CLINICAL GUIDELINES FOR MANAGEMENT OF HYPERTENSION IN ADULTS 2025

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CLINICAL GUIDELINES FOR MANAGEMENT OF HYPERTENSION IN ADULTS

1. Introduction

Hypertension is a serious medical condition that is also a significant modifiable risk factor for cardiovascular, chronic kidney disease and a leading cause of premature death worldwide. Most patients with hypertension have essential or primary hypertension, where the exact cause remains unknown, while an estimated 10% have secondary hypertension, with an identifiable cause[1.]

Untreated or inadequate treatment of hypertension can lead to organ damage resulting in cardiovascular and renal disease that contribute significantly to global burden of non-communicable disease (NCD) morbidity and mortality. Organs adversely affected by hypertension include the heart, brain, kidneys, eyes, and blood vessels[1,2.]

The prevalence of Hypertension continues to increase globally, and detection, treatment and prevention are yet far from being adequate. Many people with hypertension are either not diagnosed or even among the diagnosed, many are not on treatment or are receiving inadequate treatment. An estimated 1.4 billion people aged 30-79 years have hypertension worldwide but only 14 percent have it under control.[11]

More than 50% of hypertensive patients have additional cardiovascular risk factors, the most common being diabetes, lipid disorders and metabolic syndrome. In addition, they also have common unhealthy habits such as smoking and sedentary lifestyle habits that further increase the risk of cardiovascular and renal diseases.[1]

Hypertension is one the most prevalent risk factors for cardiovascular disease in the Maldives, where cardiovascular disease account for 39 percent of the total deaths in Maldives, as per the WHO NCD country report of 2014. According to WHO STEP survey on risk factors for Non communicable disease conducted in Maldives from 2020-2021, 23.9 % of the age group between 15 to 69 years had hypertension and 87.8 % of those diagnosed with hypertension were on medication. Among those on treatment, only 53.9% had their blood pressure controlled at the time of the survey. [6]

It was also seen that 1 in 3 people in the study group had 3 or more other risk factors for cardiovascular disease. As for salt consumption, every 1 in 3 people added extra salt to their diet with a person averagely consuming around 8.8grams of salt per day.[6]

The above STEP survey data indicate the need to enhance and strengthen the detection of hypertension and ensure that all those diagnosed receive adequate management through healthy lifestyle interventions and anti-hypertensive medicines, if we are to reduce the risk of cardiovascular morbidity and mortality.

2. Scope of the guideline

Hypertension is one of the most common Non communicable diseases in the Maldives.
Among those diagnosed and on treatment for hypertension, 46.1% of them have uncontrolled blood pressure due to either non-adherence to treatment or due to inadequate treatment[6]. This highlights the need to strengthen the management of hypertension for adequate control of blood pressure in these patients.
This clinical practice guideline on the management of hypertension aims to provide a clear and concise approach on managing hypertension in adults. The goal of this guideline is to improve prevention and effective management of hypertension, with the ultimate reduction of cardiovascular morbidity and mortality.
This guideline is based on the best available evidence at the time of guideline development and intends to ensure effective treatment of the condition and standardize the care across the country.
The guideline covers the definition and classification of hypertension, blood pressure measurement, diagnostic criteria, investigations, non-pharmacological and pharmacological management, management of patient subgroups and approach to resistant hypertension and hypertensive emergencies.

The guideline is intended as a guidance document to general medical practitioners, physicians and other health care professionals engaged in managing hypertensive patients.
It is also intended for use as a reference document by healthcare policy makers, to assist in formulating health care policy decisions regarding the management of hypertension.

3. Definition of Hypertension

A confirmed blood pressure measured at the hospital/clinic where the systolic blood pressure (SBP) is ≥140 mmHg and / or the diastolic blood pressure (DBP) is ≥90 mmHg is diagnosed as Hypertension. [1,2]

3.1 Classification of Hypertension based on office/clinic blood pressure reading[1].

Category	Systolic(mmHg)		Diastolic (mmHg
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

3.2 Criteria for hypertension diagnosis based on hospital/clinic, Home, and ambulatory blood pressure measurement[1.]

	Systolic/Diastolic blood pressure
Clinic/Hospital BP	≥140 and / or ≥90 mmHg
Home	≥135 and / or ≥85 mmHg
Ambulatory	
▪ 24-hour average	≥130 and / or ≥80 mmHg
▪ Day time(awake) average	≥135 and / or ≥85 mmHg
▪ Nighttime (asleep) average	≥120 and / or ≥70 mmHg

White coat hypertension:
Defined as consistently elevated blood pressure in the presence of medical staff in the hospital/clinic but out-of-clinic measurements are normal. If the CVD risk is low and if there is no hypertension mediated organ damage, they can be managed with lifestyle measures and followed up.

Masked hypertension:
Defined as consistently elevated, out of office BP measurements but the hospital/clinic blood pressure readings are normal. These patients have a similar risk for cardiovascular events as sustained hypertensive patients and may require anti-hypertensive medication. [1]

4. Measurement of blood pressure and diagnosis of Hypertension

Blood pressure measurements can be influenced by many factors including the room temperature, the technique of measurement, accuracy of equipment used, the physical condition of the patient and the presence of medical staff. Therefore, it is necessary to have standardized measurement protocols to ensure accuracy of measurements. A validated electronic upper arm cuff device or a calibrated auscultatory device (aneroid) should be used to measure blood pressure.[1,2.]
Home (HBPM) or ambulatory blood pressure monitoring (ABPM)) help to build an accurate blood pressure profile on which to base treatment decisions, as they help to identify conditions such as white coat hypertension and masked hypertension.[1,2.]
Other clinical indications for HBPM /ABPM include identification of true resistant hypertension, in diagnosing patients with suspicion of nocturnal hypertension and in patients with postural and drug induced hypotension.

4.1 Diagnosis

- The diagnosis of Hypertension should not be based on a single visit and repeat blood pressure assessment, preferably out of hospital/clinic measurements, should be taken. Usually, 2-3 outpatient clinic visits over 1–4-week intervals depending on the blood pressure level would be required for diagnosis.[1]

- Where outpatient clinic BP is 140–159/90–99 mmHg, the diagnosis of hypertension should be based on out of office BP measurements (ABPM and/or HBPM) if available or alternately confirm with repeated office measurements on more than one visit. [2]

- For screening systolic BP of 160–179 mmHg or diastolic BP of 100–109 mmHg, prompt confirmation should be done as soon as possible (within 1 month) preferably with HBPM or ABPM, if available, as delays in treatment are associated with increased CVD event rates.[2]

- Hypertension may be diagnosed on the 1st visit itself, if the blood pressure is ≥160/100 mmHg and there is evidence of target organ damage or cardiovascular disease.[1]

- For those with a screening BP ≥180/120 mmHg, assess for hypertensive emergency as, in the setting of hypertensive emergency, immediate commencing of BP lowering treatment would be required. Otherwise, prompt confirmation (preferably within a week) can be considered prior to starting treatment[2].

- Patients with home readings suggestive of white coat hypertension should be confirmed with ABPM and should undergo reevaluation at least yearly as they can develop hypertension over time.

4.2 Blood pressure measurement in outpatient clinic

4.2.1. Conditions for BP measurement

- The patient should avoid smoking, exercise, and caffeine at least 30 minutes prior to measuring blood pressure.[1]

- Blood pressure should be measured after 5 min of rest, with the patient seated comfortably, with the legs unfolded and back supported.

- Patients should avoid conversation during the measurement and the bladder should be emptied if needed, prior to the measurement.

- The arm should be supported, and the cuff of the correct size should be placed on the bare arm. Rolling up shirt sleeves should be avoided as this can result in a tourniquet effect.

- The bladder length of the cuff should be ≥80 % and the width ≥40 % of the mid upper arm circumference. The cuff should be positioned on the patient's upper arm at the level of the heart with the lower edge of the cuff a few centimeters above the antecubital fossa. [1,2]

4.2.2. Three measurements should be taken if by manual auscultation, each 1–2 min apart, (additional measurements only if the readings differ by >10 mmHg). The BP recorded should be the average of the last two BP readings. [2]

4.2.3. At the initial visit, BP should be measured in both arms to detect an inter-arm difference (systolic BP differs by >10 mmHg). Measurement in the contra lateral arm should be undertaken once the three measurements in the index arm have been taken, and if a difference is detected, further measurement in the original arm is indicated to ensure the difference is consistent. Significant inter-arm blood pressure difference may reflect arterial stenosis or coarctation of the aorta, which would require additional investigation.[2]

4.2.4. Assessment of orthostatic hypotension (≥20 systolic BP and/or ≥10 diastolic BP mmHg drop at 1 and/or 3 min after standing) should be considered at least at the initial diagnosis and thereafter if suggestive symptoms arise. This should be performed after the patient is first lying or sitting for 5 min.[2]

4.2.5. Pulse assessment: heart rate should be recorded at the initial visit and arrhythmia excluded.[2]

4.3 Out of Clinic blood pressure measurement

4.3.1 Home blood pressure measurement (HBPM)

Home blood pressure measurement is a useful adjunct in the diagnosis and management of hypertension and when properly performed, it can be useful at initial assessment and diagnosis. It can also assist in diagnosing masked hypertension, assessing treatment response, diagnosing true resistant hypertension, encourage patient's adherence and optimize blood pressure treatment.

- The conditions and position of the patient are the same as the recommendations for the measurement of blood pressure at the outpatient clinic.

- Measurements should be made twice a day (morning and evening) at the same time for a minimum of 3 to 7 days. If the average after 3 days is close to the treatment threshold, then measurement should continue for the full 7 days. [1,2]
- Two measurements should be taken at each measurement session, performed 1–2 minutes apart between measurements. [1,2,15]
- Patients should be informed to keep a record of their home BP measurements.

