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Effectiveness of team-based care interventions in improving blood pressure outcomes among adults with hypertension in Africa: a systematic review and meta-analysis

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ABSTRACT

Objective We evaluated the effectiveness of team-based care interventions in improving blood pressure (BP) outcomes among adults with hypertension in Africa.
Design Systematic review and meta-analysis.
Data source PubMed, CINAHL, EMBASE, Cochrane Library, HINARI and African Index Medicus databases were searched from inception to March 2023.
Eligibility criteria for selecting studies We included randomised controlled trials (RCTs) and pre-post study designs published in English language focusing on (1) Adults diagnosed with hypertension, (2) Team-based care hypertension interventions led by non-physician healthcare providers (HCPs) and (3) Studies conducted in Africa.
Data extraction and synthesis We extracted study characteristics, the nature of team-based care interventions, team members involved and other reported secondary outcomes. Risk of bias was assessed using the Cochrane Risk of Bias tool for RCTs and the National Heart, Lung, and Blood Institute assessment tool for pre-post studies. Findings were summarised and presented narratively including data from pre-post studies. Meta-analysis was conducted using a random effects model for only RCT studies. Overall certainty of evidence was determined using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) tool for only the primary outcome (systolic BP).
Results Of the 3375 records screened, 33 studies (16 RCTs and 17 pre-post studies) were included and 11 RCTs were in the meta-analysis. The overall mean effect of team-based care interventions on systolic BP reduction was −3.91 mm Hg (95% CI −5.68 to −2.15, $I^2 = 0.0\%$). Systolic BP reduction in team-based care interventions involving community health workers was −4.43 mm Hg (95% CI −5.69 to −3.17, $I^2 = 0.00\%$) and nurses −3.75 mm Hg (95% CI −10.62 to 3.12, $I^2 = 42.0\%$). Based on the GRADE assessment, we judged the overall certainty of evidence low for systolic BP reduction suggesting that team-based care intervention may result in a small reduction in systolic BP.
Conclusion Evidence from this review supports the implementation of team-based care interventions across the continuum of care to improve awareness, prevention, diagnosis, treatment and control of hypertension in Africa.
PROSPERO registration number CRD42023398900.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The strength of this review lies in the inclusion of only randomised controlled trials (RCTs) which have been peer-reviewed providing evidence in the meta-analysis for the potential effectiveness of team-based intervention in hypertension management.
⇒ Rather than focusing on blood pressure outcomes alone, this systematic review narratively synthesises the potential impact of team-based care interventions on other patient and health system outcomes.
⇒ However, our analysis of the effectiveness of team-based care interventions is limited given the insufficient RCTs to perform robust analysis, which may limit the translation of our findings into long-term therapeutic and clinical value.
⇒ The inclusion of studies published in English alone could have led to inclusion bias given the substantial number of francophone countries in Africa.

INTRODUCTION

Hypertension is the leading risk factor for cardiovascular diseases (CVDs) and is attributed to 44% of global adult morbidity and mortality.[1 2] About 57% of CVD-related deaths occur in low-income and middle-income countries (LMICs) including sub-Saharan Africa (SSA).[3] Approximately 32%–57% of the adult population in SSA live with hypertension with other documented diabetes comorbidities.[4–6] This burden is projected to increase due to the epidemiological transition and rapid urbanisation in the region.[7 8] Given the existing double burden of diseases in the region, there is a need to implement context-appropriate interventions that leverage the existing health system capacities in SSA.[9]

Hypertension management in SSA is challenging due to the myriad health systems and economic challenges including fragmentation of care that hinder adequate integration of interventions to address the gaps in hypertension care. Acute shortage of physicians and other healthcare providers (HCPs) in Africa also hampers the capacity of health systems to meet the needs of the increasing population living with hypertension.[10 11] Evidence from a multinational study highlights the physician-patient gap in access to hypertension services in SSA.[12] Even at three visits per year, there is a substantial deficit in the number of physicians required for the clinical management of hypertension in LMICs.

Without context-appropriate strategies and interventions, the gap between patient needs and provider capacity may worsen in SSA. Health system interventions that address global health disparities and enhance access to high-quality patient-centred hypertension care are direly needed.[9] Few population and individual-level interventions have focused on dietary salt intake reduction, community-based blood pressure (BP) screenings, physical activities, weight loss and smoking cessation as targets for hypertension control in SSA.[13 14] However, these interventions are likely to be less sustainable, untargeted and poorly linked within the existing health policies and practices.[15] The current epidemiological transition from infectious diseases to non-communicable diseases, the changing health needs of people diagnosed with hypertension, and the quest for person-centred healthcare necessitate the need for a context-feasible approach that incorporates local resources and health systems' capacity to enhance hypertension control in Africa.[13]

Team-based care can potentially improve hypertension care, enhance care coordination and address the physician-patient gap by distributing tasks efficiently among a transdisciplinary healthcare team to improve hypertension outcomes.[12] Team-based care can be defined as an evidence-based approach to providing high-quality care, established when at least two HCPs collaborate with patients and their families or caregivers to achieve a shared treatment goal across different healthcare settings.[16 17] Depending on the available HCPs in a particular healthcare setting, these teams can include primary care physicians, nurses, pharmacists, community health workers (CHWs), dieticians and patients.[18] There is evidence that team-based care can improve BP reduction in a cost-effective way in LMICs;[16 19 20] however, despite the benefits, there is sparse evidence of its effectiveness in African countries.

To optimise hypertension care, particularly in primary-level healthcare settings in Africa, it is essential to establish a context-appropriate and cost-effective model of care that aligns with the locally existing health systems resources and infrastructure. Thus, we aimed to: (1) Summarise the evidence of team-based care interventions and their effect on BP outcomes and (2) Identify HCPs and patient-reported outcomes.

METHODS

This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (PRISMA Checklist: online supplemental file 1) and was registered on PROSPERO.[21] However, to adequately tailor the review to address the gaps in hypertension care in SSA, the initial registration was revised, with justification of deviations from the initial protocol (online supplemental file 2).

Conceptual framework

This review was guided by the Resolve to Save Lives (RTSL) conceptual framework for team-based care in hypertension management.[16] The framework classifies hypertension tasks executed by HCPs as administrative tasks (level 1), basic clinical tasks (level 2) and advanced clinical tasks (level 3) (figure 1). Specific tasks in each domain include level 1—registry management, medication delivery, retrieving patients, scheduling; level 2—counselling and health education of patients, refilling medications, BP measurement, taking patient history, CVD risk assessment; level 3—diagnosing, titrating treatment and initiating treatment.

