Federal Ministry of Health

Guidelines for Prevention and Management of Hypertension in Nigeria 2023-2028

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PREFACE

Globally, hypertension is a leading cause of premature deaths. It is commonly referred to as a “silent killer” because most people with this condition are unaware that they have it, as they may not have prominent warning signs or symptoms before complication sets in. According to WHO data, over 1.4 billion people globally have hypertension, translating to about one in three adults living with hypertension. Of these numbers, about two-thirds live in the low-and middle-income countries, including Nigeria.

Uncontrolled blood pressure is one of the main risk factors for CVD and is estimated to be responsible for more than 10 million deaths per year, more than all infectious diseases combined. Unfortunately, only about one in five people with hypertension have their blood pressure controlled. Improving blood pressure control will save lives by preventing fatal heart attacks and strokes, and improve productivity by reducing the number of people who are disabled by CVDs and are unable to work.

In stemming this tide, the Federal Ministry of Health, in collaboration with the National Primary Healthcare Development Agency, World Health Organization, and the Resolve to Save Lives, is implementing the National Hypertension Control Initiative (NHCI) Project in Primary Healthcare Facilities in Nigeria. Within the NHCI Project, the hypertension treatment protocol was developed as a quick win for implementation at the PHC facilities.

The guideline for the prevention and management of hypertension was therefore developed to provide a more detailed evidence-based approach for the prevention and management of hypertension across all the healthcare facilities in Nigeria. In addition, this national guideline would enable sustainable blood pressure control, including methods for diagnosing and effectively treating hypertension and care for hypertensive patients.

We hope and desire that this document will guide health providers in preventing, controlling, and managing hypertension in all our healthcare facilities across the country.

Dr. Chukwuma Anyaike
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ACKNOWLEGEMENT

The non-communicable disease (NCDs) division appreciates all stakeholders at the local, state and federal government as well as partners, civil society networks, professional associations and the private sectors whose enormous contribution and participation have provided abundant insight to the development of the National Guidelines for Prevention and Management of Hypertension in Nigeria 2023-2028.

I wish to sincerely acknowledge the visionary leadership of the Top Management Committee (TMC) of the Federal Ministry of Health led by the Honourable Minister of Health, Prof. Muhammad Ali Pate, CON. I also wish to sincerely appreciate the Permanente Secretary, Daju, Kachollom S. mni and the Director of Public Health Dr Chukwuma Anyaike for their guidance and leadership. Our gratitude equally goes to the Directors and Program managers within the Federal Ministry of Health and other line Ministries, Civil Society Organizations (CSOs) for their commitment and dedication to ensure this guidelines is actualized.

In a special way, I want to recognize and commend the effort of WHO, Nigeria Heart Foundation, Resolve to save lives (RSTL) and all other Stakeholders in Nigeria for sharing their wealth of experience and contributing to the development of this very important document. The technical and financial support by Resolve to save Lives (RSTL) in the development of this document is worthy of mention. Not forgetting the immense technical contribution of the National Hypertension Steering Committee comprising representative of all stakeholders including but not limited to members of the State Cardiovascular health (CVH) branches, Federal Ministry of Health, National Primary Health Care Development Agency (NPHCDA) and other Line Ministries, Civil Society and the association of public health physician of Nigeria (APHPN). I sincerely appreciate the efforts of the Expert committee team led by Professor Augustine Orji for coordinating and harmonizing all the efforts that went into this National guidelines development.

My commendations go to the Hon. Commissioners of Health and the NCD State Coordinators of the 36 states and FCT, especially those from Kano and Ogun States for providing the state levels reports and all the useful inputs into this national guideline.

I also want to acknowledge the resilience, commitment and dedication of our staff especially from the Cardiovascular Disease branch (CVD) of the NCD division.

Finally, my ultimate gratitude goes to Almighty God for giving us life and for his plan of wellbeing and good life for all his children.

Dr. Deborah Bako Odoh
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FOREWORD

Hypertension is the number one cause of mortality and morbidity: Cardiovascular diseases (CVDs), including heart attacks and stroke, are the most common cause of mortality and morbidity worldwide and are responsible for one-tenth of all deaths in Nigeria. Hypertension prevention and management occur at all levels of health care in Nigeria, including the public and private sectors. Hypertension is diagnosed when a person's systolic blood pressure (SBP) in the office or clinic is ≥140 mm Hg and their diastolic blood pressure (DBP) is ≥ 90 mm Hg following a repeated examination on two different days.

According to the World Health Organization (WHO), about 1.13 billion people have hypertension globally. WHO report also shows that about two-thirds of these individuals live in low- and middle-income countries, and unfortunately, less than 1 in 5 persons have controlled hypertension. In Nigeria, the only national survey on NCDs conducted in 1991 estimated the prevalence of hypertension to be 11.2%. However, the WHO 2018 NCD country profile estimated that mortality from cardiovascular diseases is 11%, while the prevalence of raised blood pressure among adults aged 18 and above is 18%. There have been several studies on the prevalence of NCDs, including hypertension, in the country. A recent systematic review of the major NCDs and risk factors in Nigeria reported a prevalence of 27.6% for hypertensive heart diseases. In comparison, another recent study carried out in one state in each of the six geopolitical zones in the country reported a prevalence of 38.1%.

A systematic review and meta-analysis of hypertension prevalence studies conducted in Nigeria showed that the overall hypertension prevalence is 28.9%, with urban and rural prevalence being 30.6% and 26.4%, respectively. It was estimated that in 2010, there were about 20 million cases of hypertension in Nigeria in adults > 20 years, and there is a projection that this will increase to 39.1 million cases by 2030 within the same age group. Sadly, the overall awareness rate of raised blood pressure among hypertension cases is low, estimated at 17.4%.

To ensure coordinated efforts towards tackling the hypertension epidemic, the Federal Ministry of Health (FMOH), in collaboration with stakeholders, developed the Guideline for the Prevention and Management of Hypertension in Nigeria. This document was to inform evidence-based interventions to assist practitioners and patients in making decisions about appropriate health care for specific circumstances concerning hypertension prevention and management in Nigeria.

Furthermore, developing this guideline shows the Nigerian government's continuous efforts and commitment to reducing the burden of hypertension in Nigeria. It offers recommendations to clinicians and non-physician health workers alike on different aspects of hypertension care, and it is for use across all healthcare facilities nationwide. This national guideline will provide uniformity of care for caregivers and ensure long-term blood pressure control in hypertensive patients.

I, therefore, recommend this document as the national guideline to be used by all healthcare practitioners and facilities in Nigeria and ensure strict adherence to it in the prevention, control, and management of hypertension in Nigeria.

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ACRONYMS AND ABBREVIATIONS

ACEi	angiotensin Converting Enzyme inhibitor
ADR	Adverse Drug Reaction
ARB	angiotensin receptor blocker
BP	blood pressure
CCB	calcium channel blocker
CHEW	community health extension worker
CLHW	community lay health worker
DBP	diastolic blood pressure
ECG	electrocardiogram
FMOH	Federal Ministry of Health
HIV	Human Immuno-Deficiency Virus
HMOD	hypertension mediated organ damage
JCHEW	Junior community health extension worker
MUCH	masked uncontrolled hypertension
NCD	non communicable diseases
NHS	Nigerian Hypertension Society
NSAIDs	non-steroidal ant-inflammatory drugs
PHCDA	Primary Health Care Development Agency
PICO	population, intervention, comparison and outcome
REMAH	REmoving the MASk on Hpertension
SBP	systolic blood pressure
SMOH	State Ministry of Health
STEPs	STEPwise approach to surveillance
WHO	World Health Organization

EXECUTIVE SUMMARY/KEY RECOMMENDATIONS

Executive Summary/ Key Recommendation

Non communicable disease (NCDs) are the leading cause of mortality globally, causing more deaths than all other causes combined. In Nigeria, Hypertension is the commonest NCDs posing a major public health challenge in recent times. Hypertension has been ranked consistently as the leading risk factor contributing to the global disease burden. The National guidelines for the prevention and management of Hypertension in Nigeria 2023-2028 is a strategic guide for the National response to Hypertension for the next 5 years. In addition, development partners and stakeholders will use this document to align their priorities and supporting the country in Hypertension control and management efforts.

With the "end user" in mind, this guideline contains the minimum standard of care necessary to equip the health care professionals and patients with all aspect of Hypertension prevention, treatment and care. In order to address human resources for health gaps concerns and implementation in the primary health care, the guidelines incorporates task sharing/shifting polices in Hypertension management in Nigeria. This guideline offers recommendations to clinicians and non-physician health workers alike on different aspects of hypertension and it is for use across all levels of health care delivery in Nigeria. Furthermore, its consider implementation strategies and data collection tools for monitoring of hypertension management and control in the country.

The National guidelines for the prevention and management of Hypertension in Nigeria 2023-2028 aims to provide the most current and relevant evidence guidance adopted from the previous Nigeria Hypertension Society Guidelines 2020, WHO Guidelines for the pharmacological treatment of Hypertension in Adults, the International Society of Hypertension global practice guidelines and the WHO HEARTS technical packages of cardiovascular disease management in Primary Health Care.

Guidelines development methodology: The development of this guidelines was led and coordinated by the NCD division of the FMOH. A wide range of relevant stakeholders from Health, Non-health MDAs and non-governmental organization /civil society organization (NGOs/CSOs) participated and contributed to the development of this document. A Core Team of Guideline Development Committee constituted from relevant MDAs and sector met to determine the scope and PICO (population, intervention, comparison, and outcome) questions for the guideline. Attention was paid to hypertension management in specific settings within the Nigerian context including pregnancy, HIV/AIDs, Chronic Kidney Disease (CKD), Covid-19 and stroke. The core team also identified other areas of controversy in previous guidelines to guide appropriate review that will inform evidence-based recommendations. Following this, a preliminary scoping review and discussion between the core team held where the methodology, PICO questions were developed. Concerted efforts were made to include local data wherever it is available. The development of the National hypertension guidelines was an output of a highly participatory and consultative process involving a wide cross-section of stakeholders, including policymakers, federal and state government officials, technical experts from the academia and other sectors, representatives of the National Non Communicable disease (NCDs) Technical Working Group,

representatives of Civil Society, and other interest groups), as well as bilateral and multilateral development partners. Among others, the process included a review of the trends of Hypertension in Nigeria, previous national response efforts and results, the existing hypertension polices, and current developments in the global hypertension landscape.

Recommendation for prevention and management of hypertension: The document offers recommendations to clinicians and non-physicians health workers on the specific and general principles of management, prevention and pharmacological management of Hypertension. A holistic approach embodied in this recommendation are backed by evidence and in line with international society of hypertension global practice guidelines, WHO guidelines for pharmacological treatment of hypertension, WHO technical package for cardiovascular disease management and the Nigeria Society for hypertension guidelines. The general principle for hypertension management includes lifestyle medication with antihypertensive medication, regular physical activity, reduction of alcohol consumption, reduction of salt consumption (<5g salt per day).

Prevention of hypertension can be achieved either by deploying targeted and/or population-based approach. The targeted approach is primarily used in health care settings and seeks to achieve a clinically important reduction in BP for individuals at the upper end of the BP. Population-based approach is applied to the entire population and it is aimed to achieve a smaller reduction in BP thereby resulting in a downward shift in BP distribution of the entire population. Population-based approach include: widespread education on hypertension, provision of physical infrastructure that promotes physical activity, alcohol and tobacco policy, food policy that regulates sugar sweetened beverages, salt content and food labelling. Such preventive measures need multi-sectoral involvement and strong political will by governments at all levels. Community outreaches and screening activities in markets, barbers shops and places of worship enable increased awareness of hypertension and education of the general public on prevention strategies.

Pharmacological and drug therapy for the management of hypertension is based on a nationally approved hypertension treatment protocol & simple algorithm with a threshold for initiation of pharmacological therapy. The simple treatment algorithm applies to all patients and recommended especially in the context of treatment by non-physician health worker. The threshold for the initiation of pharmacological treatment include a conformed diagnosis of hypertension with systolic blood pressure (SBP) of > 140 MMHG or diastolic blood pressure (DBP) >90MMHG. Individuals with existing cardiovascular disease or high cardiovascular risk, DM, CKD, SBP of 130-139mmhh is considered for initiation. Five (5) classes of drugs namely Calcium channel blockers (CCBs), Beta blockers, Diuretics, Angiotensin converting enzyme inhibitors (ACEIs) and Angiotensin receptors blockers (ARBs) are broadly used for pharmacological treatment of hypertension. The key recommendations for hypertension management in special setting include;

1. For Resistant Hypertension: Treatment approach should include evaluation and use of spironolactone and Eplerenone, followed with high dose of thiazide diuretics. Centrally acting alpha-methyl Dopa and direct acting vasodilators may be added to treatment. All patients suspected to have resistant hypertension should be referred to a hypertension specialist.

2. For Masked Hypertension: Approach should include evaluation for masked hypertension using ABPM or HBPM in individuals whose office BP are high normal and/or have DM, HMOD such as CKD. Up titrating treatment and night-time dosing regimen should be considered.
3. White-Coat Hypertension: Management Approach include implementing Lifestyle changes aimed at reducing CV risk and periodic out-of-office BP monitoring, whilst routine drug treatment should be considered in high-risk patients or those with HMOD
4. Secondary hypertension: Management approach should include Investigating for secondary hypertension in individuals < 30 years, treat any identified underlying cause and administer antihypertensive medications accordingly
5. Hypertension in pregnancy: In hypertensive crisis situations, IV labetalol and magnesium sulphate should be used. Other Medications options include Labetalol, alpha-methyldopa, nifedipine, and hydralazine. ACEIs, ARBs, direct renin inhibitors and diuretics are contraindicated in pregnancy.
6. Hypertension in Chronic Kidney Disease (CKD): Initiate Hypertension treatment with an ACEI or ARB combined with either CCB or diuretic with loop diuretic being preferred against thiazide diuretics if GFR <30ml/min. Consider HBPM or ABPM in all patients at presentation and at least once yearly. The target BP should be < 130/80mmHg
7. Hypertension in HIV : Dose adjustments if a patient is on protease inhibitors and non-nucleoside reverse transcriptase inhibitors due to drug-drug interaction
8. Hypertension in COVID-19: Continue antihypertensive medications including ARBs/ACEIs if a patient was on the medications before COVID-19 infection, Use of tele-monitoring of BP and extended follow-up time can be considered where possible to reduce crowding
9. Hypertension in Sickle Cell Disease : CCB, ARBs/ACEIs are preferred medication of choice
10. Hypertensive Urgency/Emergency: In urgency, oral anti-hypertensive are recommended with the aim of lowering the BP to target level in 24-48 hours, In hypertensive emergencies, intravenous medications such as labetalol, hydralazines are recommended with the aim of reduction in BP within minutes to hours.
11. Hypertension in stroke patients: In ischemic stroke, acute lowering of BP is not indicated except if there is plan for thrombolysis. If BP is > 220/150 mm Hg, a 15% reduction over 24 hours is recommended. In hemorrhagic stroke, acute lowering of raised BP is recommended to the target level of below 140/90 mmHg. After a stroke, antihypertensive medication for secondary prevention should commence 10 days following the event.
12. Hypertension in Peri-operative Conditions: In low-risk patients with controlled BP, surgeries can be done without recourse to extensive cardiovascular evaluation. In high-risk patients, further CV evaluation with ECG and echocardiography must precede surgery. On the day of surgery, antihypertensive can be taken with a sip of worker, not less than two hours before procedure.

These recommendations for the management of hypertension are documented in the chapter 5 of this National hypertension management guidelines.

CHAPTER ONE: INTRODUCTION, OBJECTIVES AND SCOPE

1.1. Introduction

Over the past decade, hypertension has been ranked consistently as a leading risk factor contributing to the global disease burden[1-4]. In 2019, it was responsible for about 10.8 million deaths globally[4]. In Nigeria, it is the commonest non-communicable disease and has posed a major public health challenge in recent times. Prevention and management of hypertension take place at all levels of health care in Nigeria, including public and private sectors.

To ensure coordinated efforts towards tackling the hypertension epidemic, a guideline containing the minimum standard of care is necessary to equip health care professionals and patients with all aspects of hypertension care. Guidelines in Healthcare Practice[5] are defined as systematically developed statements to assist practitioners and patients make decisions about appropriate health care for specific circumstances. They help decision-makers make better decisions with a view to proffering better solutions to achieving the best outcomes possible, whether individually or collectively. It is essential that both development and implementation strategies are clearly focused on the "end user".

Previous hypertension guidelines in Nigeria have been issued by the Nigerian Hypertension Society, first in 1996, revised in 2005[6] and more recently in 2020[7]. These guidelines were developed by clinicians with minimal input from non-physician health workers and other relevant stakeholders. With the growing interest in deploying task-sharing and task-shifting policies in hypertension management in Nigeria, there is a need to develop a guideline that will garner inputs from a wide range of end users. Furthermore, for effective monitoring of hypertension management and control in the country, the current guideline incorporated implementation strategies and data collection tools which had not featured in previous ones.

