



Approach to Management of Hypertension

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442- 2018



Objectives of The Lecture

- Hypertension in KSA
- New definitions of hypertension
- Understand how to diagnose hypertension
- Evaluation and Risk Assessment of patients with high blood pressure
- When to screen for Secondary Causes of HTN
- Review the Management of hypertension
- Hypertensive Emergencies

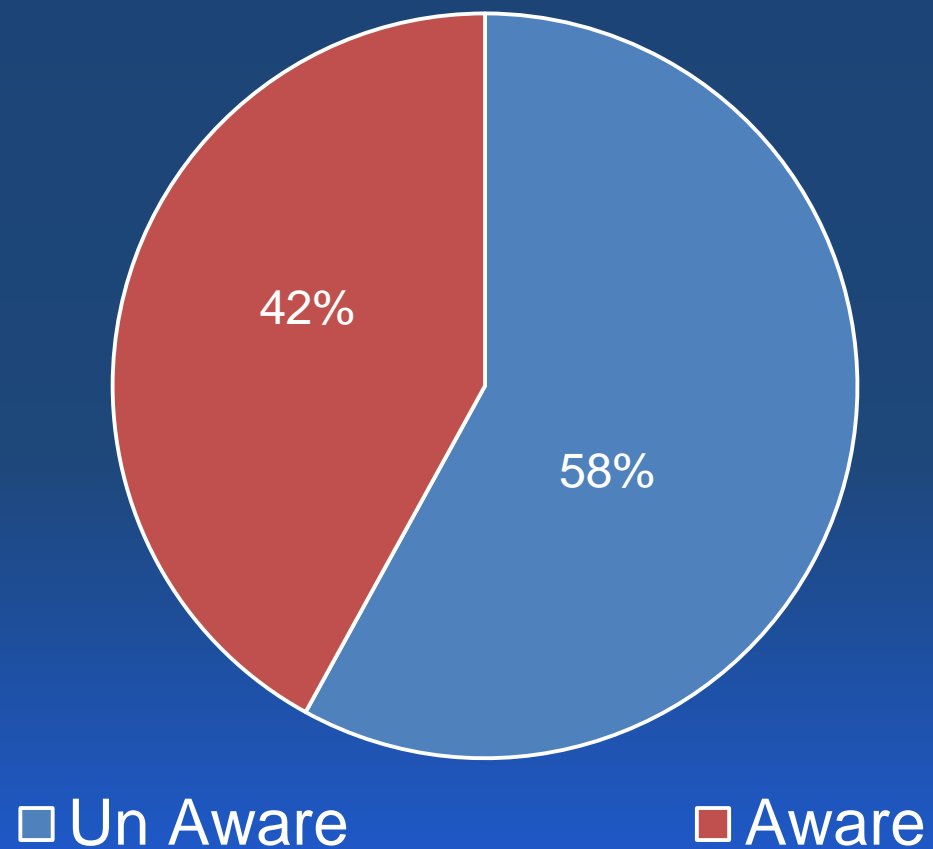
PREVELANCE OF HYPERTENSION

- The prevalence of HTN is 25% among individuals 15–64 years old in Saudi Arabia
- Hypertension is a leading risk factor for death.

* Institute for Health Metrics and Evaluation (IHME), “GBD arrow Diagram, Saudi Arabia. Risk of deaths.1990–2010,” IHME, University of Washington, Seattle, Wash, USA, 2013

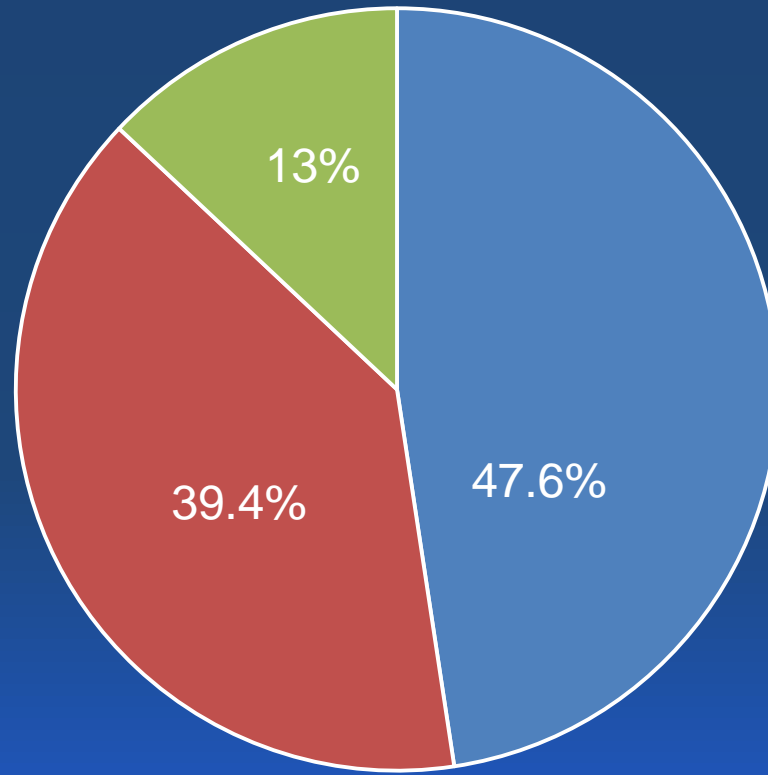
* The Global Burden of Disease 2010 (GBD 2010)

