA	NA
29	42	Postgraduate	Primary care physician	NA	NA

CHEW: Community Health Extension Worker; CHO: Community Health Officer

NA: Not asked

Table 2. Themes and Quotes that Emerged from Formative Interviews about the Hypertension Program in Primary Care Clinics

Domains and Themes	Quotes
I. System (outer setting)	
Ia. Quality Management Infrastructure	“Yes, ah, like for immunization, every month, after giving the report, we have a general meeting for only those who report those things so that you’ll know, so that you’ll know how far you are doing. We are even given categories. And I will like to take opportunity to tell you that this clinic is under grade one for the past ten years, in terms of our report.”
II. Inputs (Intervention and Individuals)	
Iia. Drugs and Supplies	<p>“Also drugs are free. Test is even free. So they will always come back. They will always; even they by themselves ma, will even go and _ cos I remember the first case we had of TB here, that was first treated here, he went and brought about five people.”</p> <p>“Drug Revolving Fund. What happen is that, government gives fund for [medicines].”</p>
Iib. Information Systems	“Everyday, there is data that we do send. The patient that we have, we have register that we write, this is the patient we see. In fact, every month, every department gives their records, data.”
Iic. Workforce	<p>“If it is still going higher as we said, then we will do the treatment though depend on whom is on the seat. [inaudible] their doctors. We don’t treat, the doctors does [sic] the work. But if doctor is not on seat, then anyone of us, if it is the nurse or the CHEW that is available, then we go ahead and do the treatment.”</p> <p>“We are very confident if there is good training. They must be training so that everybody knows what is expected of him.”</p>
III. Service Delivery (Outer Setting, Inner Setting, and Processes)	
IIIa. Access <ul style="list-style-type: none"> • <u>Financial</u> • <u>Geographic</u> • <u>Timeliness</u> 	“Of course, because somebody having malaria will prefer to go, you collect two paracetamols, collect ehh...you know, just few vitamins, they will mix it with antibiotics, and then they will just take and then they find out that they are okay. So they will prefer to go to such places, hundred naira or two hundred naira you go there. But by the time they are now coming here, you want to check BP, you want to check weight, you want to open card, and all those protocols, they see it as this is a delay. So, that thing can stop them from coming.”

<p>IIIb. Population Health Management</p> <ul style="list-style-type: none"> • <u>Community Engagement</u> • <u>Proactive Population Outreach</u> 	<p>“In community work, we have what we call mobilizers, we have town announcers, they go to inform them on some important issues if we need them to be here. And mostly, they encourage them to have the, what is it called, the digital BP apparatus, which they can use on their own without even struggling to come here. And we have to get some of their relatives, that can read and can understand better to help us through them to bring them to us or to even call us if need be. So those are the things we do.”</p>
<p>IIIc. Availability of Effective PHC Services</p> <ul style="list-style-type: none"> • <u>Provider Availability</u> • <u>Provider Competence</u> • <u>Patient-provider Respect & Trust</u> 	<p>“Well, they didn’t. Right there and then, I was told that I have hypertension, but they didn’t explain anything to me.”</p> <p>“It’s useful because once the drugs, you put the drugs there, which means, any other person that comes, should follow the same pattern. So that there will be uniformity in the treatment of hypertension.”</p> <p>“Just like in HIV, we have standing order.”</p> <p>“When I was told that I have high blood pressure, I was told to take care of myself, I should always be happy, I should not be sad in my life, because this illness even if you are taking your medicines but you don’t have peace in your home, you won’t get better. They said it’s treatment is living in peace, and also I should take care of myself and also take my medicines.”</p>
<p>IIId. High quality primary healthcare</p> <ul style="list-style-type: none"> • <u>First Contact Accessibility</u> • <u>Person-Centered</u> • <u>Coordination</u> 	<p>“Hundred percent because we can see they are coming up very well. Like the patients of TB, they can confidently come here and we’ll give them all the confidentiality they need; like the HIV, we make sure we take care of the confidential aspect of it. We make sure we give them the drugs that they need; we give them the counseling, all the advice that they need to be able to make a positive impact on them, and even to pro, to progress even in the program itself.”</p>