1.2. Objective and scope of the guideline:

1.3. The guideline for prevention and management of hypertension in Nigeria aims to provide the most current and relevant evidence-based guidance adapted from the previous Nigerian Hypertension Society Guidelines,[6,7] WHO Guideline for the Pharmacological Treatment of Hypertension in Adults[8], the International Society of Hypertension Global Practice Guideline [9] and the WHO HEARTS technical package. This guideline offers recommendations to clinicians and non-physician health workers alike on different aspects of hypertension and it is for use across all levels

of health care delivery in Nigeria. It also incorporates relevant elements of the WHO HEARTS[10] the technical package of cardiovascular disease management in Primary Health Care

1.4. Method for developing the guideline

A Core Team of Guideline Development Committee met to determine the scope and PICO (population, intervention, comparison, and outcome) questions for the guideline. Attention was paid to priority areas in the Nigerian context including pregnancy and HIV. The core team also identified other areas of controversy in previous guidelines to guide appropriate review that will inform evidence-based recommendations. Following this, and a preliminary scoping review and discussion between the core team and methodology, PICO questions were developed. Concerted efforts were made to include local data wherever it is available.

The development of the National hypertension guidelines was an output of a highly participatory and consultative process involving a wide cross-section of stakeholders, including policymakers, federal and state government officials, technical experts from the academia and other sectors, representatives of the National Non Communicable disease (NCDs) Technical Working Group, representatives of Civil Society, and other interest groups), as well as bilateral and multilateral development partners. Among others, the process included a review of the trends of Hypertension in Nigeria, previous national response efforts and results, the existing hypertension polices, and current developments in the global hypertension landscape.

CHAPTER TWO:
EPIDEMIOLOGY, DEFINITION AND CLASSIFICATION OF HYPERTENSION

2.1. Epidemiology

The first report on the national prevalence of hypertension was based on the 1990 Non-communicable Disease (NCD) Survey[11] organized by the Federal Ministry of Health (FMOH). The survey which evaluated NCDs including diabetes, hypertension and sickle cell anaemia included 16, 019 participants drawn from selected local government areas in 13 states of the federation. Hypertension was defined as a systolic blood pressure (SBP) of 160 mmHg and above, and or a diastolic pressure (DBP) equal to or greater than 95 mm Hg or a blood pressure below this figure in individuals who were on treatment. Overall crude prevalence was 11.2%, 11.1% in men and 11.2% in women. Hypertension was more prevalent in urban than the rural communities with crude rates of 14.7 and 9.8% respectively. In that report, the country was divided into three geographic zones viz semi-desert, Savannah and Forest zones. The crude hypertension prevalence in these populations was Semi-desert 11.5%, Savanah 6.8% and Forest 14.6% for men and Semi-desert 12.3% Savannah 6.1% and Forest 11.6% for women.

Years after the 1990 survey, smaller regional surveys were conducted at different parts of the country and have been summarized in the past decade in different meta-analysis/systematic reviews[12-14] thus updating this earlier nationwide survey. In 2002 the World Health Organization introduced the STEPwise approach to surveillance (STEPS) having recognized a global need for risk-factor data on key NCDs of which hypertension is the major component, and encouraged member nations to conduct nationwide survey using this methodology. A nationwide survey using the WHO STEPs survey was part of Removing the MAsk on Hypertension (REMAH) study [15] which was conducted in 2017. REMAH included 4192 participants drawn from the 6 states of the federation (each state representing each of the six geopolitical zones of the country). The diagnostic threshold of hypertension was 140/90 mmHg. The overall age standardized prevalence of hypertension was 38.1%, 39.2% in urban and 37.5% in rural areas. In terms of the geo-political region, the South-east region had the highest prevalence rate of 52.8% while the North-central region had the lowest rate of 20.9%. According to the report, about 62% of hypertensive Nigerians was aware of their status, 33% of them were receiving treatment out of which only about 13% had controlled blood pressure.

2.2. Definition

Hypertension should be diagnosed when a person's systolic blood pressure (SBP) in the office or clinic is ≥140 mm Hg and/or their diastolic blood pressure (DBP) is ≥ 90 mm Hg following repeated examination on two different days.

2.3. Classification of Hypertension

a. Based on level of office BP

Category	SBP (mmHg)	DBP (mmHg)
Optimal	<120	<80
Normal	<130	<85
High normal	130-139	80-89
Grade 1	140-159	90-99
Grade 2	160-179	100-109
Grade 3	≥180	≥110
Isolated Systolic Hypertension	≥140	<90

b. According to office, ambulatory and home blood pressure levels.

Category	SBP (mmHg)	DBP (mmHg)
Office/Clinic	≥140	≥90
Ambulatory		
Night-time (mean)	≥120	≥70
24-hour mean	≥130	≥80
Day-time mean	≥135	≥85
Home BP mean	≥135	≥85

CHAPTER THREE:
MEASUREMENT OF BLOOD PRESSURE

3.1. Clinic/Office Measurement

Blood pressure should be measured in the clinic using either the auscultatory or the semi-automated oscillometric method. It is important to ensure that the devices used are validated according to standardized protocols.[16] Validation status of instruments can be checked on this website: www.stridebp.org.

3.1.1. Optimal conditions necessary for accurate BP measurement

- The subject should rest for at least five minutes before measurement of blood pressure. The rest period should be used by the health worker for greetings, exchange of pleasantries and discussion of events that may likely be of pleasurable interest to the subject other than the subject of hypertension.
- The subject should not have smoked cigarette or ingested caffeine in the preceding 30minutes before the measurement.
- The urinary bladder should be emptied
- The subject should be seated on a comfortable chair with a back rest, the feet on the floor, arm supported at the heart level and should desist from talking
- At the first encounter, BP should be measured in both arms and the arm with the highest measurement should be used for subsequent measurements
- The circumference of the arm should be noted and an appropriately sized cuff chosen accordingly. The bladder should cover at least two thirds of the circumference of the arm (see table below for the sizes of cuff)

Mid Arm Circumference (cm)	Bladder size
<22	9x8
22-26	12x22
27-34	16x30
35-44	16x36
>44	16x42

3.1.2. Auscultatory Approach:

- The cuff is inflated until the observer cannot palpate the radial pulse and the level of BP is noted
- The cuff is then inflated rapidly 20mmHg above the level at which the radial pulse was occluded
- The stethoscope is placed at the cubital fossa and the cuff is slowly deflated at the rate of 2mm/sec
- The first appearance of repeated sounds (phase 1 Korotkoff sound) and the disappearance of the sounds (phase V Korotkoff sound) are regarded as the systolic and diastolic blood pressure respectively.
- In hyper dynamic states such as pregnancy, aortic regurgitation and thyrotoxicosis, the sounds may not disappear and the point of muffling (Phase IV) and phase V should be documented.

The auscultatory method is the most common blood pressure measurement technique deployed for research and clinical purposes in Nigeria. However, it may be prone to errors such as zero end digit preference, number preference and misinterpretation of Korotkoff sounds. These errors are minimized by training and re-training of observers both in clinic settings and for research purposes.[17-19]

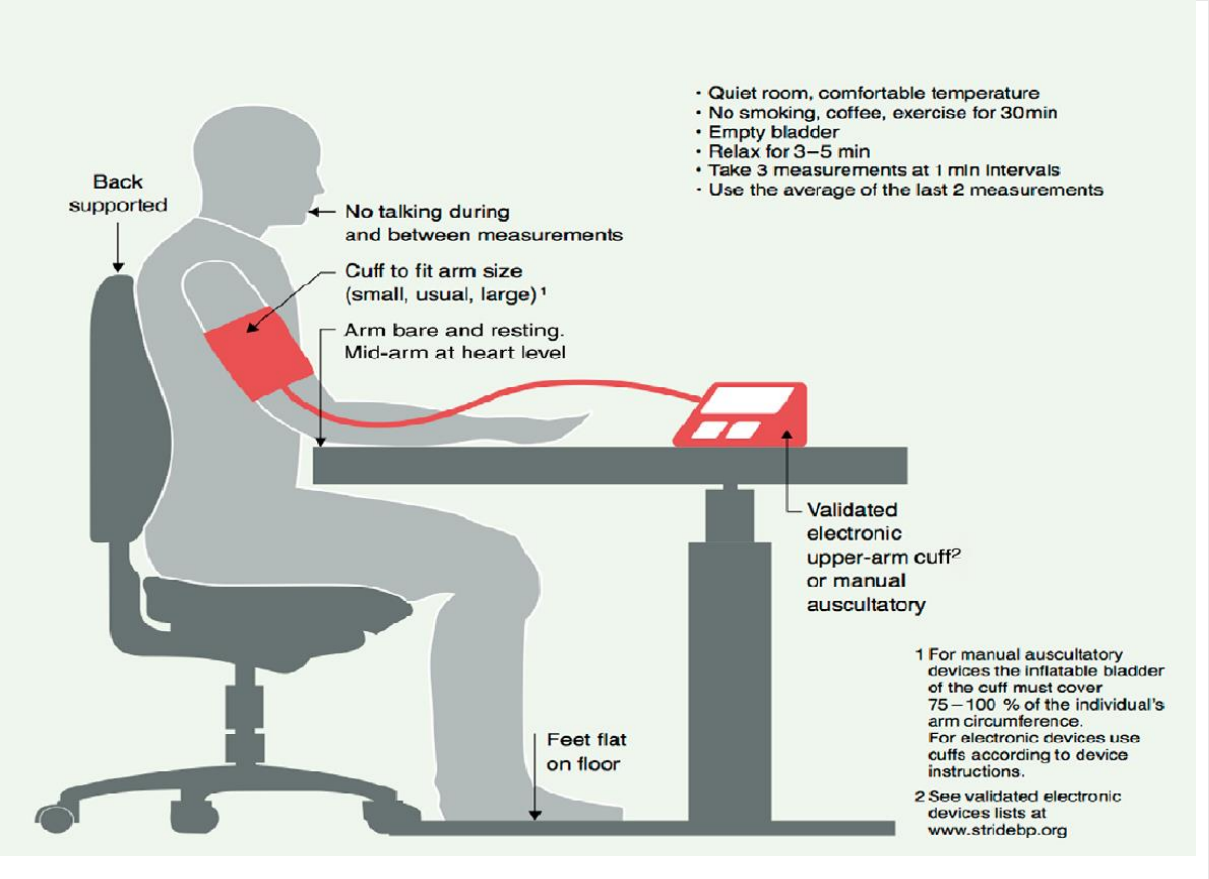
3.2. Out-of-Office Blood Pressure Measurement:

This includes the use of Home Blood Pressure Monitoring (HBPM) or Ambulatory Blood pressure monitoring (ABPM). ABPM should be done over a twenty-four-hour period. Both ABPM and HBPM give more readings than office (clinic) measurement, are more reproducible and have been found to be more predictive of cardiovascular morbidity and mortality[20] including the hypertension mediated organ damage than office BP readings. Patient self-monitoring of BP has been found to increase adherence and improve control of hypertension.[21,22]

Indications for Out-of-Office Blood Pressure Monitoring

- Suspicion of White-Coat Hypertension
    - Marked office BP elevation without any hypertension mediated organ damage
    - Grade 1 hypertension on office BP measurement
- Suspicion of Masked Hypertension
    - High normal office blood pressure
    - Normal office BP in individuals with hypertension mediated organ damage or high total cardiovascular risk
- Evaluation of Resistant Hypertension

- Evaluation of BP control
- High variability of office measurement
- Evaluating suspected symptoms of postural hypotension in treated patients.



How to measure blood pressure. Adapted from Unger et al [9]

3.3. Diagnosis of Hypertension:

Hypertension is diagnosed if, when it is measured in the office or clinic on two different days at least two weeks apart, the SBP readings on both days are ≥140 mmHg and/or the DBP readings on both days are ≥90 mmHg. The diagnosis might be made on a single visit, if BP is ≥180/110 mm Hg and there is evidence of HMOD.

CHAPTER FOUR:
CLINICAL EVALAUATION

4.1. Aims of Clinical Evaluation

The aims of clinical evaluation of hypertension are:

1. Establish the diagnosis and grade of hypertension
2. Identify possible secondary causes
3. Screen for lifestyle factors that may be exacerbating the condition
4. Screen for additional cardiovascular risk factors
5. Identify any hypertension-mediated organ damage

Clinical evaluation will follow the traditional pattern of history, physical examination, laboratory investigations.

Medical History: Important aspects of medical history include:

- Time the patient was first diagnosed hypertensive, including record of past and current BP readings
- Past antihypertensive medications
- Family history of hypertension, stroke and renal disease.
- Evaluation of lifestyle including physical exercise, cigarette smoking, use of alcohol and recreational drugs.
- For women, history of past pregnancies, use of contraceptive pills and menopause
- Medication history with particular reference to medicines that may increase blood pressure.

Physical examination: Key steps in physical examination

- Weight and height measured without the shoes and headgear using calibrated weighing scale The BMI is calculated as Weight/Height^2
- Waist circumference: The waist circumference is measured with a non-expansible tape without clothing or light clothing, in between the lower coastal margin and the iliac crest with the arm relaxed by the side.
- Palpation of radial arteries to ascertain thickening of the vessels as well as palpation of other peripheral arteries
- Measurement of BP on both arms (at least at the first evaluation of patient)
- Examination of the precordium: Examine for displaced apex and auscultation of the heart for added sounds
- Fundoscopy
- Examination targeted at identifying secondary hypertension
    - Palpate for kidney enlargement in suspected polycystic kidney disease

- Auscultation for renal bruits in Reno vascular hypertension
- Cushinoid facies (Cushing syndrome) coarse facies (acromegaly)

Red Flags for secondary hypertension

- Age of onset <30 years
- Severe/resistant hypertension
- Acute rise in blood pressure from previously stable reading
- Significant blood pressure variability

4.2. Laboratory Investigations:

- Urine analysis: for urine protein, blood , specific gravity
- Serum electrolyte urea and creatinine: Estimated Glomerular Filtration Rate (eGFR) using any of the recommended equations e.g. CKD-EPI equation, MDRD study equation, etc.
- Fasting blood glucose and 2-hours post-prandial in those who have high risk of diabetes (e.g. first degree relatives of diabetic patients, obese patients)
- Glycated hemoglobin (HBA1c)
- Packed Cell Volume (PCV)/ haematocrit/haemoglobin
- Serum lipid profile
- Serum uric acid
- 12-lead ECG
- More detailed evaluation is dependent on clinical presentation and the presence of hypertension mediated organ damage
    - Echocardiography: In suspected cardiac remodeling
    - Carotid ultrasound: in cerebrovascular disease or vascular disease noticed elsewhere
    - Abdominal ultrasound: For determining renal sizes and scarring
    - Ankle Brachial Index: In cases of lower extremity arterial disease (LEAD)

4.3. Assessment of total cardiovascular risk

Cardiovascular risk assessment should accompany all clinical decision making in management of hypertension. Therapeutic decisions should not be made based on BP alone except in very poor settings where basic laboratory test for the risk assessment cannot be carried out. It is recommended that WHO chart (see Appendix) should be used whenever possible.

CHAPTER FIVE
MANAGEMENT OF HYPERTENSION

5.1 Evidence supporting benefit of treatment:

Large bodies of evidence23-25 derived from meta-analysis of randomized clinical trials across the globe have clearly demonstrated that reduction of blood pressure in patients with hypertension results in clear cut benefits in terms of cardiovascular (CV) outcomes. This is irrespective of the baseline blood pressure, additional comorbidity or CV risk factors, age, sex, and ethnicity. In terms of effect size, a 10-mmHg reduction in systolic blood pressure (SBP) or a 5-mmHg reduction in diastolic blood pressure (DBP) is associated with significant reductions in all-cause mortality by 10 -15%, stroke by 35%, and heart failure by 40%. Benefit in blood pressure lowering especially in stroke reduction has also been demonstrated in individuals whose blood pressure were either high normal or normal but have high cardiovascular risk.[26]

5.2: General Principles of Management:

- Cardiovascular risk assessment is desirable for all patients as treatment based on predicted risk assessment is marginally more effective than that based on BP levels alone.[27] ~~h~~ However, due to the increased costs attributable to risk assessment and unavailability of risk prediction equation derived from local data, initiation of therapy especially in low resource settings are recommended with or without risk assessment.
- Lifestyle modifications and use of anti-hypertensives~~-~~ medications are recommended for treatment either alone or in combination.
- Lifestyle measures are recommended for all grades of hypertension.
- Initial one monthly follow-up is recommended until target blood pressure is achieved and 3-6 monthly follow up afterwards.[28,29] Deployment of tele monitoring of BP may enable longer follow up intervals in both cases.[30]
- Non-physician health workers including nurses, pharmacists and community health workers who have received appropriate training can initiate antihypertensive treatment in primary health care levels where there are no physicians. In such scenarios, remote oversight by a physician using strategies such as mhealth technologies is mandatory. In higher level health care, non-physician health workers should support the physician through blood pressure measurement, education and medication delivery in a collaborative care model.
- Self-monitoring of blood pressure by patients is recommended, as evidence[31] shows that this is associated with a substantial reduction in blood pressure.

Evidence in support of self-titration of anti-hypertensive medication is minimal and therefore not recommended.

5.3. Lifestyle Modifications

Healthy lifestyle choices are important for prevention of hypertension; it reduces blood pressure in individuals who are already hypertensive and potentiates the effect of anti-hypertensive medications. Furthermore, it improves general well-being and is helpful in the control of other non-communicable diseases including cancers. Its usefulness is however limited by poor adherence over time and lack of standardization. It is recommended that lifestyle modification should be combined with anti-hypertensive medication and should only be tried alone in those with high normal BP.