Percent distribution of HTN awareness among hypertensive Saudi aged 15 years or older, 2013



Majority of the hypertensive patients were unaware

Percent distribution of diagnosis and treatment status among hypertensive Saudi aged 15 years or older, 2013.



Majority of the patients with HTN were untreated or Rx but uncontrolled

□ Treated, Uncontrolled

■ Treated, Controlled

■ Diagnosed, untreated

Hypertension New Definitions Based on the American College and Cardiology (ACC) and the American Heart Association (AHA) 2017

Hypertension is defined as a SBP of 130 mm Hg or more or a DBP of 80 mm Hg or more

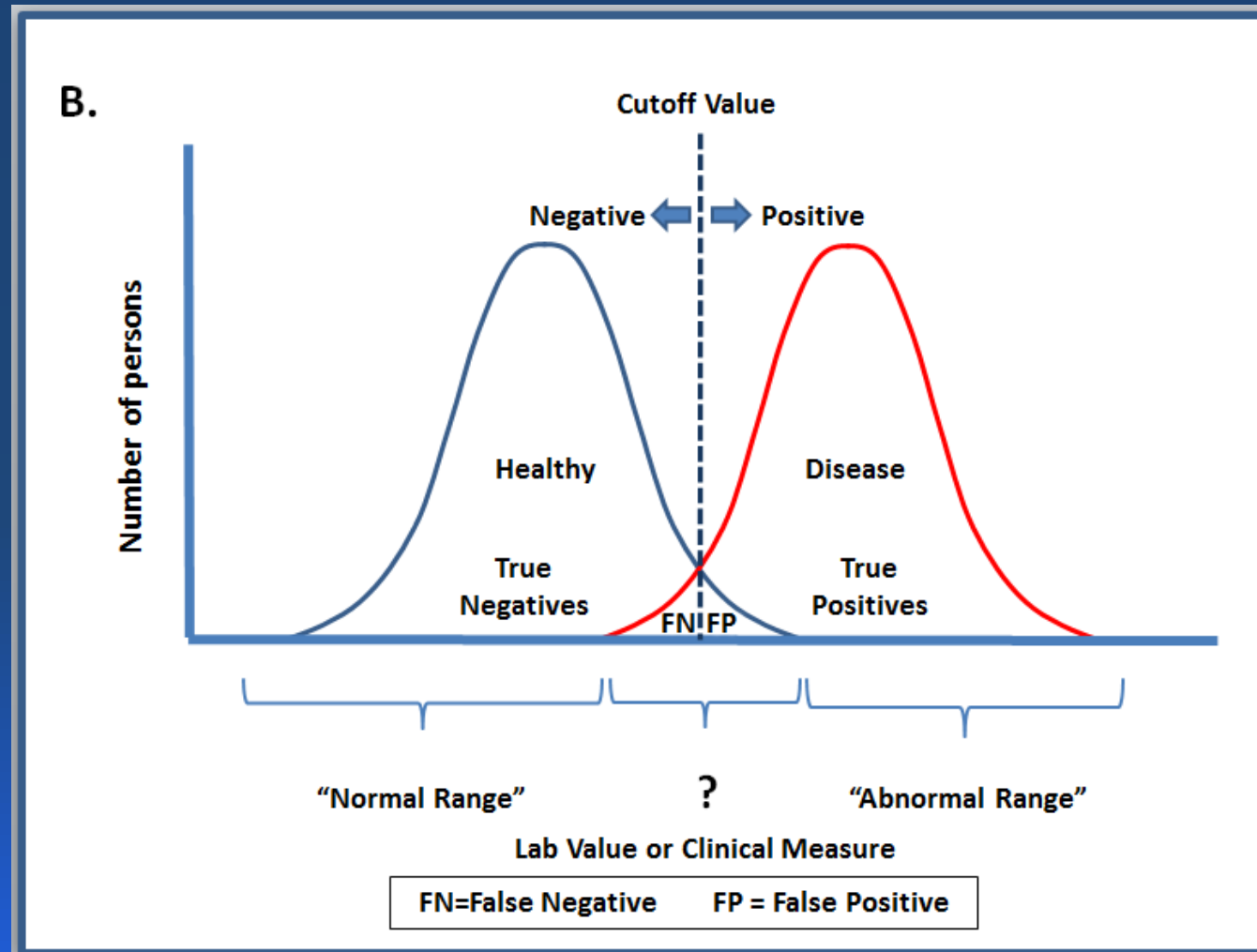
BP Category	Clinic Systolic BP	Clinic Diastolic BP
Normal	<120	and <80
Elevated	120-129	and <80
Stage I	130-139	or 80-89
stage II	≥140	or ≥90