Eligibility criteria

Population

Adult populations aged 18 years and over in Africa are diagnosed with hypertension, irrespective of age and gender, and comorbidity status. Hypertension was defined as a systolic BP above 140 mm Hg and a diastolic BP over 90 mm Hg per the WHO criteria for diagnosis of hypertension.[22]

Intervention

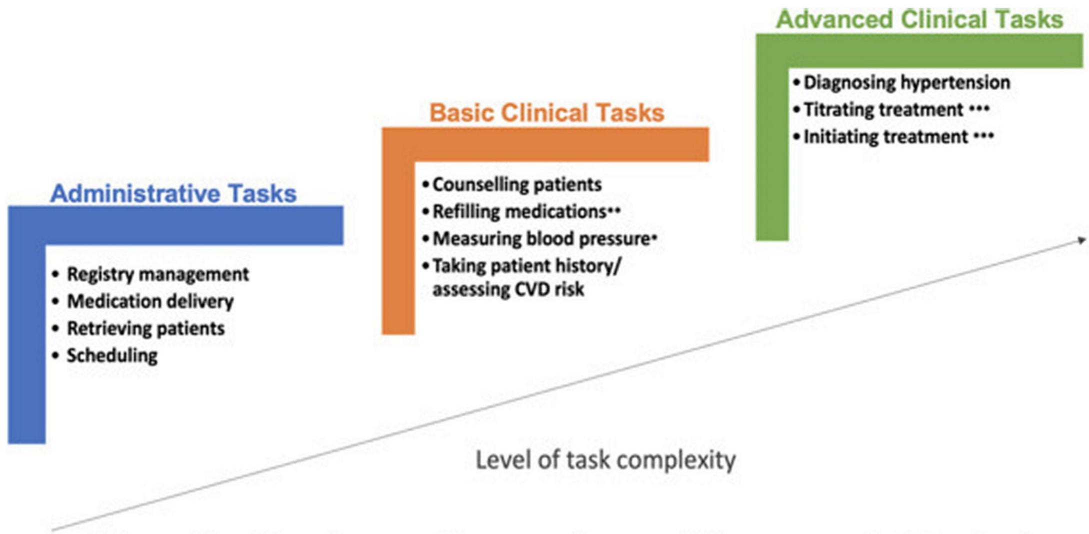
Non-physician-led team-based care intervention management was reported in randomised controlled trials (RCTs) and pre-post studies. Consistent with the RTSL conceptual framework, we defined team-based care as a strategy that involves multidisciplinary teams (patients themselves, primary care physicians, nurses, pharmacists, counsellors, social workers, nutritionists and CHWs) to deliver hypertension care. Studies are eligible if more than one team member was included and delivered hypertension-specific tasks. Studies published in languages other than English, did not specify the team involved in the delivery of care, were not primary peer-reviewed articles, or were conducted in a country outside of Africa were excluded.

Comparison

Usual care or standard care.

Primary outcomes

Reduction in systolic BP.



** with an automated device; ** without change in dose or medications; *** per protocol; CVD: Cardiovascular disease*

Definitions

Administrative Tasks
Scheduling: Scheduling return to clinic for patients diagnosed with hypertension
Retrieving patients: Retrieving and bringing back to clinic hypertension patients who missed appointments
Medication Delivery: Delivering medications to a patient's home, or the community
Registry Management: Entering new patient information into a registry and updating as necessary

Basic Clinical Tasks
Taking Patient History: Taking patient history or assessing cardiovascular risk
Measuring Blood Pressure: Measuring blood pressure with an automated device
Refilling Medications: Refilling prescriptions of antihypertensive medications without adjusting dosage or medication type
Counseling Patients: Counseling patients about lifestyle changes and medication adherence

Advanced Clinical Tasks
Initiating treatment per protocol: Initiating hypertension treatment based on a treatment protocol

Figure 1 Resolve to Save Lives conceptual framework for team-based care in hypertension management.

Secondary outcomes

Patient-reported outcomes (medication adherence, patient satisfaction).

Health system-reported outcomes (retention in care, linkage to care, service utilisation and clinic functioning).

Data sources and searches

PubMed, Cummulative Index to Nursing and Allied Health Literature (CINAHL), Excerpta Medical dataBASE (EMBASE), Cochrane Library, African Index Medicus (AIM) and Health Inter-Network Access to Research Initiative (HINARI) databases were searched through 31 March 2023, and from inception. The full search strategy for PubMed was developed with guidance from an informationist and adapted for other databases (online supplemental file 3). Secondary references were screened for further eligible studies.

Study selection and data extraction

All articles retrieved were exported to Covidence for deduplication.[23] Three reviewers (TH, FM and HB) independently conducted title and abstract screening followed by a full-text review by two reviewers (TH and HB) with resolution of disagreements by OO. Data extraction was independently conducted by TH and HB. Baseline and follow-up BP measurements were extracted for participants in the intervention and usual care groups for RCT studies. The data extraction tool was developed in line with the RTSL framework, piloted, and reviewed by OO and YC-M. Data extracted from the articles included authors, date of publication, country, study design, study setting, type of team-based care model, age of participants, sample size, tasks performed, components of the intervention, team members involved, and patient and HCP-reported outcomes. TH nad SK conducted Risk of Bias assessment. Authors of some studies were contacted for additional data if the data reported in the original articles were incomplete in the published article.

Assessment of risk of bias

Risk of bias and quality assessment were performed using the Cochrane risk-of-bias tool for RCTs[24] and the National Heart, Lung, and Blood Institute assessment tool for pre-post design studies.[25] The elements assessed for RCTs were appropriateness of random sequence generation, allocation concealment and blinding of outcome assessors, patients, and HCPs, completeness of outcome data, selective reporting, and intervention fidelity.[26] The risk of bias visualisation application was adopted to present the findings of the assessment (red—'High risk'; yellow—'Unclear risk'; and green—'Low risk'). For pre-post design studies, the risk of confounding, completeness of outcome data and intervention adherence were assessed.

Certainty of evidence

Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) methodology was used to determine the certainty of evidence for the primary outcome (systolic BP) and rated certainty of evidence as high, moderate, low or very low. Detailed GRADE guidance was followed to assess issues of imprecision, inconsistency, indirectness and publication bias.[27] In accordance with the current interpretation of the GRADE guideline, the significance of the levels of evidence was interpreted as; High: Very confident that the true effect on SBP (systolic blood pressure) lies close to the estimated effect on SBP. Moderate: Moderately confident in the effect estimate; the true effect on SBP is likely to be close to the estimated effect on SBP but may be substantially different. Low: Confidence in the effect estimate is limited; the true effect on SBP may be substantially different from the estimated effect on SBP. Very Low: Very little confidence in the effect estimate; the true effect on SBP is likely to be substantially different from the estimated effect on SBP.[28]

Statistical analysis

To estimate the systolic BP-lowering effect of team-based care intervention, a meta-analysis was performed to estimate the mean systolic BP difference between team-based interventions and the usual care. Only RCTs with complete systolic BP data were included in this meta-analysis. Given that the unit of BP measurement was the same across studies, the average BP mean difference was estimated as the effect size. A DerSimonian-Laird's random-effects model was applied to evaluate the overall mean difference, and a 95% CI for systolic BP was estimated.[29] The degree of heterogeneity was measured using Higgins' I^2 and Q statistics of effect size.[30] Subgroup analyses were performed for healthcare type, comorbidity status and level of task complexity according to the conceptual framework. Publication bias was examined using the symmetry of the funnel plot and Egger's regression test.[31] Other secondary outcomes were narratively presented.

Patient and public involvement

No patient Involved

RESULTS

Study results and identification

The database search yielded 3375 records; PubMed (n=2522), CINAHL (n=114), EMBASE (n=464), Cochrane (n=134), AIM (n=136) and other sources (n=5) . De-duplication led to the exclusion of 472 articles. The remaining 2903 articles progressed through titles and abstracts screening, leading to the exclusion of 2649 records. The full texts of the remaining 254 records were reviewed against eligibility criteria leading to the exclusion of 221 articles. Thirty-three[32] articles met the inclusion criteria and were considered for this review. The process of the study selection is represented in figure 2.

