



Directorate of Public Health
Non-communicable Diseases
Prevention and Control Department

National Guidelines for Primary Health Care Physicians

Hypertension Prevention, Diagnosis, and Treatment



Iraq 2021

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Health Care Physicians**

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Abbreviations:

ABPM	Ambulatory blood pressure monitoring
ACEI	Angiotensin converting enzyme inhibitor
ARBs	Angiotensin receptor blockers
BB	Beta Blocker
BMI	Body mass index
BPH	Benign prostatic hyperplasia
BP	Blood pressure
CCB	Calcium channel blocker
CNS	Central nervous system
COPD	Chronic Obstructive Pulmonary Disease
CVD	Cardiovascular Disease
DASH	Dietary approach to stop hypertension
DBP	Diastolic blood pressure
ER	Extended release
GFR	Glomerular filtration rate
HBPM	Home blood pressure measurement
HF	Heart failure
HFrEF	Heart failure with reduced ejection fraction
HIC	high-income countries
HIIT	High intensity interval training
HMOD	Hypertension mediated organ damage
IHD	Ischemic heart disease
IR	Immediate release
IRD	Inflammatory Rheumatic Disease
ISH	International Society of Hypertension
JNC	Joint National Committee
LA	Long acting
LMIC	low and middle income countries
LVH	Left Ventricular Hypertrophy
NICE	National Institute for Health and Care Excellence
OTC	Over the counter
SBP	Systolic blood pressure
SR	Sustained release

Introduction

Hypertension is one of the most common worldwide health problems, as it is estimated that over 20% of all adults across the world have hypertension. Developing countries are experiencing dramatic changes in health needs. The increasing prevalence of chronic diseases as hypertension is increasing globally creating a public health challenge and creating an adverse impact on cardiovascular morbidity and mortality, irrespective of income.

Raised BP remains the leading cause of death globally accounting for 10.4 million deaths per year. BP trends show a clear shift of the highest BPs from high-income to low-income regions. The large disparities in the regional burden of hypertension are accompanied by low levels of awareness, treatment and control rates in low and middle income countries (LMIC). The incidence of hypertension is growing among women and adolescents as well as the older adults.

According to the 2015 Iraqi national survey for chronic disease risk factors, 35.6% of the Iraqi adults population (18+ years) have elevated blood pressure.

General principles:

- **Hypertension and cardiovascular diseases:** The relationship between BP and risk of CVD events is continuous, consistent, and independent of other risk factors. The higher the BP, the greater is the chance of heart attack, heart failure, stroke, and kidney disease. For individuals 40–70 years of age, each increment of 20 mmHg in systolic BP (SBP) or 10 mmHg in diastolic BP (DBP) doubles the risk of CVD across the entire BP range .
- **Benefit of lowering BP:** In clinical trials, antihypertensive therapy has been associated with reductions in incidence of stroke 35–40%, myocardial infarction 20–25%, and heart failure more than 50% .

Definition of hypertension:

Based on the WHO/ISH recommendations, and the JNC8, NICE guidelines, it is recommended that hypertension be diagnosed in adults aged 18 years or older when a person's systolic blood pressure (SBP) in the office or clinic is ≥ 140 mm Hg and/or the diastolic blood pressure (DBP) is ≥ 90 mm Hg following repeated examinations.

Usually 2–3 office visits at 1–4-week intervals (depending on the BP level) are required to confirm the diagnosis of hypertension.

The diagnosis might be made on a single visit, if BP is $\geq 180/110$ mm Hg and there is evidence of cardiovascular disease (CVD).

Classification of hypertension:

According to ISH guideline, classification of hypertension is presented in table(1).

Table (1): Classification of Hypertension Based on Office Blood Pressure (BP) Measurement			
Category	Systolic BP(mm Hg)		Diastolic BP(mm Hg)
Normal BP	<130	And	<85
High-normal BP	130-139	and/or	85-89
Grade 1 Hypertension	140-159	and/or	90-99
Grade 2 Hypertension	≥160	and/or	≥100

Source: International society of hypertension global hypertension practice guidelines (2020)

High-normal BP is intended to identify individuals who could benefit from lifestyle interventions and who would receive pharmacological treatment if compelling indications are present.

Ambulatory and home BP measurements are used to confirm the diagnosis of hypertension in people with a clinic blood pressure of 140/90 mmHg or higher and ABPM daytime average or HBPM average of 135/85 mmHg or higher (table 2, annex1).

Table (2): Criteria for Hypertension Based on Office, Ambulatory (ABPM), and Home Blood Pressure (HBPM) Measurement	
	SBP/DBP, mm Hg
Office BP	≥140 and/or ≥90
ABPM	
24 -h average	≥130 and/or ≥80
Day time (or awake) average	≥135 and/or ≥85
Night time (or asleep) average	≥120 and/or ≥70
HBPM	≥135 and/or ≥85

Source: International society of hypertension global hypertension practice guideline (2020)

Types of hypertension:

Essential hypertension:

That represents over 90% of the cases. It is diagnosed in the absence of an identifiable cause. However, the following conditions increase the likelihood of its occurrence (Table 3).

Table (3): conditions increase the likelihood of essential hypertension
Obesity Diabetes/ insulin resistance High salt intake High fat intake More than moderate intake of alcohol Inadequate intake of fruits, vegetables (low potassium) Sedentary life style Stress Family history of hypertension, age, gender and race (non modifiable risk).

Secondary hypertension:

That represents less than 10% of all cases. It is defined as hypertension resulting from an underlying identifiable cause (Table 4). Early diagnosis of secondary hypertension and the institution of appropriate targeted treatment have the potential to cure hypertension in some patients or improve BP control/reduce the number of prescribed antihypertensive medications in others.

Table (4): Identifiable causes of secondary hypertension	
Source or category of cause	Possible causes
Renal diseases	Renal parenchymal disease Polycystic kidney Urinary tract obstruction Rennin-producing tumor Liddle syndrome
Renovascular hypertension	Renal artery stenosis Connective tissue disease Glomerulonephritis
Vascular	Coarctation of aorta Vasculitis/polycythemia Collagen vascular disease
Hormone and steroid intake	Oral contraceptives Estrogen replacement therapy Oral and Depot contraceptives, Steroid
Adrenal	Primary aldosteronism Cushing syndrome Pheochromocytoma Congenital adrenal hyperplasia
Other endocrine disorders	Hyperthyroidism and hypothyroidism Hyperparathyroidism Acromegaly

Neurogenic	Brain tumor Lesions of brainstem or hypothalamus Raised intracranial pressure
Prohypertensive substances	Adrenergic medication, nasal decongestants Nonsteroidal anti-inflammatory drugs Anti-depressants (tricyclic, MAOI), Alcohol, Cyclosporine and Tacrolimus, erythropoietin
Other	Pregnancy Hypercalcemia Sleep Apnea

White Coat and Masked Hypertension

White coat hypertension refers to those who have elevated BP only in the office (non elevated ambulatory or home BP). These subjects are at intermediate cardiovascular risk between normotensives and sustained hypertensives. The diagnosis needs confirmation with repeated office and out-of-office blood pressure measurements.

If their total cardiovascular risk is low and there is no hypertension-mediated organ damage (HMOD), drug treatment may not be prescribed. However, they should be followed with lifestyle modification, as they may develop sustained hypertension requiring drug treatment.

Masked hypertension refers to those who have nonelevated BP in the office but elevated BP out of the office (ambulatory or home). Those patients are at similar risk of cardiovascular events as sustained hypertensives. The diagnosis needs confirmation with repeated office and out-of-office measurements. Masked hypertension may require drug treatment aiming to normalize out-of-office BP.

Malignant or accelerated hypertension

It is characterized by increase in blood pressure to 180/120 mmHg or higher. This clinical entity may complicate hypertension of any etiology and characterized by accelerated microvascular damage with necrosis in the wall of small arteries and arterioles and intravascular thrombosis.

The diagnosis is made clinically by a high BP and rapidly progressive end organ damage such as retinopathy (grade 3 or 4), renal dysfunction (especially proteinuria) and/or hypertensive encephalopathy. If left untreated, death will occur within few months.

Seasonal BP Variation

BP exhibits seasonal variation with lower levels at higher temperatures and higher at lower temperatures. Similar changes occur in people traveling from places with cold to hot temperature, or the reverse.

Evaluation of patients with confirmed hypertension

Evaluation of patients with confirmed hypertension has three objectives, all of which contribute to risk stratification of hypertensive patients that may affect prognosis and guide management. These objectives are as follows:

- (1) To assess lifestyle and identify other cardiovascular risk factors or concomitant disorders (table 5).
- (2) To reveal identifiable causes of high BP (secondary hypertension) (see table 4).
- (3) To assess the presence or absence of Hypertension mediated organ damage (HMOD) that refers to the structural or functional alteration of the arterial vasculature and/or the organs it supplies (table 6).