Hypertension New Definitions Based on The European Society of Cardiology (ESC) and the European Society of Hypertension (ESH) 2018

Hypertension is defined as a SBP of 140 mm Hg or more or a DBP of 90 mm Hg or more

Category	Systolic (mmHg)		Diastolic (mmHg)
Normal	120–129	and/or	80–84
High normal	130–139	and/or	85–89
Grade 1	140–159	and/or	90–99
Grade 2	160–179	and/or	100–109
Grade 3	≥180	and/or	≥110

Cutoff point above which the value of a physiologic measurement reflects a disease



Case Study

- Mr. M is a 51-year-old teacher came to the clinic with upper respiratory tract infections.
- He has no significant past medical history and not taking no medicines. He is a regular smoker. He occasional got a big toes pain. Father has hypertension & IHD.
- You noticed that his Pulse rate 78 regular with radio-radial or radio femoral delay. Blood pressure (BP) 148/94 mmHg in both arms. His height 170 cm and weight 98 Kg. He has fourth heart sound but no murmur. Fundoscopic examination of both eyes was normal. He has normal peripheral pulses with no carotid or renal bruit. There were no signs of thyroid or Cushing's disease.
- **Does Mr. M have hypertension?**



Criteria for the diagnosis of hypertension and recommendations for follow-up

- Hypertension can be diagnosed using one of the following three strategies:
 1. Ambulatory blood pressure monitoring (ABPM)
 2. Home blood pressure monitoring
 3. Office-based blood pressure measurements



Criteria for the diagnosis of hypertension

- Office-based blood pressure measurements
 - High BP readings in at least two visits, spaced over a period of one week or more.
 - One reading is enough if hypertensive emergency or SBP > 180 or DBP > 120.



