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Supportive supervision visits in a large community hypertension programme in Nigeria: implementation methods and outcomes

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ABSTRACT

Background The Hypertension Treatment in Nigeria (HTN) Programme established a system for hypertension diagnosis and management in 60 public primary healthcare facilities in the Federal Capital Territory of Nigeria through the implementation of HEARTS, a multilevel strategy bundle including team-based care led by community health extension workers (CHEWs). To improve HEARTS implementation, supportive supervision was added as an implementation strategy in April 2020.

Methods A multidisciplinary supportive supervision team and data collection forms were developed and implemented at HTN-supported sites. Data from April 2020 to December 2023 from supportive supervision visits were used to measure supportive supervision implementation outcomes, including reach, fidelity, adoption and feasibility and effectiveness of quality of care, data reporting and facility readiness. Descriptive analyses were performed to summarise outcomes. Jonckheere-Terpstra or Cochran-Armitage trend test was used to measure change over time for medians or proportions, respectively.

Results The programme successfully designed and performed quarterly supportive supervision visits. There was high reach (100% sites with visits each year), fidelity (median 100% (IQR 89%–100%) of core components completed), adoption (100% teams provided quarterly visits) and increase in feasibility (planned visits completed) (90.8% to 97.8%, p=0.002). Effectiveness outcomes included an increase in patients with blood pressure (BP) checked in the last 3 days (78.4% to 84.4%, p=0.009), treatment cards without errors (71.5% to 85%. p<0.001), but a slight drop in CHEW fidelity to BP measurement technique (91.5% to 86.5%, p=0.02). Facility readiness increased in adequate staffing (56.7% to 98.3%, p<0.001), but decreased for equipment availability (98.3% to 90.0%, p=0.03). Overall, the proportion of facilities with all readiness components present increased from 0% to 63.3% (p<0.001).

Conclusions We designed and implemented a supportive supervision strategy with strong implementation outcomes and most effectiveness outcomes including facility readiness to provide quality hypertension care in Nigeria. This approach can be modelled for supporting HEARTS implementation in other settings.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Supportive supervision at primary healthcare is aimed at the provision of guidance, mentorship and resource allocations to healthcare workers to improve performance, service delivery and patient outcomes. It focuses on joint problem-solving, teamwork, facilitation and coaching, and staff motivation rather than a punitive approach.

WHAT THIS STUDY ADDS

⇒ A thoroughly well-designed supportive supervision led to overall high implementation outcomes including reach, fidelity, adoption and feasibility and improved effectiveness outcomes including quality diagnosis and management of patients with hypertension, increases in facility readiness in terms of equipment and availability of blood pressure-lowering medications.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ There is the need for the inclusion of a well-designed and holistic supportive supervision for future implementation and expansion of HEARTS in low-income and middle-income countries.

Trial registration number The trial was prospectively registered at www.clinicaltrials.gov under NCT04158154 on 8 November 2019; https://clinicaltrials.gov/ct2/show/NCT04158154.

BACKGROUND

Hypertension is the most common cause of cardiovascular-related morbidity and mortality and accounts for more than 10 million deaths in 2021.[1 2] In the African region, the prevalence of hypertension among adults aged 30 to 79 years is 27%, while in Nigeria, 32.5% of adults are estimated to have hypertension.[3 4] To address the significant and growing burden of hypertension and related conditions, the Nigerian Federal

Ministry of Health has begun to integrate hypertension diagnosis and management into public primary healthcare centres (PHCs) at the local government level,[5] in alignment with the recommendations of the WHO. The Federal Ministry of Health has also adopted a national policy on task sharing and task shifting to support implementation of hypertension services at PHC in Nigeria using non-physician health workers, including community health extension workers (CHEWs). The Federal Ministry of Health has also developed, in collaboration with other stakeholders, the Nigerian Hypertension Treatment Protocol for Primary Care.[6–8]