Characteristics of included studies

Online supplemental table 1 shows the characteristics of the studies included in this review. Of the 33 studies, 16 were RCTs and 17 were pre-post designs. There was no unique distinction regarding the duration, nature of the intervention, task complexity or team composition. Fourteen[14] studies were conducted in West Africa, 12 in East Africa, 3 in Central Africa and 4 in Southern Africa. Most studies were conducted in rural primary healthcare contexts (n=21); the remaining were conducted in tertiary-level and secondary-level healthcare settings. The sample size for the studies ranged from 24 to 2647. The average age of the study participants was 58 (±12.2) years and ranged from 29 years to 75 years. The mean duration of the interventions was 8 months.

The majority (49%) were nurse-led followed by CHW-led (27%), pharmacist-led (24%) and dietician-led (3%). A few of the studies included implemented team care interventions with no discernable lead for the interventions (n=3).[32–34] Other studies included physicians in the intervention implementation (n=6).[35–40]

Quality assessment and risk of bias

The risk of bias for the individual RCT studies is shown in figure 3. The overall risk of bias was moderate; random sequence generation was 90% of the studies and 85% for allocation concealment (online supplemental figure 1). All studies had at least one domain judged as high or uncertain risk of bias. On data completeness, six RCTs had a high risk of attrition bias due to data incompleteness.[39 41–46] Seven studies did not blind the assessor citing the lack of possibility of blinding due to the nature of the intervention.[38 39 41–43 45–48] Most studies reported sufficient adherence to the intervention. For pre-post-study designs, six studies were rated as high risk for failing to account for potential confounders (online supplemental file 4).[32 34 40 49 50] Three studies were identified as high risk due to a lack of sample representativeness.[49–51] There was no indication of publication bias from Egger's regression test (z=0.457, p=0.74) or the funnel plots (online supplemental figure 2).

Context and settings of team based interventions

Most of the team-based care interventions identified were delivered in clinical/hospital settings and focused more on treatment than prevention. While most of the interventions were implemented in primary healthcare settings, a few were conducted at tertiary and secondary levels of healthcare.[14 37 38 42] Eight (24%) studies also implemented team-based care interventions in the community setting including screening, home visits, and sometimes medication titration at community pharmacies.[33 34 39 41 44 52–54]

Team composition and task distribution

Most of the studies included nurses 16 (48%), and physicians 1 (3%),[55] pharmacists 8 (24%) and CHWs 8 (24%).

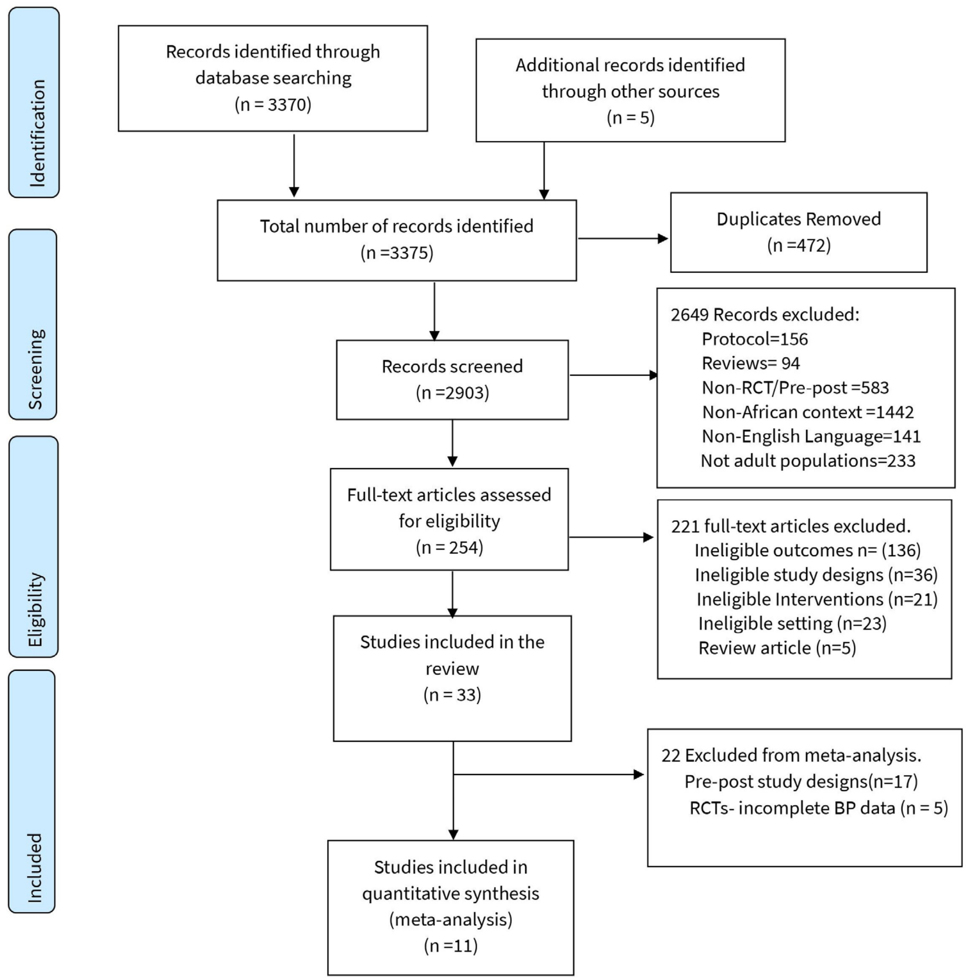


Figure 2 Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) flow diagram for study selection for the systematic review and meta-analysis. BP, blood pressure; RCT, randomised controlled trial.

However, for two studies that adopted an integrated approach to care CHWs were mostly included with other team members. In clinical interventions, where advanced clinical roles such as initiating treatment, diagnosis of hypertension and titration of treatment were included, physicians were involved in the training of non-physician HCPs and provided support throughout the delivery of the interventions.[35 37 39 42 54 56 57] For example, in interventions where nurses were allowed to diagnose or titrate treatment, training preceded the execution of those tasks.[36 37 39 42 54] In all instances, the training provided was focused on the specific task to be delegated. In some of the interventions, CHWs diagnosed and treated patients when BP was less than 140/90 mm Hg. Five studies also reported community pharmacist interventions that included medication titration, counselling and health education on medication adherence in community pharmacies.[34 41 49 52 53] In one instance, patients with uncontrolled BP were referred to physicians at primary-level hospitals for further management.[54]

Task complexity according to the RTSL conceptual framework

Six studies (18%) included both level 1 and level 2 tasks (administrative and basic clinical tasks), 17 (50%) combined level 2 and level 3 tasks (basic and advanced clinical tasks) and 11 (32%) included only level 2 tasks (basic clinical tasks). None of the studies included only level 1, level 3 or all levels of team-based care tasks in the interventions. The three main components identified in this review based on the team-based care framework were further stratified.