5.3.1. Physical Activity:

A meta-analysis[32] of the effect of different types of exercise on blood pressure in normotensive, pre-hypertensive and hypertensive individuals lays strong evidence for the recommendation of regular physical activity for the prevention and treatment of hypertension.

Table 5.1: Blood pressure lowering effect of different types of exercise.

Exercise type	Systolic BP (mmHg)	Diastolic BP (mmHg)
Endurance dynamic	3.5	2.5
Dynamic resistance	1.8	3.2
Combined	No effect	2.2
Isometric	10.9	6.2

The blood pressure lowering effect of exercise training is greater in people with hypertension compared to those with prehypertension and normal BP. As regards the intensity and duration of this exercise, regular moderate to high intensity exercises lowers mortality when compared to low intensity exercises in cohort studies.[33]

Recommendations on Physical Activity:

At least 150 minutes of moderate physical activity (a mild increase in heart rate or breathing rate resulting from, for example, brisk walking, climbing stairs, dancing, gardening or doing household chores) spread throughout the week, or at least 75 minutes of vigorous physical activity (including vigorous gardening, running, fast cycling, fast swimming, or playing sport) spread throughout the week), or an equivalent combination of moderate and vigorous activity; muscle-strengthening activities involving major muscle groups on two or more days a week.

5.3.2. Limitation/Cessation of Alcohol.

Evidence from two small randomized controlled trials[34,35] suggest a strong positive linear relationship between BP and alcohol consumption in both normotensive[35] and individuals with hypertension.[34] The Prevention and Treatment of Hypertension Study (PATHS)[36] investigated the effects of alcohol reduction on BP. The intervention group had a modest 1.2/ 0.7 mmHg lower BP than the control group at the end of the 6-month period. To further investigate the role of alcohol in cardiovascular health, a Mendelian randomization of 56 epidemiological studies[37] involving 261, 991 individuals of European descent, concluded that individuals with a genetic variant associated with non-drinking and lower alcohol consumption had a more favorable cardiovascular profile and a reduced risk of coronary heart disease than those without the genetic variant. This study suggests that reduction of alcohol consumption, even for light to moderate drinkers, is beneficial for cardiovascular health

On the contrary, a number of observational studies[38] reported a J-shaped association between alcohol intake and a variety of cardiovascular diseases including stroke, congestive cardiac failure, dementia, Raynaud's phenomenon and all-cause mortality. It was opined that the alcohol molecule and not any other component of alcoholic drink exert positive effect through increase in HDL-C/LDL-C ratio. In line with this evidence, many guidelines[39] recommended moderation in alcohol intake in hypertensive patients without a recourse to the strength of such evidence on which the recommendation is based.

Recommendations on Alcohol Use:

- ✓ Individuals who do not drink alcohol at all should be encouraged to maintain abstinence
- ✓ For those who drink, it is recommended that they consider stopping or drink no more than two units of alcohol per day and to not drink on at least two days of the week. A unit of alcohol is equivalent to 8-10gm of pure alcohol

5.3.3. Reduction in Salt consumption

Recommendations on Salt Intake:

Total salt intake should be less than 5 g of salt per day (equivalent to approximately 1 level teaspoon) including salt added while cooking or eating, as well as salt contained in foods such as processed foods and bread.

5.3.3. Other Dietary Advice:

Other Dietary Recommendations:

✓ Vegetables: **at least 400 g (five portions) of vegetables and fruits per day.** One portion is equivalent, to a single orange, apple, mango, banana, or 3 tablespoons of cooked vegetables

✓ Sugar: **total daily energy intake from free sugars of less than 10%** equivalent to 50 g (or approximately 12 level teaspoons) for a person of healthy body weight. Free sugars are those added to foods such as cakes, cookies and sweets or drinks (for example, soda, sweetened milk, fruit juices). Free sugars are also naturally present in honey, syrups, fruit juices and fruit juice concentrates.

Fats and Oils: **a total daily energy intake from fats of less than 30%** unsaturated fats are preferable to saturated fats. Less than 10% of total energy intake should be from saturated fats. **Saturated fats** are found mainly in animal products such as meat, milk, butter, cream, cheese, ghee and lard. They can also be found in palm and coconut oil. Many saturated fats are solid, such as the fat in meat. Consuming saturated fats in unhealthy amounts can lead to raised cholesterol levels and can increase the risk of heart attack and stroke. **Trans-fats** Industrially-produced trans-fats (also called partially hydrogenated vegetable oils) are liquid vegetable oils that have been processed to make them solid at room temperature. Trans-fats are unhealthy and cause heart disease. Trans-fats are often found in processed food, fast food, snacks, fried food, frozen pizza, pies, cookies, margarines and spreads. **Unsaturated fats/oils** are generally found in plant foods such as seeds, grains, nuts, vegetables and fruits (for example, avocado) and also in fish. They can either be polyunsaturated (as in sunflower, soya, corn, and sesame oils), or monounsaturated (for example, olive and rapeseed oils). Consuming unsaturated fats/oils instead of saturated fats helps to control cholesterol levels and reduces the risk of heart attack and stroke.

✓

✓

5.4. Pharmacological Therapy

5.4.1 Choice of Medications:

Five classes of antihypertensive medications have been widely used in major clinical trials and have been found to reduce BP and improve cardiovascular outcomes in patients with hypertension. They include diuretics, calcium channel blockers (CCBs), angiotensin receptor blockers (ARBs), angiotensin converting enzyme inhibitors (ACEIs) and beta blockers. A large body of evidence [40-43] indicates that diuretics and calcium channel blockers are the most efficacious in terms of BP lowering in Black people compared to the other three groups. The main concern about the use of thiazide and thiazide-like diuretic (chlorthalidone, indapamide) is the documented side effects including hypokalemia and hyperuricaemia, dyslipidaemia and increased incidence of new onset diabetes mellitus associated with its use.[44] The long-term effect of these concerns on the cardiovascular outcomes among Africans has not been studied in randomized clinical trials. A 2004 review of the antihypertensive therapy in Black Africans[45] reported that despite the differing efficacy of blood pressure lowering among Blacks, there is no strong evidence that efficacy for reducing morbidity and mortality outcomes varies once patients achieve the BP goal. Calcium channel blockers are thus recommended as first-line monotherapy and should be used with either diuretics or ACEIs/ARBs in combination therapy if the need arises.

Beta blockers, ACEIs and ARBs are less effective in Blacks and therefore not recommended for monotherapy. Other classes of antihypertensive medications such as alpha-adrenergic blockers, direct vasodilators, and centrally acting agents should be used as second line preferably by a hypertension specialist after ensuring that the first line medications have been administered in recommended doses.

5.4.2. Key recommendations on Pharmacological Therapy

Strategy	Recommendations
Threshold for the initiation of pharmacological treatment	✓ Individuals with a confirmed diagnosis of hypertension and SBP of ≥ 140mmHg or DBP ≥ 90mmHg ✓ Individuals with existing cardiovascular disease and SBP of 130-139 mmHg ✓ Individuals without cardiovascular disease, but with high cardiovascular risk, DM or CKD, and

	SBP of 130-139 mmHg
Goal for therapy	✓ In all patients without comorbidities, the target BP should be <140/90 mmHg. ✓ For patients with hypertension and known CVD, target of 130/80 mmHg is recommended. ✓ For high-risk patients with hypertension (patients with high CV risk, DM, CKD), target is 130/80 mmHg.
Drug administration	✓ Low doses of choice medicines should be used to initiate therapy as this is known to minimize side effects. ✓ Two or more medicines from different classes should be used if BP is 20/10 mmHg above the goal. (see below) ✓ Long-acting medications as against short acting ones provide longer duration of BP lowering effect thereby reducing BP variability. ✓ Medicine from different classes works synergistically to maximize antihypertensive effect and also minimize side effects. ✓ Most patients will require two or more medications to achieve control. ✓ Combination of two or more medicines in a single pill formulation against administration of multiple pills encourages adherence and is recommended when appropriate.
Treatment Algorithm	✓ A simple treatment algorithm that applies to all patients is recommended especially in the context of treatment by non-physician health workers (Treatment protocol figure 5.1) ✓ For higher levels of care administered by physicians, other treatment algorithm applies as ✓ For monotherapy, a CCB should be used except if there is a contraindication or any compelling

	indication for the use of other medications (see table 5.1 and 5.2) ✓ If the BP is not controlled on CCB therapy, or when initial therapy requires the use of two medicines, the combination of diuretic (a fixed dose combination thiazide and amiloride) and CCB could be used, or another medicine selected from ACEI, ARB, beta-blocker, should be added to the CCB. ✓ A third medicine, from a class other than the two, should be added as required.
Recommended combinations	✓ Diuretics and beta blockers should be used with caution because of the risk of new onset DM. ✓ ARBs and ACEIs should not be administered together because of increased risk of hyperkalemia.
Time of drug administration	✓ Night time therapy is recommended [46] except for those on diuretics who may have distorted sleep from increased urinary frequency at night.
Additional therapy	✓ Antiplatelet therapy (e.g. low-dose aspirin) is recommended in patients who have had previous vascular events such as Transient ischemic attack (TIA) ischaemic stroke, ischemic heart disease and peripheral arterial disease. Aspirin should not be used in primary prevention in patients with elevated BP with no previous CVD. ✓ Low dose aspirin should only be used if indicated after the BP has been controlled. ✓ Patients with moderate to high CV risk or those with previous vascular event including TIA, stroke and ischemic heart disease should be treated with statins.

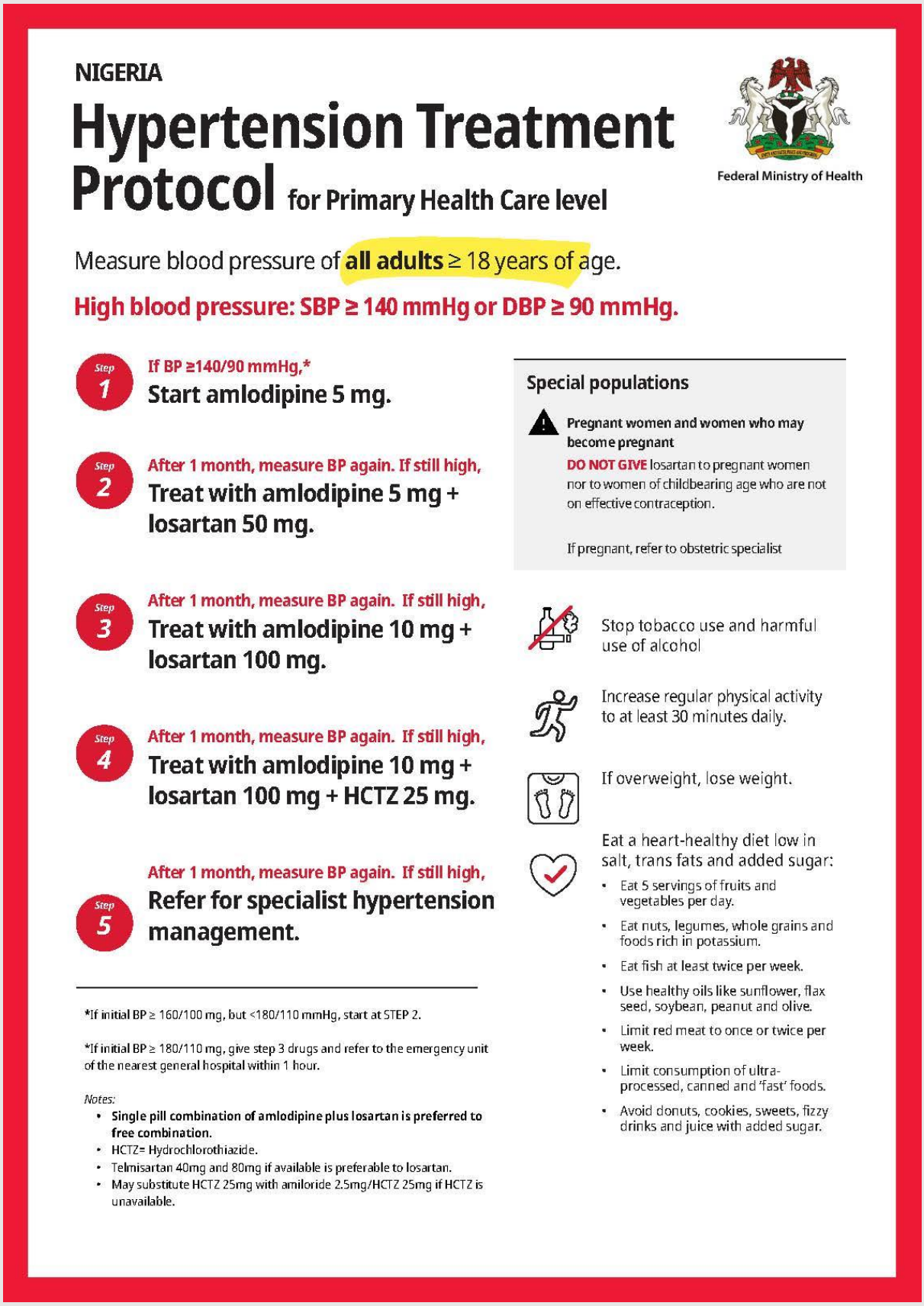


Figure 5.1: Nigerian Hypertension Treatment Protocol for Primary Healthcare

Table 5.1 Compelling indications in Special settings ((Adapted from NHS guideline 2020)[7]

Clinical condition	Medications
Left ventricular hypertrophy	ACEIs, ARBs, diuretic, β-blocker
Heart Failure	ACEIs, ARBs, β-blocker, diuretic, MRA
Ischaemic Heart Disease	β -blocker, ACEIs, ARBs
Stroke	CCB, diuretic, ACEIs.
Nephropathy	ACEIs, ARBs, diuretic
Diabetes mellitus	ACEIs, ARBs, thiazide and thiazide-like diuretic, CCB
Elderly	Diuretic, CCB
Pregnancy	∝-methyldopa, CCB (Nifedipine), labetalol, hydralazine

Table 5.2 Contraindications for Specific antihypertensive medicines (Adapted from NHS guideline 2020)[7]

Medication	Contraindication	Caution
Diuretic	Gout	Pregnancy, glucose intolerance
CCB (non-dihydopyridines)	2° and 3° heart block, heart failure,	
CCB (dihydropyridines)		Nephropathy with proteinuria, heart failure, tachyarrhythmia
β -blocker	2° and 3° heart block, reactive airway disease, severe bradycardia <50/min, peripheral vascular disease	Glucose intolerance, athletes, pregnancy, autonomic neuropathy
ACEI/ARB	Pregnancy, hyperkalemia, bilateral renal artery stenosis	Women of child bearing age, GFR (<30mls/min)
Centrally acting medicines	Active liver disease	Liver disease, erectile dysfunction, elderly, depression.

5.4.3. Pharmacovigilance

Pharmacovigilance is the science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other medicine-related problem. The ultimate goal of pharmacovigilance is to improve the safe and rational use of medicines, thereby improving patient care and public health. An adverse drug reaction (ADR) is 'a response to a drug that is noxious and unintended and occurs at doses normally used in human for the prophylaxis, diagnosis, and treatment of disease, or for modification of physiological function. Voluntary reporting or spontaneous reporting of ADR is a sure way of improving drug safety but underreporting is a major challenge in most low-and-middle income countries[47,48]. The cardiovascular medications such as anti-hypertensives contribute just about 0.03% to the number of individual case safety reports (ICSRs) received by the National Pharmacovigilance Centre between 2004-2015. However, the situation may have been underreported.[48] Hypertension being a chronic illness requires

long term therapy and as such there is increased propensity to adverse drug events.[49] Furthermore, with increasing shift towards hypertension control as a public health programme, opportunities to track ADRs should be explored.

Unlike ADRs, side effects are often related to the medicine's pharmacological properties, and may even be beneficial. Side effects of common antihypertensive medications should be discussed with the patients as this is known to increase the confidence and trust of patients in the health workers. Health workers should be trained on the pharmacovigilance system including the use of yellow form (see appendix L for reporting).

Table 5.3: Side effects of common antihypertensive medications:

Drug Class	Side effect	Recommendation
CCBs	Ankle swelling, tachycardia	Combination with ACEI or ARB
ACEIs	Dry cough, angioneurotic oedema	Withdraw drug
ARBs	Angioneurotic oedema	Withdraw drug
Beta Blockers	Bradycardia, bronchial constriction	Avoid in patients with Asthma
Thiazide diuretics	Electrolyte disturbances, increase urinary frequency, dyslipidaemia and new-onset DM	Combination with a potassium sparing diuretic, consider morning dosing if nocturia causes insomnia

5.4.4. Follow up

Following the initiation of treatment either with lifestyle measures and/or pharmacological therapy, it is recommended that follow up visit intervals should be shorter within the range of one to four weeks. If the clinic BP remains controlled at three consecutive monthly visits i.e. a visit interval of between three to six months is recommended. Evidence[29] in more developed countries show that there is no difference between three month and six months interval of follow up visits in controlled patients. Stable' patients with controlled BP can receive multi-month dispensing of anti-hypertensive medications along with visit spacing for their follow-up visits. The following criteria can be used to identify a 'stable' patient:

- Must have been on anti-hypertensive treatment for at least six months.
- Have their BP under control – **BP < 140/90mmHg** at the last two consecutive visits/measured on two occasions at least one month apart.
- Must be on current medication combination for at least three months.
- A good understanding of life-long treatment and adherence.
- Patients must generally be well, without acute illness/co-morbidity requiring intensive follow-up.
- Absence of any adverse drug reaction (ADR) and side effect that requires constant monitoring.

