



Dr.
Mohammed Ismael Dawood
Assistant Professor of Medicine

HYPERTENSION

Definitions:

- Blood pressure is essential for proper perfusion of the organs of the body.
- If elevated above certain levels, blood pressure is an important cardiovascular risk factor for myocardial infarction, stroke, renal and heart failure, and death.
- It is defined as persistent elevation of arterial blood pressure.
- Diastolic BP is higher than 90 mm Hg and or the systolic BP is higher than 140 mm Hg.
- The measurement of BP should be done at least twice on at least two subsequent visits.
- A single measurement of systolic BP 160 mmHg and/or diastolic BP > 105 is sufficient for diagnosis.
- Under complete mental & physical rest.

Aetiology:

- ❑ In more than 95% of cases, no specific underlying cause of hypertension can be found, and such patients are said to have essential hypertension.
- ❑ Important predisposing factors for essential hypertension include:
 - Age.
 - Ethnicity (higher incidence in African Americans and Japanese).
 - Genetic factors.
 - High salt intake.
 - Alcohol excess.
 - Obesity.
 - Lack of exercise.
 - Impaired intrauterine growth.
- ❑ In around 5% of cases, hypertension results from a specific underlying disorder (secondary hypertension). Causes include:
 - Renal disease (renal vascular disease, glomerulonephritis, polycystic kidney disease).
 - Endocrine disorders (phaeochromocytoma, Cushing's syndrome, Conn's syndrome, acromegaly, thyrotoxicosis, congenital adrenal hyperplasia).
 - Pregnancy.
 - Drugs (corticosteroids, oestrogen-containing oral contraceptive pill, anabolic steroids).
 - Coarctation of the aorta.

Clinical Features:

- ❑ Hypertension is usually asymptomatic until discovered at a routine examination or when a complication arises.
- ❑ A BP check is therefore advisable every 5 years in adults older than 40 years to detect occult hypertension.
- ❑ The history may reveal familial hypertension, lifestyle factors (exercise, salt intake, smoking, alcohol intake) and potential drug causes.
- ❑ Examination may reveal radio-femoral delay (coarctation of the aorta), enlarged kidneys (polycystic kidney disease), abdominal bruits (renal artery stenosis) or features of Cushing's syndrome.
- ❑ More commonly, there may be evidence of risk factors such as central obesity or hyperlipidaemia, or of complications such as LV hypertrophy (LV heave, fourth heart sound), aortic aneurysm, stroke or retinopathy.

BP Measurement:

- ❑ Antihypertensive therapy is commonly lifelong, so it is vital that the BP readings on which the diagnosis is based are accurate.
- ❑ Measurements should be made to the nearest 2 mmHg, sitting with the arm supported, using an appropriately sized cuff and repeated after 5 minutes' rest if initial values are high.
- ❑ Sphygmomanometry, particularly when performed by a doctor, can cause a transient rise in BP ('white coat' hypertension).
- ❑ A series of automated ambulatory BP measurements obtained over 24 hours or longer provides a better profile than a limited number of clinic readings.
- ❑ Home self-measurement is an alternative that is less well established.

- Ambulatory or home measurements may be particularly helpful in:
1. patients with unusually labile or refractory BP.
 2. those with symptomatic hypotension.
 3. those in whom white coat hypertension is suspected.

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16.64 Definition of hypertension

Category	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Blood pressure		
Optimal	<120	<80
Normal	<130	85
High normal	130–139	85–89
Hypertension		
Grade 1 (mild)	140–159	90–99
Grade 2 (moderate)	160–179	100–109
Grade 3 (severe)	≥180	>110
Isolated systolic hypertension		
Grade 1	140–159	<90
Grade 2	≥160	<90

Investigations:

- ❑ All hypertensive patients should also be investigated by:
 - ✓ Urinalysis for blood, protein and glucose.
 - ✓ U&Es.
 - ✓ Blood glucose.
 - ✓ Serum lipids.
 - ✓ Thyroid function.
 - ✓ 12-lead ECG.

- ❑ Additional investigations are appropriate in selected patients to identify:
 - ✓ Target organ damage (e.g. echocardiography).
 - ✓ Potential causes of secondary hypertension (e.g. renal USS, urinary catecholamines).

Management:

- ❑ The following lifestyle measures can not only lower BP but also reduce cardiovascular risk:
 - Correcting obesity.
 - Reducing alcohol intake.
 - Restricting salt intake.
 - Engaging in regular physical exercise.
 - Increasing consumption of fruit and vegetables.
- ❑ Decisions on treatment should therefore be guided by an overall assessment of cardiovascular risk.
- ❑ In practice this is best calculated using risk-prediction charts.