Components of team-based care interventions

Health education and counselling were the common tasks performed by healthcare personnel (n=29), and mainly focused on smoking prevention, improving physical activity and healthy dietary intake. The interventions were mainly behavioural and lifestyle interventions, medication and treatment compliance interventions, and digital health interventions. Apart from patient behaviours, some of the studies that specifically implemented health education interventions also assessed the impact of team-based care interventions on patients' clinical status (glycated haemoglobin and BP improvement).[58–60] Studies that implemented medical adherence interventions basically included behaviour adjustment, medication feedback and medication-taking skills, and were often led by pharmacists, and resulted in medication adherence.[34 49 51 53] In

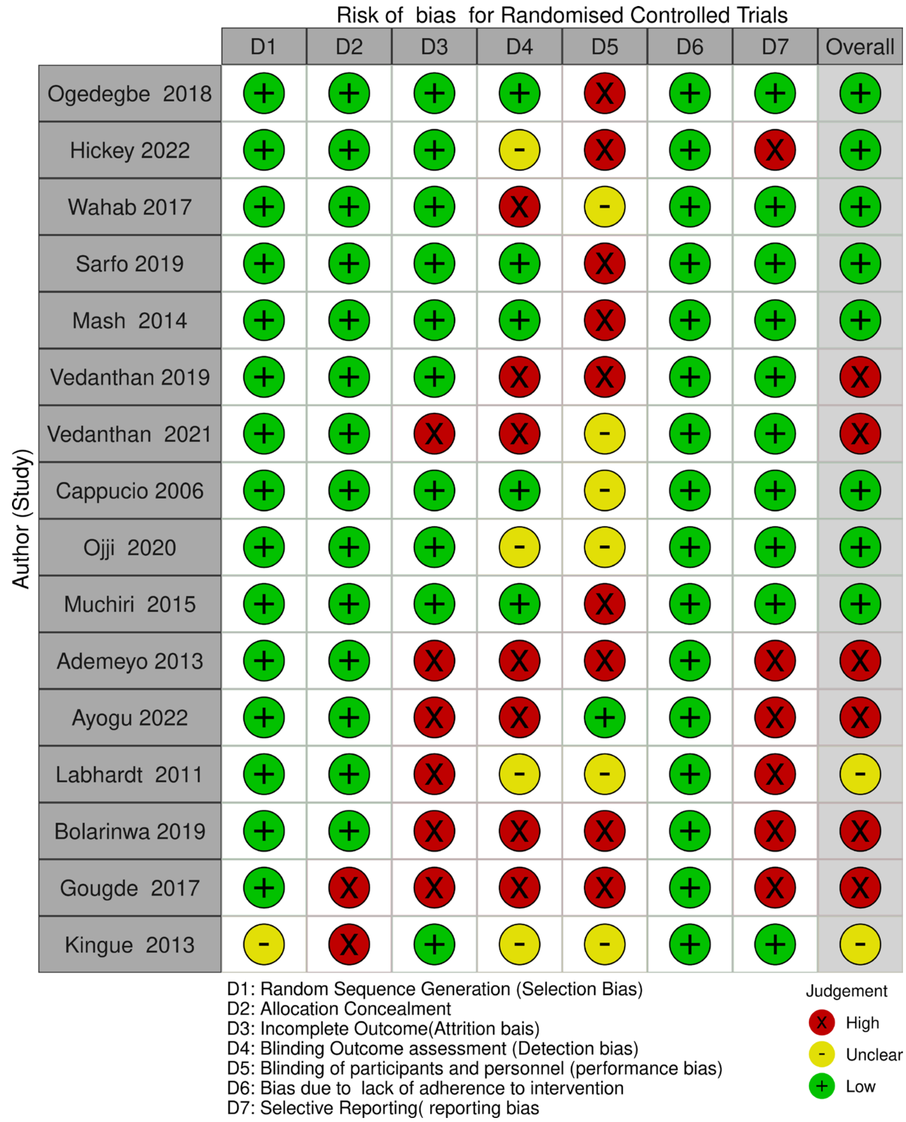


Figure 3 Authors' judgements about the risk of different types of bias across all included RCTs. Based on the risk of each type of bias, all the studies were classified as low risk (green), unclear risk (yellow) or high risk (red) of bias. RCT, randomised controlled trial.

such studies, pharmacists performed counselling, assessed medication adherence and sometimes checked the BP of patients.

Five studies included a digital health intervention to improve hypertension control.[34 36 47 61 62] Four studies incorporated remote home BP monitoring among participants.[38 47 62 63] The focus of digital interventions in most of the studies was to enable HCPs to disseminate behavioural modification messages and to establish common grounds for data-sharing among the team.[34 36 61 62] Quite distinctively, Otieno *et al* employed an Empower Health application that automatically generated an individualised follow-up time and allowed HCPs to estimate CVD risk based on comorbidities and risk factors.[62] HCPs and patients were trained before the implementation of the interventions across all four studies that implemented digital health interventions.

Meta-analysis

BP outcomes

Reduction in systolic BP

Eleven RCTs that reported changes in systolic BP were included in the meta-analysis.[14 36 38 44 46–48 58 60 61 63] The mean intervention duration was 8 months and ranged from 2 weeks to 12 months. Five RCTs were not included in the final meta-analysis due to incomplete data on systolic BP at baseline.[39 41–43 45] Overall, the pooled effect of team-based care interventions on systolic BP reduction was −3.91 mm Hg (95% CI −5.68 to −2.15, $I^2 = 0.0\%$) (figure 4). Certainty of evidence for effect of team-based care interventions was graded low suggesting a small reduction in systolic BP reduction due to imprecision in the assessment of BP outcomes, wide CI, and high risk of bias due to incomplete data (online supplemental file 55).

Study	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Ogedegbe	-19.80	15.7953	157	-16.50	17.1143	168	21.0%	-3.30 [-6.88; 0.28]
Wahab	-0.94	37.0524	17	-4.97	26.7449	18	0.6%	4.03 [-17.48; 25.54]
Kingue	-18.10	37.6630	165	-4.80	34.1592	103	3.5%	-13.30 [-22.05; -4.55]
Sarfo	-9.00	34.3588	16	-7.50	29.0656	16	0.6%	-1.50 [-23.55; 20.55]
Mash	2.90	32.9757	175	8.90	34.5782	145	4.8%	-6.00 [-13.45; 1.45]
Vedanthan (a)	-13.10	27.8368	496	-9.70	30.1425	491	20.5%	-3.40 [-7.02; 0.22]
Vedanthan(b)	-16.40	28.0729	672	-11.40	26.6993	661	31.1%	-5.00 [-7.94; -2.06]
Cappucio	-1.30	37.3134	168	1.80	37.4833	169	4.2%	-3.10 [-11.09; 4.89]
Ojji	-31.00	16.3379	20	-26.00	16.2788	20	2.6%	-5.00 [-15.11; 5.11]
Muchiri	-1.80	23.0829	41	-3.30	28.1498	41	2.2%	1.50 [-9.64; 12.64]
Hickey	-20.00	18.3153	99	-20.00	20.9304	100	9.0%	0.00 [-5.46; 5.46]
Total (95% CI)			**2026**			**1932**	**100.0%**	**-3.91 [-5.68; -2.15]**

Heterogeneity: $Tau^2 = 0$; $Chi^2 = 8.97$, df = 10 (P = 0.54); $I^2 = 0\%$

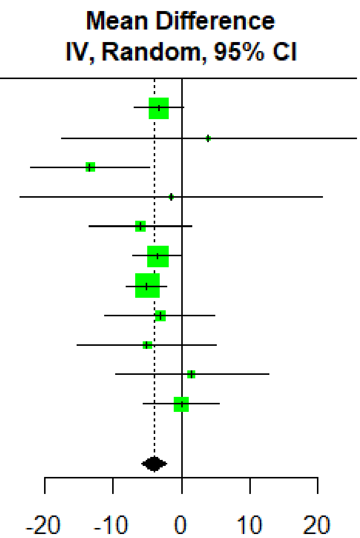


Figure 4 Forest plot of the effectiveness of team-based care interventions on systolic blood pressure.