Getting BP controlled is the main objective of follow up visits. Ensuring adherence and self-monitoring of BP are two very important ways of getting BP to target levels.

5.4.5 Adherence

The most reliable ways of detecting adherence include measurement of drug concentration in urine and directly observed treatment followed by ABPM over subsequent hours. Although the use of questionnaires is very easy to do, it overestimates adherence. Barriers to adherence ranges from physician's attitude, patient's belief and behavior, complexity of the dosing regimen, medication availability and affordability and a range of other health system factors. Interventions found to improve adherence include those that link therapy to habits[50], self-monitoring of BP[51], motivational interviewing and use of simplified dosing formulations.

Home BP monitoring is encouraged during the follow up period as this has been noted to improve adherence to medication[53] and increase rate of control of hypertension.[54] It is recommended that patients should be trained on how to use home BP monitors, using validated instruments. To help the health worker to assess the BP control using the home BP monitors, at least 12 measurements comprising of duplicate morning and evening recording over three days preceding the clinic visit is recommended. Morning measurement should be on waking up and evening measurement before bedtime. Where feasible, inclusion of tele-monitoring of blood pressure will further reduce the number of clinic visits and may reduce unnecessary treatment of white-coat hypertension.[55]

5.5. Prevention of Hypertension

Prevention of hypertension can be achieved either by deploying targeted and/or population-based approach. The targeted approach is primarily used in health care settings and seeks to achieve a clinically important reduction in BP for individuals at the upper end of the BP. Population-based approach is applied to the entire population and it

is aimed to achieve a smaller reduction in BP thereby resulting in a downward shift in BP distribution of the entire population. The impact and cost effectiveness of population-based preventive approach is higher compared to the targeted approach. This assertion is based on the principle that a large number of people exposed to a small increased CVD risk may generate many more cases than a small number of people exposed to a large increased risk. [56]

Population-based approach include: widespread education on hypertension, provision of physical infrastructure that promotes physical activity such as trails for walking and cycling, alcohol and tobacco policy, food policy that regulates sugar sweetened beverages, salt content and food labelling. Such preventive measures need multi-sectoral involvement and strong political will by governments at all levels.

Community outreaches and screening activities in markets, barbers shops and places of worship enable increased awareness of hypertension and education of the general public on prevention strategies. Lay members of the public including opinion influencers can be trained on measurement of BP and basic hypertension preventive measures. These individuals in turn, will become peer educators thereby complementing the efforts of health workers in their communities.

CHAPTER SIX
HPERTENSION IN SPECIAL SETTINGS

6.1. Resistant Hypertension

Hypertension is defined as resistant or refractory to treatment when a therapeutic plan that includes attention to lifestyle measures and the prescription of at least three antihypertensive medications (including a diuretic) at maximal doses has failed to lower office systolic and diastolic BP values to <140 mmHg and/or <90 mmHg, respectively. Before a diagnosis of resistant hypertension is made, it is necessary to exclude the following causes of Pseudo resistant hypertension:

i. Poor adherence to prescribed medications.
ii. White-coat phenomenon: in which office BP is elevated, but BP is controlled using out-of-office measurement (ABPM or HBPM)
iii. Office measurement error e.g use of inappropriately sized cuff.
iv. Marked brachial artery calcification especially in the elderly. (Check for prominent locomotor brachialis)

Common causes of resistant hypertension include:

- Lifestyle factors e.g harmful alcohol consumption, excessive salt consumption, rapid weight gain, substance abuse.
- Concurrent intake of agents that raise BP e.g steroids, NSAIDs, Erythropoietin, cyclosporine
- Obstructive sleep apnoea
- Undetected secondary forms of hypertension

Resistant hypertension occurs in about 5-10% of treated patients with hypertension and up to 20-30% in clinical trials.[57] Patients' characteristics associated with resistant hypertension include older age, female sex, Black race, high baseline blood pressure, obesity, left ventricular hypertrophy, CKD and DM.[57,58] Approach to a patient with Resistant Hypertension includes evaluation and use of spironolactone[59,60] and selective endothelin receptor antagonist.[61]

6.2. Masked Hypertension

This is a condition whereby a patient is normotensive in the clinic, but the BP measurement outside the clinic setting either using ABPM or HBPM is in the hypertensive range. This condition is seen even in treated patients when it is specifically referred to as masked uncontrolled hypertension (MUCH). REmoving the MAsk on Hypertension (REMAH), a nationwide observational study[62] conducted in 2017 reported that the prevalence of

masked hypertension in Nigeria was 13% in the general population, 12% among untreated individuals and 27% among those being treated for hypertension. In another study, the prevalence and determinants of masked hypertension in a Nigerian urban population were comparable to that in an international database including Caucasians, South Americans and Asians[63]. According to the nationwide REMAH study,[62] the characteristics of individuals with masked hypertension include older age, high normal office BP and higher random blood glucose. In addition to these characteristics, cigarette smoking and male gender were reported in a similar epidemiological study[64] involving a large cohort of Black Americans. Masked uncontrolled hypertension is very common among patients with DM and CKD.

The prognostic implication of masked hypertension in the general population as well as in different patient groups was reported in a meta-analysis of 21 prospective observational studies.[65] A total of 130,318 participants were included in the meta-analysis and the studies used either ambulatory BP monitoring or home BP measurement to assess out-of-office BP. The pooled risk ratio for MH vs normotension was 1.67 and 2.19 for all-cause and cardiovascular mortality, respectively. The pooled risk ratios for fatal and nonfatal cardiovascular, stroke, cardiac, coronary, and renal disease events were 1.71, 1.95, 1.76, 1.62, 3.85, respectively.

Approach to a Patient with Masked Uncontrolled Hypertension: Identification of patients with masked hypertension is always difficult since the clinic blood pressure in such patients are always normal. However, individuals whose office BP are high normal and have HMOD such as CKD or have DM are candidates for further evaluation for masked hypertension using ABPM or HBPM. Up titration of treatment as well as night time dosing regimen should be considered to ensure that both office and out-of-office BP are controlled

6.3. White-Coat Hypertension

This refers to a situation where an individual who is not on treatment for hypertension has elevated office blood pressure in the hypertensive range but normal out-office BP measured with ABPM. It occurs in about 15-30% of individuals with elevated office BP.[66,67] Characteristically, WCH occurs more frequently in women, non-smokers, older adults, recently diagnosed patients with hypertension and patients without hypertension mediated organ damage. Compared with sustained normotensive people, white-coat hypertension is associated with increased CV risk.[68,69] Treatment of patients with white-coat hypertension is still object of controversy; while some studies report no benefit,[70] others report a possibility of reduction in CV morbidity and mortality especially in the very

elderly.[71] At the moment, there is no RCT aimed to address whether white-coat hypertension should be treated or not, clinical decisions in this regard remains empirical.

6.4. Secondary Hypertension:

This implies hypertension caused by another medical condition and it accounts for about 5% of all hypertensive cases. It should be suspected in the following settings

- Sudden onset of hypertension before age 30 or after 55
- Severely elevated blood pressure
- No family history of hypertension
- Resistant hypertension
- Long standing history of kidney disease

Approach to Patient: Treatment should not be delayed while diagnostic workup is ongoing. In many cases, hypertension resolves if the underlying cause is treated.

6.5. Hypertension in Pregnancy

Hypertensive disorders in pregnancy are among the leading causes of poor pregnancy outcomes in sub-Saharan Africa (SSA). A recent systematic review[72] which aimed at defining the overall and type specific prevalence of hypertensive disorders in pregnancy in SSA, included 70 studies about half of which were conducted in Nigeria. The pooled prevalence of hypertensive disorders of pregnancy (all types combined), chronic hypertension, gestational hypertension, preeclampsia, and eclampsia were 8%, 0.9%, 4.1%, 4.1%, and 1.5% respectively.

Classification:

I. Preeclampsia-Eclampsia
II. Chronic hypertension of any cause
III. Chronic hypertension with superimposed preeclampsia
IV. Gestational hypertension

Due to the hemodynamic and vascular changes that occur in pregnancy, instruments for recording office or out-of-office blood pressure must be validated in pregnancy using standardized protocols.[73,74] While using the auscultatory method, the 4th Korotkoff sound i.e the point at which the sounds muffle should be used as the DBP.

Approach to a pregnant patient with hypertension:

Validated instruments should be used for measurement of both office and out-of-office blood pressure. BP should be measured either sitting or in lateral decubitus position. Common medications to be considered include nifedipine, labetalol, alpha-methyldopa

and hydralazine. Pregnant women with hypertension should be referred to a specialist.

6.6. Hypertension in DM

Elevated and distorted pattern of blood pressure is a common feature of both type I and II DM. Prevalence of hypertension diagnosed using office blood pressure measurement alone in patients with DM is usually higher than in the general population[75,76]. Patients with DM have a blunted fall in nocturnal blood pressure and exhibit higher incidence of masked hypertension compared to those in the general population[77]. Among the treated patients with hypertension, those who have DM are also known to have higher incidence of masked uncontrolled hypertension[78,79].

The presence of hypertension in type 2 DM (T2DM) accelerates the development and progression of chronic complications. Hypertension has also been found to increase atherosclerotic cardiovascular disease (ASCVD) risk among persons with T2DM. Blood pressure lowering in people with diabetes, reduces the risk of mortality and cardiovascular morbidity [80,81]. Cardiac autonomic dysfunction is a common complication in diabetes[82] and as such exposes both treated and untreated patients to postural hypotension. Selective inhibitors of the sodium glucose co-transport 2 such as empaglifozin and canaglifozin have been demonstrated in more recent randomized control trials.[83,84] to reduce both office and ambulatory blood pressure substantially in addition to their glucose lowering effect.

Clinical approach to a Patient with Hypertension and DM

Diagnosis: Measure the blood pressure standing in addition to the lying due to high incidence of postural hypotension. Out of -office-BP recording using ABPM is highly recommended in treated patients as many may have masked uncontrolled hypertension.

Treatment: Treatment strategy should include an ACEI or an ARB because of its salutary effect on albuminuria. The target BP recommended is 130/80 mmHg. It is recommended that for patients who have blunted nocturnal dipping of blood pressure, a night time dosing regimen should be added. Sodium glucose cotransport inhibitor may be considered in situations where the blood pressure is difficult to lower to target.

6.7. Hypertension in Chronic Kidney Disease:

Hypertension affects up to 80% of patients with CKD;[85] and is defined as the presence of reduced kidney function (an estimated glomerular filtration rate eGFR) < 60 mL /min / 1.73 m^2. On the other hand, hypertension is a major risk factor for the development and progression of CKD. Characteristically, in hypertensive patients with CKD, masked hypertension with blunted dipping of night time blood pressure and resistant hypertension are common. A meta-analysis published in 2013[86] reviewed the cardiovascular and renal effects of intensive blood pressure lowering in CKD patients. Intensive blood pressure lowering compared to standard therapy reduced the risk of progression to end-stage renal disease in those with proteinuria, but no obvious benefit in cardiovascular events or death. A more recent meta-analysis[87] in 2017 included more studies and reported that a more intensive blood pressure lowering caused a reduction in all-cause mortality compared to the standard therapy. Angiotensin system blockade with either ARB or ACEI lowers proteinuria and are more reno-protective compared to other antihypertensive classes[88,89].

Approach to hypertension in a Patient with CKD: Out-of-office BP measurement may be considered to rule out masked hypertension and non-dipping blood pressure pattern. Loop diuretic should be preferred to thiazide diuretics when the GFR is <30mls/min. Initiation of BP treatment should start with a renin angiotensin blocker combined with either calcium channel blocker or diuretics. The target BP should be less than 130/80mmHg.

6.8. Hypertension in the elderly:

Among Nigerians as in other populations, blood pressure increases with age and as such prevalence of hypertension increases from 6.8% among those less than 30 years to 63% among those 70 years and above[15]. Initial concerns about benefit of antihypertensive medications in the old and very old patients have been addressed by RCTs[90,91] which related antihypertensive medications in such populations to reduction in CV morbidity, CV mortality and all-cause mortality. The major challenge with management of hypertension in the elderly, is the presence of comorbidities such atherosclerotic vascular disease, renal, and heart failure. Postural hypotension is common and it may be worsened by antihypertensive medications.

6.9. Hypertension in Children and Adolescents

In the absence of outcome data, hypertension definition in children and adolescent is based on the normal distribution of blood pressure among healthy children. Blood pressure greater than 95th percentile value is regarded as hypertensive. Appropriately sized cuff with the bladder covering two-thirds of

the arm must be used in children and adolescents. Table 6.1 shows the classification of hypertension from the American Academy of Pediatricians.[92]

Table 6.1: Reproduced from Flynn et al[92]

For Children Aged 1–13 y	For Children Aged ≥13 y
Normal BP: <90th percentile	Normal BP: <120/<80mmHg
Elevated BP: ≥90th percentile to <95th percentile or 120/80mmHg to <95th percentile (whichever is lower)	Elevated BP: 120/<80 to 129/<80mmHg
Stage 1 HTN: ≥95th percentile to <95th percentile + 12 mmHg or 130/80 to 139/89 mmHg (whichever is lower)	Stage 1 HTN: 130/80 to 139/89mmHg
Stage 2 HTN: ≥95th percentile + 12 mmHg, or ≥140/90mmHg	Stage 2 HTN: ≥140/90

6.10. Hypertension in HIV

The burden of hypertension among people living with HIV is higher compared to individuals who are HIV negative[93,94]. The pathophysiological pathway that underpins the association of HIV infection and hypertension is not well understood. However, various factors ranging from T-cell activation and release of cytokines promotes renal sodium and water retention, vasoconstriction and vascular remodeling; all of which act synergistically to cause elevation in blood pressure. Furthermore, a few studies[95,96] have reported that HIV patients on antiretroviral therapy over months to years as compared to drug naïve patients have higher incidence of hypertension. Possible drug-drug interaction between anti-retroviral drugs and antihypertensive agents poses some therapeutic challenges when the two conditions co-exist. Table 6.2 summarizes the interaction between commonly prescribed antihypertensive medications and antiretroviral drugs.

Approach to patient with HIV and hypertension Comorbidity: It follows the general guideline, but particular attention should be paid to the drug-drug interaction especially for HIV patients on protease inhibitors (saquinavir) and non-nucleoside reverse transcriptase inhibitors (e.g tenoforvir, lamivudine). Table 6.2 shows the drug-drug interaction between common antihypertensive and Anti-retroviral (ARVs) medications. Note that protease inhibitors generally increase serum concentration of CCBs while they decrease that of some ARBs such as losartan. This should be taken into consideration while deciding the doses of antihypertensive medications to use in patients on ARVs

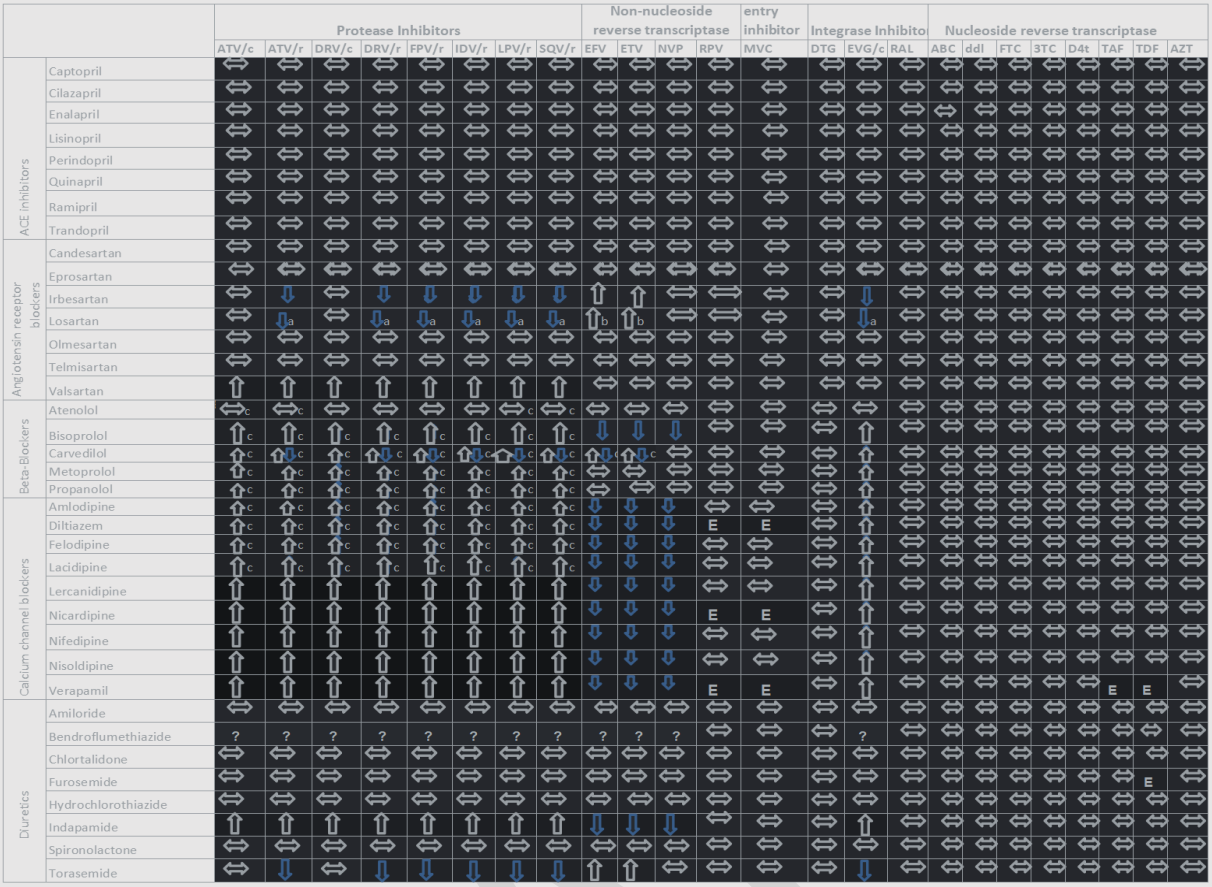


Table 6.2: reproduced from Zoest et al[94]

3TC, lamivudine; ABC, abacavir; ACE, angiotensin-converting-enzyme; ATV, atazanavir; AZT, zidovudine; COBI, cobicistat; d4T, stavudine; ddI, didanosine;

DRV, darunavir; DTG, dolutegravir; EFV, efavirenz; ETV, etravirine; EVG, elvitegravir; FPV, fosamprenavir; FTC, emtricitabine; IDV, indinavir; LPV, lopinavir; MVC,

maraviroc; NVP, nevirapine; r, ritonavir; RAL, raltegravir; RPV, rilpivirine; SQV, saquinavir; TAF, tenofovir alafenamide fumarate; TDF, tenofovir.