Components of the HEARTS technical packages include healthy lifestyle counselling, evidence-based treatment protocols, access to essential medicines and technology, risk-based cardiovascular disease management, team-based care and systems for monitoring including supportive supervision. The adoption of supportive supervision as an implementation strategy was chosen based on knowledge of the need to supplement training with this additional strategy to ensure fidelity to the protocols, maintain site readiness (medications and equipment), provide data audit and feedback, ensure data quality and support overall monitoring of programme implementation and has been recommended in guidance for HEARTS programmes.[9–11]

Studies of healthcare delivery at PHCs in sub-Saharan Africa have described gaps in quality, leading to underutilisation and poor health outcomes with a baseline hypertension control of 13.1%, despite their presence within the communities they serve.[12 13] Underlying causes of poor quality in healthcare services at the system level include inadequate equipment and medications, staff shortages and lack of knowledge and skills by healthcare workers, among others.[14] Poor quality of service delivery and its consequences are also associated with a lack of or limited supportive supervision of health workers and facility managers to ensure readiness and quality care delivery.[12 15]

Supportive supervision in the context of healthcare is a strategy designed to strengthen the healthcare system and to improve the quality and delivery of care.[15] Supportive supervision is effective when it focuses on joint problem-solving, teamwork, cross-sharing of expertise and the facilitation and coaching of supervisees to improve their skills and empower them through a shared decision-making process.[16 17] Components of supportive supervision include regular visits by supportive staff, encouragement of multidisciplinary teamwork to promote problem-solving, use of checklists to structure supervision and to identify gaps in quality of care, and training and retraining of staff that is delivered in a supportive, rather than punitive, approach.[18] When effectively implemented, supportive supervision can improve knowledge, skills and the quality of healthcare delivery at minimal costs.[17 19–22] Understanding the design and implementation of supportive supervision is therefore important to interpret the results of improving capacity readiness and quality service delivery, including for the management of hypertension.

The Hypertension Treatment in Nigeria (HTN) Programme implemented and studied the effectiveness of integration of hypertension service delivery in 60 PHCs in the Federal Capital Territory of Nigeria from January 2020 to December 2023.[13] The programme adapted the WHO HEARTS technical package and was led by CHEWs who were trained to screen, diagnose and treat uncomplicated hypertension based on a national treatment protocol.[23] We adapted HEARTS to include quarterly, team-based supportive supervision visits to PHCs starting in April 2020 to further strengthen implementation of the programme and delivery of care. The aim of the current study is to use implementation research methods to describe the design, implementation and effectiveness of the supportive supervision model for HEARTS implementation in the HTN Programme.

METHODS

Public sector primary healthcare system in Nigeria

The Nigerian primary healthcare system operates at federal, state and local levels, which adheres to the WHO's recommendation of ensuring healthcare accessibility. Embracing the PHC Under One Roof Strategy,[24] Nigeria consolidated PHC services under the State Primary Health Care Board to align with national health goals. The National Primary Healthcare Development Agency leads and provides financial support to PHCs, while State Boards manage service delivery implementation. Local government health authorities supervise services in the PHCs, and the ward health system manages and implements interventions based on political wards.[25 26]

Supportive supervision within the HTN programme

The design and methods of the HTN Programme have been published.[27] Briefly, the HTN Programme was a single arm, type 2, hybrid, interrupted time series trial that sought to evaluate implementation and effectiveness of a multilevel hypertension treatment programme in 60 PHCs in the Federal Capital Territory in Nigeria. Following a formative period, the HTN Programme was implemented from January 2020 to December 2023, which included training of CHEWs, data audit and feedback of HTN screening, provision of blood pressure (BP) monitoring equipment at baseline. Adding supportive supervision as an implementation strategy emerged during the formative stages of the HTN Programme following the early identification of gaps in care quality. The goals of the supportive supervision were to support the PHC staff participating in the HTN Programme to identify and address: (1) gaps in quality in hypertension diagnosis and management, (2) availability of functioning equipment (eg, BP monitors and weighing scales), (3) availability of BP-lowering medications and (4) ensure high-quality data management. The activities were designed to provide

additional support to the staff trained to improve their skills and quality of healthcare delivery.