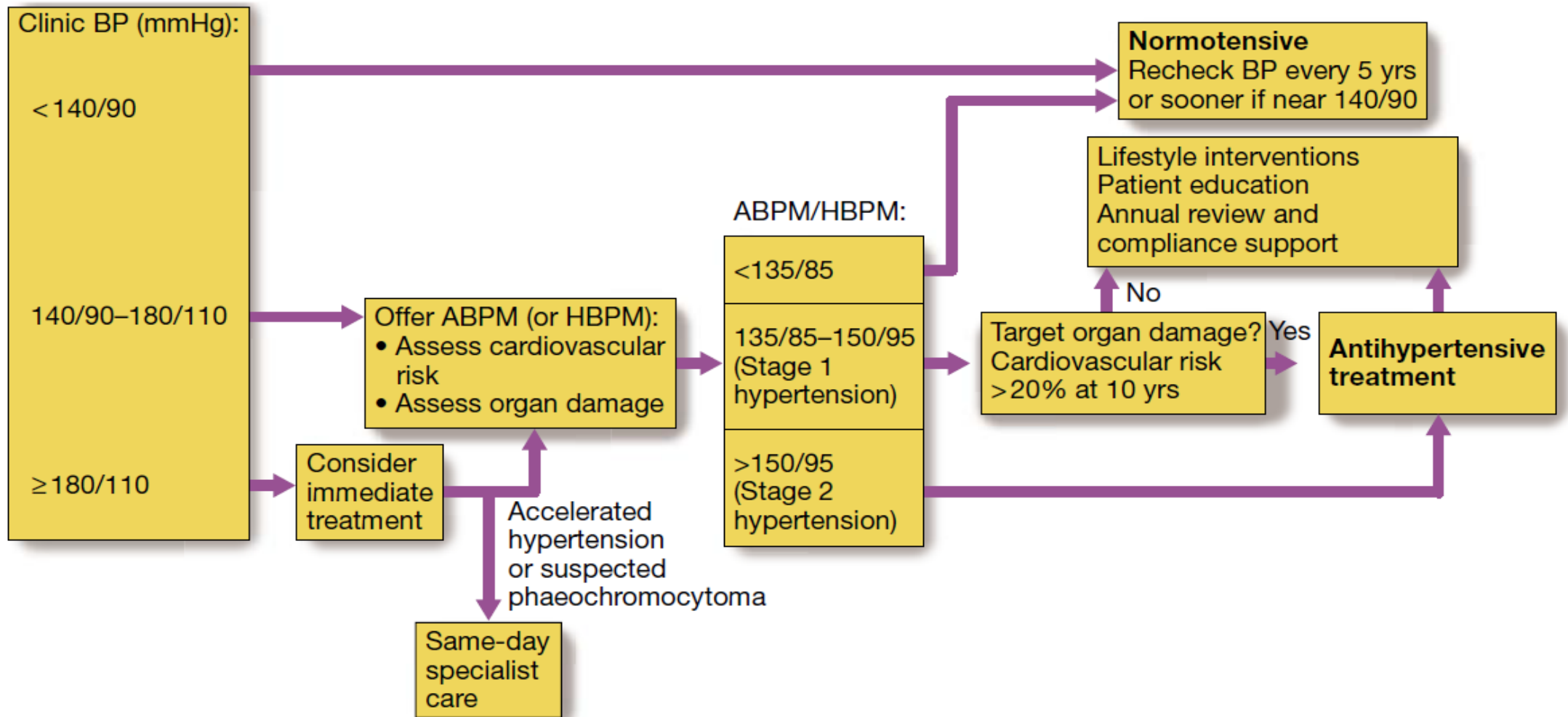


Fig. 8.18 Management of hypertension: British Hypertension Society guidelines. Consider specialist referral for stage 1 hypertension in those aged younger than 40 years. *ABPM*, Ambulatory blood pressure monitoring; *HBPM*, home blood pressure monitoring.

Pharmacology:

- ❑ **Thiazides:** The antihypertensive action of thiazides is incompletely understood, and may take up to a month to take effect. The daily dose of bendroflumethiazide is 2.5 mg.
- ❑ **ACE inhibitors:** ACE inhibitors (e.g. lisinopril 10–40 mg daily) are effective, but can precipitate renal failure in patients with renal impairment or renal artery stenosis. U&E should be checked before and 1 to 2 weeks into therapy. Side effects include first-dose hypotension, cough, rash, hyperkalaemia and renal dysfunction.
- ❑ **Angiotensin receptor blockers: ARBs** (e.g. irbesartan 150–300 mg daily) have similar efficacy to ACE inhibitors but do not cause cough and are better tolerated.