Criteria for the diagnosis of hypertension

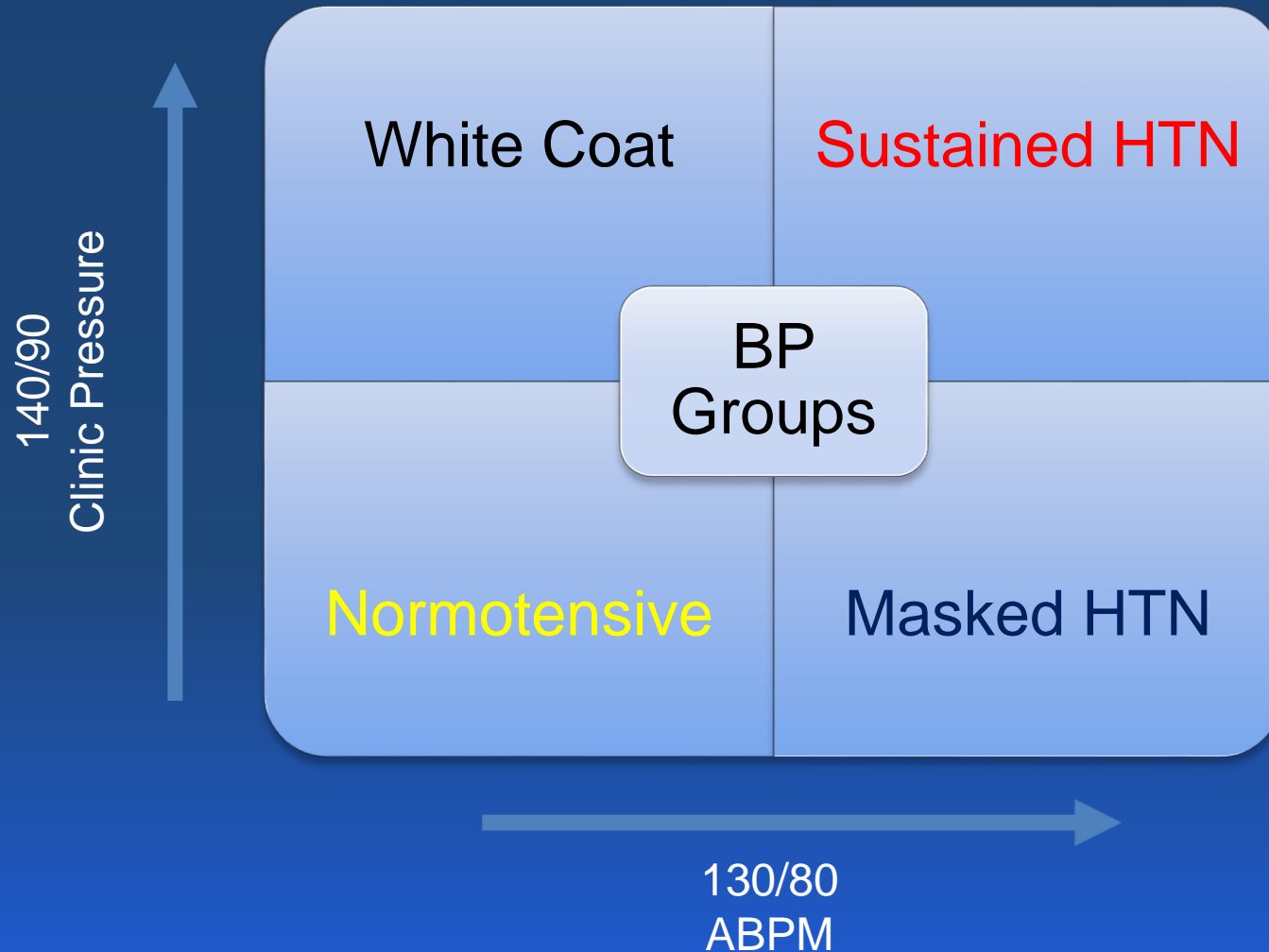
- Ambulatory blood pressure monitoring (ABPM)
 - a 24-hour average BP greater than or equal to 130/80 mmHg



Criteria for the diagnosis of hypertension

- Home blood pressure monitoring
 - at least 12 to 14 measurements;
 - morning and evening measurements taken, over a period of one week;
 - BP greater than or equal to 135/85 mmHg.

Patterns of Blood Pressure





His average ABPM readings is 145/89 mm Hg

Which of the following is the most accurate clinical assessment of his present situation?

- A. Elevated blood pressure
- B. White coat hypertension
- C. Sustained hypertension
- D. Masked hypertension



Which of the following is the most appropriate next management step?


- (A) Initiate Aspirin therapy
- (B) Initiate therapy and schedule a clinic visit in 3 month
- (C) Initiate statin therapy
- (D) Assess cardiovascular risk and end organ damage.



Clinical Evaluation of patients with documented HTN

- Look for clues for secondary causes of high BP.
- Identify CV risk factors or concomitant disorders.
- Assess for target organ damage or existing CVD, Cerebrovascular or renal disease.

Causes of Secondary Hypertension

- **Chronic kidney disease**
 - **Primary aldosteronism**
 - **Renovascular disease**
 - **Sleep apnea**
 - **Drug (e.g. NSAID) or Alcohol induced causes**
 - Steroid therapy and Cushing's syndrome
 - Pheochromocytoma
 - Coarctation of the aorta (A thigh BP measurement is recommended for adults younger than 30 years of age)
 - Thyroid or parathyroid disease
- 
- Common Causes**


Search for target organ damage?



- **Arteries**
 - Peripheral artery disease
 - How?
 - Clinical assessment of peripheral pulses and carotid bruit
- **Kidney**
 - Chronic kidney disease and Albuminuria
 - How?
 - Urine analysis
 - Serum Creatinine with eGFR
- **Heart**
 - Left ventricular dysfunction, Left ventricular hypertrophy, Coronary artery disease
 - How?
 - Clinical and EKG
 - Limited echo
- **Brain**
 - Cerebrovascular disease, transient ischemic attacks, ischemic or hemorrhagic stroke and vascular dementia
 - How?
 - Clinical Assessment.
- **Eyes**
 - Hypertensive retinopathy
 - How?
 - Fundoscopy

Assessment of the overall cardiovascular risk?