Supportive supervision team composition and training

The supportive supervision team included trained primary care physicians, pharmacists, nurses and data entry officers who were part of the HTN Programme team. Prior to the commencement of supportive supervision, the multidisciplinary team underwent a 1-day training on the goals of supportive supervision and the use of a supervision checklist designed by the study team to guide quarterly visits to the PHCs. The training emphasised key skills including coaching and two-way communication, audit and feedback, and delivery of individual or group educational and skill development activities. Training also stressed the role of team members in joint problem-solving and mentorship of healthcare workers at the PHCs. The HTN Programme supervision team members were grouped into six teams based on the six local government areas in the Federal Capital Territory (online supplemental figure 1). Each team was led by a primary care physician who was either working at the local government level or the University of Abuja Teaching Hospital. Each member of the supportive supervision team had specific roles described in online supplemental table 1. As new team members joined, they underwent similar training in supportive supervision skills.

Implementation of supportive supervision visits

Supportive supervision included previsit preparation and the visit itself.

Previsit preparation: The PHC facility manager was informed before each visit to ensure that relevant personnel were available in primary healthcare facilities. The team also used data from records of past visits at the PHCs or collected during the HTN Programme to review performance based on tasks assigned.

Supportive supervision visit: On arrival at the PHC, the team met with the officer in charge of the PHC before being introduced to the rest of the PHC staff. The team worked closely with healthcare workers at the PHC to assess and provide feedback on their job performance. Visits included a review of data quality from patients' treatment card documentation, including hypertension history, BP measurements and BP-lowering medications dispensed, and the outpatient registry to assess BP measurement of adults seen in the previous three working days. BP-lowering medication stocks were assessed, and needs forecasted for the next quarter (online supplemental table 2).

These activities were followed by direct observation of CHEWs on accurate BP measurement of patients or fellow healthcare providers if no patients were available. Before concluding the visit, the team always met with CHEWs and facility managers to review and discuss the outcome of the supervision visit and gave feedback through open communication. During the interactive session, identified barriers and facilitators were discussed, and role plays were performed where necessary to facilitate problem-solving. The supervision team members also provided one-on-one, on-site retraining and skill-building to CHEWs based on identified gaps such as incorrect BP measurement or data quality in treatment cards, if applicable. Tasks were assigned to CHEWs with timelines for accomplishment. Contact information for the team members was left with the CHEWs at the PHCs for virtual support between quarterly visits.

Data collection

To guide the supervision team and ensure fidelity to the supervision process by the team, a supervision checklist was adapted for readiness to deliver hypertension care using the WHO Service Availability and Readiness Assessment tool.[28] The checklist consisted of seven sections, including facility information, staffing, patient access and capacity, basic equipment availability and functioning, service availability, training, and medicines and commodities (online supplemental table 2). The checklist questions focused on areas of readiness. We used this tool during the formative period, and the research team was trained using active learning techniques (eg, role play) to ensure familiarity and facility with the instrument. We also prospectively collected data on contextual factors that occurred during the study period and assessed the potential impact of supportive supervision implementation and effectiveness (online supplemental table 3).

Outcomes and data analysis

We chose implementation outcomes based on Proctor's framework,[29] including reach, fidelity, adoption and feasibility as defined in table 1. A fidelity score was calculated as a proportion of the nine core components that were completed for each supportive supervision visit. Effectiveness of supportive supervision included fidelity to the BP measurement protocol, BP measurement coverage and data quality. Facility readiness included the availability of functional BP monitoring equipment and BP-lowering medication, adequate staffing and overall facility readiness (table 1). A complete-case analysis was performed. Descriptive statistics were summarised as proportions for categorical variables and medians with QRs for continuous variables. We evaluated differences across local government areas through χ^2 or Kruskal-Wallis tests as appropriate. We evaluated differences in implementation outcomes over time through linear trend tests using Cochran-Armitage or Jonckheere-Terpstra tests. A complete case analysis was performed, and statistical significance was defined a priori as two-sided $p<0.05$. Analyses were performed using SAS V.9.4.