Table (5): Cardiovascular Risk Factors:
<ul style="list-style-type: none"> • Hypertension BP \geq140/90 • Age men >55 years, women >65 years • Cigarette smoking • Overweight or Obesity <ul style="list-style-type: none"> - Body mass index \geq25 Kg/M² - Abdominal obesity (waist circumference of >102 cm for men, >88 cm. for women) • Physical inactivity • Dyslipidemia <ul style="list-style-type: none"> - Total Cholesterol > 200 mg/dl. (5.2 mmol/L) - HDL in men <40 mg/dl (<1 mmol/L); and in women < 45 mg/dl. (<1.2 mmol/L) - Triglycerides > 150 mg/dl. (1.7 mmol.L) • Diabetes Mellitus or impaired glucose tolerance • Renal dysfunction <ul style="list-style-type: none"> - Microalbuminuria (urine albumin >300 mg/dl.) - Estimated GFR <60ml/min • Family history of premature cardiovascular disease (man<55 years or woman <65 years) in first degree relative

Table (6): Hypertension Mediated Organ Damage (HMOD)
<ul style="list-style-type: none"> • Heart <ul style="list-style-type: none"> - Left ventricular hypertrophy - Ischemic Heart Disease - Heart failure
<ul style="list-style-type: none"> • Brain <ul style="list-style-type: none"> - Stroke or transient ischemic attack
<ul style="list-style-type: none"> • Arteries <ul style="list-style-type: none"> - Carotid arteries atherosclerotic plaque /stenosis - Aortic disease - Lower extremity arteries
<ul style="list-style-type: none"> • Eye <ul style="list-style-type: none"> - Retinopathy - Papilledema
<ul style="list-style-type: none"> • Kidney <ul style="list-style-type: none"> - Proteinuria - Urine sediments - and/or low GFR

Assessment :

History:

To adequately evaluate accompanying risk factors, possible treatable causes, and hypertension-mediated organ damage (HMOD), a careful and comprehensive clinical history and physical examination is essential. The history should include:

- Family history of the following:
 - hypertension
 - diabetes
 - dyslipidaemia
 - chronic heart disease
 - stroke (CVA)
 - renal disease.
- Duration and previous levels of blood pressure, and results and side effects of previous antihypertensive therapy.
- Past history or current symptoms of the following, as well as information about the drugs used to treat these conditions:
 - Chronic heart disease and heart failure
 - Cerebrovascular disease
 - Peripheral vascular disease
 - Diabetes
 - Gout
 - Dyslipidemia
 - Bronchospasm /chronic respiratory diseases
 - Sexual dysfunction
 - Renal disease
 - Other significant illnesses
- Symptoms suggestive of secondary causes of hypertension, such as:
 - Loud nocturnal snoring or interrupted respirations
 - Hypertension in childhood or adolescence
 - Palpitations
 - Frequent episodes of sweating or tremor
 - Abdominal and back pain
 - Evidence of renal disease or insufficiency
- Careful assessment of lifestyle and factors including:
 - Dietary intake of fat
 - Dietary intake of salt (sodium)
 - Possible use of alcohol
 - History of smoking

- Frequency of and type of regular physical activity
- History of weight gain since early adult life (as useful index of excess body fat)
- Past history of drug use or use of substances that can raise blood pressure, such as: NSAIDs or over the counter OTC drugs
hormones, steroids and other prohypertensive drugs and substances
- Personal, psychological and environmental factors that could influence the course and outcome of antihypertensive care, including family situation, work environment and educational background.

Physical examination:

Points to be considered:

- General signs suggestive of secondary causes and other risk factors like :
 - Characteristic faces of Cushing syndrome.
 - Signs of acromegaly
- Presence of other risk factors: central obesity, tendon xanthomas (dyslipidemia)
- Measurement of height and weight and waist circumference, with calculation of Body Mass Index (BMI).
- Cardiovascular system:
 - Apical heave, (LVH)
 - Loud S2 or S4, JVP (evidence of heart failure)
 - Arterial disease (carotid, peripheral, renal)
 - Radial-femoral delay of pulse (coarctation of aorta)
 - Dependent edema
- Lungs:
 - Basal crackles
 - Wheezes
- Abdomen:
 - Palpable kidney (polycystic kidney)
 - Other masses(abdominal aortic aneurysm)
 - Bruit (renal artery stenosis)
- Fundoscopy:
 - Arteries: tortuosity, thickening, arterio-venous nicking
 - Background: haemorrhage, exudates, diabetic retinopathy
 - Discs: papilledema
- Nervous system:
 - Evidence of previous neurological disease
- Endocrine:
 - Evidence of Cushing's syndrome, thyroid disease

Laboratory Tests and Other Diagnostic procedures:

Routine laboratory tests recommended before initiating therapy include (all patients):

- Urinalysis for blood and protein
- Hematocrit CBC
- Chemical profile: Blood glucose, urea, creatinine (or the corresponding estimated glomerular filtration rate (e GFR), potassium, calcium, uric acid.
- Lipid profile: total cholesterol, (TC) high density lipoprotein cholesterol (HDL), low- density lipoprotein cholesterol (LDL), and triglycerides (TG).
- Twelve lead ECG.

Tests for selected patients:

- CXR to detect cardiomegaly, heart failure and coarctation of aorta.
- Ambulatory blood pressure monitoring to assess borderline hypertension or white coat hypertension.
- Echocardiography to detect LVH.
- Nitroprusside for heart failure detection.
- Abdominal ultrasound to detect renal disease, aortic aneurysm.
- Thyroid function test
- Urinary catecholamine or VMA (and plasma catecholamine) (venyl mandilic acid) to detect pheochromocytoma.
- Urinary cortisol and dexamethasone suppression test to detect Cushing syndrome.
- Plasma renin activity and aldosterone to detect primary aldosteronism.

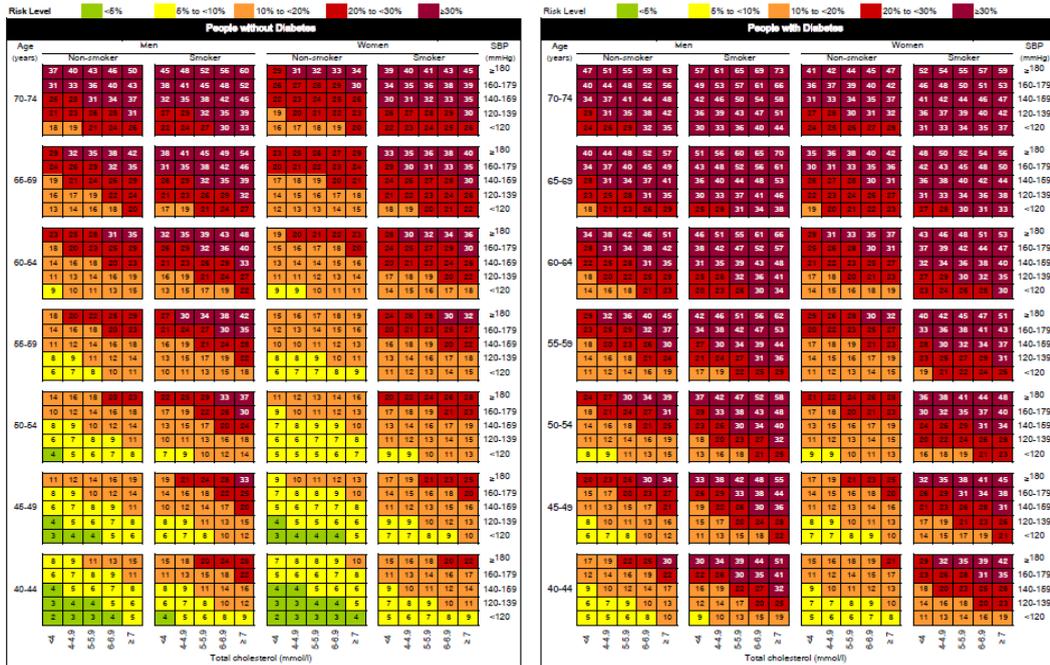
CVD Risk prediction:

Cardiovascular risk can be expressed as the percentage chance of an individual experiencing a cardiovascular event over a pre-defined period of time, usually the next 10 years. It mainly depends on the presence of CVD risk factors such as smoking, average blood pressure, BMI, cholesterol levels, age, and presence or absence of diabetes.