4.3.2 Ambulatory blood pressure measurement (ABPM)

Availability of ABPM limits its widespread use, especially for patients living outside Male'. ABPM is useful in clinical situations like diagnosing isolated outpatient clinic hypertension, patients with borderline hypertension, evaluation of suspected hypotensive symptoms especially in elderly, fluctuating Outpatient clinic readings and confirmation of resistant hypertension

- ABPM should be measured during a routine working day and avoid strenuous activity
- The arm should be still and relaxed during each measurement
- Use a validated device, and blood pressure monitored over a 24-hour period with readings obtained at 15–30 min intervals during the day and 30–60 min intervals at night.[2]
- At least 20 valid daytime and 7 nighttime BP readings are required. If less, the test should be repeated.

5. Patient assessment and evaluation

Patients with hypertension are often asymptomatic, however specific symptoms and signs can be suggestive of complications due to hypertension or secondary hypertension.

Assessment of the hypertensive patient aims to:

- Identify lifestyle and other cardiovascular risk factors and the presence of comorbidities in the patient
- To look for the presence of target organ damage or complication related to hypertension
- To exclude secondary causes of hypertension. (refer Table2)

A good assessment includes taking a detailed history, focused on lifestyle and cardiovascular risk factors (refer to Table 1), assessment of CVD risk, clinical examination and investigations that would help to reach a diagnosis.
Comprehensive evaluation for secondary hypertension is especially recommended in young adults diagnosed with hypertension before the age of 40 years and in those with history or clinical features suggestive of secondary hypertension.

5.1 Risk factors for Hypertension

Table1: Risk factors for hypertension[2,15]

Behavioural factors	**Socioeconomic and psychosocial factors**
Physical inactivity Sedentary behaviour Insufficient Sleep quality/quantity Unhealthy dietary patterns High Sodium Intake Low potassium intake[15] Obesity Excessive alcohol consumption Drugs/substances that increase blood pressure	Stress Low socio-economic status Social deprivation Lack of healthcare access Discrimination
Vascular mechanisms	**Renal mechanisms**
Endothelial dysfunction Small artery remodeling Large artery stiffness	Salt sensitivity renin-angiotensin-aldosterone system Renal ischemia
Genetic factors	**Neural mechanisms**
BP-associated Single nucleotide polymorphism Monogenic forms of hypertension	Autonomic nervous system Baroreceptor reflex

5.2 History taking

A detailed history should be obtained from the patient and should include:

- Duration of elevated BP, if known, Previous blood pressure levels if known
- Current and previous anti-hypertensive medications, if on treatment
- Adherence to the anti-hypertensive treatment
- Symptoms suggestive of cardiovascular disease
- Symptoms suggestive of hypertension mediated organ damage (refer to Table4)
- Symptoms suggestive of secondary causes of hypertension (refer to 5.2.1)
- Use of other drugs or medication that may affect blood pressure (refer to Table 2)
- History of cardiovascular disease, diabetes, hyperlipidemia, chronic kidney disease
- Smoking status and history of Substance use
- Diet and physical activity
- Psychosocial aspects
- Early onset menopause
- Family history of hypertension / premature cardiovascular disease, hyperlipidemia or diabetes

Table 2: Frequently used medications and substances that may cause elevated blood pressure

- Non-steroidal anti-inflammatory drugs
- Estrogen contraceptives
- Hormone replacement therapy
- Corticosteroids
- Alcohol consumption
- Sympathomimetics and stimulants i.e. cocaine, decongestants, amphetamine
- Monoamine oxidase inhibitors (moclobemide, phenelzine, tranylcypromine)
- Clozapine
- Serotonin-norephinephrine reuptake inhibitor e.g. venlafaxine
- Rebound hypertension due to abrupt withdrawal of bromocriptine, clonidine
- Caffeine
- Energy drinks

5.2.1 Symptoms

Most patients with hypertension are asymptomatic with the high BP noted during an incidental examination.

Patients may have headache, dizziness, blurred vision, Chest pain, palpitations, shortness of breath, peripheral edema, claudication, nocturia, hematuria which may be due to hypertension mediated organ damage.

Symptoms suggestive of secondary hypertension (refer to Table 2**)**

- Sweating, palpitations, Frequent headaches (pheochromocytoma)
- Snoring, daytime sleepiness (obstructive sleep apnea)
- Muscle weakness, tetany, cramps, arrhythmia (primary aldosteronism)
- Flash pulmonary edema, (renal artery stenosis)
- Symptoms of thyroid disease (heat intolerance, weight loss, tremor and palpitations in hyperthyroidism and cold intolerance, weight gain in hypothyroidism

5.3 Physical examination

A thorough physical examination can assist in diagnosis of Hypertension and identification of hypertension mediated organ damage.

- Measurement of blood pressure
- Presence of obesity: Increased Body mass Index, waist circumference
- Cardiovascular examination: pulse rate and rhythm, radio femoral delay, jugular venous pressure, apex beat, heart sounds, carotid, abdominal bruit, peripheral edema
- Abdominal examination for renal masses and bruit
- Coloured striae (cushings)
- Enlarged thyroid gland
- Neurological examination for evidence of stroke (face, arm or leg weakness, dysphasia, dysarthria, visual field defect)
- Fundus examination: abnormalities such as retinal hemorrhages, exudates or retinopathy, papilledema

Table 3: Secondary causes of Hypertension and suggestive signs

- Parenchymal kidney disease: anemia, oedema, palpation on enlarged kidneys (polycystic kidney)
- Renovascular disease: Renal bruit (renal artery stenosis)
- Sleep apnea: obesity, short neck, witnessed apnea
- Primary aldosteronism
- Drug-induced: Oral contraceptives, Steroids, NSAID, Erythropoietin
- Cushing syndrome: truncal obesity, acne, plethora, bruising, moon face with purple striae
- Phaeochromocytoma: inappropriate tachycardia
- Acromegaly: enlarged face, hands and feet, protrusion of jaw, large tongue)
- Thyroid disease: enlarged thyroid gland
- Parathyroid disease
- Coarctation of the aorta: precordial murmurs, radio-femoral delay

5.4 Hypertension mediated organ damage

Hypertension-mediated organ damage (HMOD) is a structural or functional alteration of arterial vasculature and/or the organs it supplies, that is caused by elevated blood pressure. End organs include the brain, the heart, the kidneys, central and peripheral arteries, and the eyes.

Assessment for the presence of HOMD (refer to Table 3) can provide guidance on management of hypertension as it increases the overall CVD risk and aid in the preferential selection of drug treatment based on the affected target organ.

Table 4 : Manifestations of HMOD[2,7]

Brain	**Heart**
▪ Ischemic stroke ▪ Cerebral hemorrhage ▪ White matter lesions ▪ Silent microinfarcts ▪ Microbleeds ▪ Cognitive impairment ▪ Vascular dementia	▪ Left ventricular hypertrophy ▪ Left atrial and left ventricular dilatation ▪ Atrial fibrillation ▪ Coronary artery disease ▪ Diastolic and/or systolic heart failure
Eye	**Kidney**
▪ Microvascular remodeling ▪ Hypertensive retinopathy ▪ papilledema	▪ Glomerular arteriolar hypertension ▪ Glomerulosclerosis ▪ Albuminuria/Proteinuria ▪ Decreased glomerular filtration rate
Large and medium arteries	**Microcirculation**
▪ Atherosclerosis ▪ Vascular calcification ▪ Arterial stiffness	▪ Endothelial dysfunction ▪ Vascular remodeling ▪ Fibrosis and inflammation ▪ Peripheral vascular resistance

5.5 Laboratory investigations

5.5.1 Recommended essential tests include

- Fasting blood glucose
- Glycosylated hemoglobin (HbA1c)
- Complete blood count
- Lipid profile
- Renal profile with sodium, potassium and estimated glomerular filtration rate (eGFR)
- Urinalysis for albuminuria and hematuria
- TSH
- Electrocardiogram for routine workup of patients with hypertension: detection of atrial fibrillation, previous ischemic heart disease and left ventricular hypertrophy (Simple criteria (Sokolow-Lyon index: SV1+RV5 ≥35 mm, Cornell index: SV3+RaVL >28 mm for men or >20 mm for women can be used to detect presence of LVH)[2]
- Echocardiography if ECG abnormalities or signs of cardiac disease[2]

5.5.2 **Additional tests** should be done when it is indicated, to confirm Hypertension mediated organ damage and/or secondary hypertension:

- Kidneys/renal artery and adrenal imaging including ultrasound, renal artery doppler /CT-MR angiography to evaluate renal parenchymal disease, renal artery stenosis, adrenal lesions, other abdominal pathology

- Echocardiography for Left ventricular hypertrophy, systolic/diastolic dysfunction, atrial dilatation, aortic coarctation.
- Carotid ultrasound for plaques or stenosis and assessment of lower extremities: their routine use is currently not recommended unless clinically indicated, that is, in patients with neurologic symptoms or suspected peripheral artery disease, respectively[1]
- Fundoscopy to screen for hypertensive retinopathy and is particularly important in hypertensive emergency, to detect retinal hemorrhage, microaneurysms and papilledema.[1,2]
- Brain CT /Magnetic Resonance Imaging: indicated in ischemic or hemorrhagic brain injury. MRI is not recommended for routine practice but should be considered in patients with neurologic disturbances, cognitive decline and memory loss.[1]
- Aldosterone-renin ratio, plasma free metanephrines, cortisol, urinary albumin/ creatinine ratio as per clinical indication

5.6. Predicting cardiovascular risk

- More than 50% of patients with hypertension also have other additional cardiovascular risk factors including diabetes, hyperlipidemia, overweight and unhealthy lifestyle habits including smoking and sedentary lifestyle. The presence of additional risk factors proportionally increases the risk of coronary, cerebrovascular, and renal diseases in hypertensive patients.