RESULTS

Implementation outcomes

Table 2 shows implementation outcomes of supportive supervision visits to HTN Programme sites over the study period. There was high reach with the 60 PHCs receiving one or more visits per year. Fidelity to supportive supervision protocol was high with a median (IQR) of 100%

Table 1 Definition of implementation outcomes of supportive supervision

Implementation outcome	Definition
Implementation	
Reach	Proportion of targeted PHCs which received one or more supportive supervision per programme year
Fidelity	Proportion (median (IQR)) of core components of supervision visit completed during each visit. Defined as documentation on: 1. Community health workers (JCHEWs, CHEWs, CHOs) staffing documented 2. Adult BP measurement record reviewed from site records 3. Availability of BP measuring monitor checked 4. Unfilled treatment cards availability checked 5. Review of registry and filled treatment cards done 6. Supervisor observed BP measurement during site visit 7. Quality of care data reviewed 8. Training on BP measurement or data entry quality 9. BP-lowering medication availability checked
Adoption	Proportion of supportive supervision teams providing one or more supportive supervision visits per quarter
Feasibility	Proportion of visits performed according to planned schedule (every quarter)
Effectiveness	
Quality of care	BP measurement fidelity: Proportion (n/N) of supervision visits with observed blood pressure measurement performed per protocol. BP measurement coverage: Proportion of (n/N) supervision visits in which all the patients seen in the last three working days had their blood pressure checked
Quality of data	Median (IQR) proportion of patient treatment cards without errors.
Facility readiness	
Equipment	Proportion (n/N) of PHCs with a functioning BP monitor available at all supportive supervision visits.
BP-lowering medication based on a simplified protocol for treatment of hypertension in Nigeria	Proportion of PHCs with stock availability at all supervision visits based on hypertension treatment in Nigeria protocol for primary healthcare level: Step 1: Amlodipine 5 mg Step 2: Amlodipine 5 mg and losartan 50 mg
Adequate staffing	Proportion (n/N) of PHCs with at least two staff available and able to perform BP measurement and hypertension treatment at all supervision visits (2 CHEWs or 2 JCHEWs, or 1 CHEW+1 JCHEW or 1 CHO+1 CHEW or 1 JCHEW)
Overall facility readiness	Proportion (n/N) of PHCs that had all necessary components (a functional BP monitor, at least 1 dose of step 1 and step 2 BP-lowering medication and adequate staffing) at supervision visits

The fourth year has only three quarters because the project ended 2023Q4.
BP, blood pressure; CHEW, community health extension worker; CHO, community health officer; JCHEW, junior CHEW; PHCs, primary healthcare centres.

(88.9%, 100%) of all core components completed during a visit. The proportion of visits with all nine components completed increased from 64% to 70% (figure 1). Adoption was also high with all teams providing one or more visits per quarter. Feasibility increased from 90.8% of planned visits performed in one quarter to 97.8% (p=0.002). Online supplemental table 4 shows selected implementation and effectiveness outcomes by quarter.

Effectiveness outcomes

Fidelity to the BP measurement protocol was high starting at 91.5% of visits in year one and decreased modestly to 86.5% by year 4 (p=0.02). BP measurement coverage of all patients seen in the preceding 3 days increased from 78.4% of visits in year 1 to 84.4% in year 4 (p=0.009). The quality of documentation in patient treatment cards also increased significantly (71.5% to 85.0%, p<0.0001). Facility-level readiness also increased. The proportion of PHCs with a functional BP monitor present during the last visit started very high (98.3%) but decreased slightly to 90.0% in year 4 (p=0.03). The proportion of PHCs with BP-lowering medications in stock at all quarterly supportive supervision visits during the year rose from 0% to 68.3% for both step 1 and step 2 BP-lowering regimens (p<0.0001). The proportion of PHCs with adequate staffing also increased from the start of supportive supervision visits from above one-half (56.7%) to almost all (98.3%, p<0.0001). The overall facility readiness measure also increased from no sites (0%) having all components to nearly two-thirds (63.3%, p<0.0001) having equipment, staffing and medications. Online supplemental table 5 shows

Table 2 Implementation and effectiveness outcomes of supportive supervision visits to Hypertension Treatment in Nigeria Programme Sites