, No significant effect.

, Potential elevated concentration of the antihypertensive drug.

, Potential decreased concentration of the antihypertensive drug.

D, Potential decreased concentration of antiretroviral drug.

E, Potential elevated concentration of antiretroviral drug.

?, This interaction has not been studied.

a Parental drug decreased but active metabolite increased.

b Parental drug increased but active metabolite decreased.

c Risk of PR interval prolongation. Partial response interval monitoring may be warranted in patients with underlying heart block or those treated with

Atrio-ventricular nodal blocking agents.

d ECG monitoring is recommended.

e Use with caution as both LPV and calcium channel blockers prolong PR interval. Clinical monitoring is recommended.

No clear data available.

No clinically significant interaction expected.

Potential interaction predicted to be of weak intensity (less than two-fold " area under the curve (AUC) or less than 50% # AUC). A dosage adjustment is a

priori not recommended.

Potential interaction, that may require a dosage adjustment or close monitoring.

These drugs should not be co-administered.

Note: although some drug interactions are predicted to potentially require a dosage adjustment based on the drug's metabolic pathway, clinical experience with

a particular antihypertensive and antiretroviral drug may indicate that dosage adjustments are not an a priori requirement.

6.11. Hypertension in COVID-19

Severe acute respiratory coronavirus 2 (SARS-CoV-2) has become a world-wide epidemic. In a 2020 meta-analysis[97] which included 7 studies and a total of 1,576 COVID-19 infected patients, hypertension was the most prevalent comorbidity, affecting about one in five of infected patients. Additionally, among infected patients, those with background hypertension are twice as likely to have severe diseases when compared with their normotensive counterparts. It has remained unclear if this relationship was causal or confounded by age and other associated comorbidities including obesity, DM and CKD.

The viral spike protein of SARS-CoV-2 attaches itself to the cell surface using the angiotension 2 enyzme (ACE 2) receptor. ACE 2 receptors are upregulated in patients on ARBs or ACEis. [98,99] This raised initial concerns regarding the use of angiotensin-converting enzyme inhibitors (ACEis) and ARBs in these patients. The WHO conducted a rapid review[8] of evidence related to the use ACEIs or ARBs in COVID-19 patients which identified 11 observational studies. After adjustment for confounders, history of ACEi or ARB use was not found to be associated with increased severity of COVID-19 illness. This position was supported by another review[100] that included higher quality studies. A more recent study[101] evaluated whether COVID-19 risk differs according to antihypertensive drug class in patients treated with ACEIs and ARBs compared with CCBs. Their findings suggest a lower COVID-19 risk in patients with hypertension treated over a long period with ACE inhibitors or ARBs compared with CCBs.

Approach to a Patient with Hypertension and COVID19 infection: It is recommended that ACEIs and ARBs should be continued.

6.12. Hypertension in Sickle Cell Disease:

Blood pressure is generally lower in individuals with sickle cell anaemia than their age and sex matched counterparts with hemoglobin AA.[102,103] Also the prevalence of hypertension, using the threshold of 140/90 mmHg, in SCD is documented to be lower than controls[104]. Blood pressure above 130/80 mmHg should be considered as relative systemic hypertension as this is associated with increased risk of pulmonary hypertension and renal dysfunction[105] Although glomerulopathies are common in SCD, the development of systemic hypertension is uncommon in SCD patients.[106]

6.13. Hypertensive Urgency and Emergency.

Hypertensive emergencies are situations in which severe hypertension (grade 3) is accompanied with acute life-threatening hypertension mediated organ damage. It requires immediate reduction of blood pressure using intravenous medications. The following conditions should be treated as hypertensive emergencies

- Acute left ventricular failure
- Eclampsia and severe preeclampsia
- Acute aortic dissection
- Hypertensive encephalopathy
- Malignant hypertension with or without acute kidney injury
- Intracerebral haemorrhage

Clinical approach to hypertensive emergencies: Blood pressure lowering should be accomplished with a short acting intravenous medication to allow careful titration of the blood pressure response using medications such as labetalol, alpha-methyldopa and hydralazine.

Hypertensive urgency: This is a condition where there is severe hypertension, but there is no evidence of ongoing hypertension mediated target organ damage.

Clinical approach to hypertensive urgency: Administer the regular oral antihypertensive medications with an aim to lower blood pressure over a 24-to-48-hour period. There is no need for hospital admission in this case.

6.14 Hypertension in Stroke Patients:

Hypertension is the most prevalent risk factor for both ischaemic and hemorrhagic stroke; and has been reported in about 64% of stroke patients[107]. The management of BP in adults with stroke is challenging and complex because of the varied causes of stroke. Furthermore, stroke induces a plethora of haemodynamic changes including labile blood pressure, thus making decision about BP lowering rather difficult. The pathophysiology of brain damage in each of the stroke type is different and as such management should be tailored to the disease type, the diagnosis of which is based on clinical features and brain imaging.

In Acute Ischaemic stroke, BP may be severely elevated and rapid reduction in BP is indicated if other comorbid conditions such as acute left ventricular failure or aortic dissection is present. It should be noted however; that excessive BP lowering may worsen cerebral ischaemia. In the absence of other comorbid conditions, acute BP lowering is not indicated except if the patient is to receive thrombolytics. A 15% lowering of BP over 24 hours is adjudged safe if the BP is above 220/120 mmHg.

For patients with intracranial hemorrhage presenting with SBP between 150 and 220 mm Hg and without contraindication to acute BP treatment, acute lowering of SBP to 140 mm Hg is safe and can be effective for improving functional outcome[108]

The use of antihypertensive medications was confirmed to reduce the risk of recurrent stroke after stroke or TIA in a meta-analysis[109] that included 10 randomized trials. Inclusion criteria were participants who have had TIA, ischaemic stroke, or intracerebral hemorrhage and were randomized for days to months after the index event and followed up for up to 2 to 5 years. Treatment with anti-hypertensive medications was associated with a significant reduction in recurrent stroke and so should be initiated few days after the event.

Approach to Patient:

i. Acute Ischaemic Stroke:
   a. Acute BP lowering in severely elevated BP is indicated if there is evidence of ongoing target organ damage.
   b. Patients who are eligible for thrombolysis should have their BP lowered to <180/105 mmHg for the first 24 hours after thrombolysis
   c. For patients not going for thrombolysis, BP should be lowered by 15% in the first 24 hours if BP is ≥ 220/120 mm Hg.

ii. In acute hemorrhagic stroke, acute BP lowering to the target level of 140mm Hg is recommended if SBP is between 150-220mm Hg.

iii. In patients with hypertension who have an acute cerebrovascular event, antihypertensive treatment should be initiated immediately for TIA or after 10 days for ischaemic stroke.

6.15. Hypertension in Peri-operative Conditions

Hypertension at the perioperative period increases the morbidity and mortality associated with the surgical procedure[110]. At the induction of anesthesia, patients with and without preexisting hypertension are likely to develop blood pressure elevations and tachycardia[111]. Previous history of hypertension, especially a diastolic blood pressure greater than 110 mm Hg, and the type of surgery[112] are common predictors of perioperative hypertension. Surgeries commonly associated with high rates of postoperative hypertension include coronary artery bypass surgery, aortic aneurysm repair and carotid endarterectomy.

Approach to patient: peri-operative assessment should be done at least one week before surgery. If BP is well controlled and physical examination is unremarkable, further testing may not be necessary for uncomplicated surgeries or procedures. High-risk patients or patients undergoing complicated surgeries should be referred to a hypertension specialist. Perioperative risk assessment should be focused with a view to requesting perioperative test including ECG, and echocardiography. It is recommended that surgery is postponed until blood pressure is controlled in elective cases. It is recommended that patients should take their oral antihypertensive medication with a sip of water on the day of surgery, but not less than two hours before the procedure. Diuretics should be avoided to guard against surgery dependent volume depletion. Hypertensive urgencies and emergencies may occur and should be treated accordingly with intravenous agents. A treatment algorithm as suggested by Erstad[111] may be considered depending on the availability of medications. Abrupt discontinuation of beta blockers or centrally acting agents such as clonidine is potentially harmful and not recommended.

6.16. Summary of Recommendations in Special Settings

S/NO	Condition	Recommendations
1	Resistant Hypertension	✓ Ensure adherence before the diagnosis ✓ Reinforce lifestyle changes especially sodium reduction ✓ MRA (Spironolactone and Eplerenone) should be considered. This may be followed by a higher dose of thiazide diuretics. ✓ Centrally acting agents e.g alpha-methyl dopa and the direct acting vasodilators can be added to the treatment ✓ All patients suspected to have resistant hypertension should be referred to a hypertension specialist.
2	Masked Hypertension	✓ Evaluate for masked hypertension using ABPM or HBPM in individuals whose office BP are high normal and/or have DM, HMOD such as CKD. ✓ Consider up titrating treatment and night-time dosing regimen.
3	White-Coat Hypertension	✓ Lifestyle changes aimed at reducing CV risk and periodic out-of-office BP monitoring should be implemented. ✓ Routine drug treatment should be considered in high-risk patients or those with HMOD.
4	Secondary hypertension	✓ Investigate for secondary hypertension in individuals < 30 years ✓ Treat any identified underlying cause and administer antihypertensive medications accordingly
5	Hypertension in	✓ Labetalol, alpha-methyldopa, nifedipine,

	pregnancy	hydralazine are recommended. In hypertensive crisis situations, IV labetalol and magnesium sulphate should be used. ✓ ACEIs, ARBs, direct renin inhibitors and diuretics are contraindicated in pregnancy. ✓ If pre-eclampsia is diagnosed, delivery should be expedited if there are presence of adverse conditions such as visual disturbances and haemostatic disorders
6	Hypertension in DM	✓ Measure BP standing at first visit and at least once every year during follow-up ✓ Consider HBPM or ABPM in all patients at presentation and at least once yearly ✓ Target BP should be less than 130/80 mmHg
7	Hypertension in CKD	✓ Consider HBPM or ABPM in all patients at presentation and at least once yearly ✓ Use loop diuretic as against thiazide diuretics if GFR is <30mls/min ✓ Initiate treatment with an ACEI or ARB combined with either CCB or diuretic. ✓ The target BP should be < 130/80mmHg
8	Hypertension in the Elderly	✓ Measure BP standing in all occasions ✓ Search for other co-morbidities and take note of concurrent therapies. Consider possibilities of compelling indications and contraindications to certain therapies.
9	Hypertension in Children and adolescents	✓ Measure the arm size and use the appropriately sized cuff ✓ Search for secondary causes
10	Hypertension in HIV	✓ Consider dose adjustments if a patient is on protease inhibitors and non-nucleoside reverse transcriptase inhibitors due to drug-drug interaction

11	Hypertension in COVID-19	✓ Continue antihypertensive medications including ARBs/ACEIs if a patient was on the medications before COVID-19 infection ✓ Use of tele-monitoring of BP and extended follow-up time can be considered where possible to reduce crowding
12	Hypertension in SCD	✓ Initiate therapy if BP >130/80 mmHg. ✓ CCB, ARBs/ACEIs are preferred
13	Hypertensive Urgency/Emergency	✓ In urgency, oral anti-hypertensives are recommended with the aim of lowering the BP to target level in 24-48 hours ✓ In hypertensive emergencies, intravenous medications such as labetalol, hydralazines are recommended with the aim of reduction in BP within minutes to hours. ✓ Counseling is mandatory before discharge to guard against poor adherence.
14	Hypertension in stroke patients	✓ In ischaemic stroke, acute lowering of BP is not indicated except if there is plan for thrombolysis. If BP is > 220/150 mm Hg, a 15% reduction over 24 hours is recommended ✓ In haemorrhagic stroke, acute lowering of raised BP is recommended to the target level of below 140/90 mmHg. ✓ After a stroke, antihypertensive medication for secondary prevention should commence 10 days following the event.
15	Hypertension in peri-operative Conditions	✓ In low-risk patients with controlled BP, surgeries can be done without recourse to extensive cardiovascular evaluation ✓ In high-risk patients, further CV

		evaluation with ECG and echocardiography must precede surgery ✓ On the day of surgery, antihypertensive can be taken with a sip of worker, not less than two hours before procedure.

7.15 Summary of Recommendations in Special Settings

S/NO	Condition	Recommendations
1	Resistant Hypertension	✓ Ensure adherence before the diagnosis ✓ Reinforce lifestyle changes especially sodium reduction ✓ MRA (Spironolactone and Eplerenone) should be considered. This may be followed by a higher dose of thiazide diuretics. ✓ Centrally acting agents e.g alpha-methyl dopa and the direct acting vasodilators can be added to the treatment ✓ All patients suspected to have resistant hypertension should be referred to a hypertension specialist.
2	Masked Hypertension	✓ Evaluate for masked hypertension using ABPM or HBPM in individuals whose office BP are high normal and/or have DM, HMOD such as CKD. ✓ Consider up titrating treatment and night-time dosing regimen
3	White-Coat Hypertension	✓ Lifestyle changes aimed at reducing CV risk and periodic out-of-office BP monitoring should be implemented ✓ Routine drug treatment should be considered in high-risk patients or those with HMOD
4	Secondary hypertension	✓ Investigate for secondary hypertension in individuals < 30 years ✓ Treat any identified underlying cause and administer antihypertensive medications accordingly
5	Hypertension in pregnancy	✓ Labetalol, alpha-methyldopa, nifedipine, and hydralazine are recommended. In hypertensive crisis situations, IV labetalol

		and magnesium sulphate should be used. ✓ ACEIs, ARBs,direct renin inhibitors and diuretics are contraindicated in pregnancy. ✓ If pre-eclampsia is diagnosed, delivery should be expedited if there are presence of adverse conditions such as visual disturbances and haemostatic disorders
6	Hypertension in DM	✓ Measure BP standing at first visit and at least once every year during follow-up ✓ Consider HBPM or ABPM in all patients at presentation and at least once yearly ✓ Target BP should be less than 130/80 mmHg
7	Hypertension in CKD	✓ Consider HBPM or ABPM in all patients at presentation and at least once yearly ✓ Use loop diuretic as against thiazide diuretics if GFR <30ml/min ✓ Initiate treatment with an ACEI or ARB combined with either CCB or diuretic. ✓ The target BP should be < 130/80mmHg
8	Hypertension in the Elderly	✓ Measure BP standing in all occasions ✓ Search for other co-morbidities and take note of concurrent therapies. Consider possibilities of compelling indications and contraindications to certain therapies.
9	Hypertension in Children and adolescents	✓ Measure the arm and use the appropriately sized cuff ✓ Search for secondary causes
10	Hypertension in HIV	✓ Consider dose adjustments if a patient is on protease inhibitors and non-nucleoside reverse transcriptase inhibitors due to drug-drug interaction
11	Hypertension in COVID-19	✓ Continue antihypertensive medications including ARBs/ACEIs if a patient was on

		the medications before COVID-19 infection ✓ Use of tele-monitoring of BP and extended follow-up time can be considered where possible to reduce crowding
12	Hypertension in SCD	✓ Initiate therapy if BP >130/80 mmHg ✓ CCB, ARBs/ACEIs are preferred
13	Hypertensive Urgency/Emergency	✓ In urgency, oral anti-hypertensives are recommended with the aim of lowering the BP to target level in 24-48 hours ✓ In hypertensive emergencies, intravenous medications such as labetalol, hydralazines are recommended with the aim of reduction in BP within minutes to hours. ✓ Counseling is mandatory before discharge to guard against poor adherence.
14	Hypertension in stroke patients	✓ In ischaemic stroke, acute lowering of BP is not indicated except if there is plan for thrombolysis. If BP is > 220/150 mm Hg, a 15% reduction over 24 hours is recommended ✓ In haemorrhagic stroke, acute lowering of raised BP is recommended to the target level of below 140/90 mmHg. ✓ After a stroke, antihypertensive medication for secondary prevention should commence 10 days following the event.
15	Hypertension in peri-operative Conditions	✓ In low-risk patients with controlled BP, surgeries can be done without recourse to extensive cardiovascular evaluation ✓ In high-risk patients, further CV evaluation with ECG and echocardiography must precede surgery

		✓ On the day of surgery, antihypertensive can be taken with a sip of worker, not less than two hours before procedure.