Meta-analysis by subgroup: healthcare worker type

Overall, nine studies were included in the HCP-type subgroup analysis. Two studies that implemented a pharmacist-led pharmaceutical care programme for hypertension management were excluded from the meta-analysis due to incomplete BP outcomes data (online supplemental figure 3).[41 49] Systolic BP decreased by −3.75 mm Hg (95% CI −10.62 to 3.12, $I^2 = 42.0\%$) for interventions delivered by nurses, and by −4.43 mm Hg (95% CI −5.69 to −3.17, $I^2 = 0.00\%$) for interventions delivered by CHWs.

A meta-analysis by subgroup: team-based care task level

Studies were stratified according to the level of task complexity based on the RTSL team-based care framework. Three categories were identified: levels 1 and 2, 2 only, and 2 and 3. The net systolic BP reduction was higher in task levels 2 and 3 combined −4.36 mm Hg (95% CI −11.25 to −2.53; I^2=57.0%), followed by level 2 only −3.39 mm Hg (95% CI −5.67 to −40.79; I^2=0.0%), and levels 1 and 2, −3.37 mm Hg (95% CI −45.53 to −40.79; I^2=0.0%) (online supplemental figure 4). Essentially, systolic BP reduction was higher if team members were delegated advanced clinical tasks compared with the basic clinical tasks. Moreover, the SBP reduction was even higher if basic clinical tasks (level 2) were combined with advanced clinical tasks (level 3).

Meta-analysis by subgroup: duration of intervention

An additional analysis of team-based care was conducted based on the duration of the intervention. The duration of intervention for studies included in the subanalysis ranged from 2 weeks to 12 months and was dichotomised into two (≤6 months vs >6 months). Systolic BP reduction was higher for interventions lasting 6 months or longer −4.79 mm Hg (95% CI −8.06 to −1.52; I^2=13.0%) than for interventions lasting less than 6 months −2.53 mm Hg (95% CI −4.99 to −0.08; I^2=0.0%) (see online supplemental figure 5).

Meta-analysis by subgroup: comorbidity status at enrolment

Four studies included participants who had diabetes at baseline.[36 38 46 58] We limited comorbidity to having both hypertension and type 2 diabetes only. We compared the effect of team-based interventions among patients with only hypertension and those with both hypertension and diabetes. SBP reduction was higher for team-based care interventions among patients with comorbidities −5.39 (95% CI −9.58 to −1.19; I^2=0.0%) compared with those without comorbidities −2.88 (95% CI −4.68 to −0.1.08; I^2=0.0%) (online supplemental figure 6).

Secondary outcomes: patient and health systems-reported outcomes

We included 16 RCTs and 17 pre-post designs in narrative synthesis for the secondary outcomes (BP control, medication adherence, patient satisfaction, service utilisation, improvement in retention and linkage to care).

The proportion of patients achieving BP control

Six pre-post studies (35%) provided data on the proportion of patients with controlled BP defined as BP <140/90 mm Hg.[34 51 53 54 57 62] BP control ranged from 29% to 75.2% between baseline and the end of the intervention for pre-post studies. There was a higher heterogeneity in the methods in the analysis of BP control and duration of intervention across studies. For instance, Opara *et al*[53] reported 75% and 69% improvement in systolic and diastolic BP control, respectively. Aguwa *et al* reported a 46% improvement in self-BP measurement.[49] The highest BP control for pre-post studies was 2.2% at baseline to 75.2% at the end of follow-up.[57] However, the duration of follow-up was 2 months compared with 12 months in other pre-post studies. Similarly, six RCTs reported improvement in BP control between baseline and follow-up ranging from 0% to 85.9%. Overall, 7 (58%) of the 12 studies that reported BP control were nurse-led, 3 were pharmacist-led (25%) and 2 were CHW-led (17%) interventions.

Medication adherence

Nine studies, including five[33 34 40 49 52] pre-post studies and four RCTs,[38 39 41 42] assessed medication adherence using different methods of assessment.[33 34 38–42 47–49 52] The Morisky Medication Adherence Scale (MMAS),[34 38 42 52] Medication Adherence Report Scale,[41 47] pill count[39] and patient self-reported methods[33 40 48 49] were used to assess medication adherence, and all the studies reported improvement in medication adherence. Most of the studies that resulted in improved medication adherence were pharmacist-led.[33 34 39 41 49 52] Of note is the retraction[64] of the MMAS which raises concerns about validity and reliability of the adherence data for studies that used the instrument, and the results should be interpreted with caution.

Patient satisfaction and service utilisation

Other reported benefits of team-based care interventions were improvement in satisfaction and utilisation of care. Four pre-post studies reported satisfaction with care from the perspective of patients.[34 51–53] Oparah *et al*, in a team-based pharmaceutical care intervention that included health education on medication adherence, achieved an improvement in the satisfaction of care at the end of the intervention.[53] Other studies also found an improvement in clinic functioning,[54] and an increase in healthcare utilisation.[50 59] No RCT assessed an improvement in care satisfaction. However, two RCTs recorded an increase in clinic functioning and attendance at the end of the intervention despite the short duration of follow-up.[36 45]

Improvement in retention and linkage to care

Retention and linkage to care were reported by five pre-post studies[34 37 50 59 65] and four RCTs.[38 43 44 59] Four of the studies that included a financial support component showed an improvement in linkage to care.[43 44 59 61] Most of the interventions that led to improvement in linkage to care were community-based and CHW-led. Additionally, five of the studies that resulted in retention in care were nurse-led.[37 38 43 54 61] One pre-post study that adopted an integrated HTN/DM approach achieved 100% retention of care at follow-up; however, the period of follow-up was only 14 days, which may have affected the true effect of the intervention on retention in care.[62]

Overall, regarding the certainty of evidence for the primary outcome, only two studies were rated as high quality. Four studies were rated moderate, with five rated lower quality with issues related to reporting bias, or imprecision (wide CI or small sample size) (online supplemental figure 5). The certainty of evidence for team-based hypertension care interventions to reduce systolic BP was rated as low according to the GRADE approach. Studies were not downgraded for lack of blinding given that it is unlikely to blind team-based hypertension care interventions in real clinical situations.