		Overall	Programme year 1 2020Q2–2021Q1	Programme year 2 2021Q2–2022Q1	Programme year 3 2022Q2–2023Q1	Programme year 4 2023Q2–2023Q4	P value*
Implementation outcome							
Reach: Proportion (n/N) of targeted PHCs which received one or more supportive supervision visits per programme year		100.0 (60/60)	100.0 (60/60)	100.0 (60/60)	100.0 (60/60)	100.0 (60/60)	–
Fidelity: Proportion (median (IQR)) of core components of visit completed during each supervision visit		100 (88.9, 100)	100 (88.9, 100)	100 (88.9, 100)	100 (88.9, 100)	100 (88.9, 100)	0.31
Adoption: Proportion (n/N) of supportive supervision teams providing one or more supportive supervision visit per quarter		100 (6/6)	100 (6/6)	100 (6/6)	100 (6/6)	100 (6/6)	–
Feasibility: Proportion (n/N) of visits performed according to planned schedule (every quarter).		96.0% (864/900)	90.8% (210/240)	99.6% (239/240)	96.3% (231/240)	97.8% (176/180)	0.002
Effectiveness							
Quality of care	BP measurement fidelity: Proportion (n/N) of supervision visits with observed BP measurement performed per protocol	90.2 (733/813)	91.5 (193/211)	94.3 (214/227)	87.3 (179/205)	86.5 (147/170)	0.02
	BP measurement coverage: Proportion (n/N) of supervision visits in which all patients seen in the last 3 working days had their BP checked.	83.1 (630/758)	78.4 (138/176)	78.3 (166/212)	91.0 (191/210)	84.4 (135/160)	0.009
Data quality	Median (IQR) proportion of treatment cards without errors	80.0 (60.0, 100.0)	71.5 (40.0, 100.0)	80.0 (60.0, 97.6)	81.8 (60.0,100.0)	85.0 (69.7, 100.0)	<0.0001†
Facility readiness							
Equipment	Proportion (n/N) of PHCs with a functional BP monitor available at all supportive supervision visits	85.0 (51/60)	98.3 (59/60)	98.3 (59/60)	98.3 (59/60)	90.0 (54/60)	0.03
BP-lowering medication	Proportion (n/N) of PHCs with stock availability at all supervision visits based on hypertension treatment in Nigeria protocol for primary healthcare level.						

Continued

Table 2 Continued

	Overall	Programme year 1 2020Q2–2021Q1	Programme year 2 2021Q2–2022Q1	Programme year 3 2022Q2–2023Q1	Programme year 4 2023Q2–2023Q4	P value*
▲ Step 1	1.7 (1/60)	3.3 (2/60)	56.7 (34/60)	58.3 (35/60)	71.7 (43/60)	<0.0001
▲ Step 2	0 (0/60)	0.0 (0/60)	40.0 (24/60)	48.3 (29/60)	80.0 (48/60)	<0.0001
▲ Step 1 and 2	0 (0/60)	0.0 (0/60)	40.0 (24/60)	46.7 (28/60)	68.3 (41/60)	<0.0001
Adequate staffing: Proportion (n/N) of PHCs with at least 2 staff available and able to perform BP measurement and hypertension treatment at all supervision visits	55.0 (33/60)	56.7 (34/60)	96.7 (58/60)	98.3 (59/60)	98.3 (59/60)	<0.0001
Overall facility readiness: Proportion (n/N) of PHCs that had all necessary components‡ at all supervision visits	0.0 (0/60)	0.0 (0/60)	38.3 (23/60)	46.7 (28/60)	63.3 (38/60)	<0.0001

The fourth year has only three quarters because the project ended 2023Q4. This reduced the denominators for the number of visits for the fourth year.
*Cochran-Armitage Trend Test.
† Jonckheere-Terpstra test.
‡ PHC has a functional BP monitor, at least 1 dose of step 1 & step 2 medications in stock, and adequate staffing.
BP, blood pressure; PHCs, primary healthcare centres.

selected implementation and effectiveness outcomes across programme years by local government area council.

External facilitators and barriers to implementation

The team identified contextual factors which served as barriers or facilitators which occurred outside of the supportive supervision team and facilities. The barriers included the COVID-19 pandemic, security challenges, strikes by PHC staff, national elections, high cost of gas and gas shortages. The facilitators included strikes by government hospitals making patients seek healthcare in PHCs. Other facilitators were donations of BP lowering medications by Resolve to Save Lives and the introduction of a drug revolving fund for BP lowering medications (online supplemental table 3).

