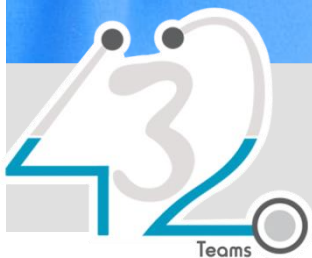


MEDICINE

432 Team

18 Hypertension



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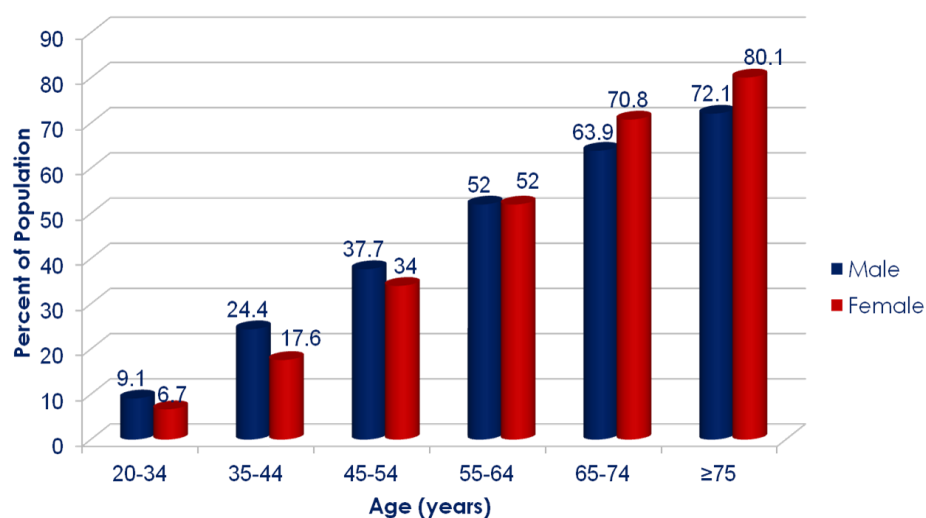
COLOR GUIDE: • Females' Notes • Males' Notes • Important • Additional

Objectives

1. To be able to recognize the definition of hypertension.
2. To be able to identify the Stages of Hypertension.
3. To find out the complication of Hypertension.
4. To learn how to measure blood pressure.
5. To acquire knowledge on how to treat hypertension.

HYPERTENSION

- ◆ The 4th most common cause of death worldwide.
- ◆ Directly and indirectly responsible for >20% of all deaths.
- ◆ 29-30% (about 66 million, 1 out of every 3) incidence of hypertension adult of the United States.
- ◆ 15.2% and 40.6% of Saudis were hypertensive or borderline hypertensive.
- ◆ Onset stage 25-55 years mainly in 40-50y.
- ◆ Occurs over 30% of persons older than 65 y.
- ◆ Only 72% are aware of their disease.
- ◆ SA 57.8% of hypertensive Saudis were undiagnosed.
- ◆ 55% of participants on medication for hypertension had their blood pressure uncontrolled.
- ◆ In 90%-95% of cases no cause can be found primary hypertension (essential).
- ◆ Secondary hypertension 5-10%.



Mechanism of Blood Pressure: (imp!)

$$\begin{aligned} \text{Blood Pressure} &= \text{Cardiac output} \times \text{Systemic Vascular Resistance} \\ &= \text{CO} \times \text{SVR} \\ &= \text{Stroke volume} \times \text{HR} \times \text{SVR} \end{aligned}$$

1) Essential HTN: (95%)

Risk factors "Unknown etiology (multifactorial)"

- ♠ Obesity---metabolic syndrome
- ♠ Excessive salt intake---low potassium intake
- ♠ Excessive alcohol intake
- ♠ Polycythemia
- ♠ Lack of exercise
- ♠ Non-steroid anti-inflammatory drugs > Salt & water retention
- ♠ Family history of essential HTN

Caffeine and smoking increase the BP acutely but are not risk factors for the development of chronic essential HTN.

2) Secondary Hypertension: (5-10%) Become normal if treat the cause

- ♠ Primary renal disease (Most common) 1st you should rule it out!
- ♠ Oral contraceptives (Most common in young females) / old females on estrogen > AGT > Renin + salt & water retention.
- ♠ Sleep apnea syndrome (obesity + snoring + fall asleep)
- ♠ Primary hyperaldosteronism (salt retention + k excretion) don't response to medications
- ♠ Renovascular disease (arterial stenosis + low blood > RAAS > HTN)
- ♠ Cushing's syndrome (increase production of corticosteroids)
- ♠ Pheochromocytoma (sudden headache+ palpitation+ diaphoresis)
- ♠ Other endocrine disorders (thyrotoxicosis, acromegaly, HPTH)
- ♠ Coarctation of the aorta (congenital, in young patients, high BP in upper part + low in lower part, radiofemoral delay)