The chart below can be used to predict the cardiovascular disease risk over the next 10 years in areas that have access to total cholesterol measurements (Fig1) or those with no access to cholesterol measurement with BMI measurement (Fig2):

Figure (1): WHO Risk Prediction Chart with Cholesterol Measurement

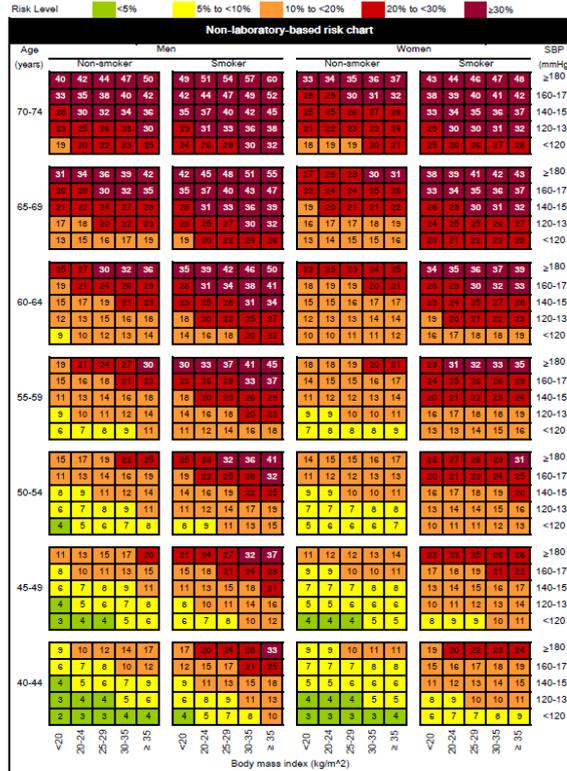
North Africa and Middle East
 Afghanistan, Algeria, Bahrain, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, occupied Palestinian territory, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, Turkey, United Arab Emirates, Yemen



North Africa and Middle East

Figure (2): WHO Risk Prediction chart with BMI WITHOUT Cholesterol Measurement

North Africa and Middle East
 Afghanistan, Algeria, Bahrain, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, occupied Palestinian territory, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, Turkey, United Arab Emirates, Yemen



North Africa and Middle East

Management Strategy of hypertension

1. Classification of the degree of hypertension of the patient based on Table 1.
2. Determining the overall risk profile of the patient based on the WHO Risk Prediction charts (fig 1,2).
3. Determining the specific therapeutic goals for the individual patient and develop a plan to lower BP and reduce the hypertension mediated organ damage (HMOD) including:
 - Life style modification to decrease risk factors.
 - Pharmacological treatment (annex 2).
 - Monitoring blood pressure and contributory risk factors.

Lifestyle Modifications counseling (annex 3A):

Lifestyle modifications may reduce the incidence of hypertension in high-normal blood pressure, decrease the dose and/or the number of drugs needed in patients with established hypertension, and reduce cardiovascular risk.

Lifestyle modifications shown to lower BP include:

1. Weight reduction in those individuals who are overweight or obese. Particularly abdominal obesity.
2. Salt reduction, healthy diet (annex2) and healthy drinks.
3. Practicing regular physical activity
4. Cessation of smoking
5. Reduction of alcohol intake if alcohol taken

Potassium supplementation:

Some of the advantages of a lower sodium intake may be related to its tendency to increase body potassium content, by a coincidental increase in dietary potassium intake and by a decrease in potassium wastage if diuretics are being used. potassium supplements are too costly and potentially hazardous for routine use by normokalemic hypertensive persons. The best source is increased consumption of fruits and vegetables.

Other dietary constituents:

Lowering blood pressure has been noted with diet rich in fruits and vegetables that could reflect increases in fiber, potassium, or other ingredients, and with high doses of omega-3 fatty acids from fish oil and supplements of vitamin C. Caffeine acutely but transiently raises blood pressure. High consumption of alcohol raises blood pressure.

Relaxation techniques:

Most studies of various cognitive-behavioral therapies have shown transient but not sustained lowering of blood pressure.

Combined therapies:

When several life-style modifications are combined, additional effects may occur.

Therapeutic goal:

Despite the fact that a reduction of BP by 20/10 mm Hg is associated with a 50% difference in cardiovascular risk, the therapeutic goal of long-term management of hypertension is to maintain a blood pressure of less than 140/90; that is, BOTH a systolic pressure of less than 140 and a diastolic pressure of less than 90 for as long as the patient lives.

Because of the higher risk of cardiovascular complications in those with current diabetes (Type I or II) or renal disease, the goal of management in these patients is blood pressure of less than 130/80.

Pharmacologic Treatment (annex IV):

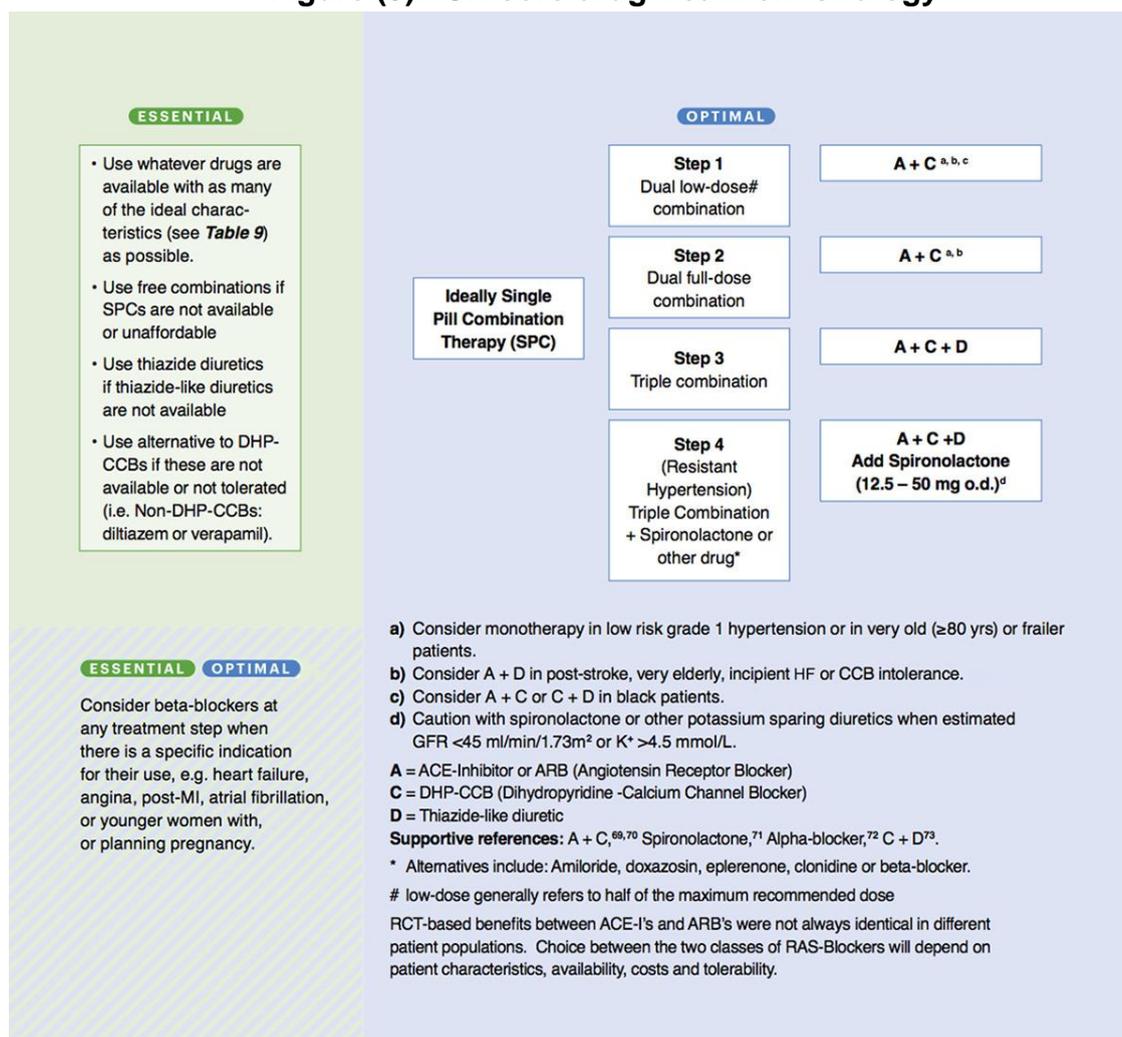
The main classes of antihypertensive medications:

1. Thiazide and thiazide-like diuretics
2. Angiotensin converting enzyme (ACE) inhibitors
3. Angiotensin receptor blockers (ARB)
4. Calcium channel blockers (CCB)
5. Others (β blockers, aldosterone antagonists (ALDO ANT), α blockers
Vasodialators, centrally acting drugs....)

Thiazide diuretics have been proven to be efficient in achieving blood pressure control and preventing the cardiovascular complications of hypertension with few side effects. They also enhance the antihypertensive efficacy of multiple drug regimens. Because of this, they are used as initial therapy for most patients with hypertension, either alone or in combination with one of the other classes which have been demonstrated to be beneficial in randomized controlled outcome trials. Other more potent loop diuretics such as furosemide, bumetanide have few advantages over thiazide except in patients with renal impairment. If a drug is not tolerated or is contraindicated, then one of the other classes proven to reduce cardiovascular events should be used instead.