- gender (men > women)
- Age
- Smoking (current or past history)
- Total cholesterol and HDL-C
- Uric acid
- Diabetes
- Overweight or obesity
- Family history of premature CVD (men aged <55 years and women aged <65 years)



Which of the following is not one of the appropriate investigations for this patient at this time?

- (A) Urine analysis
- (B) Doppler ultrasound of renal arteries
- (C) EKG
- (D) Serum creatinine
- (E) Serum potassium

Preliminary Investigations

1. Urinalysis
2. Blood chemistry (potassium, sodium and creatinine)
 - Low serum potassium with metabolic Alkalosis (Primary aldosteronism)
3. Fasting glucose
4. Fasting or Non Fasting lipid profile, Uric Acid
5. Standard 12-leads ECG
6. Urinary albumin excretion or albumin/creatinine ratio
7. Optional tests
 - a. Limited Echo for LVH

Case Study (continue)

- Laboratory Findings:
 - Urine: No Protein, No RBC & No WBC
 - EKG: LVH
 - Na 140
 - K 3.9
 - FBS 5.8 mmol/l
 - Creatinine 105 $\mu\text{mol/l}$
 - Cholesterol 6.9 (LDL 5.4, HDL 1.1)
 - Triglycerides 2.8
 - Hb 18.1
 - Uric acid 790 $\mu\text{mol/l}$

Diagnosis of Mr. M

- Stage 2 HTN, Obese with gout and hyperlipidemia. He has evidence of LVH in the EKG.



Which of the following tests are necessary before initiating therapy?

- (A) Measurement of Renin and Aldosterone
- (B) Radionuclide uptake scanning for Pheochromocytoma
- (C) Measurement of thyroglobulin level
- (D) No additional tests



Which of the following is the most likely diagnosis in this patient?

- (A) Coarctation of the aorta
- (B) Essential hypertension
- (C) Pheochromocytoma
- (D) Renal artery stenosis

Clinical Clauses for Secondary Hypertension

- Young onset HTN (age <30 years)
- Abrupt onset hypertension
- Drug resistant hypertension
- Symptoms suggestive of Pheochromocytoma
- Sleep apnoea: Obesity, snoring and daytime sleepiness
- Complementary or recreational drugs intake
- Hypokalemia
- Symptoms suggestive of thyroid disease

Benefits of Lowering BP

Average Percent Reduction

- | | |
|-----------------------------------|--------|
| ▪ Stroke incidence | 35–40% |
| ▪ Myocardial infarction incidence | 20–25% |
| ▪ Heart failure incidence | 50% |



We have to decide the following:

How low should we go? (target BP)

When and What drugs should we use?

Evidence Based Goals 2017 AHA/ACC

BP target less than 130/80 mm Hg

The European Society of Cardiology (ESC) and the European Society of Hypertension (ESH) 2018

Start with BP to $<140/90$ mmHg and, if well tolerated then lower to 130/80 mmHg

Goals of therapy in All Guidelines

Maximum reduction in long-term total risk of cardiovascular morbidity and mortality