- CVD risk assessment should be done in all hypertensive patients using a validated risk calculator. WHO/ISH Cardiovascular risk score prediction chart for Southeast Asia Region which is already being used in the NCD portal in the primary healthcare program can be used. (refer to annexure 1). [4,11]

- Assessment of a patient's risk of having a cardiovascular event is important for guiding decisions in initiating pharmacological treatment and establishing BP targets as more intensive goals are/recommended for patients with higher risk cardiovascular risk.

- Patients with certain conditions are considered as already having high CVD risk and these include patients with chronic kidney disease, established coronary heart disease, cerebrovascular disease, peripheral arterial disease, concomitant HMOD, diabetes mellitus, and familial hypercholesterolemia

5.7 Screening and early detection:

- All individuals >40 years should be evaluated for elevated blood pressure
- All those with normal blood pressure at initial assessment should have reassessment of their blood pressure annually. But if they have underlying risk factors for hypertension, they should be evaluated at a minimum, every 6 months.[2]

6. Management of Hypertension

Achieving BP targets

- The aim should be to control the blood pressure within 3 months, ideally to <140/90mmHg.
  - For younger patients <65 years, target for a BP <130/80 mmHg if tolerated (but >120/70mmHg)
  - For those ≥ 65 years, target for a BP <140/90 if tolerated, but to consider individualized BP targets in the context of frailty and tolerability[1]

- The treatment should be tailored to the needs of the patient, taking a risk-based cardiovascular approach and medications should be taken at the most convenient time of day for the patient, to establish a habitual pattern of medication taking to improve adherence

- Nonpharmacological interventions (healthy lifestyle interventions) play an important role in the prevention and management of hypertension and reducing overall cardiovascular risk and should be advised to all patients[1,2,7,15]

6.1 Lifestyle interventions

- **Smoking cessation**: Cessation counselling should be provided to all smokers along with pharmacotherapy for cessation where needed. Where available, the patient should be referred to cessation clinics. [1]

- **Regular physical activity**: Moderate intensity aerobic exercise of ≥150 min/week (≥30 min, 5–7 days/week) or alternatively 75 min of vigorous intensity aerobic exercise per week over 3 days are recommended and should be complemented with low or moderate intensity dynamic or isometric resistance training (2–3 times/week). [1,2]

  For adults >65 years, some form of physical activity, considering their health problems may require supervised physical activity. Aim for at least 30 minutes of moderate physical activity on most days but preferably daily.

Those who currently engage in vigorous physical activity should continue doing so and should follow the recommended safety procedures and guidelines.

- **Weight reduction**: It is recommended to aim for a stable and healthy BMI (18.5-22.9 kg/m2) and waist circumference values (<94cm in men and <80 cm in women) [2.]
  Any weight loss is desirable and expect about 1mmHg reduction in systolic BP for every 1 kg weight loss. [8]

- **Healthy diet**: Adopting a healthy and balanced diet, rich in whole grains, fruits, vegetables, low fat dairy products and reducing sugars, saturated and trans fats is recommended[2].

- **Salt reduction**: Restriction of sodium to approximately 2 g per day is recommended (equivalent to about 5 g of salt per day or about a teaspoon or less.[2] Reduce added salt to foods when preparing and at the table. Avoid high salt foods such as soy sauce, fast foods and processed foods.[1]

- **Potassium supplementation:** Moderate intake of potassium (<80 mmol/day) should be obtained primarily from dietary sources, except in cases of chronic kidney disease or when the patient is on medication decreasing potassium excretion, where monitoring of potassium levels is indicated.[15]

- **Reduce and manage stress** with relaxation techniques, breathing exercises and meditation as appropriate.

6.2 Approach to pharmacological treatment

6.2.1. In patients with BP > 20/10 mm above target, two-drug therapy, ideally as a single pill combination (SPC) therapy, should be initiated. If SPC is unavailable, then two separate pills can be used.

6.2.2. Monotherapy to be considered in low risk, grade 1 hypertension or in very old (≥ 80 years) or frail patients[1]

6.2.3. Prescription of initial drug therapy is recommended to come from the following three drug classes (first line therapy to lower BP): -

- Angiotensin converting enzyme inhibitors (ACE) or Angiotensin receptor blockers (ARB)
- Dihydropyridine calcium channel blockers (CCBs)
- Thiazide diuretics or thiazide-like drugs (chlorthalidone and indapamide).[1,2,8]

6.2.4. Beta blockers are generally not recommended as first line agents but should be considered at any step of the treatment when there is a specific indication for its use, such as presence of coronary heart disease or heart failure [1,7,8]

6.2.5. **For Grade 1 Hypertension** (confirmed BP ≥140-159/90-99 mmHg):

- Start lifestyle interventions for all patients
- Immediate drug treatment in high-risk patients or those with diabetes, CKD, CVD or HMOD to reduce CVD risk. The on-treatment target BP should be < 130/80 mm Hg [2]
- For patients with low or moderate cardiovascular risk, without diabetes, CKD, CVD or HMOD may be advised lifestyle intervention and antihypertensive drug therapy started if BP is still ≥140/90 mm Hg after 3 to 6 months of lifestyle modifications [1]

6.2.6. **For Grade 2 Hypertension** (confirmed BP ≥160/100mm Hg)

- Promptly initiate pharmacotherapy in all patients
- Start lifestyle interventions

6.2.7. For patients with High normal BP

- For those with high CVD risk or have existing CVD, pharmacological treatment should be started to reduce CVD risk, when BP remains >130 mmHg after 3 months of lifestyle intervention[1,2,11]
- For adults with high normal BP and low CVD risk, BP lowering with lifestyle measures is recommended [1,2]

6.2.8. For orthostatic hypotension, advise non-pharmacological approaches as first-line treatment and switch BP lowering medications that worsen orthostatic hypotension to an alternative BP medicine instead of simply de-intensifying therapy[1]

6.2.9. **Drug choice and sequencing in pharmacological treatment (**in patients who are not pregnant or are not planning pregnancy):

- **Step1**: - Use a dual low dose combination (half of the maximum recommended dose): (ACE or ARB + DHP-CCB). Monotherapy to be considered in low risk, grade 1 hypertension, symptomatic orthostatic hypotension or very old (≥ 80 years) or frail patients[1,2]

- **Step 2**: - Increase the regimen to the dual full dose combination: (ACE or ARB + DHP-CCB)

- **Step 3**: -Triple combination: Add a thiazide or thiazide like diuretic (ACE or ARB + DHP-CCB + thiazide- like diuretic)[1]

- **Step 4**: - Resistant Hypertension: Triple combination plus spironolactone. If spironolactone is not effective or tolerated, treatment with eplerenone instead of spironolactone, or other alternative drug ie a beta blocker, clonidine, alpha blocker, amiloride)[1,2]

- Beta blockers should be considered at any treatment step when there is a specific indication for their use e.g.: angina, post myocardial infarction, atrial fibrillation.[1]

6.3 Common comorbidities with hypertension

Patients with Hypertension should be evaluated for the presence of comorbidities as they have several common comorbidities that can affect cardiovascular risk and treatment strategies. Drug selection and therapeutic approaches are influenced by the presence of comorbid conditions because drugs can favorably or unfavorably impact clinical outcomes in such patients. (refer to Annexure 3)

Common comorbidities in hypertensive patients include Diabetes, CAD, stroke, heart failure, COPD and chronic kidney disease.

6.3.1 Hypertension and Coronary Artery Disease

- Maintain a target systolic blood pressure treatment goal of <130/80mmHg in patients with hypertension and established cardiovascular disease.[1,15]
- The therapeutic strategy includes:
  - Healthy lifestyle interventions (smoking cessation, exercise, healthy diet)
  - Initiate anti-hypertensive treatment with beta blockers and ACEI/ARB (improves post myocardial infarction outcomes).[1,15]
  - Addition of DHP-CCBs to beta blockers in patients with angina, relieves angina in addition to BP control.
  - Effective control of cardiovascular risk factors (lipid lowering treatment with target LDL-C <55mg/dL
  - Antiplatelet therapy with acetyl salicylic acid .[1]

6.3.2 Hypertension and heart failure

- Hypertension should be treated to maintain a target BP <130/80mmHg.
- In patients with Heart failure with reduced ejection fraction (HFrEF), even if the patient is asymptomatic, a beta blocker among bisoprolol, metoprolol succinate, or carvedilol should be used.[15]
- In patients with symptomatic HFrEF, treatment options include ACE inhibitors or ARBs or Angiotensin-neprilysin inhibitor to decrease cardiovascular mortality.[2,15]

- MRA (spironolactone or eplerenone) is recommended in patients with symptomatic Heart failure with reduced ejection fraction, if eGFR>30mL/min/1.73m2 and potassium is <5mEq/L.[2,15]
- To reduce cardiovascular morbidity and mortality, SGLT2 inhibitors are recommended in symptomatic HFrEF, irrespective of the presence of Diabetes in the patient. [2,15]
- The optimal treatment strategy for hypertensive patients with preserved ejection fraction is not known, but the strategy used for those with reduced ejection fraction can be adopted. In these patients also SGLT2 inhibitors are recommended to improve outcomes in the context of their modest BP-lowering properties[2]

6.3.3 Hypertension and Diabetes

- Maintain a target systolic blood pressure treatment goal of <130/80mmHg in hypertensive patients with diabetes [i,2,15]
- Treatment initiation in hypertensive patients with diabetes, without albuminuria, can be from any of the first line classes of hypertensive drugs (ACEI/ARB and/or CCB, and/or thiazide like diuretic)
- For diabetic patients with microalbuminuria or proteinuria, treatment initiation should be with an ACEI or ARB, as they are more effective at reducing albuminuria.[1,2]

6.3.4 Hypertension and previous stroke (secondary stroke prevention)

- Hypertension is a major risk factor for hemorrhagic and ischemic stroke and for recurrent stroke.
- In patients with a history of TIA or stroke, a systolic BP target of <130/80 mmHg is recommended to reduce CVD outcomes.[1]
- ACEI/ ARB, CCB and thiazide type diuretics are 1st line drugs for treatment of Hypertension [1.]
- Lipid lowering treatment with LDL-C target <70 mg/dL and antiplatelet therapy in ischemic stroke.