The other classes of antihypertensive drugs include angiotensin converting enzyme inhibitors (ACEI), angiotensin receptor blockers (ARB), beta-blockers (BB), calcium channel blockers (CCB), aldosterone antagonists (ALDO ANT) should especially be used for the treatment of hypertension if there are co-existing clinical conditions such as those listed below in fig 3 and table 7. Their effectiveness in reducing the morbidity of these co-existing conditions as well as in reducing blood pressure creates a compelling indication for their use.

Figure (3): ISH core drug treatment strategy



Source: International society of hypertension global hypertension practice guidelines (2020).

Table (7): Compelling Indications for Individual Drug Classes

Compelling Indication*	Recommended Drugs ⁺					
	Diuretic	BB	ACEI	ARB	CCB	ALDO ANT
Heart failure	Yes	Yes	Yes	Yes		Yes
Post myocardial infarction		Yes	Yes			Yes
High coronary disease risk	Yes	Yes	Yes		Yes	
Diabetes	Yes	Yes	Yes	Yes	Yes	
Chronic kidney Disease			Yes	Yes		
Recurrent stroke Prevention	Yes		Yes			

*Compelling indications for antihypertensive drugs are based on benefits from outcome studies or existing clinical guidelines; the compelling indication is managed in parallel with the BP.

+ Drug abbreviations: ACEI, angiotensin converting enzyme inhibitor; ARB, angiotensin receptor blocker; Aldo ANT, aldosterone antagonist; BB, beta-blocker; CCB, calcium channel blocker.

Achieving Blood Pressure Control in Individual Patients:

Most patients who are hypertensive will require two or more antihypertensive medications to achieve their BP goals. Addition of a second drug from a different class should be initiated when use of a single drug in adequate doses fails to achieve the BP goal. When BP is more than 20/10 mmHg above goal, consideration should be given to initiating therapy with two drugs, either as separate prescriptions or in fixed-dose combinations.

The initiation of drug therapy with more than one agent may increase the likelihood of achieving the BP goal in a more timely fashion, but particular caution is advised in those at risk for orthostatic hypotension, such as patients with diabetes, autonomic dysfunction, and some older persons. Use of generic and fixed combination drugs should be considered to reduce prescription costs.

Key points in drug therapy

- In unselected group of hypertensive population, no one class of agents is any more effective at lowering BP than another.
- Begin with the lowest possible dose of the particular agent so as to reduce BP by 5-10 mmHg at a time. Too rapid BP lowering may lead to undue side effects (fatigue, lethargy and postural dizziness) and this may affect the compliance of the patient.
- If this is not successful at achieving the BP goal, then increase the dose gradually provided that it is well tolerated.
- Using low doses of two drugs that act by different mechanisms, allows better BP control with least side effects. Examples of useful combinations:
 - Thiazide diuretic can be used in combination with all antihypertensive drugs
 - ACEI + CCB
 - Dihydropyridine CCB + BB
 - ACEI + ARB .
- Some combinations may have additive ADVERSE effects, such as BB + Verapamil or diltiazem (can lead to bradycardia, cardiac depression and heart block)
- Change to a different class of antihypertensive drug if there is little response, poor tolerability or side effect. This should be done cautiously with further consultation, especially if discontinuing B-Blocker medication.
- Remember that the presence of certain clinical conditions in hypertensive patient (IHD, HF, renal disease, dyslipidemia, prostatic hypertrophy, COPD) may necessitate the use of certain classes of antihypertensive drugs.

- Using drugs with long duration of action is preferred to improve patient compliance as to be taken in a single dose daily.
- The best time to take the drug with long duration of action is as early as possible in the morning to cover the early morning surge of BP.
- The patient should know about his medication, dosing, mode of actions and possible side effects.
- When possible, to improve compliance with the management program, other staff members such as nurses should be trained to counsel the patient regarding the medications, dosing, and possible side effects
- The importance of regular visits to monitor the effectiveness of therapy and lifestyle changes should be emphasized.
- Treatment should be affordable and/or cost-effective relative to other agents.
- Treatments should be well-tolerated
- If the patient is already on another medication regimen, blood pressure is controlled to the target level, and the medications the patient is taking are accessible and affordable, there is no reason to change the regimen.
- Antihypertensive drugs can have both favorable or unfavorable effects on other possible co- morbidities This can influence the indications and contraindications of specific antihypertensive drugs in these selected patients (table 8).
- Pregnant women and women of childbearing age not on effective contraception should not be given ACE inhibitors, ARBs, or thiazide/thiazide-like diuretics; CCBs should be used. If not controlled with intensification dose of medication, refer to specialist.
- Beta blockers are not recommended as first-line therapy. If a heart attack has been diagnosed within the previous three years, or there is atrial fibrillation or heart failure, then a beta blocker should be added to the starting dose of antihypertensive medication. Patients with angina may also benefit from treatment with a beta blocker.

Other treatment considerations

- If there is a prior heart attack or stroke, or the person is otherwise at high risk of CVD, start a statin at the same time as starting antihypertensive medication. (Statins should not be used in women who are or who may become pregnant.)
- If there is a prior heart attack or ischemic stroke, start low-dose aspirin.

Table (8): Indications and contra indications of antihypertensive drugs

-- Indications and Contraindications for the Use of Antihypertensive Drugs

Class of Drug	Indications	Contraindications
Diuretics	Heart failure	Gout
	Advanced age	
	Systolic hypertension	
Beta blockers	Angina or previous myocardial infarction	Asthma or chronic obstructive pulmonary disease
	Heart failure	Heart block
	Tachyarrhythmias	
	Migraine	
Alpha blockers	Prostatic hypertrophy	Incipient heart failure
Calcium channel blockers	Advanced age	Heart block (verapamil, diltiazem)
	Systolic hypertension	
	Cyclosporine-induced hypertension	
Angiotensin-converting enzyme inhibitors	Heart failure or left ventricular dysfunction	Pregnancy
	Previous myocardial infarction	Bilateral renal artery stenosis
	Diabetic or other nephropathy or proteinuria	Hyperkalemia
Angiotensin receptor blockers	Angiotensin-converting enzyme inhibitor-associated cough	Pregnancy
	Diabetic or other nephropathy	Bilateral renal artery stenosis
	Congestive heart failure	Hyperkalemia

Source: Libby: Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 8th ed.

Non-compliance with drug treatment

Failure of compliance with drug treatment is a major problem in all hypertensive patients which may reach up to 60%, compliance of hypertensive patients should be assessed, may result from many causes:

- Complex drug regimen.
- Nature of the doctor –patient relationship.
- Frequent dosing schedules.
- Side effects.
- Cost of medication.
- Resistant hypertension which need multi drug regimen and more side effects.

Strategies to improve compliance to treatment:

- Reducing polypharmacy – use of fixed drug combination as linking adherence behavior with daily habits.
- Reminder packaging of medications.
- Empowerment-based counseling for self-monitoring.
- multidisciplinary healthcare team approach (ie, pharmacists) to improve monitoring for adherence.

Adherence to treatment is critical for blood pressure control. If antihypertensive medication is being prescribed, the following are critical to ensuring adherence:

- Explain the difference between medicines for long-term control (for example, of blood pressure) and medicines for quick relief (such as for headaches).
- Explain the reason for prescribing the medicine(s).
- Explain the diagnosis of hypertension.
- Discuss the asymptomatic nature of hypertension and explain that medications must be taken even if there are no symptoms.
- Inform the patient of the complications of untreated hypertension, including stroke, heart attack, kidney failure.
- Explain the disability and economic and family burden these preventable complications cause.
- Teach the patient how to take the medications at home.
- Show the patient the appropriate dose.
- Explain how many times a day the patient should take the medication and at what time, and adopt the following simple steps to help them to adhere to the guidelines
- Label and package the tablets.
- Check the patient's understanding before the patient leaves the health centre.
- Wherever possible, use once-daily dosages of all medications, to be given at the same time each day.

Special considerations in Management of Hypertension

Ischemic Heart Disease

Ischemic heart disease (IHD) is the most common form of HMOD associated with hypertension. In patients with hypertension and stable angina pectoris, the first drug of choice is usually a BB; alternatively, long-acting CCBs. In patients with acute coronary syndromes (unstable angina or myocardial infarction), hypertension should be treated initially with BBs and ACEIs, with addition of other drugs as needed for BP control. In patients with postmyocardial infarction, ACEIs, BBs, and aldosterone antagonists have proven to be most beneficial.

Heart Failure

Heart failure (HF), in the form of systolic or diastolic ventricular dysfunction, results primarily from systolic hypertension and IHD. In asymptomatic individuals with demonstrable ventricular dysfunction, ACEIs and BBs are recommended. For those with symptomatic ventricular dysfunction or end-stage heart disease, ACEIs, BBs, ARBs and aldosterone blockers are recommended along with loop diuretics.

Diabetes with Hypertension

Combinations of two or more drugs are usually needed to achieve the target goal of <130/80 mmHg. ACEI or ARB based treatments favorably affect the progression of diabetic nephropathy and reduce albuminuria, and ARBs have been shown to reduce progression to macroalbuminuria. Thiazide diuretics, BBs, ACEIs, ARBs, and CCBs have been shown to be beneficial in reducing CVD and stroke incidence in patients with diabetes.