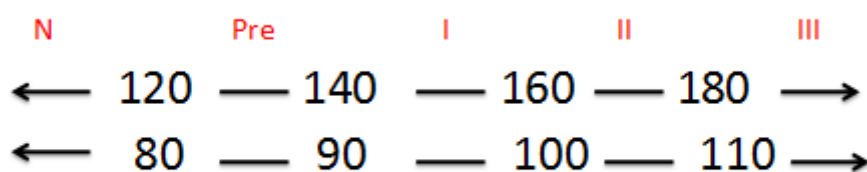
Classification of Blood Pressure Levels in HTN:

Office and out-of-office blood pressure levels

Category	Systolic BP (mmHg)		Diastolic (mmHg)
Office BP	≥140	and/or	≥90
Ambulatory BP			
Daytime (or awake)	≥135	and/or	≥85
Nighttime (or sleep)	≥120	and/or	≥70
24 h	≥ 130	and/or	≥80
Home BP	≥135	and/or	≥85

European Society of Nephrology

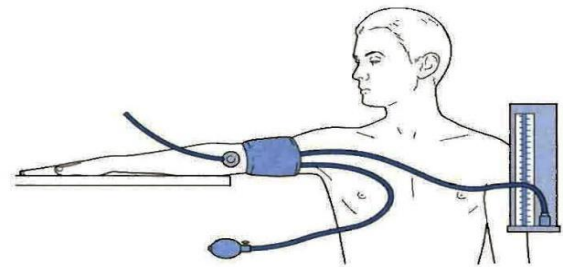
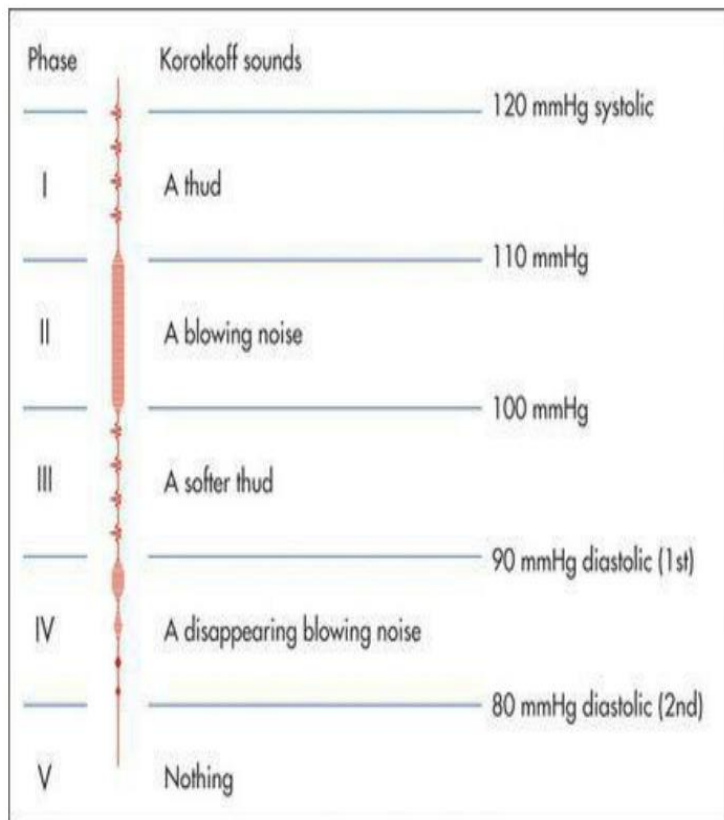
Category	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Optimal blood pressure	<120	<80
Normal blood pressure	<130	<85
High-normal blood pressure	130-139	85-89
Grade 1 hypertension (mild)	140-159	90-99
Grade 2 hypertension (moderate)	160-179	100-109
Grade 3 hypertension (severe)	>/= 180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



Blood Pressure Measurement:

- ♣ Apply to adults on **no antihypertensive** medications and who are **not acutely ill**.
- ♣ If there is a disparity in category between the systolic and diastolic pressures, **the higher value** determines the severity of the hypertension.
- ♣ Measure blood pressure to arm the high reading.
- ♣ To allow the patients to sit for 3–5 minutes **before beginning** BP measurements.
- ♣ Place the cuff, back straight and arm supported **at heart level**.
- ♣ **Take at least two** BP measurements, spaced 1–2 min apart, and additional measurements if the first two are quite different.
- ♣ Consider the **average BP** if deemed appropriate.
- ♣ To use a **standard bladder** (12–13 cm wide and 35 cm long).
- ♣ A **larger bladder** for larger arm (circumference >32 cm).
- ♣ The bladder of the pressure cuff should encircle **at least 80% of the upper arm**.
- ♣ Measure BP **in both arms** at first visit to detect possible differences. In this instance, take the arm **with the higher value** as the reference.
- ♣ Measure BP **in sitting and standing position** in elderly subjects and diabetic patients.
- ♣ Use phase I and V (disappearance) **Korotkoff** sounds to identify systolic and diastolic BP, respectively.