6.3.5 Hypertension and CKD

- Hypertension is common in patients with chronic kidney disease, both as a cause and a consequence of CKD.
- Maintain a target systolic blood pressure treatment goal of <130/80mmHg.[1,2,15]
- ACE or ARB are the first line drugs for patients with CKD. CCB and diuretics (loop diuretics if eGFR<30ml/min/1.73m) to be added if target BP is not reached.
- Avoid dual RAS blockade (ACEI plus ARB) in patients with CKD.[7]
- In hypertensive patients with CKD and eGFR >20 mL/min/1.73 m2, SGLT2 inhibitors are recommended to improve outcomes in the context of their modest BP-lowering properties.[2]

6.4 When to refer to Specialist Care

Most patients can be effectively managed by general practitioners at primary care but patients with the following conditions should be referred to appropriate specialist, for further assessment and investigation.

- Suspected secondary hypertension based on history and evaluation.
- Resistant hypertension
- Recent onset target organ damage
- Pregnancy
- Hypertensive emergencies
- White-coat hypertension / masked hypertension (when ABPM is required)

7. Management of Hypertension in Specific Circumstances

7.1 Resistant Hypertension

Although BP measurement errors, lifestyle factors, suboptimal treatment strategies and undiagnosed secondary hypertension may explain poor BP control in some individuals, a proportion of people present with true resistant hypertension and remain at risk of adverse CVD outcomes.

- Suspect Resistant hypertension, if blood pressure remains uncontrolled (>140/90 mmHg) in a patient treated with optimal doses of 3 or more anti-hypertensive medications at optimal doses including a diuretic. [1,2,7]

- Resistant Hypertension should be labelled after excluding pseudo resistance.[1,2] Causes of pseudo resistant hypertension include:
  - white coat hypertension
  - poor BP measurement technique
  - non-adherence to medicines
  - inadequate doses or inappropriate combinations
  - substance/drug -induced increases in blood pressure
  - secondary hypertension

- Resistant hypertension should be managed by a specialist at a hospital with available resources for further investigations.

7.1.1. Management of Resistant hypertension

7.1.1.1 Exclude causes of pseudo resistance

- Verify accurate blood pressure measurement
- Perform out of office measurements (HBPM/ABPM)
- Ensure optimal choices in antihypertensive therapy
- Look for substance-induced increases in blood pressure
- Prescribed and over the counter drugs consumed by patients should be scrutinized for agents known to raise BP (e.g., NSAIDs, steroids, oral contraceptives).

7.1.1.2 Screen patients for secondary causes as appropriate

7.1.1.3 Optimize the current management regimen:

- Reinforcement of Healthy behavior and lifestyle change
- optimization of diuretic including substitution of a thiazide like diuretic (chlorthalidone or indapamide.[8]

7.1.1.4 Add low dose spironolactone as the 4th line agent in those with serum potassium < 4.5mmol and eGFR > 45ml/min/1.73m^2

7.1.1.5 If spironolactone is contraindicated or not tolerated, treatment with eplerenone or addition of beta blockers if not already used. Further amiloride, clonidine, alpha blockers are alternatives or any available anti-hypertensive class not already in use.[1,2]

7.2 Secondary Hypertension

- A specific cause of secondary hypertension can be identified in 5-10% of hypertensive patients. The most common causes of secondary hypertension are renovascular hypertension, renal parenchymal disease, primary aldosteronism, chronic sleep apnea and drug /substance induced.

- Patients with suspected secondary hypertension should be referred to a specialist (physician) consultation at a center where appropriate investigations are available.

- Screening for secondary hypertension should be done in patients with:
  - Early onset hypertension (<40 years), especially in those with the absence of hypertension risk factors such as obesity, metabolic syndrome and family history[1]
  - Those with resistant hypertension.[1,2,15]
  - Patients with sudden deterioration in blood pressure control[15]
  - Disproportionate target organ damage to the duration and severity of hypertension [15]
  - Hypertensive urgency and emergency
  - Patients with high possibility of secondary hypertension based on clinical findings
- Additional investigations should be carefully chosen based on history, clinical examination and basic investigations.

Table 5: features of common causes of secondary hypertension

Common cause of Secondary Hypertension	Clinical History and Physical Examination	Basic Biochemistry and Urine Analysis	Further Diagnostic Tests	Management
Renal parenchymal disease	Personal/familial history of CKD Ankle swelling, hematuria, pruritic,dyspnoea	Proteinuria, hematuria, elevated plasma creatinine/ACR Decreased eGFR	Renal ultrasound	ACEI/ARB
Primary aldosteronism	Symptoms of hypokalemia (muscle weakness, muscle cramps, tetany)	●Spontaneous hypokalemia or diuretic induced hypokalemia. (50–60% are normokalemic) ● Elevated plasma aldosterone-renin activity ratio	●Confirmatory testing (eg, IV saline suppression test), Adrenal CT, Adrenal vein sampling	Endocrine referral /Spironolactone and tumor resection
Renal artery stenosis	● Abdominal bruit • Drop in eGFR >30% on exposure to ACEI/ARB • For suspected atherosclerotic RAS, history of flash pulmonary edema or atherosclerotic disease or presence of cardiovascular risk factors • For suspected fibromuscular dysplasia, young women with onset of hypertension <30 years	Decrease in estimated GFR	Imaging renal arteries (duplex ultrasound, Abdominal CT/ MR angiogram depending on availability and patient's level of renal function)	Revascularization may be considered for selective non atherosclerotic renal artery disease or selective cases of uncontrolled HTN with progressive worsening renal function [15]
Pheochromocytoma	- Headaches - Palpitations - Perspiration	- Increased plasma metanephrines	Abdominal /pelvic CT or MRI	Alpha blocker

	- Pallor - History of labile hypertension	- Increased 24-hour urinary excretion of metanephrines and catecholamines		Tumour resection
Cushing's syndrome and disease	- Central obesity - Purple striae - Facial rubor - Signs of skin atrophy - Easy bruising - Dorsal and supraclavicular fat pad - Proximal muscle weakness	- Hypokalemia - Increased late-night salivary cortisol	Dexamethasone suppression test • 24-hour urinary cortisol •Abdominal/pituitary imaging	Withdrawal of steroids if iatrogenic Tumor resection
Coarctation of aorta	- Higher blood pressure in the upper than lower extremities - Delayed or absent femoral pulses		●Echocardiogram • CT angiogram • MRA	
Obstructive sleep apnea	- Increased BMI - Snoring and Daytime sleepiness - Gasping or choking at night - Witnessed apneas during sleep - Nocturia		•polysomnography	Weight loss interventions / combined with CPAP
Thyroid disease	- Symptoms of hyperthyroidism: heat intolerance, weight loss, tremor, palpitations - Symptoms of hypothyroidism: cold intolerance, weight gain, dry brittle hair	TSH, Free T4		

7.3 Hypertension and Pregnancy

Hypertension in pregnancy is a condition affecting 5%–10% of pregnancies worldwide and can lead to maternal and fetal complications.[1] Maternal risks of hypertension in pregnancy include placental abruption, stroke, liver failure, renal failure and disseminated vascular coagulation. Risks for the fetus include intrauterine growth retardation, preterm birth and intrauterine death. [1]

Basic laboratory investigations include urinalysis, blood count, liver enzymes, serum creatinine, and serum uric acid. Serum uric acid is increased in pre-eclampsia and identifies women at increased risk of adverse maternal and fetal outcomes in hypertensive pregnancies[2]
All pregnant women should be assessed for proteinuria in early pregnancy (e.g. 11–14 weeks' gestation).

Hypertension in pregnancy could be due to:

- **Preexisting hypertension**: Diagnosed before pregnancy or <20 weeks of gestation and lasts >6 weeks postpartum with proteinuria.[1]
- **Gestational hypertension**: Starts >20 weeks of gestation and lasts < 6 weeks postpartum.[1]
- **Preexisting hypertension plus superimposed gestational hypertension with proteinuria**
- **Preeclampsia**: Hypertension with proteinuria (>300 mg/24 h or ACR >30 mg/mmol).[2]
- **Eclampsia**: Hypertension in pregnancy with seizures, severe headaches, visual disturbance, abdominal pain, nausea and vomiting, low urinary output
- **HELLP** (hemolysis, elevated liver enzymes, low platelets) syndrome

Eclampsia and HELLP syndrome are hypertensive emergencies requiring immediate treatment and delivery. Predisposing risk factors (refer to table) for pre-eclampsia should be identified and measures taken to prevent pre-eclampsia in the pregnant patient.