CHAPTER SEVEN:
IMPLEMENTATION, MONITORING & EVALUATION AND RESEARCH GAPS

7.1. Role of Health Workers

Lay Community Health Worker (LCHW)

A lay community health worker is someone who received a short training meant for a specific intervention (in this case hypertension) but has not received a formal professional or paraprofessional certificate or tertiary education degree. They may be referred to as village health workers or lay health workers. Use of Lay health workers in hypertension screening has been piloted in Nigeria in the Community Action Against Non-Communicable disease (COMAAND) project [113] and they were found to be effective (unpublished report). Their role in hypertension management includes

- Measurement of blood pressure for community Screening of hypertension
- Referral of suspected hypertensive cases to the Primary Health Care Centre
- Lead/support adherence clubs especially for hypertensive patients
- Support tracking and follow-up of patients in the community
- Support community refill of antihypertensive medicines for stable patients
- Serve as role models/ expert hypertensive patients if they are hypertensive
- Engage in peer education of community members for group lifestyle modification programmes such as community physical activity.

Nurses, CHOs/CHEWs/ JCHEW

- Community screening for hypertension
- Confirm diagnosis of hypertension
- Provide culturally relevant and structured health education
- Initiate treatment in low to moderate-risk patients
- Support adherence, tracking and follow-up of patients both in the facility and community
- Support refill of antihypertensive medicines for stable patients.
- Community delivery of medications
- Identify high-risk patients and refer them to the higher level of health -care
- Documentation of services using the relevant tools

Medical Officers

- Confirmation of diagnosis of hypertension
- Clinical evaluation
- Follow up of patients with hypertension and other comorbidities

- Prescription of medications including some second line agents if need be
- Management of hypertension in the special settings including mild pre-eclampsia, stroke, urgencies and emergencies.

Specialist/Consultants Physicians

- Confirmation of Resistant Hypertension
- Management of Severe Pre-eclampsia /Eclampsia
- Hypertension in the setting of CKD and other high-risk patients

7.2. Monitoring of Hypertension Control.

Monitoring of hypertension control is the on-going collection, management and use of information to assess whether the program is proceeding according to plan and/or achieving defined targets. It is important to know if health care facilities – and ultimately the country – are meeting the agreed goals and objectives for managing hypertension.

Realistic, clear and measurable outcomes and indicators have been identified that relate to the most important changes expected to result from the program. In-country, the monitoring tools integrate data for hypertension and diabetes mellitus. These tools are described below:

a. **Hypertension and diabetes screening Register**: This is a register used to document access to hypertension care and treatment services at the facility and community. It is expected that this register is made available at every service delivery point in the facility. In addition, during campaigns and outreaches, this register will be used for documentation and the data harmonized at the end of each month with the facility register and transferred into the monthly summary form
b. **Hypertension and Diabetes Treatment Card**: This tool is used to record and track patient's response to treatment for hypertension and diabetes. It also provides information for individual patient's management (e.g date of previous visit, due date of follow-up, BP and blood sugar control status, longitudinal data of patients medications) that will enable the healthcare worker to titrate treatment as appropriate.
c. **Client Enrolment Register**: This is a health facility-based register that documents all patients screened and enrolled into the program. It provides information on clients who have been diagnosed hypertensive but are yet to commence medications.

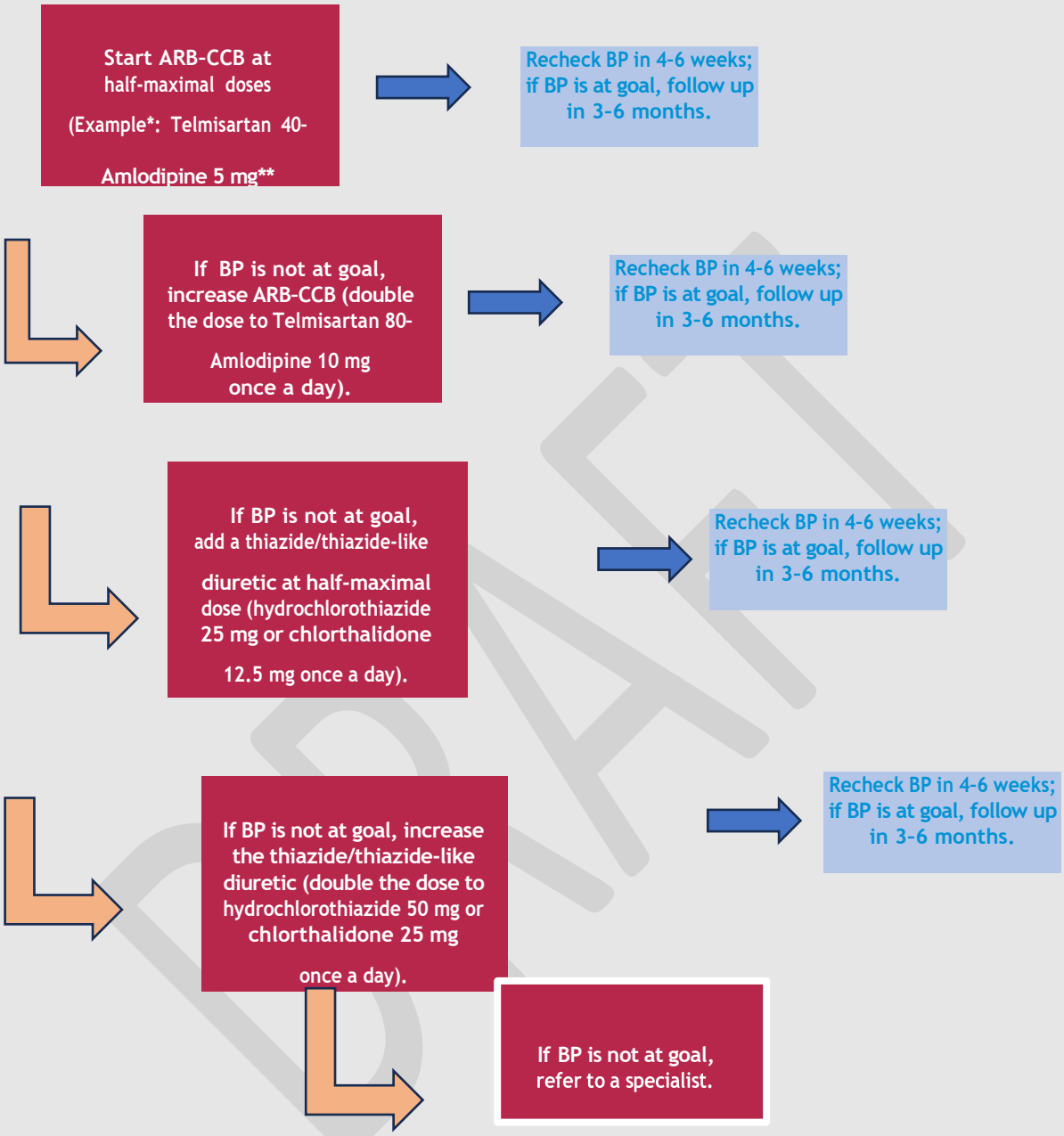
d. **Hypertension and Diabetes Treatment Register**: This is a register that documents longitudinal records of a patient's blood pressure/ blood glucose history. It provides data on the total number of patients that have been initiated on treatment and their treatment response. This register will help in cohort monitoring and patients' retention in the program.

e. **Hypertension and Diabetes Monthly Summary Form:** This tool helps in summarizing data collected from the health facility and community outreaches at the end of the month. It provides at a glance, the summary of hypertension and diabetes activities that have taken place for that month. It also provides data for hypertension and diabetes indicators.

f. **DHIS-**2 Platform: The District Health Information System version 2 (DHIS-2 Platform) is the electronic health information system that manages data. The hypertension and diabetes data in the country are to be migrated unto the DHIS-platform

Appendix

A. WHO treatment algorithm 1: Initiation of treatment with a single pill combination



SCREENING REGISTER

STATE: **LGA:**

FACILITY NAME: **MONTH:** **YEAR:**

Name of Community (In case of outreach services):

S/N	Date of visit	Hospital No.	PATIENT NAME	ADDRESS	Phone Number	AGE	SEX	BP (sbp/dbp)	Blood Sugar (FBS)	Blood Sugar (RBS)	New cases		Previously diagnosed		Remark	
											HTN (Y/N)	DM (Y/N)	HTN (Y/N)	DM (Y/N)	First Visit	Confirmatory Visit

Completed by: Designation:..... Name: ..... Signature: ..... Date: .....

Verified by: Designation:..... Name: ..... Signature: ..... Date: .....

ii. Hypertension and Diabetes Treatment Card

Screening, treatment and follow-up																						
Date (DD/MM/YY)																						
Screening																						
Blood Pressure (SBP/DBP)																						
Blood sugar (FBS)																						
Blood sugar (RBS)																						
Weight (Kg)																						
Waist circumference (cm)																						
SE/U/CR																						
Urinalysis																						
Treatment dose ***(Please write dose, example 5mg)***																						
Medication Adherence																						
Amlodipine 5mg																						
Amlodipine 10mg																						
Losartan 5mg																						
Losartan 10mg																						
Hydrochlorothiazide 25mg																						
Combination pill (Losartan 100mg/ Hydrochlorothiazide 25mg																						
Metformin 500mg																						
Metformin 1000mg																						
Glibenclamide 5mg																						
Glibenclamide 10mg																						
Side effect/adverse effects of medication																						
Present (Y/N), State type (side effect and Describe)																						
Patient follow-up																						
Next Visit Date (DD/MM/YY)																						
Referred to another health facility (Yes/No)																						

If a patient misses a visit, please contact promptly to return to care:

Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted	Date contact attempted
○ No response	○ No response	○ No response	○ No response	○ No response	○ No response	○ No response	○ No response	○ No response	○ No response	○ No response	○ No response
○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found	○ House not found
○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return	○ Agreed to return

iii. Hypertension and Diabetes Enrolment Register

ENROLMENT REGISTER

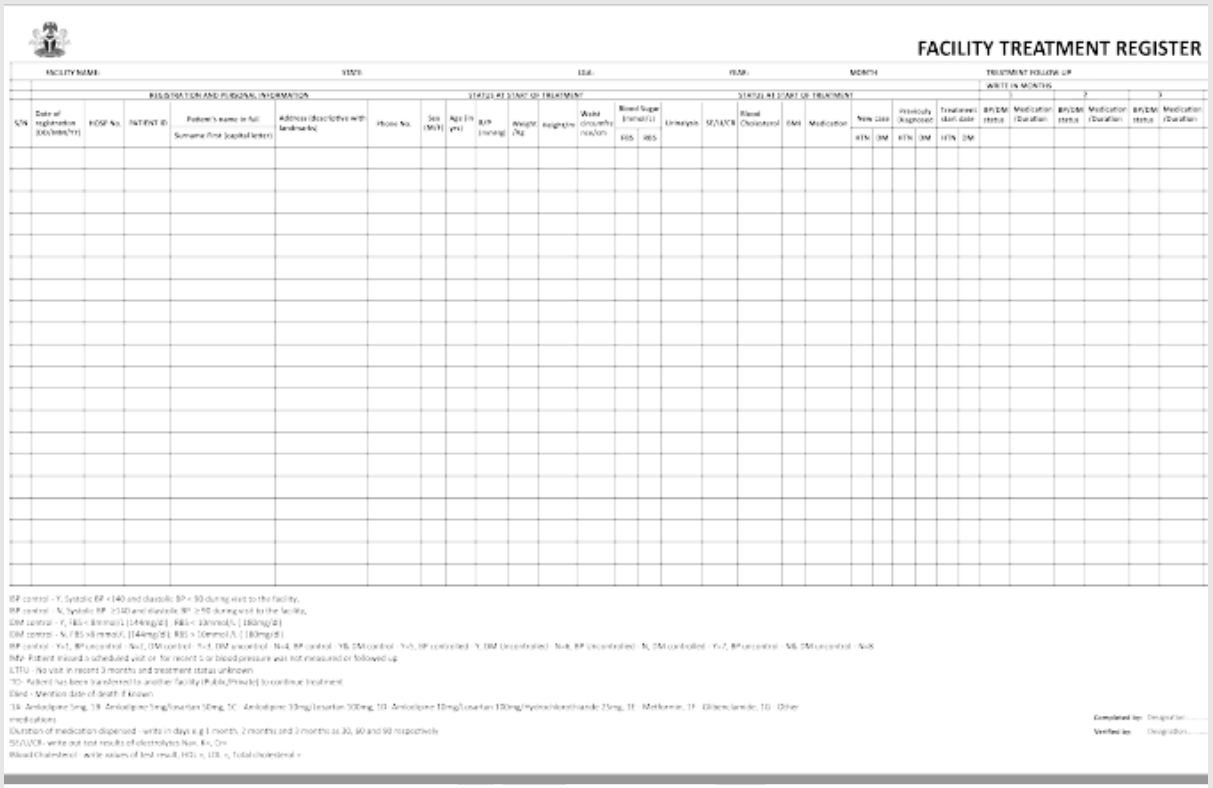
FACILITY NAME: **STATE:** **LGA:** **YEAR:**

S/N	Date enrolled (DD/MM/YY)	HOSP No.	PATIENT ID	Patient's name in full Surname First (capital letter)	Address (descriptive with landmarks)	Phone number	Sex (M/F)	Age (in yrs)	B/P(mmHg)	Weight/Kg	Height/m	BMI	Waist circumfrence /cm	Blood Sugar (mmol/L)		New case		Previously Diagnosed		Transfer in (Tick if patient was previously enrolled in another facility)	Comments
														FBS	RBS	HTN	DM	HTN	DM		

Completed by: Designation:..... Name: ..... Signature: ..... Date: .....

Verified by: Designation:..... Name: ..... Signature: ..... Date: .....

iv. Hypertension and Diabetes Treatment Register



FACILITY TREATMENT REGISTER

FACILITY NAME: WARD: LGA: YEAR: MONTH:

BP control - Y, Systolic BP <140 and diastolic BP < 90 during visit to the facility.
BP control - N, Systolic BP ≥140 and diastolic BP ≥ 90 during visit to the facility.
DM control - Y, FBS < 8mmol/L (144mg/dl) RBS< 12mmol/L (180mg/dl)
DM control - N, FBS >8 mmol/L (144mg/dl) RBS > 12mmol/L (180mg/dl)
BP control - Y=1, BP uncontrol - N=2, DM control - Y=3, DM uncontrol - N=4, BP control - YB, DM control - Y=5, BP controlled - Y, DM Uncontrolled - N=6, BP Uncontrolled - N, DM controlled - Y=7, BP uncontrol - NB, DM uncontrol - N=8
INV- Patient missed a scheduled visit or for recent S or blood pressure was not measured or followed up
LTFU - No visit in recent 3 months and treatment status unknown
TO- Patient has been transferred to another facility (Public/Private) to continue treatment
Died - Mention date of death if known
1A- Amlodipine 5mg, 1B- Amlodipine 5mg/losartan 50mg, 1C- Amlodipine 10mg/losartan 100mg, 1D- Amlodipine 10mg/losartan 100mg/Hydrochlorothiazide 25mg, 1E- Methyldopa, 1F- Chlorothiazide, 1G- Other medications
Duration of medication dispensed - write in days e.g 1 month, 2 months and 3 months as 30, 60 and 90 respectively
S/E/U/CR- write out test results of electrolytes Na+, K+, Cr+
Blood Cholesterol - write values of test result, HDL =, LDL =, Total cholesterol =

Consulted by: Designation: Name: Signature: Date:
Verified by: Designation: Name: Signature: Date:

FACILITY TREATMENT REGISTER

MONTH: TREATMENT FOLLOW UP

WRITE IN MONTHS

N/A

Consulted by: Designation: Name: Signature: Date:
Verified by: Designation: Name: Signature: Date:

v. Hypertension and Diabetes Monthly Summary Form

NCD MONTHLY SUMMARY FORM

A	Identification		
	Health Facility:	Month:	
	Political Ward:	Year:	
	STATE:	Public:	Private:
	LGA:	Beds:	
	Facility code:		

B	Data Elements	Male												Female												
		18-22	23-27	28-32	33-37	38-42	43-47	48-52	53-57	58-62	63-67	67+	Total	18-22	23-27	28-32	33-37	38-42	43- 47	48-52	53-57	58-62	63-67	67+	Total	GRAND TOTAL
	Screening																									
1	Total number screened for raised blood pressure																									
2	Total number screened for diabetes																									
	Diagnosis																									
3	Hypertension new cases																									
4	Previously diagnosed																									
5	Diabetes new cases																									
6	Diabetes old cases																									
	Enrollment and treatment																									
7	Total enrolled on hypertension care																									
8	Total enrolled on diabetes care																									
9	Persons with high blood pressure started on antihypertensive medicines																									
10	Persons with diabetes started on oral glucose lowering drugs (e.g metformin, glibenclamide etc)																									
	Control																									
11	Persons with high blood pressure controlled within 3 months (on the last visit)																									
12	Persons with diabetes controlled within 3 months (on the last visit)																									
	Referral																									
13	Persons with high blood pressure referred out for further treatment																									
14	Persons with diabetes referred out for further treatment																									

15 **Drug Stockout in the past 7days within reporting month** Yes ☐ No ☐

Completed by: Designation:..... Name: ..... Signature: ..... Date: .....