Chronic Kidney Disease

In people with chronic kidney disease (CKD), as defined by either

(1) Reduced excretory function with an estimated GFR below 60 ml/min per 1.73 m²
OR

(2) The presence of albuminuria (>300 mg/day or 200 mg albumin/g creatinine).
Therapeutic goals are to slow deterioration of renal function and prevent CVD. Hypertension appears in the majority of these patients, and they should receive aggressive BP management, often with three or more drugs to reach target BP values of <130/80 mmHg.

ACEIs and ARBs have demonstrated favorable effects on the progression of diabetic and non-diabetic renal disease. A limited rise in serum creatinine of as much as 35 percent above baseline with ACEIs or ARBs is acceptable and is not a reason to withhold treatment unless hyperkalemia develops. With advanced renal disease (estimated GFR <30 ml/min 1.73 m²), increasing doses of loop diuretics are usually needed in combination with other drug classes.

Cerebrovascular Disease

The risks and benefits of acute lowering of BP during an acute stroke are still unclear; control of BP at intermediate levels (approximately 160/100 mmHg) is appropriate until the condition has stabilized or improved. Recurrent stroke rates are lowered by the combination of an ACEI and thiazide-type diuretic.

Obesity and the metabolic syndrome

Obesity (BMI >30 kg/m²) is an increasingly prevalent risk factor for the development of hypertension and CVD. Metabolic syndrome defined as the presence of and increased waist circumference (waist circumference >102 cm. in men or >88 cm. in women) with two or more of the following conditions: glucose intolerance (fasting glucose >100 mg/dL), BP >130/80 mmHg, high triglycerides (>150 mg/dL), or low HDL (<40 mg/dL in men or <50 mg/dL in women).

Intensive lifestyle modification should be pursued in all individuals with the metabolic syndrome, and appropriate drug therapy should be instituted for each of its components as indicated.

Left ventricular hypertrophy

Left ventricular hypertrophy (LVH) is an independent risk factor that increases the risk of subsequent CVD. Regression of LVH occurs with aggressive BP management, including weight loss, sodium restriction, and treatment with all classes of antihypertensive agents except the direct vasodilators hydralazine, and minoxidil.

Peripheral arterial disease

Peripheral arterial disease (PAD) is equivalent in risk to IHD. Any class of anti-hypertensive drugs can be used in most PAD patients. Other risk factors should be managed aggressively, and aspirin should be used.

Hypertension in older persons

Hypertension occurs in more than two-thirds of individuals after age 65. This is also the population with the lowest rates of BP control. Treatment recommendations for older people with hypertension, including those who have isolated systolic hypertension, should follow the same principles outlined for the general care of hypertension. In many individuals, lower initial drug doses may be indicated to avoid symptoms; however, standard doses and multiple drugs are needed in the majority of older people to reach appropriate BP targets. Thiazide diuretics and CCB are the preferred classes of drugs to be used in elderly patients.

Postural hypotension

A decrease in standing SBP >10 mmHg, when associated with dizziness or fainting, is more frequent in older patients with systolic hypertension, diabetes, and those taking diuretics, venodilators (e.g., nitrates, alpha-blockers, and sildenafil like drugs), and some psychotropic drugs. BP in these individuals should also be monitored in the upright position. Caution should be used to avoid volume depletion and excessively rapid dose titration of antihypertensive drugs.

Hypertension in women

Oral contraceptives may increase BP, and the risk of hypertension increases with duration of use. Women taking oral contraceptives should have their BP checked regularly. Development of hypertension is a reason to consider other forms of contraception. In contrast, menopausal hormone therapy does not raise BP.

Women with hypertension who become pregnant should be followed carefully because of increased risks to mother and fetus. Methyldopa, BBs, and vasodilators are preferred medications for the safety of the fetus. ACEI and ARBs should not be used during pregnancy because of the potential for fetal defects and should be avoided in women who are likely to become pregnant.

Hypertension in Pregnancy

Hypertension in pregnancy is a condition affecting 5%–10% of pregnancies worldwide. Maternal risks include placental abruption, stroke, multiple organ failure (liver, kidney), disseminated vascular coagulation. Fetal risks include intrauterine growth retardation, preterm birth, intrauterine death.

Pre-eclampsia, which occurs after the 20th week of pregnancy, is characterized by new-onset or worsening hypertension, albuminuria, and hyperuricemia, sometimes with coagulation abnormalities. In some patients, preeclampsia may develop into a hypertensive urgency or emergency and may require hospitalization, intensive monitoring, early fetal delivery, and parenteral antihypertensive.

Hypertension and Chronic Obstructive Pulmonary Disease (COPD)

Hypertension is the most frequent comorbidity in patients with COPD. BP should be lowered if $\geq 140/90$ mm Hg and treated to a target $< 130/80$ mm Hg ($< 140/80$ in elderly patients). Lifestyle changes (smoking cessation) are mandatory. Environmental (air) pollution should be considered and avoided if possible.

The treatment strategy should include an angiotensin AT1-receptor blocker (ARB) and CCB and/or diuretic, while beta blockers (β_1 -receptor selective) may be used in selected patients (eg, CAD, HF). Additional cardiovascular risk factors should be managed according to cardiovascular risk profile.

Hypertension and Psychiatric Diseases

The prevalence of hypertension is increased in patients with psychiatric disorders and in particular depression. According to guidelines, psychosocial stress and major psychiatric disorders increase the cardiovascular risk.

Depression has been associated with cardiovascular morbidity and mortality, suggesting the importance of BP control.

Hypertension and Inflammatory Rheumatic Diseases (IRD)

IRD (rheumatoid arthritis, psoriasis-arthritis, etc.) are associated with an increased prevalence of hypertension under diagnosed and poorly controlled. IRD show an increase in cardiovascular risk only partially related to cardiovascular risk factors. Rheumatoid arthritis is predominant among IRD. The presence of IRD should increase 1 step of cardiovascular risk.

Hypertensive urgencies and emergencies

Emergency:

Patients with marked BP elevations and acute HMOD (e.g., encephalopathy, myocardial infarction, unstable angina, pulmonary edema, eclampsia, intra cranial hemorrhage , head trauma, life-threatening arterial bleeding, or aortic dissection) require hospitalization and parenteral drug therapy.

Urgency:

Patients with markedly elevated BP but without acute HMOD usually do not require hospitalization, but they should receive immediate combination oral antihypertensive therapy. They should be carefully evaluated and monitored for hypertension-induced heart and kidney damage and for identifiable causes of hypertension.

Resistant Hypertension

Resistant hypertension is the failure to reach goal BP in patients who are adhering to full doses of an appropriate three-drug regimen that includes a diuretic (for 2 months). After excluding potential identifiable causes of resistant hypertension (table 9), With particular attention paid to diuretic type and dose in relation to renal function, Consultation with a specialist should be considered .

Table (9): Some Potential Causes of Resistant Hypertension

- Improper BP measurement
- Volume overload and pseudo-tolerance
 - Excess sodium intake
 - Volume retention from kidney disease
 - Inadequate diuretic therapy
- Drug induced or other causes
 - Non adherence to medication protocol
 - Inadequate doses(that does not cover 24 hours)
 - Inappropriate combinations of medications
 - Non-steroidal anti-inflammatories
 - Cocaine, amphetamines, other illicit drugs
 - Sympathomimetics (oral decongestant medications)
 - Oral contraceptives
 - Corticosteroids
 - Cyclosporine, tacrolimus
 - Erythropoietin
 - Licorice, including some chewing tobacco
 - Selected dietary supplements
- Associated conditions
 - Obesity
 - Excess alcohol intake
 - White coat
- Secondary hypertension

Referral Guidelines for PHCCs

A hypertensive patient should be referred to an appropriate specialist under the following conditions:

1. All hypertension emergencies cases should be referred to hospital
2. If therapeutic goals, including blood pressure control, have not been reached within six months.
3. For further assessment, screening, and management of HMOD or associated conditions, such as:
 - Hemorrhage and exudates or papilloedema on fundoscopic examination)
 - Suspicion of left ventricular failure
 - Suspicion of cerebrovascular accident or transient ischemic attack
 - Suspicion of coronary event
 - Progressive increase in serum creatinine or renal failure
 - Hypertensive encephalopathy
 - (Any stage) peripheral vascular disease
 - Any possibility of secondary hypertension

Follow up and monitoring

Patients treated only with lifestyle modification should be seen after 3-6 months. After their blood pressure is stabilized, they should be seen every 6-12 months to reinforce the necessity and goals of maintaining these modifications of lifestyle.

Once antihypertensive drug therapy is initiated, most patients should return for follow up and adjustment of medications at approximately monthly intervals until the BP goal is reached. More frequent visits will be necessary for patients with stage II hypertension or with complicating co-morbid conditions.