DISCUSSION

We designed and implemented a multidisciplinary supportive supervision strategy to strengthen implementation of the HTN Programme to integrate quality hypertension screening, diagnosis and management in 60 PHCs in the Federal Capital Territory, Nigeria. We found overall high implementation outcomes including reach, fidelity, adoption and feasibility of quarterly supportive supervision. We also found that the supportive supervision effectiveness outcomes were associated with significant improvements in key areas needed for quality diagnosis and management of patients with hypertension, including increases in facility readiness in terms of equipment, BP-lowering medication availability and staffing.

The high implementation outcomes of reach, adoption, feasibility and fidelity likely reflect the strategies used in design and implementation for supportive supervision. For example, we involved supportive supervision team members in the design, which likely improved implementation fit and feasibility. The multidisciplinary structure of the supervision team, including a primary care/community physician, research nurse, pharmacist and data entry officer, helped to ensure a comprehensive approach to supportive supervision with onsite feedback, corrections and one-on-one coaching where needed in both quality and facility readiness. This is similar to findings in two systematic reviews by Proia *et al* and Mills *et al*, which both demonstrated the role of supportive supervision for team-based care to be effective for BP management and control.[30 31] The high reach, fidelity and adoption of the supportive supervision visits were resilient to a number of barriers to HEARTS implementation which occurred during the study period. Barriers included strikes by CHEWs in the Federal Capital Territory, security challenges in some PHCs, limiting accessibility and inflation leading to higher costs and fuel shortages which delayed some visits. Adaptations were made to the supportive supervision of PHCs to reflect context. For example, the team closely coordinates with the facility managers for planning of visits, and when in-person visits were not