Korotkoff sounds:



المرحلة	أصوات كورتكوف	القياس
		١٢٠ مم زئبق انقباض
١	جلجلة	١١٠ زئبق
٢	ضربة مزعجة	١٠٠ زئبق
٣	جلجلة ناعمة	٩٠ مم زئبق انبساطي (الأول)
٤	ضربات ناعمة مختفية	٨٠ مم زئبق انبساطي (الثاني)
٥	لا شيء	

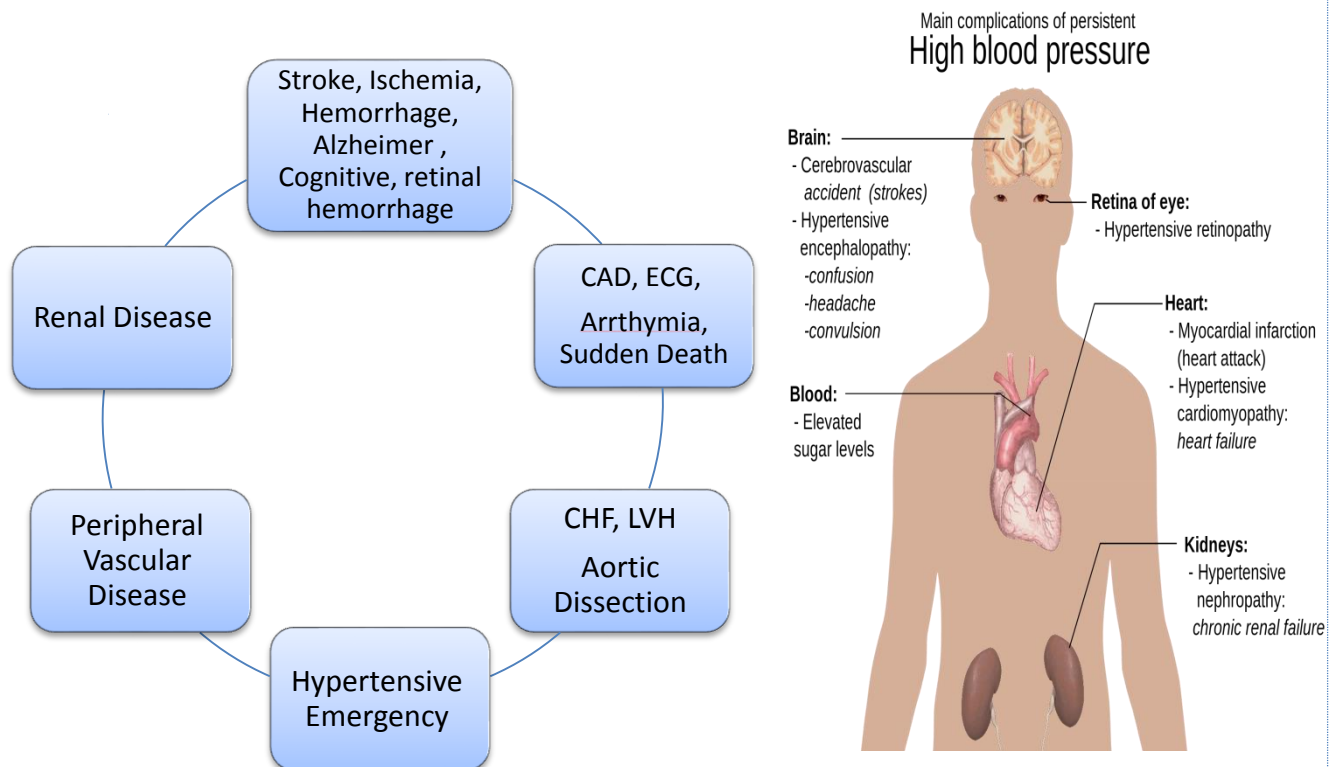
شكل ١ - ٢ القيام بقياس ضغط الدم

The doctor said the most important two phases are (I & V) = appearing and disappearing of the sound, he said don't worry about the rest.

White Coat Hypertension:

- ◆ Approximately 20 to 25% of patients with mild office hypertension
- ◆ More common in elderly
- ◆ Infrequent in patients with office diastolic pressures ≥ 105 mmHg
- ◆ The diagnosis of mild hypertension should not be made until the blood pressure has been measured on at least three to six visits.
- ◆ Average of 10 to 15 mmHg decrease between visits 1 and three.

Complications of HTN:



Hypertensive Emergency:

Severe hypertension (diastolic BP > 120) in end organ damage (MI, STROKE, AKI, CHF)

Hypertensive Urgency:

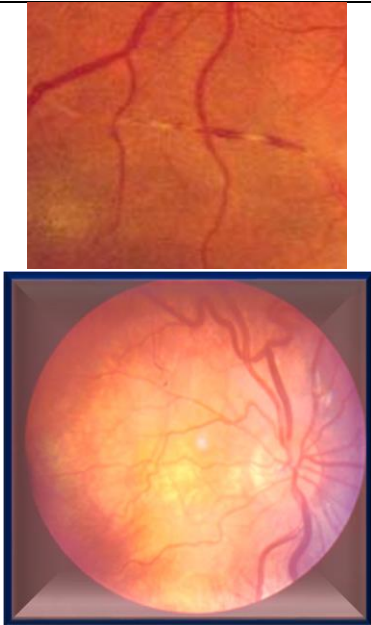

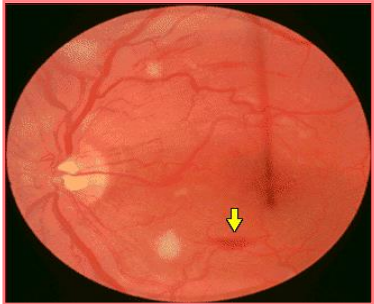
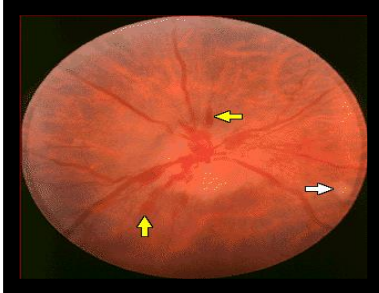
Severe hypertension (diastolic BP > 120) in asymptomatic patients.

There is no proven benefit from rapid reduction in BP in asymptomatic patients who have no evidence of acute end-organ and are little short-term risk.

Malignant (Accelerated) Hypertension:

Marked hypertension (diastolic BP > 120) with encephalopathy & retinal hemorrhages, exudates or papilledema.

Hypertensive retinopathy:

Grade	Description	
I	<p>Minimal narrowing of retinal arteries [arteriolar constriction as `silver or copper wiring` and Vascular tortuosities]</p>	
II	<p>Narrowing of retinal arteries in conjunction with regions of focal narrowing and arteriovenous nicking [Arteriovenous nicking]</p>	
III	<p>Abnormalities seen in Grade 1 and II, as well as retinal hemorrhages, hard exudation and cotton wool spots. [Flame-shaped hemorrhage]</p>	
IV	<p>Abnormalities encountered in Grades I through III, as well as swelling of the optic nerve head and macular star [Papilledema from malignant hypertension. There is blurring of the borders of the optic disk with hemorrhages (yellow arrows) and exudates (white arrow)]</p>	

Diagnosis Hypertension:

■ Clinical Presentations:

- ♠ Asymptomatic.
- ♠ Headache.
- ♠ Epistaxis.
- ♠ Chest discomfort.
- ♠ Symptom of complications.

Screening:

- Every two years for persons with systolic and diastolic pressures below 120/80 mmHg
- Yearly for persons with a systolic pressure of 120-139 mmHg OR Diastolic pressure of 80-89 mmHg

■ Physical Examination:

1. Confirm the diagnosis of hypertension.
2. Detect causes of secondary hypertension.
3. Assess CV risk.
4. Organ damage.
5. Concomitant clinical conditions.

Accurate measurement of blood pressure
General appearance
Distribution of body fat
Skin lesions
Muscle strength
Alertness
Fundoscopy
Hemorrhage
Papilledema
Cotton-wool spots
Neck
Palpation and auscultation of carotids
Thyroid
Heart
Size
Rhythm
Sounds
Lungs
Rhonchi
Rales
Abdomen
Renal masses
Bruits over aorta or renal arteries
Femoral pulses
Extremities
Peripheral pulses
Edema
Neurologic assessment
Visual disturbance
Focal weakness
Confusion

■ Laboratory Tests:

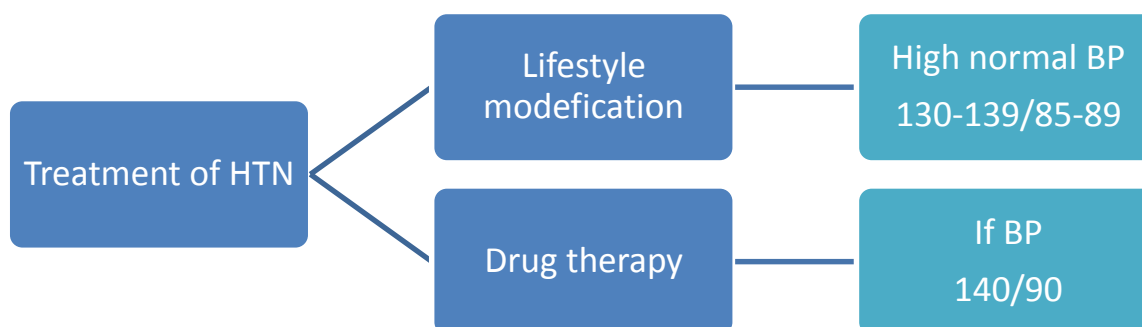
◆ Rotine tests:

- ECG.
- Urinalysis.
- Serum sodium, potassium, creatinine, or the corresponding estimated GFR, and calcium.
- Blood glucose, and hematocrit.
- Lipid profile, after 9- to 12-hour fast, that includes high density and low-density lipoprotein cholesterol, and triglycerides.

◆ Optional tests:

- Urinary albumin excretion or albumin/creatinine ratio.