- ❑ **Calcium channel antagonists:** Amlodipine (5–10 mg daily) and nifedipine (30–90 mg daily) are particularly useful in older people. Side effects include flushing, palpitations and fluid retention.
- ❑ **β -Blockers:** These are not first-line antihypertensive therapy, except in patients with a second indication such as angina. Atenolol (50–100 mg daily) and bisoprolol (5–10 mg daily) are β_1 -selective and less likely than nonselective agents to cause the side effects of poor circulation and bronchospasm.
- ❑ **Combined β -and α -blockers:** Labetalol (200 mg–2.4 g daily in divided doses) can be used as an infusion in accelerated hypertension.
- ❑ **Other vasodilators:** These include α_1 -adrenoceptor antagonists (e.g. doxazosin 1–16 mg daily) and vascular smooth muscle relaxants (e.g. hydralazine 25–100 mg twice daily). Side effects include first-dose and postural hypotension, headache, tachycardia and fluid retention.

□ Combination therapy is often required to achieve adequate control.

□ Comorbid conditions may have an important influence on initial drug selection (e.g., a β -blocker might be the most appropriate treatment for a patient with angina but should be avoided in asthma).

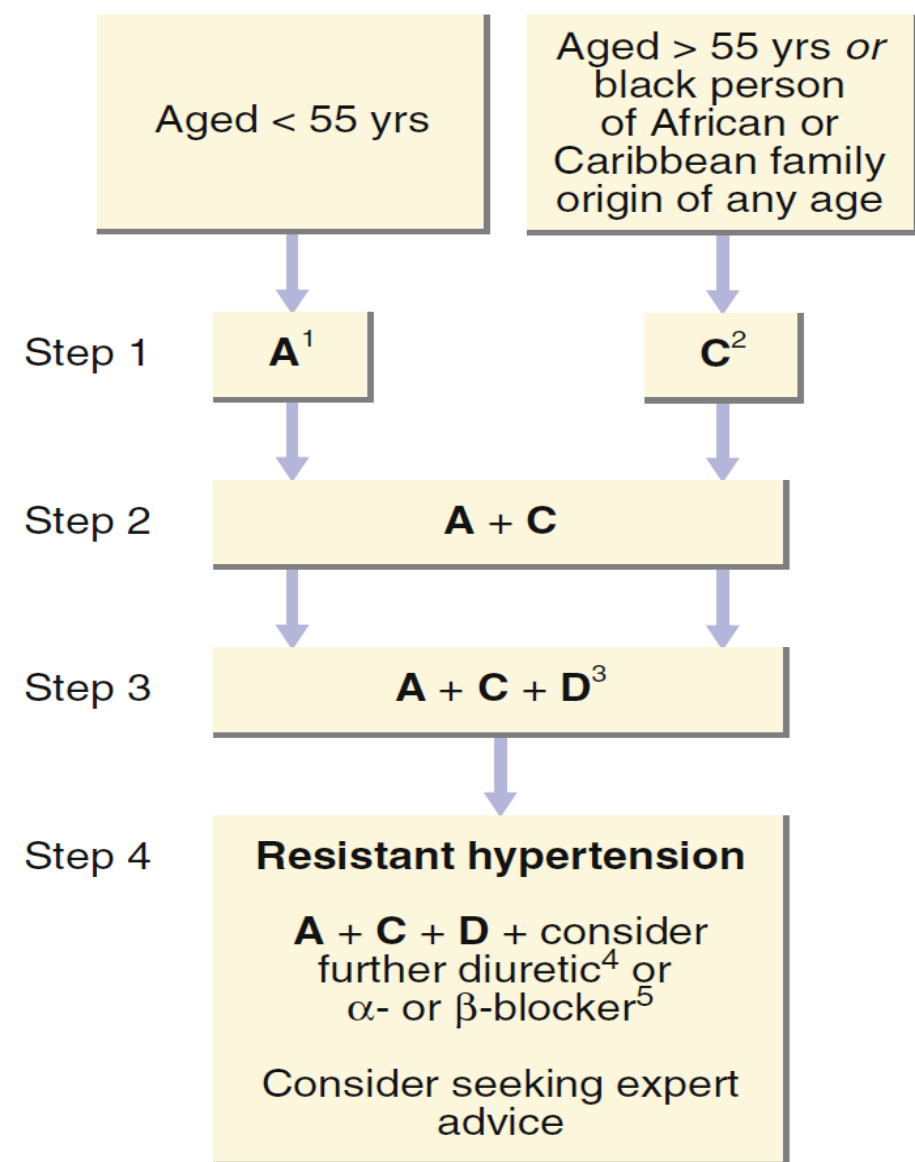


Fig. 8.19 Antihypertensive drug combinations. ¹A = ACE inhibitor or ARB. ²C = calcium channel blocker (CCB); consider thiazide if CCB not tolerated or in heart failure. ³D = thiazide. ⁴Low-dose spironolactone or higher-dose thiazide. ⁵Consider an α - or β -blocker if further diuretics are not tolerated, contraindicated or ineffective. CCB, Calcium channel blocker.