Monitoring parameters:

On each regular visit:

- Adherence to medication protocol
- Medication side effects
- Blood Pressure
- Weight and BMI
- Cardiac Examination
- Pulmonary Examination
- Optic Fundi
- Review of counseling on diet (especially salt intake), exercise, smoking

Every 6 months:

- Creatinine/ Urea Nitrogen
- Serum potassium
- ECG

Every 12 months:

- A full fundoscopic examination
- ECG – 12 lead
- Echocardiography
- Lipid profile
- Blood sugar

Patients who experienced a hypertensive emergency are at increased risk of cardiovascular and renal disease. Thorough investigation of potential underlying causes and assessment of HMOD is mandatory to avoid recurrent presentations with hypertensive emergencies.

Co-morbidities, such as heart failure, associated diseases such as diabetes, and the need for laboratory tests influence the frequency of visits. Other cardiovascular risk factors should be treated to their respective goals, and tobacco avoidance should be promoted vigorously. Low- dose aspirin therapy should be considered only when BP is controlled, because the risk of hemorrhagic stroke is increased in patients with uncontrolled hypertension.

Prevention of hypertension

High blood pressure is preventable and treatable and because hypertension is a major risk factor for cardiovascular disease. Many deaths can be prevented if hypertension is prevented from developing or is detected early and managed properly.

Primary prevention:

This refers to actions that can be taken prior to the onset of hypertension through lifestyle modification.

Actions:

- Maintain normal body weight (BMI 20 - <25 kg/m)
- Avoid high salt diet (not add salt to food either in cooking or at the table, avoid canned and processed foods)
- Engage in regular aerobic activity
- Limit alcohol consumption
- Consume diet rich in fresh fruits and vegetables,
- Replace saturated fat with unsaturated fats.
- Stop smoking

Secondary prevention:

This refers to actions which halt the progress of hypertension at its incipient stage and prevents complications through early detection and proper management.

Actions:

- Regular blood pressure screening
- Lifestyle modification
- Early initiation of treatment and assurance of compliance

Tertiary prevention:

Refers to Measures used late in the stage of the disease to limit disease progression and clinical disease complication after overt clinical hypertension manifest

Actions:

- Lifestyle modifications
- Treatment of hypertension and any target organ damage with consideration of compliance, adherence, and concordance.
- Concomitant treatment of diseases developed secondary to hypertension.

Health Education Messages on Hypertension

It is very crucial that the patient should understand what hypertension is, the factors that influence it, therefore the treating physician should have a plan for the patient education, stressing the importance of the following points:

- Hypertension requires permanent, life-long treatment it can be controlled, but not cured
- Hypertension is frequently asymptomatic and may progress silently (called the silent killer); therefore regular monitoring and management of BP is important.
- Hypertension is important risk factor for many cardiovascular diseases such as heart attack and stroke, which can be prevented by adequate control.
- Life style modification is an essential part of therapy which leads to better control of hypertension and reduces the no. and doses of required drugs.
- Hypertension is usually asymptomatic and requires treatment based only on blood pressure readings rather than symptoms such as headache or dizziness
- Stress can contribute to hypertension, but is not the most common cause; a (personal predisposition is the most common factor) Continually reinforce the dangers to smoking, not only in regard to hypertension, but to cardiac and lung health.
- Both systolic and diastolic BP are important, SBP may be more predictive of complication than DBP especially in elderly people.
- Encouraging self monitoring to give guide for management & not for deciding management.

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**National Guidelines for Primary
Health Care Physicians**

**Hypertension
Prevention, Diagnosis, and Treatment**

Annexes

Annex I Equipment for Blood Pressure Measurement

A *sphygmomanometer* or blood pressure meter is a device with an inflatable cuff used to measure blood pressure, consist of inflation cuff, measuring unit (the manometer) tube to connect the two and inflation bulb connected by a tube to the cuff.

Types of sphygmomanometers:

1. **Manometric:** includes both the mercury column type and the aneroid, both manually inflated and require stethoscope. The mercury type is very accurate and used for standardization of other measuring devices. The aneroid may give inaccurate readings if not properly calibrated.

2. **Digital types:** are easy to use but can give inaccurate results, require no stethoscope. Three types are available: *finger* and *wrist* devices, both are not considered to be accurate and the *upper arm* devices which are the least susceptible to position error.

Cuff size for measuring blood pressure:

It is important to select the proper cuff size for blood pressure measurement, too small cuffs give false high BP, and too large cuffs give false low BP reading. The cuff bladder length should be at least 80% of the arm circumference, and width should be at least 40% of the arm circumference (table 3).

size of cuff

Midpoint Arm Circumference ^{***} (cm)	Cuff Name	Bladder Width (cm)	Bladder Length (cm)
22-26	Small adult	10	24
27-34	Adult	13	30
35-44	Large adult	16	38
45-52	Thigh	20	42

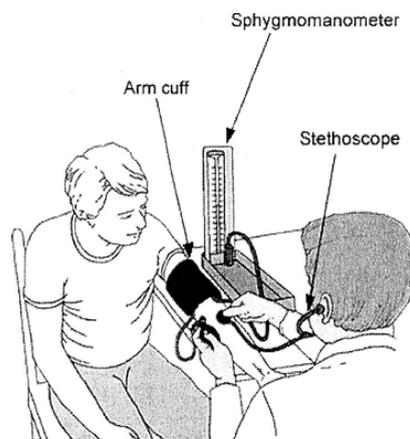
^{***} Arm circumference as measured at the midpoint of the upper arm.

Measurement of BP at the clinic/office:

1. The auscultatory method of BP measurement with a properly calibrated and validated instrument should be used.

2. Persons should :

- stop smoking and coffee drinks for at least 30 minutes
- empty the bladder before the examination.
- be seated quietly for at least 5 minutes in a chair (rather than on an exam table).
- feet on the floor and arm supported at heart level (fig.1)



Proper measurement of blood pressure

3. Measurement of BP in the standing position is indicated periodically, especially in those at risk for postural hypotension, diabetics and elderly.

4. An appropriate-sized cuff should be used to ensure accuracy, remember that for obese patients appropriate cuff size should be used; otherwise false high BP will be recorded (table two).

5. Steps for proper blood pressure measurement should be followed (table 4). Systolic and diastolic blood pressure is accordingly recorded (table 5)

6. At least two measurements should be made and take the average. Both RT and LT arm BP should be measured in the initial visit, the arm with the higher BP should be considered for diagnosis of hypertension and treatment decisions.

Clinicians should provide to patients, verbally and in writing, their specific BP numbers and BP goals.

Diagnosis of hypertension is not based on the first assessment. Blood pressure measurement should be taken three separate times one to several weeks from the initial assessment to confirm the diagnosis.

Steps for proper blood pressure measurement technique

- Expose the upper arm. Remove any tight or restrictive clothing from the arm
- Evaluate the patient's bare upper arm for the appropriate size cuff
- Place the cuff on the patient's bare upper arm, with the lower edge of the cuff 2.5 cm above the antecubital fossa, with the center of the cuff bladder over the brachial artery.
- Palpate brachial artery pulse
- Inflate the cuff until pulsation disappears
- Deflate the cuff
- The point of disappearance is the estimated systolic pressure
- Wait 15-30 seconds, then place the bell head of the stethoscope over the brachial artery and inflate the bladder to 30 mmHg above estimated SBP
- Allow the cuff to slowly deflate at a rate of 2-3 mmHg per second while listening for repetitive sounds
- Record the pressure at which the first of at least two repetitive sounds is heard. This is the systolic blood pressure (phase 1 sounds)
- Record the pressure at which the last regular sound is heard. This is the diastolic blood pressure (phase 5 sounds)
- Continue to listen during full deflation to confirm disappearance of the heart sounds.

Auscultatory sounds in reading blood pressure

- **Phase 1** the first appearance of faint, repetitive, clear tapping sounds that gradually increase in intensity for at least two consecutive beats is the systolic blood pressure.
- **Phase 2** A brief period may follow during which the sounds soften and acquire a swishing quality
- **Auscultatory gap** in some patients sounds may disappear altogether for a short time
- **Phase 3** the return of sharper sounds, may be even sharper than phase 1 sounds.
- **Phase 4** the distinct, abrupt muffling sounds, which become soft and blowing in quality
- **Phase 5** The point at which all sounds finally disappear completely is the diastolic pressure

Inaccurate blood pressure measurement:

Accurate blood measurement is essential for diagnosis and treatment of hypertensive patients. The following points need to be considered for inaccuracy:

1. **Inaccurate manometer or improper cuff size.**
The manometer should be calibrated at regular basis and the proper cuff size should be selected.
2. **Inaccuracy results from the examiner:** cuff pressure is released too fast, terminal digit bias (the examiner tends to round off the measured value so as to end in 0 or 5), examiner bias and the examiner skills.
3. **Inaccuracy results from inter-arm difference:**
Pressure difference of > 10 mm Hg between the arms of hypertensive patient may be present in hypertensive patient, in such a case the higher BP reading should be selected for diagnosis and treatment.
4. **Inaccuracy from physiological variation:**
Emotional situation of the patient(stress or fear) during the measurement, white coat hypertension, the patient activity prior to measurement, position during measurement (sitting, standing, seating) and ingestion of certain substances (caffeine , alcohol , nicotine or sympathomimetic drugs like nasal drops)

Ambulatory BP monitoring:

Ambulatory blood pressure measurement is a method of obtaining information about blood pressure in a patient outside the clinical setting.