■ Treatment



A) Blood Pressure Target:

Age < 80	< 140/90
Age > 80	< 140-150/90
Diastolic BP	< 90
DBP for DM and CKD	< 85

- ◆ If the systolic pressure is persistently ≥ 140 mmHg.
 - ◆ And/or the diastolic pressure is persistently ≥ 90 mmHg.
 - ◆ After three to six visits.
- If these three conditions happened, we start the treatment.
- *Lowering the BP will reduce:
- 1-Stroke incidence (40%) 3-HF (50%)
 - 2-MI (20%) 4-RF (50%)

B) Lifestyle changes:

- ♠ **Salt restriction** to 5-6 gm/day.
- ♠ Increased consumption of **vegetables, fruits and low-fat dairy** products.
- ♠ 7-8 servings/day of grain products, 4-5 vegetable, 4-5 fruit.
- ♠ **Reduction of weight** to BMI of 25 kg/m².
- ♠ **Regular exercise** (≥30 min of moderate dynamic exercise on 5-7 days per week)
- ♠ **Smoking cessation.**

C) Anti-hypertensive Medications Uses and Complications:

<i>Class of drug</i>	<i>Complications</i>
Diuretics	Hypokalemia
β-blockers (β-b)	Bradycardia
ACE inhibitors (ACE-I)	Hyperkalemia / cough
AG-II receptor blockers (ARB)	Hyperkalemia
Ca channel blockers (CCB)	Edema / Tachycardia / Bradycardia
α-blockers (α-b)	1 st dose hypotension
Vasodilators	Edema / Tachycardia
sympatholytic drugs	Drowsiness

<i>Condition</i>	<i>Drug use</i>
CHF	Thiazide / ACE-I / Aldosterone Antagonist / β -b
Post MI	ACE-I / β -b
DM	Thiazide / ACE-I / ARb / Ccb
CKD	Thiazide / ACE-I / ARb
Stroke	ACE-I / Ccb

*Drug Therapy:

- ❖ A low dose of initial drug should be used, slowly titrating upward.
- ❖ Optimal formulation should provide 24-hour efficacy with once-daily dose.
- ❖ Combination therapies may provide additional efficacy with fewer adverse effects.
- ❖ Patients should return for follow-up after 2- 4 weeks and adjustment of medications until the BP goal is reached.
- ❖ More frequent visits for stage 2 HTN or with complicating co-morbid conditions.
- ❖ Serum potassium and creatinine monitored 1–2 times per year.

*Combination Therapies:

- ◆ ACE inhibitors and **diuretics**
- ◆ Angiotensin II receptor antagonists and **diuretics**
- ◆ Calcium antagonists and ACE inhibitors
- ◆ Angiotensin II receptor antagonists & β -adrenergic blockers or ACEI **NOT RECOMMENDED**
- ◆ Other combinations (β -adrenergic blockers and **diuretics**)

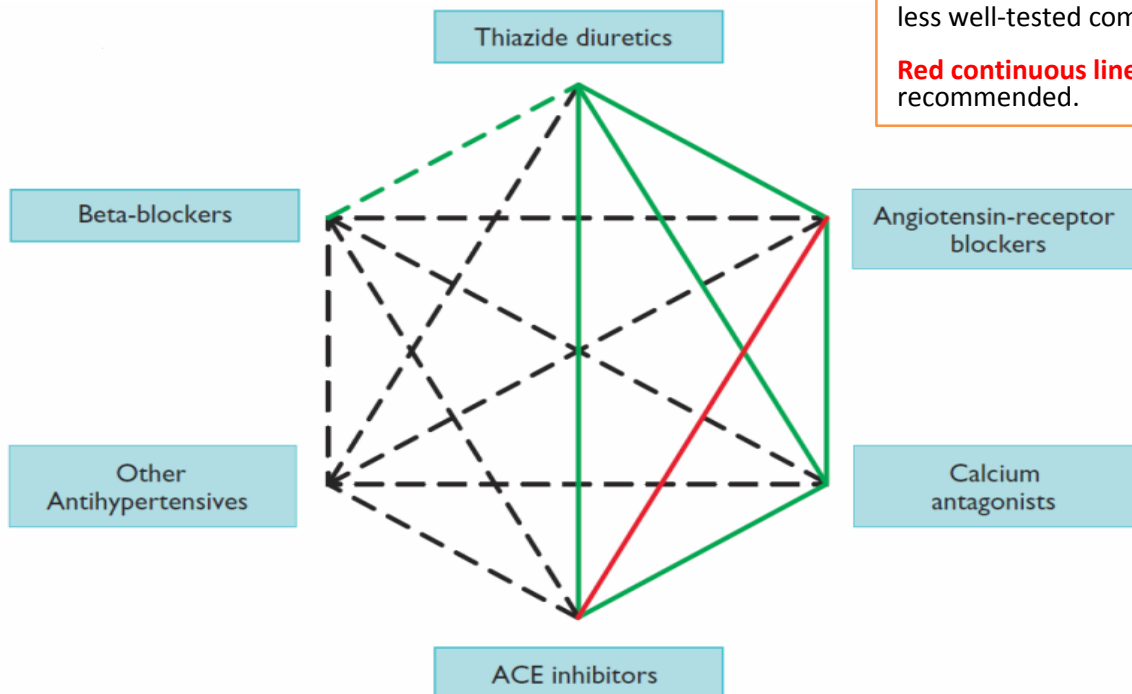
Summary of Treatment (Imp)