Table 6: Risk factors for preeclampsia

▪ Preexisting hypertension
▪ Hypertensive disease during previous pregnancy
▪ Diabetes[1,7]
▪ chronic kidney disease
▪ first pregnancy in a woman > 40 years
▪ pregnancy interval >10 years[1,7]
▪ BMI >35 kg/m2[1,7]
▪ family history of preeclampsia
▪ multiple pregnancy
▪ autoimmune disease such as systemic lupus erythematosus or anti-phospholipid syndrome[1,7]

7.3.1 Management of Hypertension and preeclampsia in pregnancy

7.3.1.1 Preconception counseling

- Women with chronic hypertension who are planning pregnancy and is taking ACEI or ARB would require alternative hypertensive treatment due to increased risk of congenital abnormalities with these drugs.
- Women in the reproductive age group requiring ACEI or ARB for other conditions such as renal disease, alternative drugs should be considered or should be advised effective contraception in discussion with the patient.
- In the event of unplanned pregnancy in a woman taking an anti-hypertensive drug contraindicated in pregnancy, stop the drugs and offer alternatives [7.]

7.3.1.2 Prevention of pre-eclampsia

- **Risk assessment** for the development of pre-eclampsia should be done at the first antenatal visit.
- **Exercise**: In consultation with physician and obstetrician, low to moderate intensity exercise is recommended in all pregnant women without contraindications to reduce the risk of gestational hypertension and pre-eclampsia.[2,13]
- **Aspiri**n: In women with high risk for preeclampsia, advice 75–150 mg aspirin at weeks 12–36 of gestation[1,2]
- **Calcium**: Oral calcium supplementation of 1.5–2 g/day is recommended, especially for those with low dietary intake (<600mg/day) [1,2]

7.3.1.3 Pharmacological therapy

- Drug treatment is recommended for those with persistent BP >140/90 mm Hg in gestational hypertension, preexisting hypertension with superimposed gestational hypertension; hypertension with subclinical HMOD at any time during pregnancy.[1,2.]
- When using medicines to treat hypertension in pregnancy, aim for a target upper limit of blood pressure of ≤ 135/85 mmHg and lower limit of blood pressure ≥ 110/70 mmHg.[12,13.]

- The first line choices of medicines (refer to Table7) include tablet methyldopa, labetalol and nifedipine XR [not capsular]. [1]

- If blood pressure cannot be controlled with one class of oral medications another drug amongst Labetalol, Nifedipine XR and methyldopa can be added and continued in combination, to control the blood pressure.[13]

- ACE-Inhibitors, Angiotensin receptor blockers and direct renin inhibitors are contraindicated due to adverse fetal and neonatal outcomes.[2]

7.3.1.4 Severe hypertension in pregnancy

- BP ≥160 mmHg systolic and/ or ≥110 mmHg diastolic) is an emergency and requires immediate hospitalization to lower[1,15]
- Monitor urine protein, full blood count, liver function, coagulation, and renal function tests.

- **Indicators for Severe pre-eclampsia/ impending eclampsia[12,13]**
  - BP ≥160/110 mmHg with proteinuria
  - BP ≥140/90 with the presence of significant proteinuria (++) and one of the following:
    - ✓ Severe headache with visual disturbances
    - ✓ epigastric pain or liver tenderness
    - ✓ Clonus
    - ✓ Platelets <100x10^3/IL, AST, or Alt >70u/L
    - ✓ Creatinine >100mmol/L
    - ✓ Papilledema
  - Eclampsia- seizure occurring in a patient with preeclampsia.
  - H.E.L.L.P syndrome

- Immediate steps should be taken to control blood pressure and prevent progression to eclampsia. Treatment with intravenous labetalol or if unavailable oral methyldopa or oral nifedipine [not capsular] (Refer to Annexure 5) with monitoring of blood pressure.
- Alternatives include intravenous esmolol, hydralazine, nicardipine, urapidil [1,2.]

- **Seizure prophylaxis**
  - Administer 4g slow IV magnesium sulfate to prevent eclampsia and to abort an eclamptic fit followed by magnesium infusion 1g/ hour for 24 hours or until delivery whichever is longer (refer to Annexure 5) [1,7.]
  - Monitor continuous pulse oximetry, hourly urine output and respiratory rate and tendon reflexes every 5 hours. Discontinue magnesium if motor paralysis, absent tendon reflexes, respiratory depression, or arrhythmia.
  - If side effects occur, administer 10 ml 10% calcium gluconate IV.
- It is not recommended to use diazepam or other anticonvulsants as an alternative to magnesium sulfate in women with eclampsia[12,13.]

- In pulmonary edema, administer nitroglycerin intravenous infusion.

- Sodium nitroprusside should be avoided due to the danger of fetal cyanide poisoning with prolonged treatment.[1]

7.3.1.5 Fetal anomaly screening

- Women with chronic hypertension have about 20-30% increased risk for fetal congenital cardiac anomaly and should be referred ideally to the Maternal-Fetal Medicine specialist for nuchal translucency scan at 12-14 weeks followed by a detailed ultrasound scan at 22-24 weeks of gestation.[7]

- If a cardiac anomaly is detected, cardiology referral is recommended.

7.3.1.6 Delivery and post-natal care

- In gestational hypertension or preeclampsia: delivery at week thirty-seven in asymptomatic women.
- Expedite delivery in women with preeclampsia with hemostatic disorders or HELLP syndrome and visual disturbances or ongoing neurologic features.

- All patients with pre-eclampsia should have their BP monitored after delivery for at least 3 days and antihypertensive drug prescribed if BP >150/100 on 2 occasions. [12,13]

- Methyldopa should be discontinued postnatally and replaced with alternative drug if required[12,13.]

- Thiazide-like diuretics, spironolactone, ARBs and ACE inhibitors other than enalapril and captopril should be avoided during breastfeeding [13.]

- It is recommended to arrange an initial outpatient review within 1-2 weeks after delivery and thereafter up to 4-6 weeks as indicated

Table 7: Anti-Hypertensive drugs commonly used in Pregnancy [7,12]

Drug	Dose	Remarks
Methyldopa	500 - 3000mg per day in 2 to 4 divided doses until BP controlled	Oldest anti-hypertensive agent used in pregnancy Safety after first trimester well documented
Labetalol	200 to 2400 mg/d in 2 to 3 divided doses	Avoid in women with asthma and decreased cardiac function and heart block.
Nifedipine	30 to 120 mg/d of extended-release preparation	Sublingual nifedipine should not be used. Avoid in women with tachycardia Immediate release preparation should generally be used to control acutely elevated BP
Hydralazine	50 to 300 mg/d in 2 to 4 divided doses	Few controlled trials, long experience with few adverse events
Contraindicated: ACEI and ARB		Use associated with cardiac defects, fetopathy, oligohydramnios, growth restriction, renal agenesis and neonatal anuric renal failure

8. Hypertensive Emergency

A hypertensive emergency is the association of substantially elevated BP (may occur with SBP>180 and/or DBP >120 mmHg, particularly if BP has risen rapidly) with acute hypertension mediated organ damage and if not attended promptly may lead to progressive life-threatening target organ damage. [2,15]

It primarily includes but not limited to, injuries to the brain (hypertensive encephalopathy, acute ischemic or hemorrhagic stroke), heart (acute myocardial infarction, unstable angina, acute left ventricular failure), large vessels (dissecting aortic aneurysm), acute renal failure and retinal damage.[9]

Hypertensive Urgency: Patients with substantially elevated BP who lack acute HMOD are not considered a hypertensive emergency but an urgency and can typically be treated with oral antihypertensive therapy.

8.1 Clinical presentation

The clinical presentation of a hypertensive emergency can vary and is mainly determined by the organ or organs acutely affected. Specific clinical presentations of hypertensive emergencies include:

- Malignant hypertension: Severe BP elevation (commonly >200/120 mm Hg) associated with advanced bilateral retinopathy (hemorrhages, cotton wool spots, papilledema)
- Hypertensive encephalopathy: Severe BP elevation associated with lethargy, seizures, cortical blindness and coma in the absence of other explanations.
- Hypertensive thrombotic microangiopathy: Severe BP elevation associated with hemolysis and thrombocytopenia in the absence of other causes and improvement with BP lowering therapy
- Severe BP elevation associated with cardiovascular involvement including cerebral hemorrhage, acute stroke, acute coronary syndrome, cardiogenic pulmonary edema and aortic aneurysm/dissection
- Preeclampsia and eclampsia.

Symptoms can include:

- headaches, dizziness, visual disturbances, confusion or features of stroke such as limb weakness, facial droop and dysphasia in CNS damage
- acute chest pain or dyspnea suggestive of acute coronary syndrome, heart failure or aortic dissection
- sudden oliguria in acute renal damage
- sudden and progressive deterioration of vision with retinal hemorrhages and exudates in retinal damage

8.2 Management

- Rapid diagnostic workup, evaluation for HMOD including fundoscopy and immediate blood pressure reduction is required is a hypertensive emergency to avoid progressive organ failure.

- The first step is to distinguish hypertensive emergencies from asymptomatic elevated blood pressure

- Take an appropriate blood pressure measurement with proper technique, assess the severity of the reading and evaluate for new or worsening target-organ damage and address any underlying cause of elevated BP.[9]

- The aim in management of a hypertensive emergency is a controlled BP reduction to safer levels to prevent or limit further hypertensive damage while avoiding hypotension and related complications. The timeline and magnitude of BP reduction is strongly dependent on the clinical context. For example, acute pulmonary edema, pheochromocytoma crisis and aortic dissection require rapid BP reduction. If these are excluded SBP to be reduced by 25% in the 1st hour and to <160/100-110 over the next 6 hours and to normal in the next 24-48 hours [15]

- Patients should be admitted for immediate intervention and monitoring.