- Smoking
- Life style modification
- Lipid
- Diabetes
- Blood pressure

Lifestyle Therapies in Adults with Hypertension: Summary

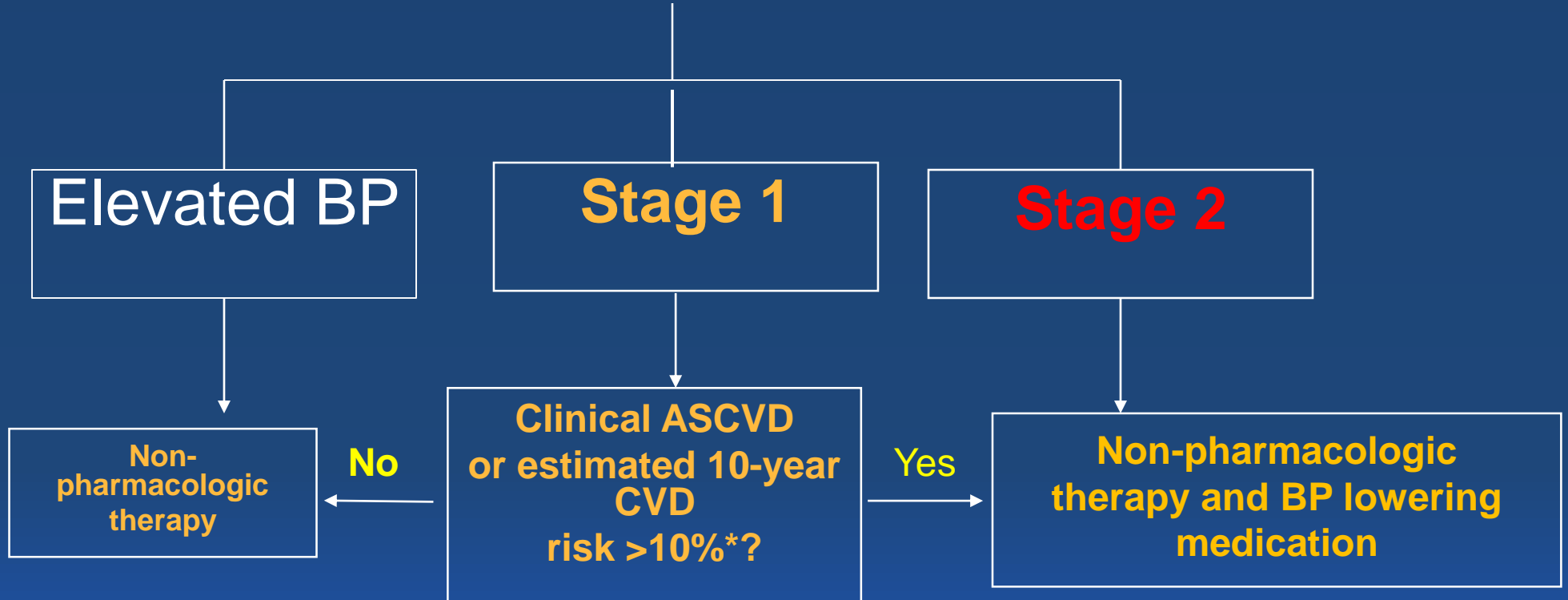
Intervention	Target
Reduce foods with added sodium	< 2300 mg /day
Weight loss	BMI <25 kg/m ²
Alcohol avoidance	
Physical activity	30-60 minutes 4-7 days/week
Dietary patterns	DASH diet
Smoking cessation	Smoke free environment
Waist circumference	Men <102 cm Women <88 cm
Increase Potassium	Be careful in CKD or K >4.5 or on ACE&ARB



This patient should be treated by ...

1. Non Pharmacological therapy for 6 months.
2. Blood pressure lowering medications.
3. 1& 2
4. Renal arteries angiogram and angioplasty.
5. Cessation of smoking and reassess after one month.

BLOOD PRESSURE



(ASCVD: Atherosclerotic Cardiovascular Disease)

Risk Score for 10 years for our case is 29.4% for developing CVD for our case

Atherosclerotic Cardiovascular Disease (ASCVD)