DISCUSSION

We conducted a systematic review and meta-analysis to assess the effectiveness of team-based care interventions in improving BP and patient-reported outcomes in Africa. Overall, team-based care interventions resulted in systolic BP reduction compared with usual care. Although the certainly of evidence was graded as low for the primary outcome of systolic BP, the overall pooled mean reduction in systolic BP found in this review holds clinical significance as a systolic BP reduction of 2 mm Hg or higher has been shown to reduce the incidence of CVD in patients diagnosed with hypertension.[66] Beyond systolic BP reduction, team-based care interventions led to improvement in medication adherence, patient satisfaction and retention in care. Also, the findings of this review suggest that when tasks are re-distributed, HCPs can perform specific tasks that could enhance patient outcomes.

A notable finding in this review is the differences in the impact of team-based care interventions by the HCP cadre who take on a lead role. Despite the limited number of studies highlighting the interventions delivered by other HCPs, BP reduction was comparable to interventions led by nurses and CHWs. Though the nuanced findings make it rather difficult to advocate for one approach over the other, it potentially offers support for a comprehensive hypertension care programme that includes diverse healthcare professionals with specific tasks for each member. Although the CHW concept was developed in response to infectious disease management such as tuberculosis and HIV/AIDS in SSA,[67] our findings suggest that their involvement in team-based hypertension care may result in improvement in linkage to care—particularly in community settings. CHWs are known in their communities and can perform basic tasks such as home visits, and sending appointment reminders without any supervision, allowing other cadres to concentrate on basic clinical and advanced clinical roles.[68] Some studies have also reported the effectiveness and feasibility of training CHWs to perform a cardiovascular risk assessment and BP measurement at primary-level healthcare centres in low-resource settings.[69 70]

We found a dose-response relationship between the complexity of tasks and systolic BP reduction. There was a higher reduction in systolic BP for interventions that combined advanced clinical tasks and basic clinical tasks than for interventions that combined basic clinical tasks only. This result has implications for team-based hypertension care in Africa. Non-physician HCP team members (nurses and CHWs) can be trained and supported to perform advanced clinical tasks in the hypertension care cascade including initiating treatment, diagnosing hypertension and prescribing medications. This result corroborates the findings from a task-shifting review where BP reduction was better when nurses prescribed medications.[71 72] With the current shortage of physicians and other HCPs in SSA, advanced clinical tasks can be delegated to non-physician HCPs with the requisite expertise based on the existing model of care and with guidance from the WHO HEARTS technical package for CVD management in low-resource settings.[18]

Most of the team-based care interventions implemented were multifaceted and effects varied according to the duration of intervention and the participants' BP levels at baseline and comorbidity status. Studies with longer durations of team-based care interventions showed effectiveness in systolic BP reduction compared with those with shorter durations. BP and other patient-reported outcomes such as medication adherence may require a longer period to show improvement. In addition, hypertension is a chronic condition and response to interventions may not be immediate. However, while this requires sustained efforts from both HCPs and patients, it also highlights the cost and financial constraints in maintaining interventions for longer durations.

Consistent with existing evidence, our findings suggest that multicompetent interventions that combine counselling, health education and screening are effective in BP improvement.[73] Besides these core interventions, some participants were supported with financial incentives to cover the cost of medications and transportation to health facilities. However, although these intervention supplements mitigate barriers to access to medications and defray the cost of transportation to healthcare facilities—which are potential risks to loss to follow-up and hamper medication adherence—there is a fundamental question of sustainability. In a practical clinical environment, financial incentives to patients may not produce a lasting benefit or impact. This is also evident in the persistent gaps in access to care, and further efforts are needed to advance work on the three dimensions of universal health coverage that include not only improving access to a wide range of hypertension services but also reducing the cost associated with accessing healthcare services.

Telehealth and mHealth components incorporated into team-based care interventions also resulted in improvement in BP reduction. We found that almost all the studies included digital components, particularly smartphones, which were published between 2018 and 2021, which signifies the increasing application of digital health interventions in healthcare in SSA. This development can be attributed to the recent rise in the use of mobile devices among the population in SSA. All the studies used mobile devices to share patients' BP readings, send appointment reminders and messages to influence behaviour modification, or establish communication between the health team. To equitably implement digital health interventions in hypertension care, the level of digital literacy of participants needs to be considered. In some of the studies, only participants who had high literacy were provided with digital BP devices, which may not be ethically appropriate. Despite these challenges, telehealth promises to be a front-runner in improving access to quality hypertension care if implemented along with team-based care, particularly in empowering patients to self-manage their conditions and must be guided by contextual factors and principles of equity and data protection.

Team-based care interventions resulted in BP reduction in patients with comorbidities compared with those without comorbidities. While further research is required to validate this evidence, a plausible explanation for this finding may be a result of increased interaction of patients with comorbidities with different HCPs and improvement of resource availability in the management of both hypertension and other comorbid conditions. Essentially, this may increase awareness and self-monitoring, medication synergy, increased health engagement and collaborative care.

Apart from the traditional community-based interventions such as screening and home visits, we found emerging community pharmacist interventions that leverage team-based care strategies and that may potentially offer the opportunity for BP improvement. This model is well advanced in high-income countries and has shown effectiveness in improving BP reduction and continuity of care.[74] Besides the usual role of dispensing medications to patients, pharmacists may provide other preventive and diagnostic services including point-of-care testing, counselling on lifestyle and medication therapy management.

The findings of this review should, however, be interpreted in the context of some limitations. Some studies were published in French and were excluded. Additionally, the limited number of RCTs identified did not allow a rigorous subgroup analysis of interventions according to healthcare worker type, model of care or specific intervention. For example, no pharmacist-led intervention was included in the meta-analysis. Additionally, there was a high level of heterogeneity across studies in terms of study design, follow-up time, populations and methods for reporting BP control, and hence was unable to account for proportional BP control. Incomplete reporting of data may also hamper the overall quality of evidence. Potential bias stemming from the limited number of robust trials and pre-post-study designs, particularly for secondary outcomes, was observed. Pre-post studies are not well designed to provide evidence of the effectiveness of interventions.

Equally, this review has strengths. To the best of our knowledge, this is the first review of team-based care in hypertension in Africa. We comprehensively searched multiple databases to estimate the effectiveness of team-based interventions on BP and assessed patient-reported outcomes. Additionally, we included varying designs to describe team-based care interventions in hypertension.

In conclusion, team-based hypertension care interventions have the potential to improve BP reduction and patient outcomes. However, RCTs testing the efficacy of team-based hypertension care interventions and their cost-effectiveness are limited. Future research must focus on examining the cost-effectiveness of team-based hypertension management in Africa. Team-based care interventions may also have implications for HCP outcomes and healthcare system functioning.