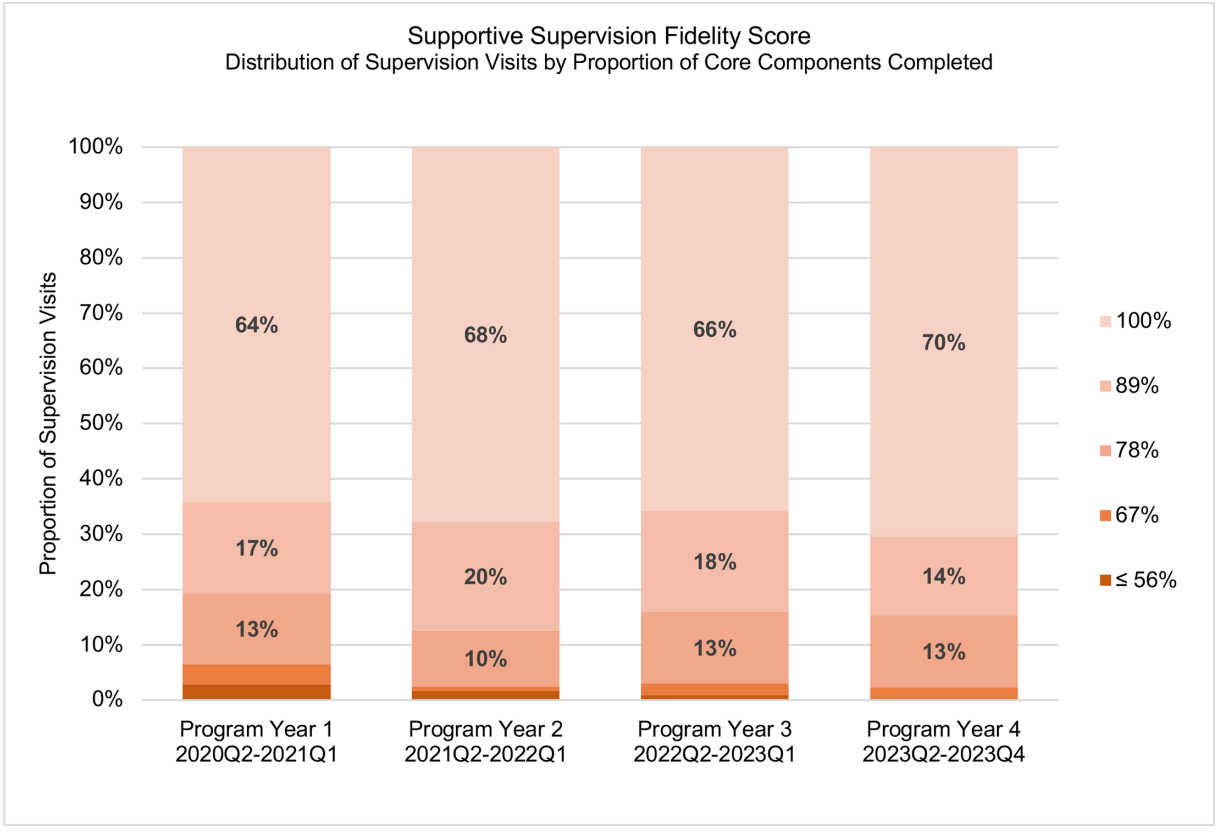

Figure 1 Distribution of supervision visits by proportion of core components completed.

possible due to security challenges or lack of access road, supervision visits were arranged and conducted at another nearby PHC or the Cardiovascular Research Office in the University of Abuja Teaching Hospital. In addition, longer duration of supervision was done for underperforming PHCs. Reviews of comparable supportive supervision programmes have identified similar challenges along with additional issues including armed conflicts, limited time availability of the supervision teams, community isolation and poor transportation systems.[32–34]

Effectiveness outcomes of our supportive supervision were also generally high, similar to evidence from a range of studies that demonstrate the benefit of supportive supervision over more traditional training, including Rowe *et al*[15 18] showing the benefits of supportive supervision. The high performance of CHEWs in BP measurement fidelity, BP measurement coverage and recording accurate data on patient's treatment cards may also be due to the well-structured training and retraining in the first programme year as part of the HTN Programme strategy[27] and throughout the HTN Programme study period. Similar results on high levels of fidelity to BP measurement were seen in a study for the integration of hypertension care into HIV clinics at PHCs by community nurses under the supportive supervision of practice facilitators in Nigeria, where training and retraining were done.[35] Other reasons for the high performance may be increased CHEW motivation due to supportive supervision.[12] Rowe *et al* in a modelled study of supportive supervision strategies among health professionals in LMICs found it can be effective by 8.8%–11.5% points higher if the supervisors are being supervised and 14.2%–20.8% points higher if engaged in joint problem solving with healthcare providers when compared with the control group.[36] While we did not include measurement of the supervision of the supervisors, these results support our findings from our model which included the joint problem solving. Our results of improving quality were similar to those from Smith *et al* in the primary care setting and task shifting in Rwanda, who found that mentoring and enhanced supervision in mental health improved quality of care by primary care nurses.[37] A scoping review by Abujaber *et al* also emphasised the importance of regular supportive supervision during task shifting with trained high-quality supervisors, providing further strength to our conclusions.[38]

Despite the many implementation and effectiveness outcomes seen over the programme, we saw some drop in observed BP measurement quality and coverage towards the end of the reporting period. The decline in CHEW fidelity to BP measurement was due to one of the local government areas where the supervision team incorrectly stopped observing CHEWs who they had determined to be competent in earlier visits, focusing instead on new staff or those with lower competency. In future, regular communication and auditing of the activities of the supervising teams is important to ensure fidelity to the process. The lower BP measurement coverage was related to lower performance in two of the local government

areas (online supplemental table 4) due to poor documentation of BP measurement. This data quality gap was addressed during the following supportive supervision visits through retraining and on-site coaching, but longer-term data beyond the study period were not included.