Green continuous lines: preferred

Green dashed line: useful combination (with some limitations)

Black dashed lines: possible but less well-tested combinations

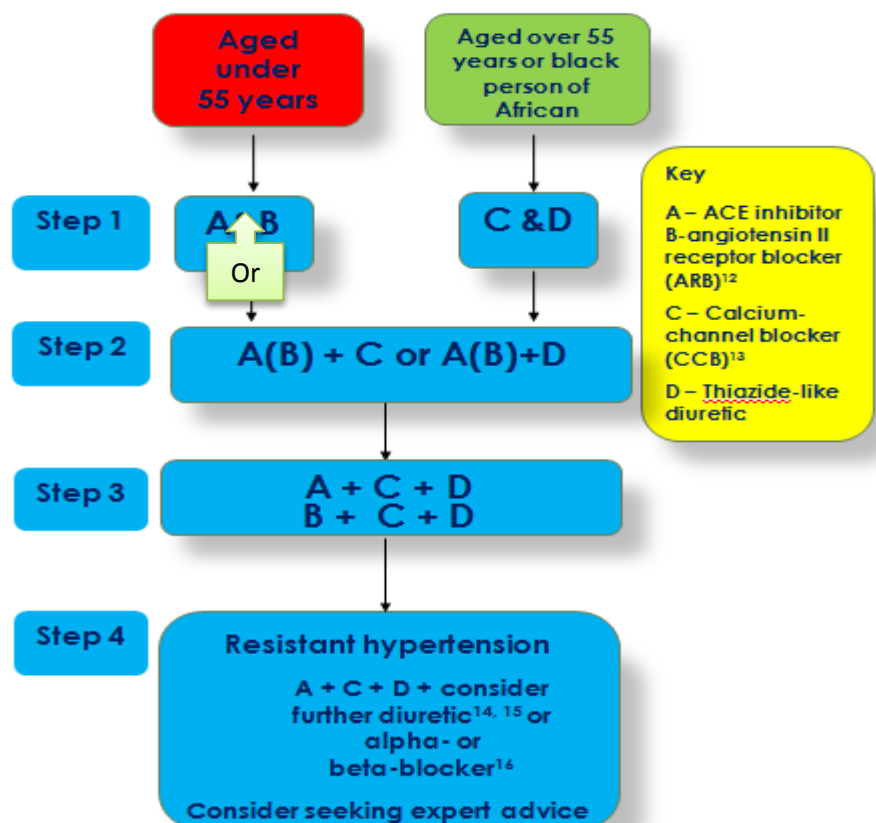
Red continuous line: not recommended.



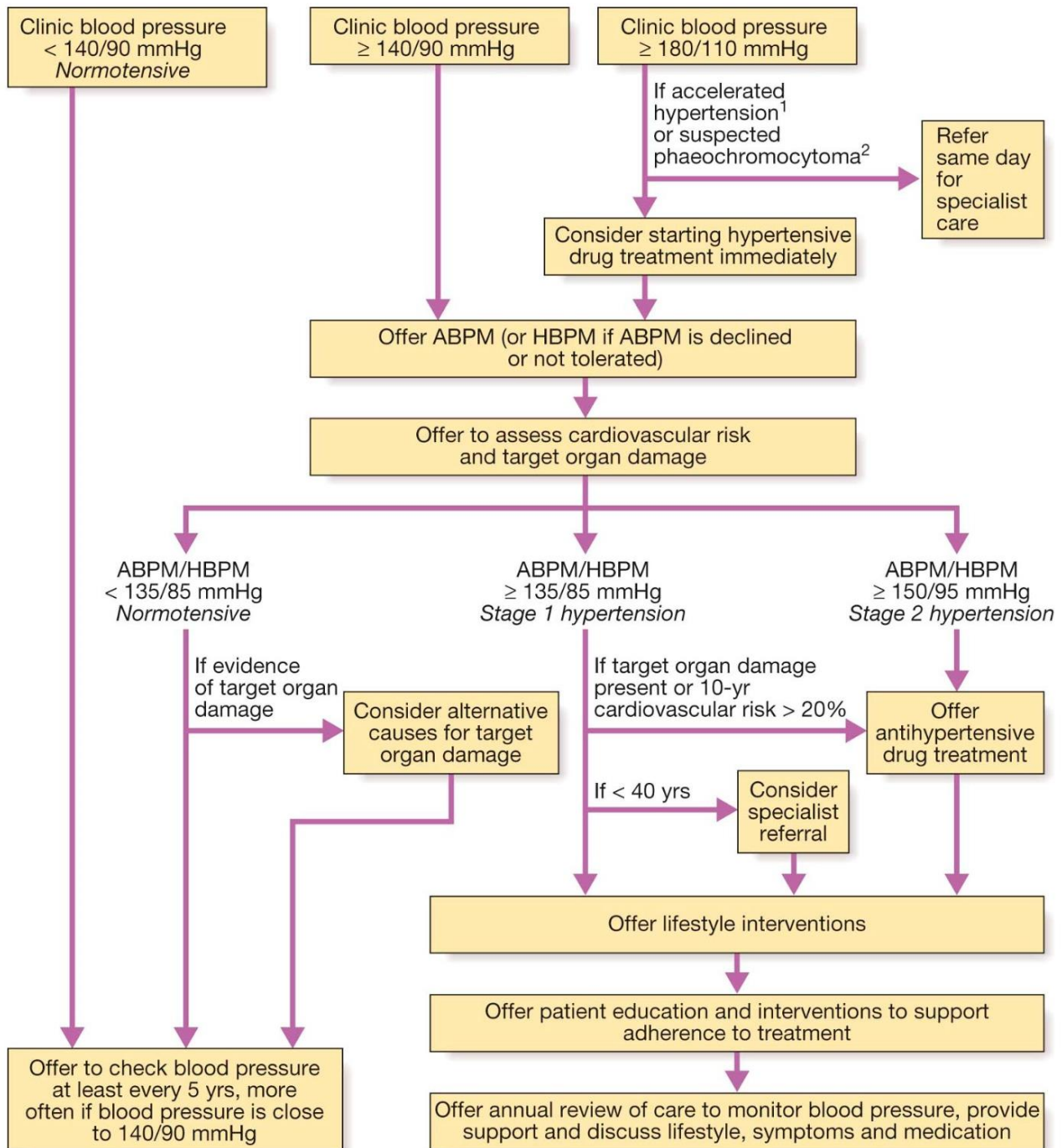
ACE = angiotensin-converting enzyme.