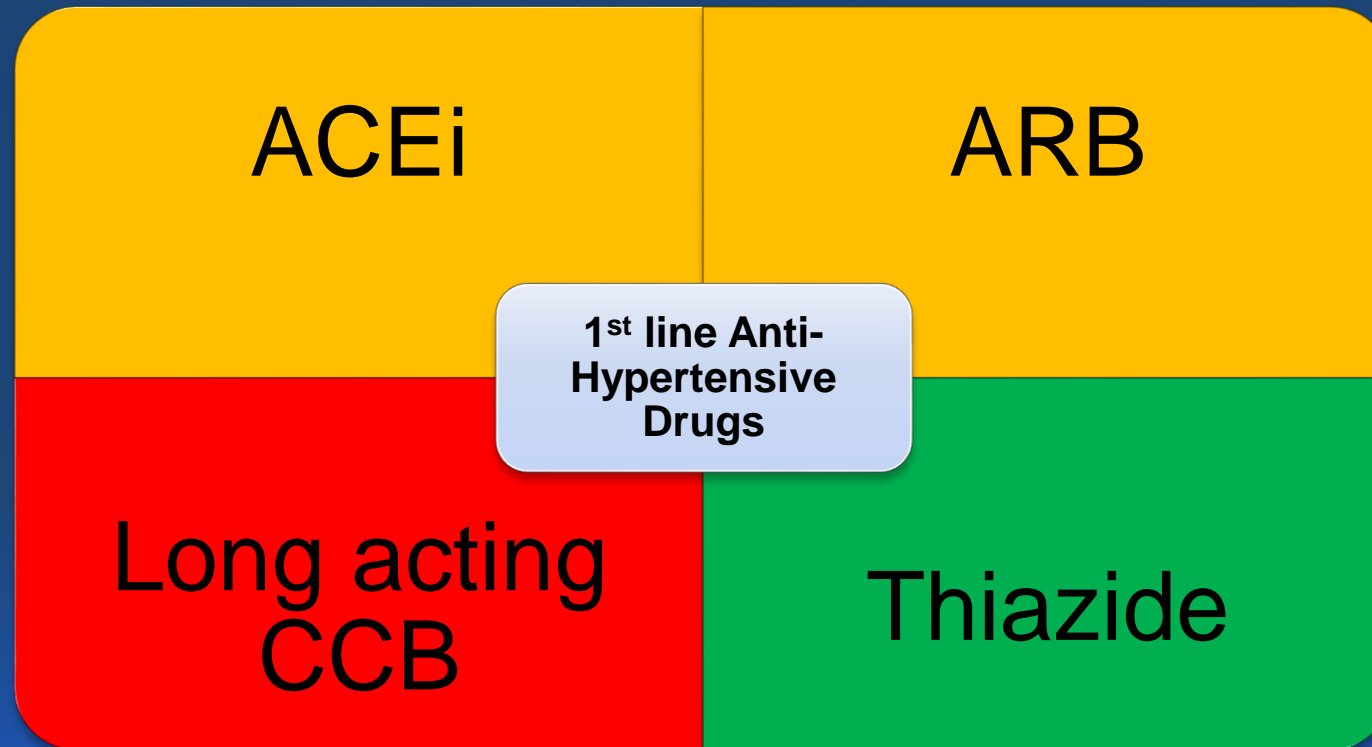
- ACC/AHA calculator calculates ASCVD risk based on the Pooled Cohort Equations data
- Risk based on age, gender, ethnicity, tobacco use, total cholesterol, HDL, systolic blood pressure, and diabetes status
- 10 year risk of atherosclerotic event calculated
- When should blood pressure-lowering drug treatment be initiated on the basis of the level of total cardiovascular risk?
 - Stage 1 HTN



Which of the following is the most appropriate next management step?

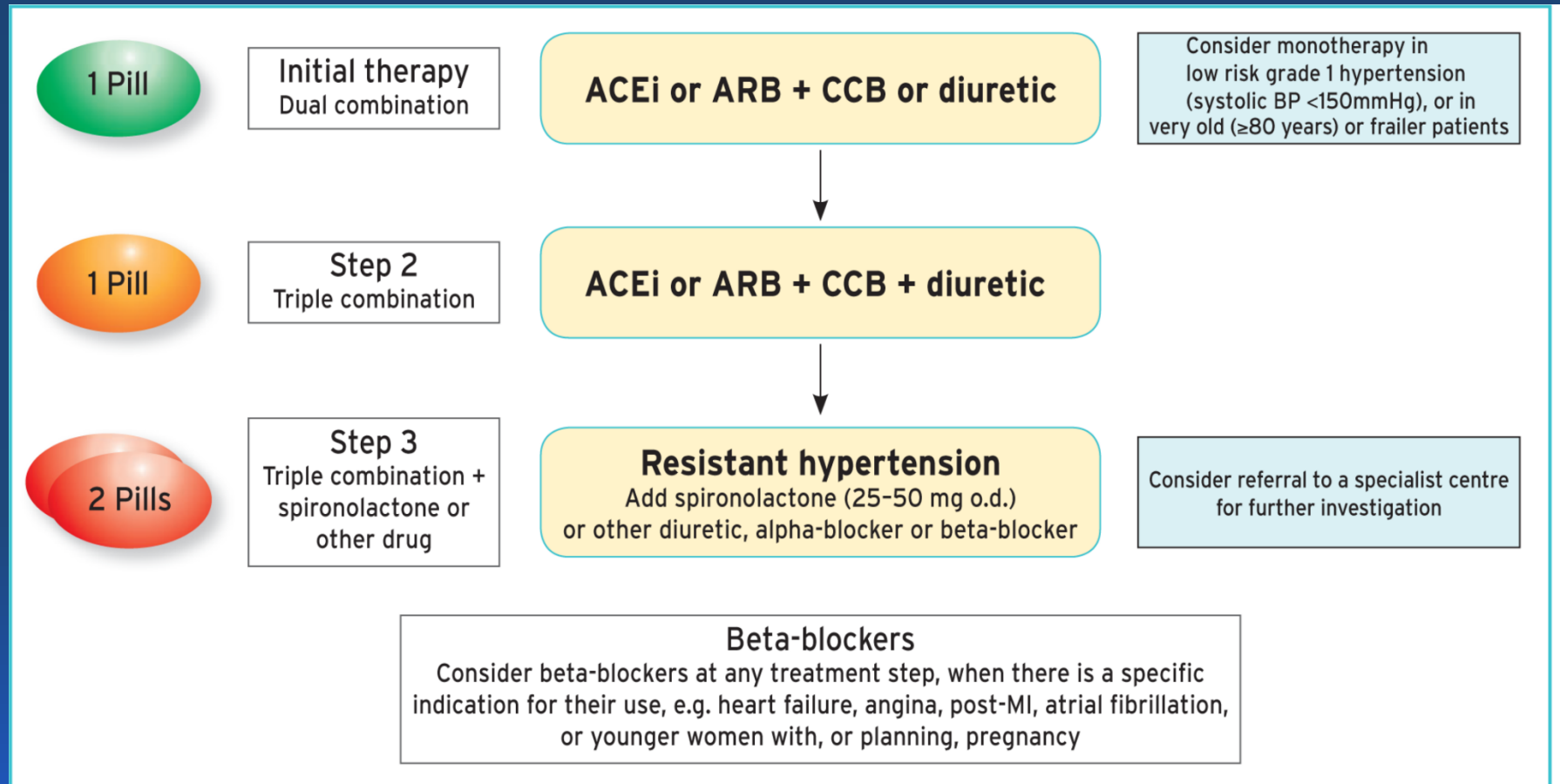
- (A) Atenolol
- (B) Diltiazem
- (C) Hydrochlorothiazide
- (D) Methyldopa
- (E) ACEi /ARB with calcium channel blockers