Facility readiness for screening, diagnosis and treatment of hypertension is often constrained by lack of critical inputs of equipment, medication stocks and staffing.[39–41] We found high levels or increases across all three areas. The high initial rate of availability of BP monitoring machines is likely due to the provision of two semiautomated BP measuring apparatus to all 60 sites at the start of the HTN Programme. We did see a decrease in year 4 for equipment, particularly in two local government areas (online supplemental table 5). The decline in equipment availability may have been due to high usage of the electronic BP monitors over time resulting in breakage of the machines or unmet need for battery replacement, which has been described in other studies in Zambia and Uganda.[42–44] Strategies to prevent these challenges included regular checking of the equipment for needed batteries during supervision visits and replacement of malfunctioning cuffs. In addition, the team encouraged end users to promptly report any malfunction to the research team without waiting for the monitoring visits. While these challenges were extensively discussed during monitoring visits with onsite coaching, other strategies are needed, such as finding sustainable supplies for batteries and regular preventive maintenance.

The proportion of PHCs with the HTN Programme-specific BP-lowering medications stock for steps 1 and 2 available during all supportive supervision visits increased dramatically from 0% to 68.3%. The very low rate of BP-lowering medication in the 60 PHCs was expected before the HTN Programme since there was no systematic approach to ensuring a reliable stock of BP-lowering medication for the management of hypertension in the primary healthcare setting in the Federal Capital Territory.[13] The HTN Programme initially provided free BP-lowering medications, which helped to strengthen BP-lowering medication supply availability, while maintenance of that availability was reflected by training and retraining of the CHEWs and other clinic staff on BP-lowering medication stock management by the research team and supportive supervision. The maintenance was also supported by the implementation of a drug revolving fund designed to maintain affordable BP-lowering medications which started during the second quarter of 2022. This maintenance of BP-lowering medication supply contrasts with other studies which reported stock outs of BP-lowering medications as a frequent challenge when HTN care is expanded to other contexts.[45 46]

Although high staff turnover rate at the primary healthcare is common and one of the major impediments to integrating NCDs into the primary care settings in LMICs,[47] we found adequate staffing of the PHCs increased from 56.7% in year 1 to 98.3% in year 4. Adequate and structured supportive supervision has been shown to improve both quality of care and staff retention.[48] Furthermore, staff turnover was limited (data not shown). High retention may reflect the strong engagement with policymakers and healthcare administrators in the Federal Capital Territory who are responsible for postings of healthcare workers (physicians and non-physicians to the different primary healthcare facilities) to emphasise the need to reduce transfer of trained healthcare providers. Another reason for the adequate staffing may be because one of the criteria for any primary healthcare facility to be included in the HTN Programme was the presence of two or more tenured non-physician healthcare workers in such facility.[27]

47 (78.3%) PHCs were rural in the overall study, and detailed results from the subanalysis are under review; hence, they may not be discussed here.

Strengths and limitations

Our study has several strengths, including the use of an implementation science approach to measure implementation and effectiveness outcomes and leveraging data from both supervision visits and the overall programme. However, we also had a few limitations. The study was observational and so we are unable to determine causality as to whether supportive supervision led to improvements in not only implementation and effectiveness outcomes but also hypertension diagnosis, treatment or control. In addition, not all sites had visits at the scheduled times, and so these were excluded from outcome calculations, which may influence the estimates. However, the rate of missingness was generally low and data were collected in routine primary care settings. Another limitation of this study is that we did not check for fidelity to the HTN protocol during supportive supervision. Finally, supportive supervision was conducted only in the Federal Capital Territory and in HTN Programme supported sites, which may limit generalisability to other settings.

Conclusions

In one of the largest studies on hypertension in primary care in sub-Saharan Africa,[23] we have been able to show the successful design, implementation and effectiveness of a holistic supportive supervision strategy integrated into HEARTS implementation. Future expansion of HEARTS implementation, including supportive supervision, to other states and geopolitical zones in Nigeria is an area of active investigation by the study team.

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Ethics approval The Hypertension Treatment in Nigeria Programme protocol, including provision of supportive supervision, was reviewed and approved by the Ethics Committee at the University of Abuja Teaching Hospital (UATH/HREC/PR/2019/002/019) and the Institutional Review Board at Northwestern University (STU00209478). The protocol was reviewed and approved by the Data and Safety Monitoring Board. Permission was sought from each site to participate in the overall study by PHC managers. Informed consent was waived based on the Common Rule. Participants gave informed consent to participate in the study before taking part.

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