Verified by: Designation:..... Name: ..... Signature: ..... Date: .....

I. Normal range of body weight according to height

BASED ON BMI (WEIGHT (KG) / HEIGHT IN M2) OF 18.5 AND 25

HEIGHT	NORMAL BODY WEIGHT RANGE	
(cm)	Lowest (kg)	Highest (kg)
200	74	100
199	73	99
198	73	98
197	72	97
196	71	96
195	70	95
194	70	94
193	69	93
192	68	92
191	67	91
190	67	90
189	66	89
188	65	88
187	65	87
186	64	86
185	63	86
184	63	85
183	62	84
182	61	83
181	61	82
180	60	81
179	59	78
178	59	79
177	58	78
176	57	77
175	57	77

HEIGHT	NORMAL BODY WEIGHT RANGE	
(cm)	Lowest (kg)	Highest (kg)
174	56	76
173	55	75
172	55	74
171	54	73
170	53	72
169	53	71
168	52	71
167	52	70
166	51	69
165	50	68
164	50	67
163	49	66
162	49	66
161	48	65
160	47	64
159	47	63
158	46	68
157	46	62
156	45	61
155	44	60
154	44	59
153	43	59
152	43	58
151	42	57
150	42	56

NORMAL BODY WEIGHT RANGE = BMI BETWEEN 18.5 & 25

J.

K. Hypertension Service Availability and Readiness Assessment Form

Checklist on availability of hypertension care services and essential medicines and technology for treatment of hypertension

1. Location of PHC (a) urban [ ] (b) semi-urban [ ] (c) rural
2. Profession of officer-in-charge in PHC facility (a) Doctor [ ] (b) Nurse [ ]
   (c) Community Health Extension Worker [ ] (d) others (specify) ……
3. Presence of a pharmacy technician in PHC facility (a) Yes [ ] (b) No [ ]
4. Presence of a laboratory technician in PHC facility (a) Yes [ ] (b) No [ ]
5. Presence of a laboratory screening point in PHC facility (a) Yes (b) No
6. Inspection of PHC facility by appropriate regulatory body in the last one year (a) Yes [ ] (b) No [ ]

Services for Hypertension Care

7. Do providers in this facility diagnose and/or manage cardiovascular diseases such as hypertension in patients? (a) Yes [ ] (b) No [ ]
8. Do you have the national guidelines for the diagnosis and management of hypertension available in this facility today? **IF AVAILABLE, ASK TO SEE THE DOCUMENT** (a) Yes [ ] (b) No [ ]
9. Has any of the providers gone for any training on management of hypertension in the last one year? (a) Yes [ ] (b) No [ ]
10. Do you have specific clinic days for hypertension services? (a) Yes [ ] (b) No [ ]

Essential medicines for hypertension

11. Amiloride + hydrochlorothiazide (a) Seen [ ] (b) Reported not seen [ ] (c) Not available []
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
12. Amlodipine (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
13. Atenolol (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
14. Bendrofluazide (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
15. Captopril (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
16. Hydralazine (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
17. Labetalol (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……

18. Lisinopril (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
19. Losartan (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
20. Methyldopa (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
21. Nifedipine (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
22. Nimodipine (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
23. Propranolol (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
24. Reserpine + dihydroergocristine + clopamide (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……
25. Valsartan (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Expired [ ] (b) Not expired [ ] (c) Price per monthly dose……

Technology for hypertension

26. Sphygmomanometer (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]
27. Stethoscope (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]
28. Test kit for urinalysis (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]
29. Lipid profile testing (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]
30. Glucometer (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]
31. Weighing scale (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]
32. Measuring tapes (a) Seen [ ] (b) Reported not seen [ ] (c) Not available [ ]
    If seen, (a) Functioning [ ] (b) Not functioning [ ] (c) Don't know [ ]

L. NAFDAC Pharmacovigillance Form

NATIONAL PHARMACOVIGILANCE CENTRE (NPC) NIGERIA

National Agency for Food and Drug Administration & Control (NAFDAC), Headquarters Office
Plot 2032 Olusegun Obasanjo Way
Wuse Zone 7 Abuja

Tel: 08086899571 or Fax: 09-5241108

FORM FOR REPORTING OF SUSPECTED ADVERSE DRUG REACTIONS

IN STRICT CONFIDENCE

1. * PATIENT'S DETAILS

Full Name or Initials: _____ Patient Record No: _____

AGE/DATE OF BIRTH: _____ SEX: M ☐ F ☐ WEIGHT (kg): _____

HOSPITAL/Treatment Centre: _____

2. * ADVERSE DRUG REACTION (ADR)

A. DESCRIPTION

DATE Reaction Started	DATE Reaction Stopped

C. OUTCOME OF REACTION

TICK AS APPROPRIATE

☐ Recovered fully ☐ Recovered with disability (Specify) _____

☐ Congenital Abnormality (Specify) _____ ☐ Life Threatening (Specify) _____

☐ Death ☐ Others (specify) _____

B. Was Patient Admitted Due to ADR Yes ☐ No ☐

If Already Hospitalized, Was it Prolonged Due to ADR Yes ☐ No ☐

Duration of Admission (days) _____

Treatment of Reaction: _____

3. * SUSPECTED DRUG (Including Biologicals Traditional/Herbal Medicines & Cosmetics)

A. DRUG DETAILS (State name and other details if available / Attach product label / Sample (if available)

Brand Name: _____ Generic Name: _____ Batch No: _____

NAFDAC No: _____ Expiry Date: _____

Name & Address of Manufacturer: _____

B. Indications for Use	Dosage	Route of Administration	Date Started	Date Stopped

4. * CONCOMITANT MEDICINES (All medicines taken within the last 3months including herbal and self medication)

Brand or Generic Name	Dosage	Route	Date Started	Date Stopped	Reason for Use

5. * SOURCE OF REPORT:

Name of Reporter: _____

Address: _____

Profession: _____

Signature: _____ Tel No/E-mail: _____

***: MANDATORY FIELDS**

M. Hypertension Indicator Sheet

Below are standard indicators that are expected to provide unbiased metrics toward achieving the national target.

Indicator Parameters	Details
Name of Indicator	Hypertension detection from opportunistic screening
Relevance	To determine efficiency of opportunistic screening
Definition	Proportion of adults who were diagnosed with hypertension among those who were screened for hypertension in the facility (including community-based screening)
Calculation	Numerator- Number of adults who were diagnosed with hypertension among those who were screened for hypertension at the facility in the last quarter Denominator- Total number of adults who were screened for hypertension at the facility in the last quarter
Recommended Target	
Sources of data	Facility Screening Register
Frequency of reporting	Monthly

Indicator Parameters	Details
Name of Indicator	**Number of new hypertensive cases**
Relevance	To determine the level of screening outcomes
Definition	Number of persons 18yrs and above that were screened and newly diagnosed with hypertension (had an elevated BP SDP≥140, DBP≥90 after two measurements during their visit to the health facility in Month).
Calculation	Numerator – N/A Denominator – N/A
Recommended Target	Zero
Sources of data	Screening Register, Enrolment Register
Frequency of reporting	Monthly

Indicator Parameters	Details
Name of Indicator	**3-6 monthly BP control (cohort-based)**
Relevance	To measure the effectiveness of clinical services among cohorts of patients treated for hypertension
Definition	Proportion of people with hypertension whose blood pressure is controlled, three months after treatment initiation
Calculation	Numerator- Number of people with controlled blood pressure at the last clinical visit in the reporting quarter among those registered for hypertension treatment in the quarter that ended three months previously Denominator- Total number of people with hypertension registered for treatment in the quarter that ended three months previously
Recommended Target	80%
Sources of data	Health facility patient registers, Patient records
Frequency of reporting	Quarterly

Indicator Parameters	Details
Name of Indicator	**Cross-sectional control**
Relevance	To monitor progress towards population hypertension control with programme (disaggregate to compare facilities)
Definition	Proportion of people with hypertension whose blood pressure is controlled in a given geographical area
Calculation	Numerator- Number of people with controlled blood pressure at the last clinical visit in the reporting quarter Denominator- Total number of people with hypertension
Recommended Target	80%
Sources of data	Health facility patient registers, Patient records
Frequency of reporting	Quarterly

Indicator Parameters	Details
Name of Indicator	**Population control**
Relevance	To assess the ability of the program to identify people with hypertension in the area served
Definition	Proportion of people who have been registered as hypertensive of those estimated to have hypertension in the catchment area.
Calculation	Numerator- Number of adult patients who have been registered as diagnosed with hypertension (>140 mm Hg and >90 mm Hg or taking medications) in the catchment area in a specific period of time (month, quarter, year) Denominator- Expected number of adults with hypertension based on best estimate of age-adjusted prevalence of hypertension (based on physical measures surveys) in the catchment area in a specific period of time (month, quarter, year)
Recommended Target	80%
Sources of data	Health facility patient registers, Patient records
Frequency of reporting	Quarterly

Indicator Parameters	Details
Name of indicator	**Loss to Follow-up**
Relevance	To assess the quality of hypertension management
Definition	Proportion of people with hypertension who were lost to follow-up
Calculation	Numerator- Total number of people with hypertension who were lost to follow-up (missed scheduled visits in the last 3 months and unknown status) Denominator- Total number of people with hypertension started on treatment prior to the last 3 months
Recommended Target	less20%
Sources of data	Health facility Treatment registers, patient records
Frequency of reporting	Quarterly

Indicator Parameters	Details
Name of indicator	**Anti-Hypertensive and CVD core Medicine Availability**
Relevance	To ensure uninterrupted supply of essential medicines and thereby improve patient treatment adherence
Definition	Proportion of health facilities in a given geographical area that have anti-hypertensive and cardiovascular disease (CVD) core medicines based on treatment protocol
Calculation	Numerator- Number of health facilities reporting “no stock-out” of anti-hypertensive and CVD core medicines in the last quarter Denominator- Total number of health facilities
Recommended Target	100%
Sources of data	Health-facility medicine stock register; health facility reports, logistics information system
Frequency of reporting	Quarterly

Indicator Parameters	Details
Name of Indicator	**Availability of validated devices for BP measurement**
Relevance	To assess quality of blood pressure measurements
Definition	Definition - Proportion of health facilities that have access to a functional (validated and if applicable, calibrated) blood pressure measurement device in a given geographical area
Calculation	Numerator- Number of health facilities that have access to a functional (validated and if applicable, calibrated) blood pressure measurement device Denominator- Total number of health facilities
Recommended Target	100%
Sources of data	Health facility reports, Surveys
Frequency of reporting	Annually

Note: Blood pressure is considered controlled when

- Systolic blood pressure (SBP) <140 mmHg and diastolic blood pressure (DBP) <90 mmHg

References

1. Lim SS, Vos T, Flaxman AD, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010 : a systematic analysis for the Global Burden of Disease Study 2010. *Lancet.* 2012;380:2224-2260.
2. Bromfield S, Muntner P. High blood pressure: the leading global burden of disease risk factor and the need for worldwide prevention programs. *Curr Hypertens Rep.* 2013;15(3):134-136.
3. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet.* 2021;398(10304):957-980.
4. Collaborators GBDRF. Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet.* 2020;396(10258):1223-1249.
5. Europe WRof. *Guidelines in Healthcare Practice: Report on a WHO Meeting* WHO;1997.
6. *Guidelines for the Management of Hypertension in Nigeria. .* Enugu, Nigeria: Ezu Books Ltd; 2005.
7. Society NH, ed *Guidelines for the Management of Hypertension in Nigeria.* Ibadan: Mosuro Publishers; 2020.
8. Weltgesundheitsorganisation, Organization WH. *Guideline for the pharmacological treatment of hypertension in adults.* World Health Organization; 2021.
9. Unger T, Borghi C, Charchar F, et al. 2020 International Society of Hypertension Global Hypertension Practice Guidelines. 2020;75(6):1334-1357.
10. World Health O. *Hearts: technical package for cardiovascular disease management in primary health care.* Geneva: World Health Organization; 2016.
11. NCD TNECo. *Non-communicable Diseases in Nigeria-Final Report of a National Survey.*: Federal Ministry of Health and Social Services;1997.
12. Ogah OS, Okpechi I, Chukwuonye II, et al. Blood pressure, prevalence of hypertension and hypertension related complications in Nigerian Africans: A review. *World J Cardiol.* 2012;4(12):327-340.
13. Adeloye D, Basquill C, Aderemi AV, Thompson JY, Obi FA. An estimate of the prevalence of hypertension in Nigeria: a systematic review and meta-analysis. *J Hypertens.* 2015;33(2):230-242.
14. Adeloye D, Owolabi EO, Ojji DB, et al. Prevalence, awareness, treatment, and control of hypertension in Nigeria in 1995 and 2020: A systematic analysis of current evidence. 2021;23(5):963-977.
15. Odili AN, Chori BS, Danladi B, et al. Prevalence, Awareness, Treatment and Control of Hypertension in Nigeria: Data from a Nationwide Survey 2017. *Glob Heart.* 2020;15(1):47.
16. Stergiou GS, Alpert B, Mieke S, et al. A universal standard for the validation of blood pressure measuring devices: Association for the Advancement of Medical Instrumentation/European Society of Hypertension/International Organization for Standardization (AAMI/ESH/ISO) Collaboration Statement. *J Hypertens.* 2018;36(3):472-478.

17. Odili AN, Ameh VO, Ogedengbe J, Staessen JA. Quality of blood pressure phenotype in the Nigerian populaion research on environment gene and health. *Blood Press Monit.* 2014;19:220-225.

18. Nwakile PC, Chori BS, Danladi B, et al. Removing the mask on hypertension (REMAH) study: Design; quality of blood pressure phenotypes and characteristics of the first 490 participants. *Blood Press.* 2019:1-10.

19. Kuznetsova T, Staessen JA, Kawecka-Jaszcz K, et al. Quality control of the blood pressure phenotype in the European Project on Genes in Hypertension. *Blood Press Monit.* 2002;7:215-224.

20. Bliziotis IA, Destounis A, Stergiou GS. Home versus ambulatory and office blood pressure in predicting target organ damage hypertension : a systematic review and meta-analysis. *J Hypertens.* 2012;30:1289-1299.

21. McManus RJ, Mant J, Bray EP, et al. Telemonitoring and self-management in the control of hypertension (TASMINH2) : a randomised controlled trial. *The Lancet.* 2010;376:163-172.

22. McManus RJ, Mant J, Haque MS, et al. Effect of self-monitoring and medication self-titration on systolic blood pressure in hypertensive patients at high risk of cardiovascular disease: the TASMIN-SR randomized clinical trial. *JAMA.* 2014;312(8):799-808.

23. Ettehad D, Emdin CA, Kiran A, et al. Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. *Lancet.* 2016;387(10022):957-967.

24. Thomopoulos C, Parati G, Zanchetti A. Effects of blood pressure lowering on outcome incidence in hypertension. 1. Overview, meta-analyses, and meta-regression analyses of randomized trials. *J Hypertens.* 2014;32(12):2285-2295.

25. Brunstrom M, Carlberg B. Association of Blood Pressure Lowering With Mortality and Cardiovascular Disease Across Blood Pressure Levels: A Systematic Review and Meta-analysis. *JAMA Intern Med.* 2018;178(1):28-36.

26. Thomopoulos C, Parati G, Zanchetti A. Effects of blood-pressure-lowering treatment on outcome incidence. 12. Effects in individuals with high-normal and normal blood pressure: overview and meta-analyses of randomized trials. *J Hypertens.* 2017;35(11):2150-2160.

27. Karmali KN, Lloyd-Jones DM, van der Leeuw J, et al. Blood pressure-lowering treatment strategies based on cardiovascular risk versus blood pressure: A meta-analysis of individual participant data. *PLoS Med.* 2018;15(3):e1002538.

28. Xu W, Goldberg SI, Shubina M, Turchin A. Optimal systolic blood pressure target, time to intensification, and time to follow-up in treatment of hypertension: population based retrospective cohort study. *BMJ.* 2015;350:h158.

29. Birtwhistle RV, Godwin MS, Delva MD, et al. Randomised equivalence trial comparing three month and six month follow up of patients with hypertension by family practitioners. *BMJ.* 2004;328(7433):204.