Anxiety, discomfort and unfamiliar surroundings at the clinic can lead to transient rise in BP. Sphygmomanometry, especially when performed by physicians, can cause unrepresentative surge in BP called “**white coat hypertension**” and up to 20% of patients with apparent hypertension in the clinic, tend to have normal BP recordings by automated devices measured at home.

Ambulatory BP measurement devices are portable automated instruments that can be held by the patient for the whole 24 hours, recording the BP automatically at specified time intervals during the actual patient day life.

Ambulatory BP recordings are better correlated with the target organ damage due to hypertension than clinic readings, yet lower reading than the clinic recordings should be considered for both diagnosis and treatment decisions (clinic reading should be $> 140/85$, ambulatory $> 130/80$). In most individuals, BP decreases by 10 to 20 percent during the night; those in whom such reductions are not present are at increased risk for cardiovascular events.

Indications for ambulatory blood pressure monitoring:

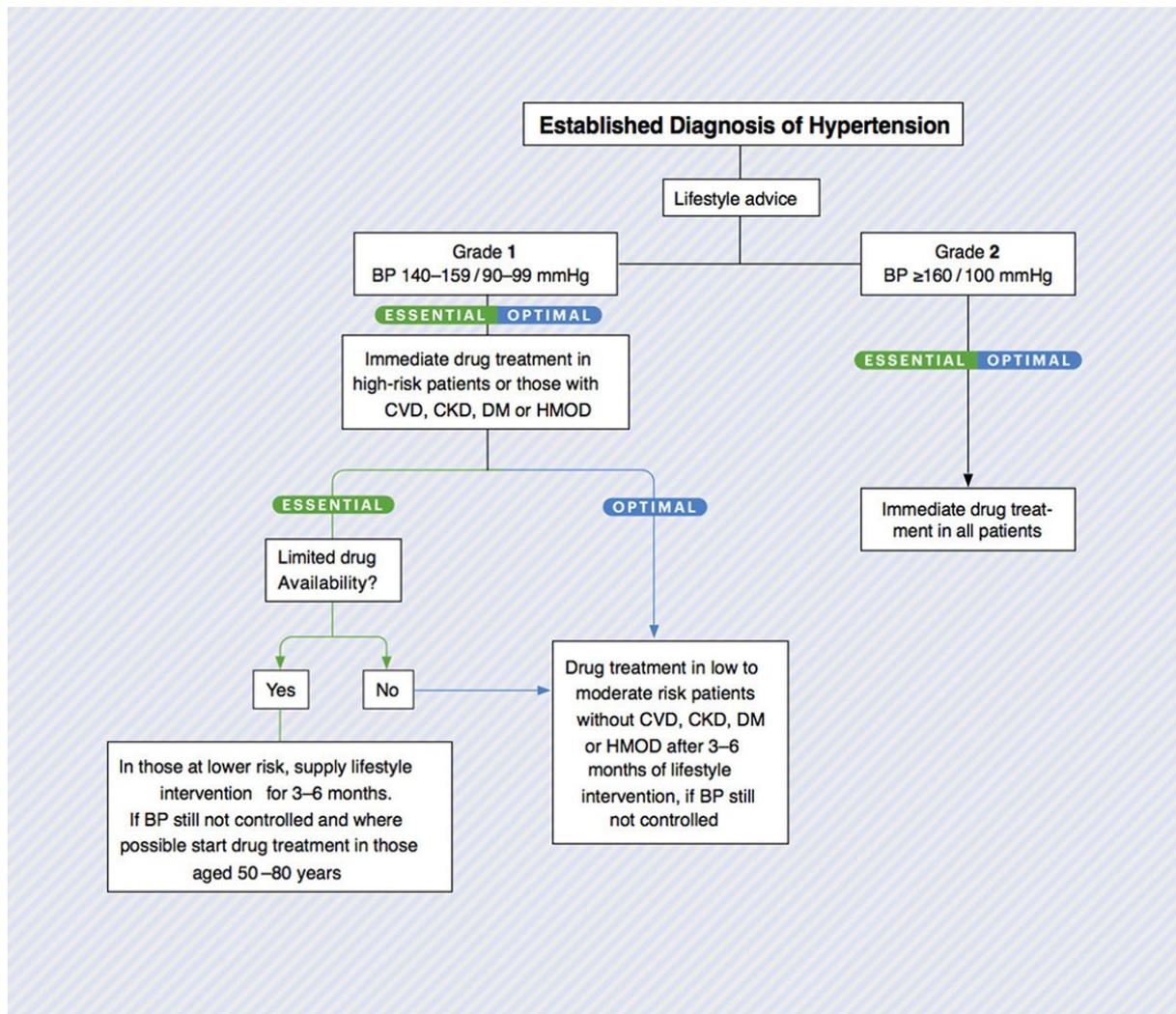
1. White-coat” hypertension in the absence of target organ damage.
2. Drug resistance hypertension.
3. Hypotensive symptoms with antihypertensive medication
4. Episodic or labile hypertension and autonomic dysfunction

Self-measurement of blood pressure:

Blood pressure self-measurements may benefit patients by providing information on response to antihypertensive medication, improving patient adherence with therapy, and in evaluating white-coat hypertension.

Persons with an average BP more than 135/85 mmHg measured at home are generally considered to be hypertensive. Home measurement devices which are of variable quality semi-automated devices should be checked regularly for accuracy.

Annex II Pharmacological treatment of hypertension: general scheme



International society of hypertension global hypertension practice guidelines (2020)

Annex III A Lifestyle Modifications

Salt reduction	There is strong evidence for a relationship between high salt intake and increased blood pressure. Reduce salt added when preparing foods, and at the table. Avoid or limit consumption of high salt foods such as soy sauce, fast foods and processed food including breads and cereals high in salt
Healthy diet	Eating a diet that is rich in whole grains, fruits, vegetables, polyunsaturated fats and dairy products and reducing food high in sugar, saturated fat and trans fats, such as the DASH diet (http://www.dashforhealth.com). Increase intake of vegetables high in nitrates known to reduce BP, such as leafy vegetables and beetroot. Other beneficial foods and nutrients include those high in magnesium, calcium and potassium such as avocados, nuts, seeds, legumes and tufo
Healthy drinks	Moderate consumption of coffee, green and black tea. Other beverages that can be beneficial include karkadé (hibiscus) tea, pomegranate juice, beetroot juice and cocoa.
Moderation of Alcohol consumption	Positive linear association exists between alcohol consumption, blood pressure, the prevalence of hypertension, and CVD risk. The recommended daily limit for alcohol consumptions is 2 standard drinks for men and 1.5 for women (10 g alcohol/standard drink). Avoid binge drinking.
Weight reduction	Body weight control is indicated to avoid obesity. Particularly abdominal obesity should be managed. Ethnic-specific cut-offs for BMI and waist circumference should be used. Alternatively, a waist-to-height ratio <0.5 is recommended for all populations.
Smoking cessation	Smoking is a major risk factor for CVD, COPD and cancer. Smoking cessation and referral to smoking cessation programs are advised.
Regular Physical activity	Studies suggest that regular aerobic and resistance exercise may be beneficial for both the prevention and treatment of hypertension Moderate intensity aerobic exercise (walking, jogging, cycling, yoga, or swimming) for 30 minutes on 5–7 days per week or HIIT (high intensity interval training) which involves alternating short bursts of intense activity with subsequent recovery periods of lighter activity. Strength training also can help reduce blood pressure. Performance of resistance/strength exercises on 2–3 days per week
Reduce stress and mindfulness	Chronic stress has been associated to high blood pressure later in life. Although more research is needed to determine the effects of chronic stress on blood pressure, randomized clinical trials examining the effects of transcendental meditation/mindfulness on blood pressure suggest that this practice lowers blood pressure. Stress should be reduced and mindfulness or meditation introduced into the daily routine.
Complimentary alternative or traditional medicines	Large proportions of hypertensive patients use complementary, alternative or traditional medicines (in regions such as Africa and China) yet large-scale and appropriate clinical trials are required to evaluate the efficacy and safety of these medicines. Thus, use of such treatment is not yet supported.
Reduce exposure to air pollution and cold temperature	Evidence from studies support a negative effect of air pollution on blood pressure in the long-term.