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REFERENCES

1 Stanaway JD, Afshin A, Gakidou E, *et al*. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the global burden of disease study 2017. *Lancet* 2018;392:1923–94.
2 Mensah GA, Roth GA, Fuster V. The global burden of cardiovascular diseases and risk factors: 2020 and beyond. *J Am Coll Cardiol* 2019;74:2529–32.
3 Qureshi NQ, Mufarrih SH, Bloomfield GS, *et al*. Disparities in cardiovascular research output and disease outcomes among high-, middle- and low-income countries – an analysis of global cardiovascular publications over the last decade. *Glob Heart* 2021;16:4.
4 Bosu WK, Reilly ST, Aheto JMK, *et al*. Hypertension in older adults in Africa: A systematic review and meta-analysis. *PLoS One* 2019;14:e0214934.
5 Ndabarora E, Nishimwe C, Mukamusoni D. Systematic review of hypertension prevalence and awareness in sub-Saharan Africa. *KPScJ* 2018;1:11–4.
6 Hinneh T, Akyirem S, Bossman IF, *et al*. Regional prevalence of hypertension among people diagnosed with diabetes in Africa, a systematic review and meta-analysis. *PLOS Glob Public Health* 2023;3:e0001931.
7 Mills KT, Stefanescu A, He J. The global epidemiology of hypertension. *Nat Rev Nephrol* 2020;16:223–37.
8 Roth GA, Abate D, Abate KH, *et al*. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the global burden of disease study 2017. *Lancet* 2018;392:1736–88.
9 Byiringiro S, Ogungbe O, Commodore-Mensah Y, *et al*. Health systems interventions for hypertension management and associated outcomes in sub-Saharan Africa: A systematic review. *PLOS Glob Public Health* 2023;3:e0001794.
10 Afriyie DO, Nyoni J, Ahmat A. The state of strategic plans for the health workforce in Africa. *BMJ Glob Health* 2019;4:e001115.
11 Ahmat A, Okoroafor SC, Kazanga I, *et al*. The health workforce status in the WHO African region: findings of a cross-sectional study. *BMJ Glob Health* 2022;7:e008317.
12 Neupane D, Gao Y, Feng Y, *et al*. Estimation of the global gap in clinic visits for hypertension care between patient need and physician capacity. *Hypertension* 2021;78:779–86.
13 Shin J, Konlan KD, Mensah E. Health promotion interventions for the control of hypertension in Africa, a systematic Scoping review from 2011 to 2021. *PLoS ONE* 2021;16:e0260411.
14 Cappuccio FP, Kerry SM, Micah FB, *et al*. A community programme to reduce salt intake and blood pressure in Ghana. *BMC Public Health* 2006;6:13.
15 Wamba AA, Takah NF, Johnman C. The impact of interventions for the primary prevention of hypertension in sub-Saharan Africa: A systematic review and meta-analysis. *PLoS One* 2019;14:e0219623.
16 Ogungbe O, Cazabon D, Ajenikoko A, *et al*. Determining the frequency and level of task-sharing for hypertension management in Lmics: A systematic review and meta-analysis. *eClin Med* 2022;47:101388.
17 Anand TN, Joseph LM, Geetha AV, *et al*. Task sharing with non-physician health-care workers for management of blood pressure in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Glob Health* 2019;7:e761–71.
18 World Health Organization. Technical package for cardiovascular disease management in primary health care, team based care. Geneva, 2018. Available: https://apps.who.int/iris/bitstream/handle/10665/260421/WHO-NMH-NVI-18.2-eng.pdf
19 Kravetz JD, Walsh RF. Team-based hypertension management to improve blood pressure control. *J Prim Care Community Health* 2016;7:272–5.
20 Proia KK, Thota AB, Njie GJ, *et al*. Team-based care and improved blood pressure control: A community guide systematic review. *Am J Prev Med* 2014;47:86–99.
21 Page MJ, McKenzie JE, Bossuyt PM, *et al*. Updating guidance for reporting systematic reviews: development of the PRISMA 2020 statement. *J Clin Epidemiol* 2021;134:103–12.
22 Moser M. World health organization-International society of hypertension guidelines for the management of hypertension-do these differ from the U.S recommendations? which guidelines should the practicing physician follow? *J Clin Hypertens (Greenwich)* 1999;1:48–54.
23 Veritas Health Innovation. Covidence systematic review software, Veritas health innovation, Melbourne, Australia. 2020. Available: www.covidence.org
24 Higgins JPT, Altman DG, Gøtzsche PC, *et al*. The Cochrane collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;343:d5928.
25 NHLBI, NIH. Study Quality Assessment Tools, Available: https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools
26 McGuinness LA, Higgins JPT. Risk-of-bias visualization (Robvis): an R package and shiny web App for Visualizing risk-of-bias assessments. *Res Synth Methods* 2021;12:55–61.
27 Guyatt GH, Oxman AD, Vist GE, *et al*. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924–6.
28 Balshem H, Helfand M, Schünemann HJ, *et al*. GRADE guidelines: 3. rating the quality of evidence. *J Clin Epidemiol* 2011;64:401–6.
29 Jackson D, Bowden J, Baker R. How does the Dersimonian and Laird procedure for random effects meta-analysis compare with its more efficient but harder to compute counterparts *J Stat Plan Inference* 2010;140:961–70.
30 Higgins JPT, Thompson SG. Quantifying heterogeneity in a Meta-Analysis. *Stat Med* 2002;21:1539–58.
31 Egger M, Smith GD, Schneider M, *et al*. Bias in meta-analysis detected by a simple, graphical test. *BMJ* 1997;315:629–34.
32 Bello SI, Ganiyu KA, Dakop YO, *et al*. Pharmacist's intervention in the control of blood sugar levels in randomised diabetes patients at a primary health care setting in Benin city. *Nig Q J Hosp Med* 2012;22:245–8.