- Intravenous therapy is usually required. The choice of antihypertensive medicine is predominantly determined by the type of organ damage.
  Labetalol and nicardipine are generally safe to use in all hypertensive emergencies and should be made available where hypertensive emergencies are being managed.
  Nitroglycerin and nitroprusside are specifically useful in hypertensive emergencies including the heart and the aorta.
  If intoxication with amphetamines, sympathomimetics or cocaine is suspected as a cause of the hypertensive emergency, the use of benzodiazepines should be considered prior to specific anti-hypertensive treatment. Phentolamine and clonidine are useful if additional BP lowering therapy is required. Nicardipine and nitroprusside are suitable alternatives.

  Patients with pheochromocytoma responds well to phentolamine (IV bolus 5-15mg). Beta-blockers should only be used once alpha blockers have been introduced to avoid acceleration of hypertension. Urapidil and nitroprusside are additional suitable options.

Table 7: Initial treatment approach to hypertensive emergencies [1,9]

Clinical Presentation	Timeline and Target BP	First Line Treatment	Alternative
Malignant hypertension with or without TMA or acute renal failure	Reduce Mean arterial pressure (MAP) by 20% to 25% over Several hours	Labetalol, Nicardipine	Nitroprusside
Hypertensive encephalopathy	Immediate, MAP decline 20% to 25%	Labetalol, Nicardipine	Nitroprusside
Acute ischaemic strokes and SBP >220 mm Hg or DBP >120 mm Hg	MAP decline 15% in 1h	Labetalol, Nicardipine	Nitroprusside
Acute ischaemic stroke with indication for thrombolytic therapy and SBP >185 mm Hg or DBP >110 mm Hg	MAP decline 15% in 1h	Labetalol, Nicardipine	Nitroprusside
Acute hemorrhagic stroke and SBP >180 mm Hg	Immediate, 130<SBP	Labetalol, Nicardipine	Urapidil
Acute coronary event	Immediate, SBP <140	Nitroglycerine, Labetalol	Urapidil
Acute cardiogenic pulmonary edema	Immediate, SBP <140	Nitroprusside or nitroglycerine (with loop diuretic)	Urapidil (with loop diuretic)
Acute aortic disease	Immediate, SBP<120 mm Hg	Esmolol and nitroprusside, nitroglycerine or nicardipine	Labetalol or metoprolol
Eclampsia and preeclampsia/ HELLP	Immediate, SBP<160 mm Hg and DBP < 105 mmHg	Labetalol or nicardipine and magnesium sulphate or Hydralazine	

9. Patient monitoring

- Follow up intervals should be individualized based on pre-treatment BP levels, drugs used, HMOD and overall cardiovascular risk.

- Patients initiating drug therapy for hypertension should be followed approximately monthly for drug titration until their BP reaches the control target. It is advisable to bring the BP to target within 3months.

- Patients who have experienced a hypertensive emergency are at an increased risk of cardiovascular and renal disease and should be followed up 2 weeks after discharge.
  At follow up:
  - adjustment and simplification of antihypertensive therapy
  - advice for lifestyle modification
  - thorough evaluation for underlying causes and assessment of HMOD to avoid presentations with hypertensive emergencies.

  Monthly follow up should be done until target BP and ideally regression of HMOD has been achieved.

- Once target BP is achieved, patients may be followed 3-6 monthly.

- During follow-up visits, patients should be assessed for persistence of BP control, adverse reaction to treatment, overall cardiovascular risk (including new onset and pre-existing CV risk factors) and complications of hypertension with may have developed since the last visit

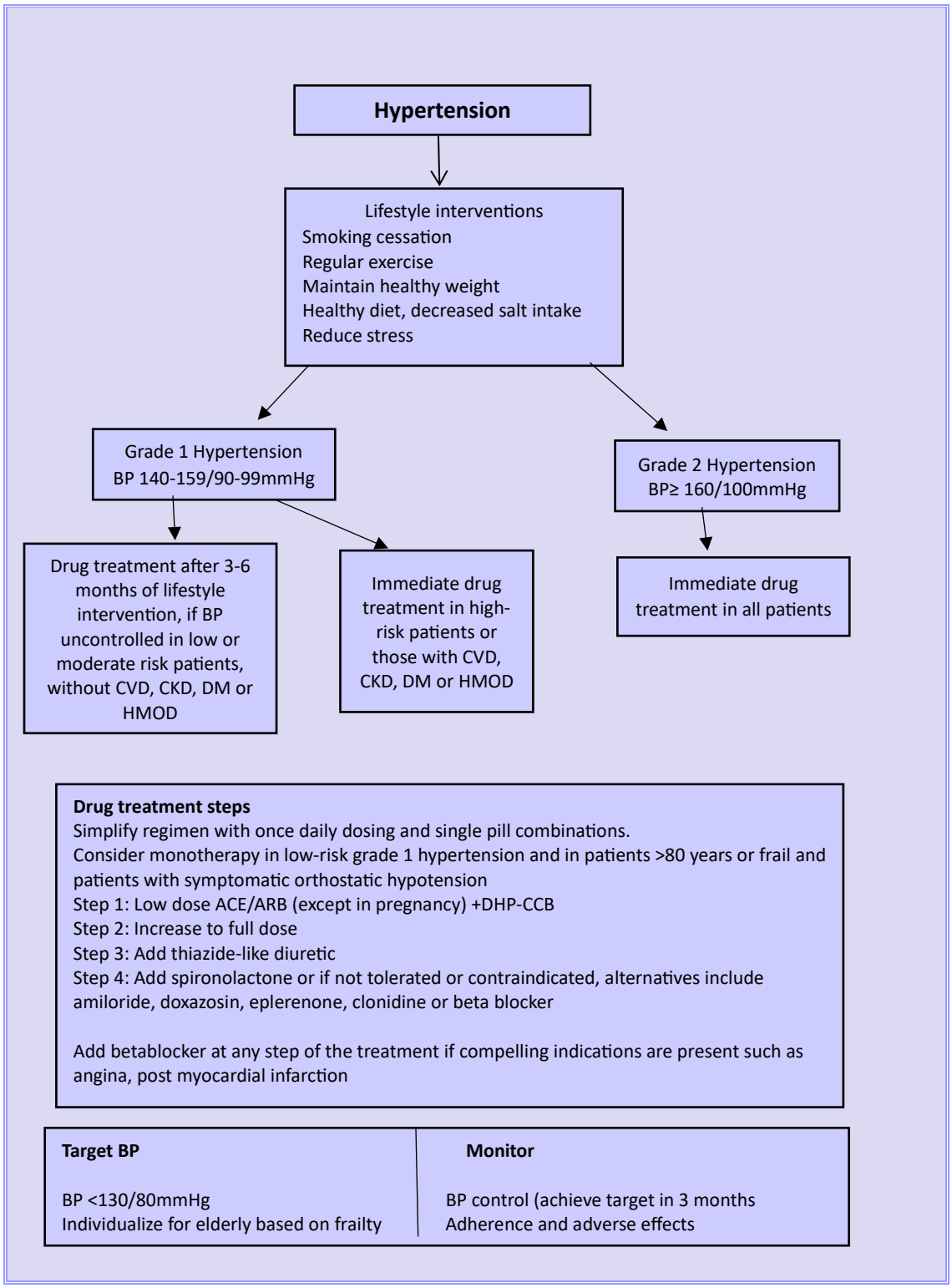
- At each follow-up visit the patients should be educated regarding the importance of lifestyle interventions.

- Patients with high normal BP and white coat hypertension should be rechecked at least annually. Home BP or daytime ambulatory BP should be measured along with office BP. (White coat hypertension transitions to sustained hypertension in 1–5% of patients with this condition each year)[1].

- Home BP measurement for managing hypertension by using self-monitored BP is recommended to achieve better BP control. Self-measurement, when properly performed, is recommended due to positive effects on the acceptance of a diagnosis of hypertension, patient empowerment, and adherence to treatment.