*(2020)International Society Of Hypertension Global Hypertension Practice Guidelines with modification

Annex III B DASH: Dietary Approaches to Stop Hypertension

Food	Servings per day	Serving Size
Grains	5-6 daily servings	½ cup cooked rice or pasta; 1 slice whole grain bread
Vegetables	4-5 daily servings	1 cup raw vegetables or fruit ½ cup cooked vegetables or fruit
Fruits	2-3 daily servings	1 cup raw fruit 1 medium banana 1 orange, ½ grapefruit
Low-fat or fat-free dairy products	2-3 daily servings	1 cup of low-fat milk or yoghurt
Lean meat, poultry and fish	2 daily servings	90 grams cooked lean meat 90 grams cooked chicken
Nuts, seeds, and dry beans/lentils	1-2 servings per day	15 grams of nuts ¼ cup cooked beans, peas, or lentils, humus
Fats and oils	2-3 daily servings.	1 teaspoon olive oil
Sweets - limited	Less than 1 serving per day	1 small piece of pastry or sweet

Note: DASH diet adapted slightly for approximately 1600 Kcal/day, and to control simple sugars. See also “Diet for Diabetes and Metabolic Syndrome” for general suggestions http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf

For dietary guideline see WHO EMRO publication Promoting a healthy diet for the WHO Eastern Mediterranean Region: user-friendly guide.

Annex IV Oral Antihypertensive Drugs

Class	Drug	Usual Dose Range (mg/d)	Daily Frequency	Comments
Primary agents				
Thiazide or thiazide – type diuretics	Chlorthalidone	12.5-25	1	<ul style="list-style-type: none"> Chlorthalidone is preferred on the basis of prolonged half-life and proven trial reduction of CVD. Monitor for hyponatremia and hypokalemia, uric acid and calcium levels. Use with caution in patients with history of acute gout unless patient is on uric acid-lowering therapy.
	Hydrochlorothiazide	25-50	1	
	Indapamide	1.25-2.5	1	
	Metolazone	2.5-5	1	
ACE inhibitors	Benazepril	10-40	1 or 2	<ul style="list-style-type: none"> Do not use in combination with ARBs or direct renin inhibitor. There is an increased risk of hyperkalemia, especially in patients with CKD or in those on K supplements or K-sparing drugs. There is a risk of acute renal failure in patients with severe bilateral renal artery stenosis. Do not use if patient has history of angioedema with ACE inhibitors. Avoid in pregnancy.
	Captopril	12.5-150	2 or 3	
	Enalapril	5-40	1 or 2	
	Fosinopril	10-40	1	
	Lisinopril	10-40	1	
	Moexipril	7.5-30	1 or 2	
	Perindopril	4-16	1	
	Quinapril	10-80	1 or 2	
	Ramipril	2.5-20	1 or 2	
Trandolapril	1-4	1		
ARBs	Azilsartan	40-80	1	<ul style="list-style-type: none"> Do not use in combination with ACE inhibitors or direct renin inhibitor. There is an increased risk of hyperkalemia in CKD or in those on K supplements or K-sparing drugs. There is a risk of acute renal failure in patients with severe bilateral renal artery stenosis. Do not use if patient has history of angioedema with ARBs. Patients with a history of angioedema with an ACE inhibitor can receive an ARB beginning 6 weeks after ACE inhibitor is discontinued. Avoid in pregnancy.
	Candesartan	8-32	1	
	Eprosartan	600-800	1 or 2	
	Irbesartan	150-300	1	
	Losartan	50-100	1 or 2	
	Olmesartan	20-40	1	
	Telmisartan	20-80	1	
	Valsartan	80-320	1	
CCB-dihydropyridines	Amlodipine	2.5-10	1	<ul style="list-style-type: none"> Avoid use in patients with HFrEF; amlodipine or felodipine may be used if required. They are associated with dose-related pedal edema, which is more common in women than men.
	Felodipine	2.5-10	1	
	Isradipine	5-10	2	
	Nicardipine SR	60-120	2	
	Nifedipine LA	30-90	1	
	Nisoldipine	17-34	1	
CCB nondihydropyridines	Diltiazem ER	120-360	1	<ul style="list-style-type: none"> Avoid routine use with beta blockers because of increased risk of bradycardia and heart block. Do not use in patients with HFrEF. There are drug interactions with diltiazem and verapamil (CYP3A4 major substrate and moderate inhibitor).
	Verapamil IR	120-360	3	
	Verapamil SR	120-360	1 or 2	
	Verapamil-delayed onset ER	100-300	1 (in the evening)	
Secondary agents				
Diuretics-Loop	Bumetanide	0.5-2	2	<ul style="list-style-type: none"> These are preferred diuretics in patients with symptomatic HF. They are preferred over thiazides in patients with moderate-to-severe CKD (e.g., GFR < 30 ml per min)
	Furosemide	20-80	2	
	Torsemide	5-10	1	
Diuretics-potassium sparing	Amiloride	5-10	1 or 2	<ul style="list-style-type: none"> These are monotherapy agents and minimally effective antihypertensive agents. Combination therapy of potassium-sparing diuretic with a thiazide can be considered in patients with hypokalemia on thiazide monotherapy. Avoid in patients with significant CKD (e.g., GFR < 45 mL/min).
	Triamterene	50-100	1 or 2	

Annex IV Oral Antihypertensive Drugs (continued)

Class	Drug	Usual Dose Range (mg/d)	Daily Frequency	Comments
Diuretics—aldosterone antagonists	Eplerenone	50–100	1 or 2	<p>These are preferred agents in primary aldosteronism and resistant hypertension.</p> <ul style="list-style-type: none"> • Spironolactone is associated with greater risk of gynecomastia and impotence as compared with eplerenone. • This is common add-on therapy in resistant hypertension. • Avoid use with K supplements, other K-sparing diuretics, or significant renal dysfunction. • Eplerenone often requires twice-daily dosing for adequate BP lowering.
	Spironolactone	25-100	1	
Betablockers-cardioselective	Atenolol	25-100	2	<ul style="list-style-type: none"> • Beta blockers are not recommended as first-line agents unless the patient has IHD or HF. • These are preferred in patients with bronchospastic airway disease requiring a beta blocker. • Bisoprolol and metoprolol succinate are preferred in patients with HFrEF. • Avoid abrupt cessation
	Betaxolol	5-20	1	
	Bisoprolol	2.5-10	1	
	Metoprolol tartate	100-200	2	
	Metoprolol succinate	50-200	1	
Betablockers-Cardioselective and vasodilatory	Nebivolol	5-40	1	<ul style="list-style-type: none"> • Nebivolol induces nitric oxide–induced vasodilation. • Avoid abrupt cessation
Beta blockers noncardioselective	Nadolol	40 -120	1	<ul style="list-style-type: none"> • Avoid in patients with reactive airways disease. • Avoid abrupt cessation.
	Propranolol IR	80 -160	2	
	Propranolol LA	80 - 160	1	
Beta blockers - intrinsic sympathomimetic activity	Acetabutolol	200 -800	2	<ul style="list-style-type: none"> • Generally avoid, especially in patients with IHD or HF. • Avoid abrupt cessation.
	Penbutolol	10 -40	1	
	Pindolol	10 -60	2	
Beta blockers—combined alpha- and beta-receptor	Carvedilol	12.5 -50	2	<ul style="list-style-type: none"> • Carvedilol is preferred in patients with HFrEF. • Avoid abrupt cessation.
	Carvedilol phosphate	20 -80	1	
	Labetolol	200 -800	2	
Direct renin inhibitor	Aliskiren	150 -300	1	<ul style="list-style-type: none"> • Do not use in combination with ACE inhibitors or ARBs. • Aliskiren is very long acting. • There is an increased risk of hyperkalemia in CKD or in those on K supplements or K-sparing drugs. • Aliskiren may cause acute renal failure in patients with severe bilateral renal artery stenosis. • Avoid in pregnancy
Alpha 1- blockers	Doxazosin	1 - 16	1	<p>These are associated with orthostatic hypotension, especially in older adults.</p> <ul style="list-style-type: none"> • They may be considered as second-line agent in patients with concomitant BPH
	Prazosin	2 -20	2 or 3	
	Tetrazosin	1 -20	1 or 2	
Central alpha2-agonist and other centrally acting drugs	Clonidine oral	0.1 -0.8	2	<ul style="list-style-type: none"> • These are generally reserved as last-line because of significant CNS adverse effects, especially in older adults. • Avoid abrupt discontinuation of clonidine, which may induce hypertensive crisis; clonidine must be tapered to avoid rebound hypertension.
	Clonidine patch	0,1 -0.3	1 weekly	
	Methyl dopa	250 -1000	2	
	Guafacine	0.5 -2	1	
Direct vasodilators	Hydralazine	100 -200	2 or 3	<ul style="list-style-type: none"> • These are associated with sodium and water retention and reflex tachycardia; use with a diuretic and beta blocker • Hydralazine is associated with drug-induced lupus-like syndrome at higher doses. • Minoxidil is associated with hirsutism and requires a loop diuretic. • Minoxidil can induce pericardial effusion
	Minoxidil	5 -100	1-3	

* 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines



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