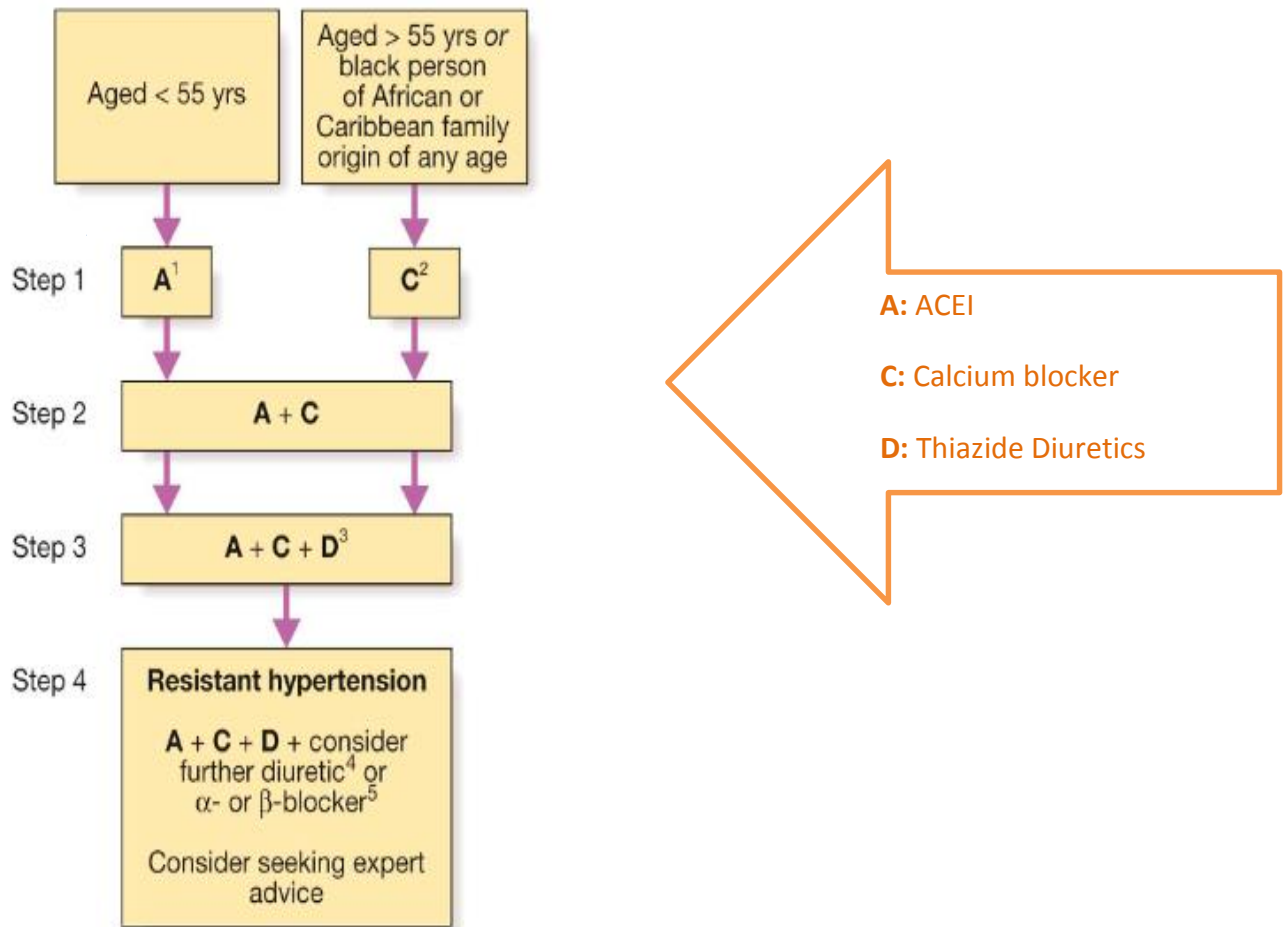
Notes:

- 1) Choose a low-cost ARB.
- 2) A CCB is preferred but consider a thiazide-like diuretic (or spironolactone) if a CCB is not tolerated or the person has edema, evidence of heart failure or a high risk of heart failure.
- 3) Consider an alpha- or beta-blocker if further diuretic therapy is not tolerated, or is contraindicated or ineffective.



Davidson's





Organ	Complication
Blood vessels	Hypertension is a major risk factor in the pathogenesis of aortic aneurysm and aortic dissection.
Central nervous system	Stroke: cerebral haemorrhage or infarction Carotid atheroma and TIAs Subarachnoid haemorrhage
Heart	Atrial fibrillation is common and may be due to diastolic dysfunction caused by left ventricular hypertrophy or the effects of coronary artery disease.

SUMMARY

Definition: hypertension is a condition in which arterial blood pressure (BP) is chronically elevated.

Stages: normal, Pre--hypertension, Stage 1 (140/90 mmHg), stage 2 (160/100 mmHg) and stage 3 (180/110 mmHg).

BP Measurement: Sphygmomanometer (more accurate), home blood pressure monitoring and ambulatory pressure monitoring.

Tests: Routine Tests (to rule out kidney disease): Electrocardiogram, urinalysis, blood glucose, hematocrit, serum sodium, serum potassium, creatinine, or the corresponding estimated GFR, calcium and lipid profile.

Treatment: Diuretics, B-Blockers, ACEI, ARB and CCB.

Complications : complications of hypertension include coronary artery disease, congestive heart failure, stroke, renal disease (including end-stage renal disease), and peripheral vascular disease.

- In the pathogenesis of essential hypertension:

-Increased sympathetic neural activity, insensitivity of baroreflex.

-Abnormal cardiovascular development, e.g. abnormality in the elasticity of aorta and/or peripheral vascular resistant.

- Risk Factors:

Polycythemia -> increased blood viscosity

NSAIDS -> Na//H₂O retention

- Secondary hypertension: OCP (large dose) Pheochromcytoma (episodic hypertension)
Primary hyperaldosteronism (sustained hypertension)

IMPORTANT NOTES FROM EXTERNAL RESOURCES

Notes

Davidson's Principles and Practice of Medicine

Hypertension is a very common feature of renal disease. Additionally, the presence of hypertension identifies a population at risk of developing CKD and current recommendations are that patients on antihypertensive medication should have renal function checked annually. Control of hypertension is very important in patients with renal impairment because of its close relationship with further decline of renal function.

Questions

- 1) A 34 year old man comes to your clinic with history of headache and dizziness for 2 months. His examination is unremarkable apart from repeated BP measurements of 200/100 mmHg. What is the most appropriate next step:
- A. Recheck his BP again in 1 month.
 - B. starts low salt diet only.
 - C. starts antihypertensive medications.
 - D. order CT scan of his head.
- 2) A 55 years old male presented to outpatient clinic with history of fatigue found to have BP of 155/90 , no previous history of hypertension, no diabetes mellitus, with normal laboratory test.-What is the best next step for the patient?
- A. Start Anti hypertension with beta blockers.
 - B. Repeat the blood pressure measurements after 3 days.
 - C. Give out patients a follow up after 3 months.
 - D. Reassure the patient.
- 3) A 77 women found to have elevated PB with typical reading of 162/84 mmgH. Which one would be most appropriate?
- A. ACEI
 - B. ARBs
 - C. Thiazide diuretic
 - D. Beta-Blocker

First choice for elderly hypertensive patient is either: Thiazide or Ca-channel-blocker "Davidson's"

4) All the following endocrine causes for 2ndary HTN EXCEPT:

- A. Pheochromocytoma
- B. Addison's disease
- C. Conn's disease
- D. Congenital adrenal hyperplasia

5) Which one is a risk factor for developing Essential HTN?

- A. Obesity
- B. High salt intake
- C. Alcohol
- D. Hyperlipidemia

All factors other than
HYPERLIPIDEMIA are
ENVIRONMENTAL

"Davidson's"

6) A 53 male known to be hypertensive and he is taking 10 mg of ramipril for several months. Despite this, his BP is suboptimal. There is no compliance issue. Which one would be the best add-on therapy?

- A. ARBs
- B. Thiazide diuretic
- C. Beta-Blocker
- D. Ca-channel-blocker

The last 4 MCQs are taken from
Davidson's book "Chapter of
Assessment"

432 Medicine Team Leaders

Raghad almutlaq & Abdulrahman Al Zahrani

For mistakes or feedback: medicine341@gmail.com

Q1: C

Q2: B

Q3: C

Q4: B

Q5: D

Q6: D