33 Tran DN, Kangogo K, Amisi JA, *et al*. Community-based medication delivery program for antihypertensive medications improves adherence and reduces blood pressure. *PLoS ONE* 2022;17:e0273655.
34 Nelissen HE, Cremers AL, Okwor TJ, *et al*. Pharmacy-based hypertension care employing mHealth in Lagos, Nigeria - A mixed methods feasibility study. *BMC Health Serv Res* 2018;18:934.
35 Kengne AP, Awah PK, Fezeu LL, *et al*. Primary health care for hypertension by nurses in rural and urban sub-Saharan Africa. *J of Clinical Hypertension* 2009;11:564–72.
36 Kingue S, Angandji P, Menanga AP, *et al*. Efficiency of an intervention package for arterial hypertension comprising Telemanagement in a Cameroonian rural setting: the TELEMED-CAM study. *Pan Afr Med J* 2013;15:153.
37 Ngoga G, Park PH, Borg R, *et al*. Outcomes of decentralizing hypertension care from district hospitals to health centers in Rwanda, 2013–2014. *Public Health Action* 2019;9:142–7.
38 Wahab KW, Owolabi M, Akinyemi R, *et al*. Short-term pilot feasibility study of a nurse-led intervention to improve blood pressure control after stroke in Nigeria. *J Neurol Sci* 2017;377:116–20.
39 Adeyemo A, Tayo BO, Luke A, *et al*. The Nigerian antihypertensive adherence trial: A community-based randomized trial. *J Hypertens* 2013;31:201–7.
40 Nanyonga RC, Spies LA, Nakaggwa F. The effectiveness of nurse-led group interventions on hypertension Lifestyle management: A mixed method study. *J Nurs Scholarsh* 2022;54:286–95.
41 Ayogu EE, Yahaya RI, Isah A, *et al*. Effectiveness of a pharmacist-led educational intervention on health outcomes in hypertension management at community pharmacies in Nigeria: A two-arm parallel single-blind randomized controlled trial. *Br J Clin Pharmacol* 2023;89:649–59.
42 Bolarinwa OA, Juni MH, Nor Afiah MZ, *et al*. Mid-term impact of home-based follow-up care on health-related quality of life of hypertensive patients at a teaching hospital in Ilorin, Nigeria. *Niger J Clin Pract* 2019;22:69–78.
43 Labhardt ND, Balo J, Ndam M, *et al*. Improved retention rates with low-cost interventions in hypertension and diabetes management in a rural African environment of nurse-led care: a cluster-randomised trial. *Tropical Med Int Health* 2011;16:1276–84.
44 Hickey MD, Owaraganise A, Sang N, *et al*. Effect of a one-time financial incentive on linkage to chronic hypertension care in Kenya and Uganda: A randomized controlled trial. *PLoS ONE* 2022;17:e0277312.
45 Goudge J, Chirwa T, Eldridge S, *et al*. Can lay health workers support the management of hypertension? findings of a cluster randomised trial in South Africa. *BMJ Glob Health* 2018;3:e000577.
46 Vedanthan R, Kamano JH, Chrysanthopoulou SA, *et al*. Group medical visits and Microfinancial intervention for patients with diabetes or hypertension in Kenya. *J Am Coll Cardiol* 2021;77:2007–18.
47 Sarfo F, Treiber F, Gebregziabher M, *et al*. PINGS (phone-based intervention under nurse guidance after stroke) interim results of a pilot randomized controlled trial. *Stroke* 2018;49:236–9.
48 Ogedegbe G, Plange-Rhule J, Gyamfi J, *et al*. Health insurance coverage with or without a nurse-led task shifting strategy for hypertension control: A pragmatic cluster randomized trial in Ghana. *PLoS Med* 2018;15:e1002561.
49 Aguwa CN, Ukwe CV, Ekwunife OI. Effect of pharmaceutical care programme on blood pressure and quality of life in a Nigerian Pharmacy. *Pharm World Sci* 2008;30:107–10.
50 Manavalan P, Madut DB, Wanda L, *et al*. A community health worker delivered intervention to address hypertension among adults engaged in HIV care in northern Tanzania: outcomes from a pilot feasibility study. *J of Clinical Hypertension* 2022;24:1095–104.
51 Erhun WO, Agbani EO, Bolaji EE. Positive benefits of a pharmacist-managed hypertension clinic in Nigeria. *Public Health* 2005;119:792–8.
52 Marfo AFA, Owusu-Daaku FT. Exploring the extended role of the community pharmacist in improving blood pressure control among hypertensive patients in a developing setting. *J Pharm Policy Pract* 2017;10:39.
53 Oparah AC, Adje DU, Enato EFO. Outcomes of pharmaceutical care intervention to hypertensive patients in a Nigerian community Pharmacy. *Int J Pharm Pract* 2010;14:115–22.
54 Adler AJ, Laar A, Prieto-Merino D, *et al*. Can a nurse-led community-based model of hypertension care improve hypertension control in Ghana? results from the Comhip cohort study. *BMJ Open* 2019;9:e026799.
55 Owolabi MO, Akinyemi RO, Gebregziabher M, *et al*. Randomized controlled trial of a Multipronged intervention to improve blood pressure control among stroke survivors in Nigeria. *Int J Stroke* 2014;9:1109–16.
56 Sharp A, Riches N, Mims A, *et al*. Decentralising NCD management in rural Southern Africa: evaluation of a pilot implementation study. *BMC Public Health* 2020;20:44.
57 Muddu M, Semitala FC, Kimera I, *et al*. Improved hypertension control at six months using an adapted WHO HEARTS-based implementation strategy at a large urban HIV clinic in Uganda. *BMC Health Serv Res* 2022;22:699.
58 Mash RJ, Rhode H, Zwarenstein M, *et al*. Effectiveness of a group diabetes education programme in under-served communities in South Africa: a pragmatic cluster randomized controlled trial. *Diabet Med* 2014;31:987–93.
59 Pastakia SD, Manyara SM, Vedanthan R, *et al*. Impact of bridging income generation with group integrated care (BIGPIC) on hypertension and diabetes in rural Western Kenya. *J Gen Intern Med* 2017;32:540–8.
60 Muchiri JW, Gericke GJ, Rheeder P. Effect of a nutrition education programme on clinical status and dietary Behaviours of adults with type 2 diabetes in a resource-limited setting in South Africa: A randomised controlled trial. *Public Health Nutr* 2016;19:142–55.
61 Vedanthan R, Kamano JH, DeLong AK, *et al*. Community health workers improve linkage to hypertension care in Western Kenya. *J Am Coll Cardiol* 2019;74:1897–906.
62 Otieno HA, Miezah C, Yonga G, *et al*. Improved blood pressure control via a novel chronic disease management model of care in sub-Saharan Africa: real-world program implementation results. *J of Clinical Hypertension* 2021;23:785–92.
63 Ojji DB, Baldridge AS, Orji AI, *et al*. Feasibility and effect of community health worker support and home monitoring for blood pressure control in Nigeria: A randomised pilot trial. *Cardiovasc J Afr* 2020;31:213–5.
64 Morisky DE, Ang A, Krousel-Wood M, *et al*. Predictive validity of a medication adherence measure in an outpatient setting. *J of Clinical Hypertension* 2008;10:348–54.
65 Vedanthan R, Kumar A, Kamano JH, *et al*. Effect of nurse-based management of hypertension in rural Western Kenya. *Glob Heart* 2020;15:77.
66 Turnbull F, Neal B, Algert C, *et al*. Effects of different blood-pressure-lowering regimens on major cardiovascular events: results of prospectively-designed Overviews of randomised trials. *Lancet* 2003;362:1527–35.
67 Mwai GW, Mburu G, Torpey K, *et al*. Role and outcomes of community health workers in HIV care in sub-Saharan Africa: a systematic review. *J Int AIDS Soc* 2013;16:18586.
68 Community Preventive Services. Heart disease & stroke prevention: team-based care | The Community Guide, Available: https://www.thecommunityguide.org/findings/heart-disease-stroke-prevention-team-based-care-improve-blood-pressure-control.html
69 Stoutenberg M, Crouch SH, McNulty LK, *et al*. Acceptability and feasibility of home-based hypertension and physical activity screening by community health workers in an under-Resourced community in South Africa. *Z Gesundh Wiss* 2023;1–12.
70 Seneviratne S, Desloge A, Haregu T, *et al*. Characteristics and outcomes of community health worker training to improve the prevention and control of Cardiometabolic diseases in low and middle-income countries: A systematic review. *Inquiry* 2022;59:00469580221112834.
71 Ogedegbe G, Gyamfi J, Plange-Rhule J, *et al*. Task shifting interventions for cardiovascular risk reduction in low-income and middle-income countries: A systematic review of randomised controlled trials. *BMJ Open* 2014;4.
72 Hinneh T, Osei Baah F, Amoako E, *et al*. Towards advancement of nursing in Ghana: the role of the Ghanaian-Diaspora nursing alliance (G-DNA). *Nurs Open* 2023;10:7450–3.
73 Xia T, Zhao F, Nianogo RA. Interventions in hypertension: systematic review and meta-analysis of natural and quasi-experiments. *Clin Hypertens* 2022;28:13.
74 Cheema E, Sutcliffe P, Singer DRJ. The impact of interventions by pharmacists in community pharmacies on control of hypertension: A systematic review and meta-analysis of randomized controlled trials. *Br J Clin Pharmacol* 2014;78:1238–47.