10. Clinical Pathways

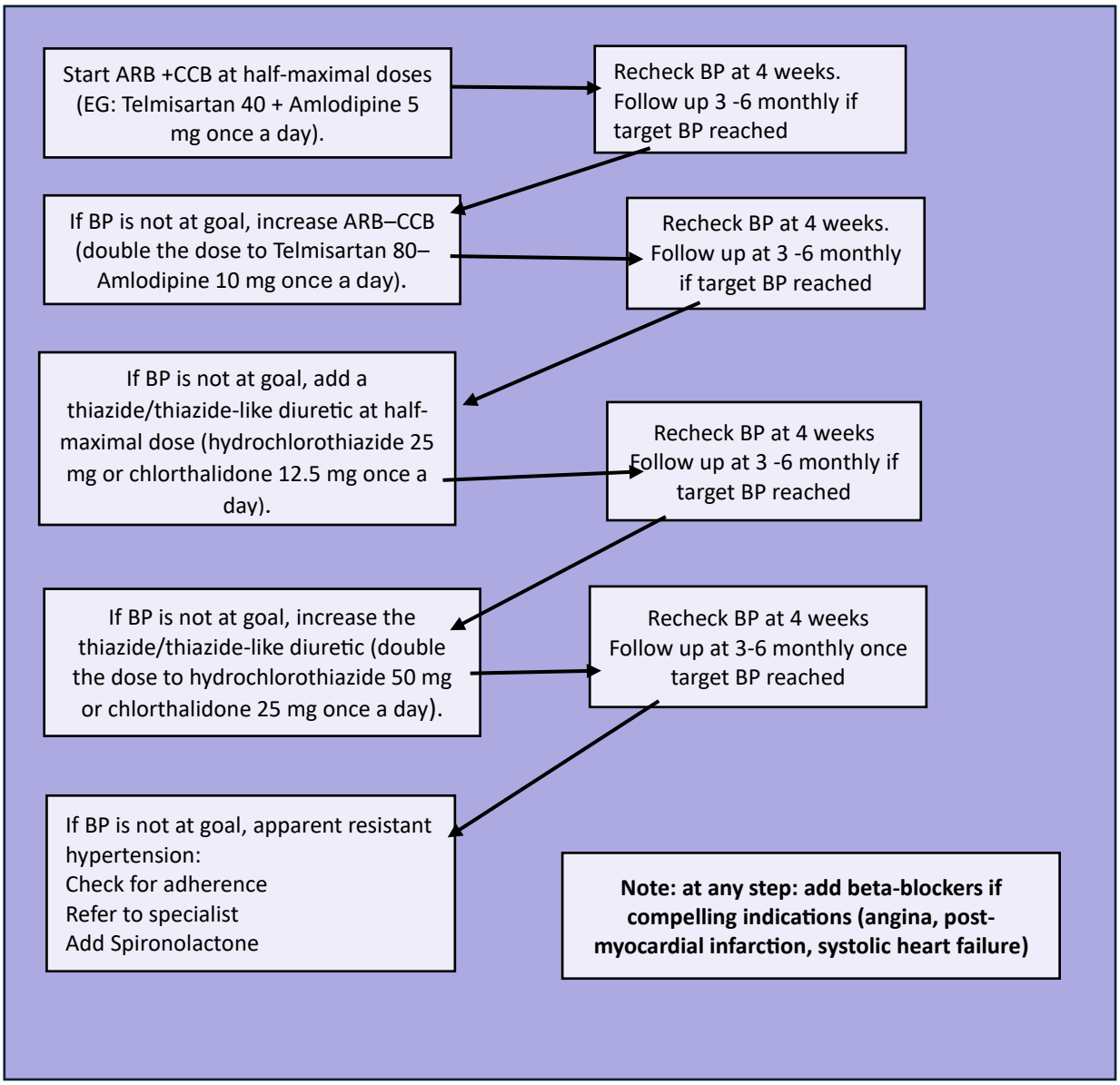
10.1 Algorithm for the Management of Hypertension



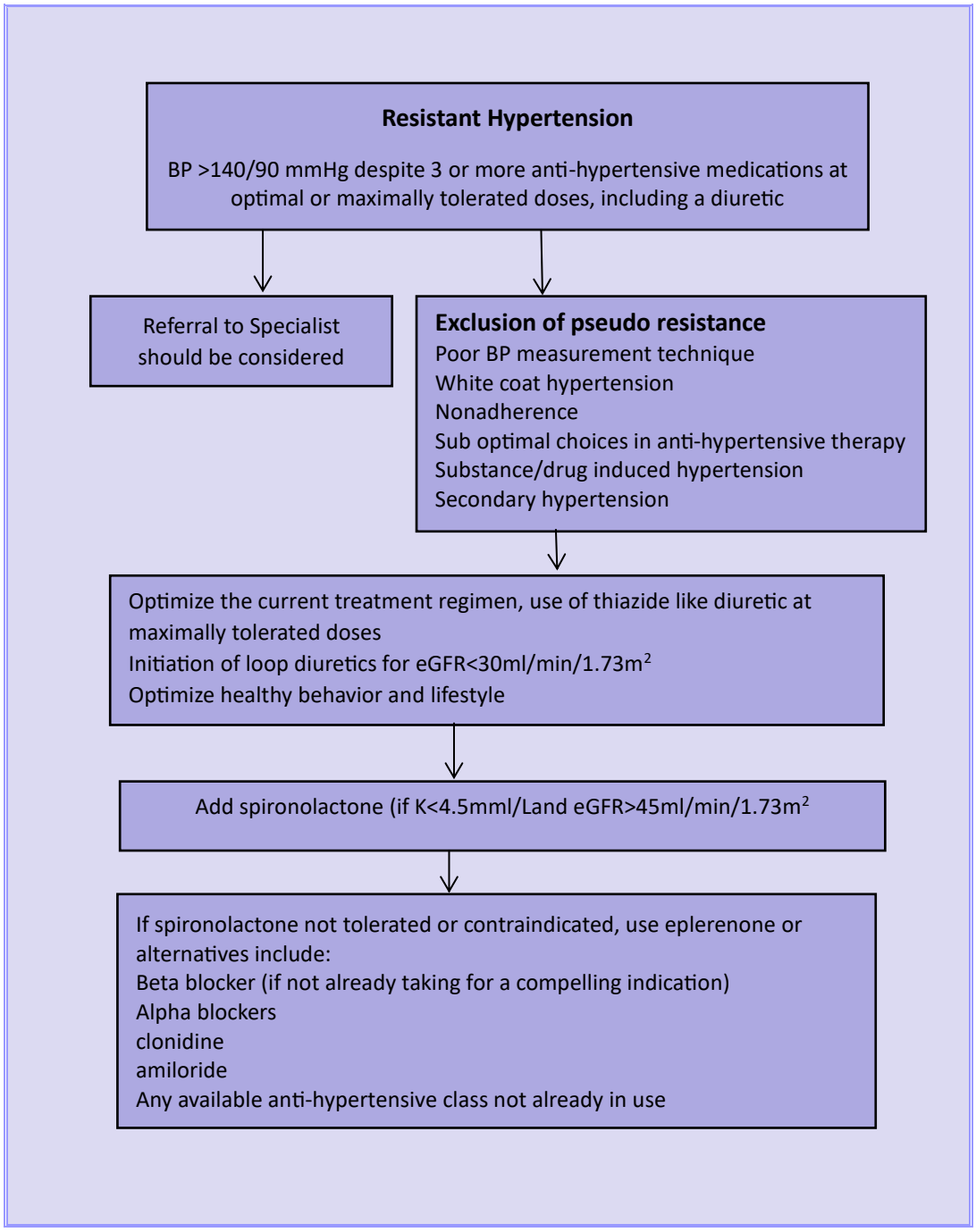
10.2 Example protocol for Initiation and treatment with single pill combination at PHC

- Commence treatment with two antihypertensive drugs from different classes of first line medicine, when BP is ≥20/10 mmHg above target/ BP is ≥140/90 mmHg
-
- Initial monotherapy may be used in low-risk grade 1 hypertension, those with symptomatic orthostatic hypotension and elderly with age ≥85 years and those with moderate-to-severe frailty
-
- The medicines mentioned in the algorithm are examples and can be replaced with any two medicines from any of the first line drugs (ACEI/ ARB, CCBs or thiazide/thiazide-like diuretics

ACEI and ARB are contraindicated in pregnancy and should not be given to pregnant women.

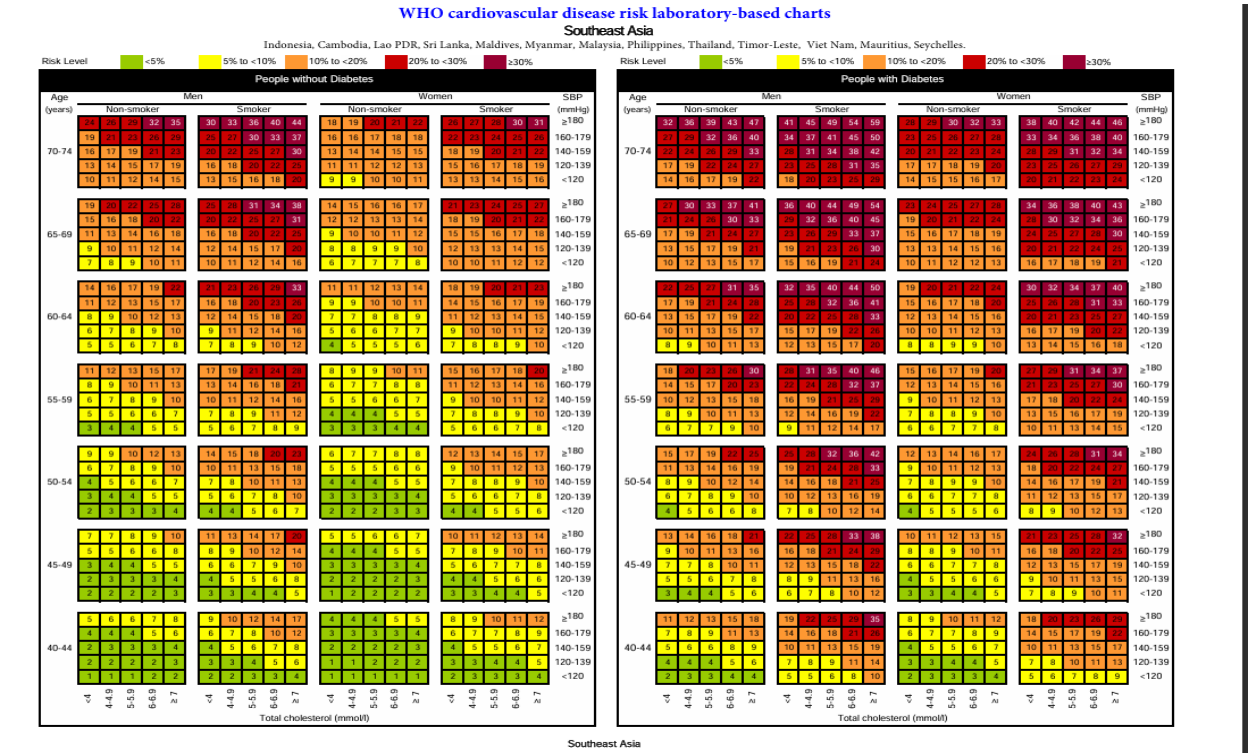


10.3 Algorithm for the Management of Resistant Hypertension



11. Annexes

Annexure 1. WHO/ISH CVD risk prediction chart for SEAR region



Action
Select the regional chart covering your country: • REGION NAME is printed at the top of the charts. • Countries included in each region can be found in Annex 1.
Have the following information ready: • age • sex • smoker* or non-smoker • presence or absence of diabetes† • systolic blood pressure • total blood cholesterol‡
Using the charts
STEP 1: Select the section of the chart as relevant for people with or without diabetes.
STEP 2: Select the table for men or women, as appropriate.
STEP 3: Select smoker or non-smoker column.
STEP 4: Select age-group.
STEP 5: Within the selected box find the cell where the person's systolic blood pressure and total blood cholesterol intersect.
STEP 6: The colour of the cell indicates the 10-year risk of a fatal or non-fatal CVD event. The value within the cell is the risk percentage. Colour coding is based on the grouping.