Tailored method:

The choice of anti-hypertensive drugs is individualized according to co-morbidity and associated diseases e.g.:

1. Coronary heart disease and hypertension:

- Beta blockers and calcium channel blockers are used.
- Avoid drugs that produce reflex tachycardia as hydralazine.

2. Heart failure and hypertension:

- ACEI and diuretics are used.
- Avoid drugs that reduce cardiac contractility as beta blockers and verapamil.

3. Diabetes mellitus and hypertension:

- ACEI is particularly useful in reducing the microalbuminuria in these patients.
- Avoid diuretics and diazoxide that may induce hyperglycemia.
- Avoid beta blockers that may mask hypoglycemia in these patients.

4. Hypertension with renal impairment:

- Alpha-methyl dopa is used as it increases renal blood flow.
- Avoid ACEI and K-retaining diuretics.

5. Hypertension with pregnancy:

- In mild cases: Methyldopa, CCB.
- In pre-eclampsia: bed rest, salt restriction and hydralazine or methyl dopa.
- In eclampsia: as pre-eclampsia but with IV hydralazine and pregnancy termination if there is no response to treatment.

Drug	Indication	(with caution) Contraindication
ACEI	<ul style="list-style-type: none"> ▪ Heart failure. ▪ Diabetes mellitus. 	<ul style="list-style-type: none"> ▪ Renal artery stenosis. ▪ Renal failure. ▪ Pregnancy.
Beta blockers	<ul style="list-style-type: none"> ▪ Coronary heart disease. ▪ Arrhythmia. 	<ul style="list-style-type: none"> ▪ Heart failure. ▪ Bronchial asthma. ▪ COPD. ▪ Diabetes mellitus.
Calcium channel blocker	<ul style="list-style-type: none"> ▪ Coronary heart disease. ▪ Diabetes mellitus. 	<ul style="list-style-type: none"> ▪ Heart failure.
Diuretics	<ul style="list-style-type: none"> ▪ Heart failure. 	<ul style="list-style-type: none"> ▪ Diabetes mellitus. ▪ Gout.

TREATMENT: URGENT CONDITIONS

- ❖ **Hypertensive urgency** is generally defined as a systolic pressure over 180 or diastolic pressure over 120 in the absence of end-organ findings or symptoms.
- ❖ **Hypertensive emergencies** are symptomatic presentations of severe BP elevation and include:
 - Hypertensive encephalopathy
 - Intracranial hemorrhage
 - Acute MI
 - Acute pulmonary edema
 - Aortic dissection
 - Eclampsia

- ❖ Hypertensive urgency requires a prompt evaluation and initiation of standard therapy, generally with two first-line agents, but intravenous therapy is not indicated, as rapid lowering of pressure has no proven benefit in asymptomatic patients.
- ❖ Hypertensive emergency should be treated with rapid lowering of BP and usually requires parenteral therapy and monitoring in the intensive care setting.
- ✓ The initial goal reduction in mean arterial pressure is approximately 20% to 25%. β -Blockers are a necessary therapy for patients with aortic dissection to decrease wall stress.

TABLE 119-4 Usual Intravenous Doses of Antihypertensive Agents Used in Hypertensive Emergencies^a

ANTIHYPERTENSIVE AGENT	IV DOSE
Nitroprusside	Initial 0.3 (mcg/kg)/min; usual 2–4 (mcg/kg)/min; maximum 10 (mcg/kg)/min for 10 min
Nicardipine	Initial 5 mg/h; titrate by 2.5 mg/h at 5–15 min intervals; max 15 mg/h
Labetalol	2 mg/min up to 300 mg or 20 mg over 2 min, then 40–80 mg at 10-min intervals up to 300 mg total
Enalaprilat	Usual 0.625–1.25 mg over 5 min every 6–8 h; maximum 5 mg/dose
Esmolol	Initial 80–500 mcg/kg over 1 min, then 50–300 (mcg/kg)/min
Phentolamine	5–15 mg bolus
Nitroglycerin	Initial 5 mcg/min, then titrate by 5 mcg/min at 3–5 min intervals; if no response is seen at 20 mcg/min, incremental increases of 10–20 mcg/min may be used
Hydralazine	10–50 mg at 30-min intervals

^aConstant blood pressure monitoring is required. Start with the lowest dose. Subsequent doses and intervals of administration should be adjusted according to the blood pressure response and duration of action of the specific agent.

CONTINUED CARE:

1. Patients on antihypertensive therapy should have regular assessment of electrolytes and renal function.
2. Additional cardiovascular risk factors (smoking, high cholesterol, diabetes) should also be treated.
3. When lifestyle changes are established and BP is well controlled, tapering to reduce or discontinue medications may be considered.