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Figures

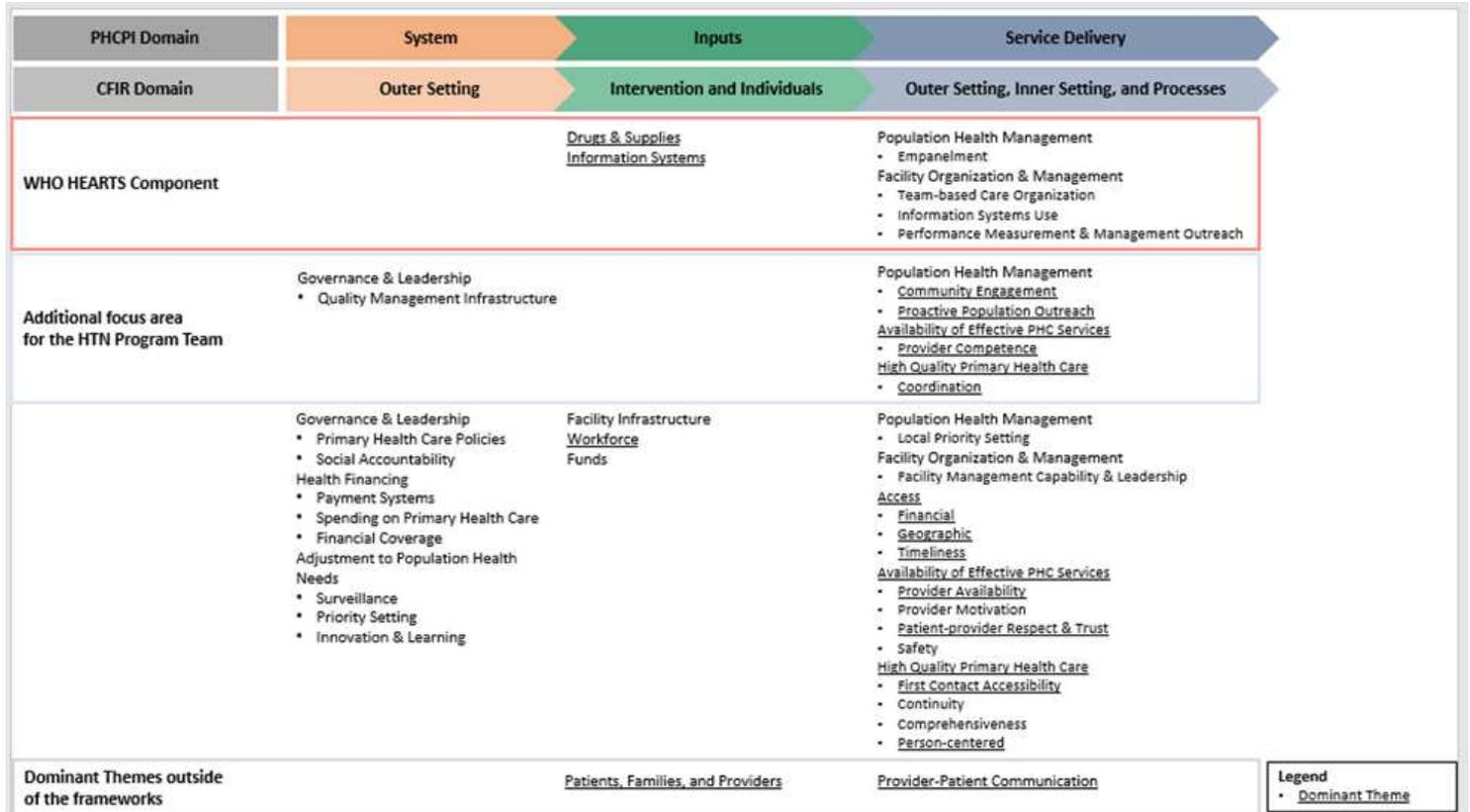


Figure 1

The PHCPI conceptual framework



Figure 1

Word Cloud of Dominant Themes

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