30. Thijs L AK, Maestre GE, Hansen TW, Buyse L, Wei DM, Melgarejo JD, Brgulian-Hitij J, Cheng HM, Souza F, Gilis-Malinowski N, Kawecka-Jaszcz K, Mels C, Mokwatsi G, Muxfeldt ES, Narkiewicz K, Odili AN, Raizer M, Schutte AE, Stolarz-Skrzypek K, Tsai YW, Vanassche T, Vanholder R, Zhang Z, Verhamme P, Kruger R, Mischak H, Staessen JA. Urinary proteomics combined with home blood pressure telemonitoring for health care reform trial: rational and protocol. *Blood Press.* 2021.

31. Tucker KL, Sheppard JP, Stevens R, et al. Self-monitoring of blood pressure in hypertension: A systematic review and individual patient data meta-analysis. *PLoS Med.* 2017;14(9):e1002389.

32. Cornelissen VA, Smart NA. Exercise training for blood pressure: a systematic review and meta-analysis. *J Am Heart Assoc.* 2013;2(1):e004473.

33. Rossi A, Dikareva A, Bacon SL, Daskalopoulou SS. The impact of physical activity on mortality in patients with high blood pressure: a systematic review. *J Hypertens.* 2012;30(7):1277-1288.

34. Puddey IB, Beilin LJ, Vandongen R. Regular alcohol use raises blood pressure in treated hypertensive subjects. A randomised controlled trial. *Lancet.* 1987;1(8534):647-651.

35. Puddey IB, Beilin LJ, Vandongen R, Rouse IL, Rogers P. Evidence for a direct effect of alcohol consumption on blood pressure in normotensive men. A randomized controlled trial. *Hypertension.* 1985;7(5):707-713.

36. Cushman WC, Cutler JA, Hanna E, et al. Prevention and Treatment of Hypertension Study (PATHS): effects of an alcohol treatment program on blood pressure. *Arch Intern Med.* 1998;158(11):1197-1207.

37. Holmes MV, Dale CE, Zuccolo L, et al. Association between alcohol and cardiovascular disease: Mendelian randomisation analysis based on individual participant data. 2014;349:g4164.

38. O'Keefe JH, Bybee KA, Lavie CJ. Alcohol and Cardiovascular Health: The Razor-Sharp Double-Edged Sword. *Journal of the American College of Cardiology.* 2007;50(11):1009-1014.

39. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. *Eur Heart J.* 2018;39(33):3021-3104.

40. Wright JT, Jr., Dunn JK, Cutler JA, et al. Outcomes in hypertensive black and nonblack patients treated with chlorthalidone, amlodipine, and lisinopril. *JAMA.* 2005;293(13):1595-1608.

41. Wright JT, Jr., Harris-Haywood S, Pressel S, et al. Clinical outcomes by race in hypertensive patients with and without the metabolic syndrome: Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *Arch Intern Med.* 2008;168(2):207-217.

42. Brewster LM, Seedat YK. Why do hypertensive patients of African ancestry respond better to calcium blockers and diuretics than to ACE inhibitors and β-adrenergic blockers? A systematic review. *BMC Med.* 2013;11:141.

43. Mehanna M, Gong Y, McDonough CW, et al. Blood pressure response to metoprolol and chlorthalidone in European and African Americans with hypertension. *J Clin Hypertens (Greenwich).* 2017;19(12):1301-1308.

44. Barzilay JI, Davis BR, Cutler JA, et al. Fasting glucose levels and incident diabetes mellitus in older nondiabetic adults randomized to receive 3 different classes of antihypertensive treatment: a report from the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). *Arch Intern Med.* 2006;166(20):2191-2201.

45. Brewster LM, Seedat YK. Why do hypertensive patients of African ancestry respond better to calcium blockers and diuretics than to ACE inhibitors and beta-adrenergic blockers? A systematic review. *BMC Med.* 2013;11:141.

46. Okeahialam B, Ohihoin E, Ajuluchukwu J. Chronotherapy in Nigerian hypertensives. *Ther Adv Cardiovasc Dis.* 2011;5(2):113-118.

47. Lopez-Gonzalez E, Herdeiro MT, Figueiras A. Determinants of under-reporting of adverse drug reactions: a systematic review. *Drug Saf.* 2009;32(1):19-31.

48. Waheed AA, AbdulKabir BA, Fatai AF. Adverse drug reactions reporting practice and associated factors among community health extension workers in public health facilities, Southwest, Nigeria. *PAMJ.* 2021;40(165).

49. Ahmad SR. Adverse drug event monitoring at the Food and Drug Administration. *Journal of general internal medicine.* 2003;18(1):57-60.

50. Conn VS, Ruppar TM, Chase JA, Enriquez M, Cooper PS. Interventions to Improve Medication Adherence in Hypertensive Patients: Systematic Review and Meta-analysis. *Curr Hypertens Rep.* 2015;17(12):94.

51. Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring: meta-analysis of randomised trials. *BMJ (Clinical research ed).* 2004;329(7458):145-145.

52. Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). *European Heart Journal.* 2018;39(33):3021-3104.

53. Ogedegbe G, Schoenthaler A. A systematic review of the effects of home blood pressure monitoring on medication adherence. *Journal of clinical hypertension (Greenwich, Conn).* 2006;8(3):174-180.

54. Cappuccio FP, Kerry SM, Forbes L, Donald A. Blood pressure control by home monitoring : meta-analysis of randomised trials. *BMJ.* 2004;329:145-148.

55. Verberk WJ, Kroon AA, Lenders JWM, et al. Self-measurement of blood pressure at home reduces the need for anithypertensive drugs. A randomized, controlled trial. *Hypertension.* 2007;50:1019-1025.

56. Rose G, Khaw K-T, Marmot M. *Rose's strategy of preventative medicine.* Oxford University Press; 2008.

57. Calhoun DA, Jones D, Textor S, et al. Resistant hypertension: diagnosis, evaluation, and treatment. A scientific statement from the American Heart Association Professional Education Committee of the Council for High Blood Pressure Research. *Hypertension.* 2008;51(6):1403-1419.

58. Williams B. Resistant hypertension: an unmet treatment need. *Lancet.* 2009;374(9699):1396-1398.

59. Lane DA, Shah S, Beevers DG. Low-dose spironolactone in the management of resistant hypertension: a surveillance study. *J Hypertens.* 2007;25(4):891-894.

60. Chapman N, Dobson J, Wilson S, et al. Effect of spironolactone on blood pressure in subjects with resistant hypertension. *Hypertension.* 2007;49(4):839-845.

61. Weber MA, Black H, Bakris G, et al. A selective endothelin-receptor antagonist to reduce blood pressure in patients with treatment-resistant hypertension: a randomised, double-blind, placebo-controlled trial. *Lancet.* 2009;374(9699):1423-1431.

62. Odili AN, Danladi B, Chori BS, et al. Prevalence and Determinants of Masked Hypertension in Nigeria: The REMAH Study. *Am J Hypertens.* 2021;34(4):359-366.

63. Odili AN, Thijs L, Hara A, et al. Prevalence and Determinants of Masked Hypertension Among Black Nigerians Compared With a Reference Population. *Hypertension.* 2016;67(6):1249-1255.

64. Diaz KM, Veerabhadrappa P, Brown MD, Whited MC, Dubbert PM, Hickson DA. Prevalence, determinants, and clinical significance of masked hypertension in a population-based sample of African American : the Jackson Heart Study. *Am J Hypertens.* 2015;28:900-908.

65. Zhang DY, Guo QH, An DW, Li Y, Wang JG. A comparative meta-analysis of prospective observational studies on masked hypertension and masked uncontrolled hypertension defined by ambulatory and home blood pressure. *J Hypertens.* 2019;37(9):1775-1785.

66. O'Brien E, Parati G, Stergiou G, et al. European Society of Hypertension position paper on ambulatory blood pressure monitoring. *J Hypertens.* 2013;31:1731-1767.

67. O'Brien E, Coats A, Owens P, et al. British Hypertension Society recommendations on the use and interpretation of ambulatory blood pressure monitoring. *BMJ.* 2000;320:1128-1134.

68. Glen SK, Elliott HL, Curzio JL, Lees KR, Reid JL. White-coat hypertension as a cause of cardiovascular dysfunction. *The Lancet.* 1996;348:654-657.

69. Cuspidi C, Rescaldani M, Tadic M, Sala C, Grassi G, Mancia G. White-coat hypertension, as defined by ambulatory blood pressure monitoring, and subclinical cardiac organ damage: a meta-analysis. *J Hypertens.* 2015;33(1):24-32.

70. Fagard RH, Staessen JA, Thijs L, et al. Response to antihypertensive therapy in older patients with sustained and nonsustained systolic hypertension. *Circulation.* 2000;102:1139-1144.

71. Bulpitt CJ, Beckett NS, Peters R, et al. Blood pressure control in the Hypertension in the Very Elderly Trial (HYVET). *J Hum Hypertens.* 2012;26(3):157-163.

72. Gemechu KS, Assefa N, Mengistie B. Prevalence of hypertensive disorders of pregnancy and pregnancy outcomes in Sub-Saharan Africa: A systematic review and meta-analysis. 2020;16:1745506520973105.

73. O'Brien E, Petrie J, Littler WA, et al. The British Hypertension Society protocol for the evaluation of blood pressure measuring devices. *J Hypertens.* 1993;11 (suppl 2):S43-S63.

74. Bello NA, Woolley JJ, Cleary KL, et al. Accuracy of Blood Pressure Measurement Devices in Pregnancy: A Systematic Review of Validation Studies. *Hypertension.* 2018;71(2):326-335.

75. Kannel WB, Wilson PW, Zhang TJ. The epidemiology of impaired glucose tolerance and hypertension. *American heart journal.* 1991;121(4 Pt 2):1268-1273.

76. Lopez-Jaramillo P, Lopez-Lopez J, Lopez-Lopez C, Rodriguez-Alvarez MI. The goal of blood pressure in the hypertensive patient with diabetes is defined: now the challenge is go from recommendations to practice. *Diabetology & metabolic syndrome.* 2014;6(1):31.

77. Wijkman M, Länne T, Engvall J, Lindström T, Östgren CJ, Nystrom FH. Masked nocturnal hypertension — a novel marker of risk in type 2 diabetes. *Diabetologia.* 2009;52:1258-1264.

78. Franklin SS, O'Brien E, Thijs L, Asayama K, Staessen JA. Masked hypertension : a phenomenon of measurement. *Hypertension.* 2015;65:16-20.

79. Franklin SS, Thijs L, Li Y, et al. Masked hypertension in diabetes mellitus : treatment implications for clinical practice. *Hypertension.* 2013;61:964-971.

80. Brunstrom M, Carlberg B. Effect of antihypertensive treatment at different blood pressure levels in patients with diabetes mellitus: systematic review and meta-analyses. *BMJ.* 2016;352:i717.

81. Thomopoulos C, Parati G, Zanchetti A. Effects of blood-pressure-lowering treatment on outcome incidence in hypertension: 10 - Should blood pressure management differ in hypertensive patients with and without diabetes mellitus? Overview and meta-analyses of randomized trials. *J Hypertens.* 2017;35(5):922-944.

82. Vinik AI, Ziegler D. Diabetic cardiovascular autonomic neuropathy. *Circulation.* 2007;115:387-397.

83. Zinman B, Lachin JM, Inzucchi SE. Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes. *N Engl J Med.* 2016;374(11):1094.

84. Neal B, Perkovic V, Matthews DR. Canagliflozin and Cardiovascular and Renal Events in Type 2 Diabetes. *N Engl J Med.* 2017;377(21):2099.

85. Ulasi, II, Arodiwe EB, Ijoma CK. Left ventricular hypertrophy in African Black patients with chronic renal failure at first evaluation. *Ethn Dis.* 2006;16(4):859-864.

86. Lv J, Ehteshami P, Sarnak MJ, et al. Effects of intensive blood pressure lowering on the progression of chronic kidney disease: a systematic review and meta-analysis. 2013;185(11):949-957.

87. Malhotra R, Nguyen HA, Benavente O, et al. Association Between More Intensive vs Less Intensive Blood Pressure Lowering and Risk of Mortality in Chronic Kidney Disease Stages 3 to 5: A Systematic Review and Meta-analysis. *JAMA Intern Med.* 2017;177(10):1498-1505.

88. Vejakama P, Thakkinstian A, Lertrattananon D, Ingsathit A, Ngarmukos C, Attia J. Reno-protective effects of renin-angiotensin system blockade in type 2 diabetic patients: a systematic review and network meta-analysis. *Diabetologia.* 2012;55(3):566-578.

89. Zhang Y, He D, Zhang W, et al. ACE Inhibitor Benefit to Kidney and Cardiovascular Outcomes for Patients with Non-Dialysis Chronic Kidney Disease Stages 3-5: A Network Meta-Analysis of Randomised Clinical Trials. *Drugs.* 2020;80(8):797-811.

90. Beckett NS, Peters R, Fletcher AE, et al. Treatment of hypertension in patients 80 years of age or older. *N Engl J Med.* 2008;358:1887-1898.

91. Briasoulis A, Agarwal V, Tousoulis D, Stefanadis C. Effects of antihypertensive treatment in patients over 65 years of age: a meta-analysis of randomised controlled studies. *Heart.* 2014;100(4):317-323.

92. Flynn JT, Kaelber DC, Baker-Smith CM, et al. Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. *Pediatrics.* 2017;140(3).

93. Nguyen KA, Peer N, Mills EJ, Kengne AP. Burden, Determinants, and Pharmacological Management of Hypertension in HIV-Positive Patients and Populations: A Systematic Narrative Review. *AIDS reviews.* 2015;17(2):83-95.

94. van Zoest RA, van den Born BH, Reiss P. Hypertension in people living with HIV. *Current opinion in HIV and AIDS.* 2017;12(6):513-522.

95. Seaberg EC, Munoz A, Lu M, et al. Association between highly active antiretroviral therapy and hypertension in a large cohort of men followed from 1984 to 2003. *AIDS.* 2005;19(9):953-960.

96. Manner IW, Baekken M, Kvale D, et al. Markers of microbial translocation predict hypertension in HIV-infected individuals. *HIV Med.* 2013;14(6):354-361.

97. Yang J, Zheng Y, Gou X, et al. Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. *Int J Infect Dis.* 2020;94:91-95.

98. Hoffmann M, Kleine-Weber H, Schroeder S, et al. SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor. *Cell.* 2020;181(2):271-280 e278.

99. Vaduganathan M, Vardeny O, Michel T, McMurray JJV, Pfeffer MA, Solomon SD. Renin-Angiotensin-Aldosterone System Inhibitors in Patients with Covid-19. *N Engl J Med.* 2020;382(17):1653-1659.

100. Chan C-K, Huang Y-S, Liao H-W, et al. Renin-Angiotensin-Aldosterone System Inhibitors and Risks of Severe Acute Respiratory Syndrome Coronavirus 2 Infection: A Systematic Review and Meta-Analysis. *Hypertension (Dallas, Tex : 1979).* 2020;76(5):1563-1571.

101. Semenzato L, Botton J, Drouin J, et al. Antihypertensive Drugs and COVID-19 Risk: A Cohort Study of 2 Million Hypertensive Patients. *Hypertension.* 2021;77(3):833-842.

102. Pegelow CH, Colangelo L, Steinberg M, et al. Natural history of blood pressure in sickle cell disease: risks for stroke and death associated with relative hypertension in sickle cell anemia. *The American journal of medicine.* 1997;102(2):171-177.

103. Aderibigbe A, Omotoso AB, Awobusuyi JO, Akande TM. Arterial blood pressure in adult Nigerian sickle cell anaemia patients. *West African journal of medicine.* 1999;18(2):114-118.

104. Ernst AA, Weiss SJ, Johnson WD, Takakuwa KM. Blood pressure in acute vaso-occlusive crises of sickle cell disease. *Southern medical journal.* 2000;93(6):590-592.

105. Gordeuk VR, Sachdev V, Taylor JG, Gladwin MT, Kato G, Castro OL. Relative systemic hypertension in patients with sickle cell disease is associated with risk of pulmonary hypertension and renal insufficiency. *Am J Hematol.* 2008;83(1):15-18.

106. Guasch A, Navarrete J, Nass K, Zayas CF. Glomerular involvement in adults with sickle cell hemoglobinopathies: Prevalence and clinical correlates of progressive renal failure. *J Am Soc Nephrol.* 2006;17(8):2228-2235.

107. Feigin VL, Norrving B, Mensah GA. Global Burden of Stroke. *Circ Res.* 2017;120(3):439-448.

108. Hemphill JC, Greenberg SM, Anderson CS, et al. Guidelines for the Management of Spontaneous Intracerebral Hemorrhage. 2015;46(7):2032-2060.

109. Liu L, Wang Z, Gong L, et al. Blood pressure reduction for the secondary prevention of stroke: a Chinese trial and a systematic review of the literature. *Hypertens Res.* 2009;32(11):1032-1040.

110. Fontes ML, Varon J. Perioperative hypertensive crisis: newer concepts. *Int Anesthesiol Clin.* 2012;50(2):40-58.

111. Erstad BL, Barletta JF. Treatment of hypertension in the perioperative patient. *The Annals of pharmacotherapy.* 2000;34(1):66-79.

112. Varon J, Marik PE. Perioperative hypertension management. *Vasc Health Risk Manag.* 2008;4(3):615-627.

113. Obagha CE, Danladi B, Kamateeka M, et al. Unmet needs of hypertension care in Nigeria: results of the community action against non-communicable diseases (COMAAND) project preintervention survey. *Blood Press Monit.* 2022;27(1):27-32.