Green	<5%
Yellow	5% to <10%
Orange	10% to <20%
Red	20% to <30%
Deep red	≥30%

STEP 7: Record CVD risk percentage in person's chart.
STEP 8: Counsel, treat and refer according to risk level

Annexure 2. Common Anti-hypertensive drugs and dosage

Drug class D	Drug class	Usual dose (mg/day)/ dosing frequency	Remarks
ACE inhibitors	Captopril Enalapril Lisinopril Perindopril Ramipril	12.5-150mg /BD or TDS 5-40mg / OD or BD 10-40 mg / OD 4-16 mg / OD 2.5-20 mg / OD or BD	-Avoid pregnancy -Not to be used in combination with ARB or direct renin inhibitor -Increased risk of hyperkalemia esp in those on K sparing drugs and on K supplements
ARB	Losartan Candesartan Irbesartan Olmesartan Telmisartan Valsartan	50- 100mg /OD or BD 8-32mg /OD 150-300mg / OD 20-40 mg / OD 20-80 mg /OD 80-320mg / OD	-Avoid in pregnancy - Not to be used in combination with ARB or direct renin inhibitor -Increased risk of hyperkalemia esp in those on K sparing drugs or K supplements
DHP-CCB	Amlodipine Felodipine Nifedipine Nicardipine SR	2.5-10 mg OD 2.5-10 mg OD 20-40mg OD or BD 60-120 mg BD	-Can cause pedal edema
Non-DHP -CCB	Diltiazem Diltiazem XR Verapamil IR Verapamil XR	30-60 mg /TDS 90-360mg / OD 120-360 mg /TDS 100-300mg OD	-Risk of bradycardia and heartblock in combination with beta blockers
Thiazide type Diuretics	Hydrochlorothiazide Chlorthalidone Indapamide	25-50mg /OD 12.5 -25mg / OD 1.25-2.5mg /OD	-Patients may develop electrolyte disturbances (hyponatremia, hypokalemia, increased sugar levels)
Beta blockers	Atenolol Bisoprolol Carvedilol Labetalol Metoprolol Nebivolol Nadolol	25-100 mg /OD 2.5-10 mg /OD 12.5-50mg /BD 200- 1200mg /BD 50-200 mg /OD 5-40 mg /OD 40-120mg /OD	-Not among the first line antihypertensive drugs unless the patient has CAD or HF - In patients with HF with reduced EF ,use of carvedilol is preferred
Aldosterone antagonists	Spironolactone	25-100 mg OD	-It is the 4th anti-hypertensive drug to be added in resistant hypertension -Associated with gynecomastia -Avoid pregnancy
Direct vasodilator	Hydralazine	100-200 mg /BD or TDS	-associated with a drug induced lupus like syndrome at higher doses
Alpha blockers	Prazosin Terazosin	2-20mg / BD or TDS 1-20 mg / OD or BD	-associated with orthostatic hypotension
Centrally acting agents	Clonidine methyldopa	0.1-0.8 mg / BD 250-1000 /BD	-Generally used as last options due to CNS adverse effects -Avoid abrupt discontinuation of clonidine

Annexure 3. Co-morbidities for which drug selection and therapeutic approach

Preferred drug classes should be prescribed first, in the absence of a major contraindication to their use

Condition	Preferred drug	Avoid	Remarks
Atrial fibrillation (AF)	ARB		ARBs may reduce AF recurrence
Aortic disease	Beta blockers		
Chronic kidney disease	ACEI or ARB		Loop diuretic (GFR <30 ml/min/1.73m2
Diabetes	ACEI or ARB if albuminuria present		Consider usual first line drugs if no albuminuria
Heart failure (preserved EF)	Diuretics for volume overload		Add ACEI or ARB and beta blocker for incremental BP control; also consider angiotensin receptor neprilysin inhibitor and mineralocorticoid receptor antagonist/SGLT2 if indicated
Heart failure (reduced EF)	Selected beta blockers (carvedilol, bisoprolol,metoprololXR,nebivolol	Non-DHP CCB	ACEI or ARB /MRA/ ARNI, SGLT2 inhibitors
Peripheral arterial disease			Consider usual first line drugs
Post-kidney transplant	Calcium antagonist	Use ACEI with caution	Calcium antagonist can improve kidney graft survival and GFR; 1st month post-transplant BP target (< 160/90) to avoid hypotension –induced graft thrombosis
Secondary stroke prevention	ACEI or ARB + CCB or thiazide (Any of the first line drugs)		If previously treated, restart drugs a few days post-event; if not previously treated, start drug treatment a few days post-event if BP ≥140/90.
Stable ischemic heart disease	beta blockers, ACEI or ARB		
Angina	beta blockers		Add DHP calcium antagonists for additional BP control
Post-MI or ACS	beta blockers		
Aortic stenosis (asymptomatic)			Initiate treatment with low medication doses and up-titrate slowly
Aortic insufficiency		Avoid beta blockers, non-DHP - CCBs	Avoid drugs that slow heart rate

Annexure 4. Treatment options for Hypertensive emergencies[7]

Drugs	Dose	Onset of action	duration	Remarks
Labetalol	20 mg injected slowly for at least 2 min; followed by 40-80 mg every 10 min. Max: 200 mg For infusion: 1 to 2 mg/min until BP stabilizes then stop or reduce it to 0.5mg/min	≤5 min	3 - 6 hrs.	Patients should remain supine during and 3 hr. after the procedure
Nitroglycerine	Initial: 5-25 mcg/min. Usual range: 10-200 mcg/ min; up to 400 mcg/min in some cases.	2 - 5 min	3 - 5 min	Preferred in acute coronary syndrome and acute pulmonary oedema.
Isosorbide Dinitrate	IV infusion 2-20 mg/hr., titrate based on target BP.	3 - 15 min	1 hour	Preferred in acute coronary syndrome
Hydralazine	Initial: 5-10 mg via slow inj, may repeat after 20-30 min. Alternatively, as a continuous infusion, initial dose of 0.2-0.3 mg/min. Maintenance: 0.05-0.15 mg/min.	10 - 30 min	3 - 8 hrs	Caution in acute coronary syndromes, cerebrovascular accidents and dissecting aneurysms. Unpredictable BP-lowering effects.
Esmolol	Loading dose of 80 mg over 15-30 sec, followed by an infusion of 150 mcg/kg/min, may increase to 300 mcg/kg/min if necessary.	1 min	10 - 20 min	Used in peri- operative situations and tachyarrhythmias.
Nicardipine	Slow IVI at an initial rate of 5 mg/hr. Increase infusion rate as necessary, up to max 15 mg/hr. Consider reducing it to 3 mg/hr. after a response is achieved	5 - 10 min	1 - 4 hrs	Caution in acute heart failure and coronary ischemia
Sodium Nitroprusside	Initial: 0.3-1.5 mcg/kg/ min, adjust gradually as needed. Usual: 0.5-6 mcg/kg/min. Max rate: 8 mcg/kg/min, discontinue if there is no response after 10 mins. May continue for a few hrs if there is response.	seconds	1 - 5 min	Caution in heart failure. Require intra-arterial blood pressure monitoring. Lower dosing adjustment required for elderly and those already receiving antihypertensives.

Annexure 5. Anti hypertensives for severe Preeclampsia in Pregnancy

Drug	Dose and route	Remarks
Labetalol	10-20 mg IV, injected slowly for at least 2 min; followed by 20-80 mg every 10 -30 min. Max: 300 mg For infusion: 1 to 3 mg/min IV until BP stabilizes then stop or reduce it to 0.5mg/min	lower incidence of maternal hypotension and other adverse effects Avoid asthma and decreased cardiac function and heart block.
Hydralazine	5 mg, IV or IM, then 5 to 10 mg every 20 to 40 minutes if needed, to maximum dose of 20mg. For infusion: 0.5 to 10.0 mg/h If no success with 20 mg IV or IM, consider another drug	Higher doses associated with abnormal fetal heart rates
Nifedipine (immediate release)	10 to 20 mg PO, repeat in 20 minutes if needed, followed by 10-20mg every 6 hours: maximum daily dose of 180mg	
Anti-Convulsant for Eclampsia		
Magnesium Sulphate	IV: 4g slow bolus over 10 mins, followed by 1-2 g/hr. maintenance infusion given via a controlled infusion pump IM (deep): 10g loading dose, followed by 5 g every 4 hrs. in alternate buttock	Clinical monitoring is important looking for signs of toxicity: -loss of deep tendon reflexes -respiratory depression with rate <16/min -renal impairment (hourly urine output <30ml/hr.
Diazepam	10 mg IV bolus, followed by 40 mg in D5% slow infusion so that patient remains sedated	Only when magnesium sulphate is contraindicated or not available

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