Treatment of Adults with Hypertension



A combination of 2 first line drugs is been used more frequently

2018 ESC/ESH Guidelines for the management of arterial hypertension



Hypertension with Other Compelling Indications

Indications	Preferred anti HTN
Recent MI	Beta-blocker and ACEI or ARB
Stable angina	ACE, B-blocker Long-acting CCB
Systolic dysfunction	ACEI and Diuretics
Stroke or TIA	ACEI / diuretic combination
LVH	ACEI, ARB, CCB, Thiazide
DM	ACE or ARB

Drug	Contraindications	
	Compelling	Possible
Diuretics (thiazides/thiazide-like, e.g. chlorthalidone and indapamide)	<ul style="list-style-type: none"> •Gout 	<ul style="list-style-type: none"> •Metabolic syndrome •Glucose intolerance •Pregnancy •Hypercalcaemia •Hypokalaemia
Beta-blockers	<ul style="list-style-type: none"> •Asthma •Any high-grade sinoatrial or atrioventricular block •Bradycardia (heart rate <60 beats per min) 	<ul style="list-style-type: none"> •Metabolic syndrome •Glucose intolerance •Athletes and physically active patients
Calcium antagonists (dihydropyridines, e.g. Amlodipine or Nifedipine)		<ul style="list-style-type: none"> •Tachyarrhythmia •Heart failure (HFrEF, class III or IV) •Pre-existing severe leg oedema
Calcium antagonists (Non-dihydropyridines e.g. verapamil, diltiazem)	<ul style="list-style-type: none"> •Any high-grade sinoatrial or atrioventricular block •Severe LV dysfunction (LV ejection fraction <40%) •Bradycardia (heart rate <60 beats per min) 	<ul style="list-style-type: none"> •Constipation
ACE inhibitors	<ul style="list-style-type: none"> •Pregnancy •Previous angioneurotic oedema •Hyperkalaemia (potassium >5.5 mmol/L) •Bilateral renal artery stenosis 	<ul style="list-style-type: none"> •Women of child-bearing potential without reliable contraception
ARBs	<ul style="list-style-type: none"> •Pregnancy •Hyperkalaemia (potassium >5.5 mmol/L) •Bilateral renal artery stenosis 	<ul style="list-style-type: none"> •Women of child-bearing potential without reliable contraception

Hypertension and breastfeeding

- All antihypertensive drugs are excreted into breast milk.
- Most are present at very low concentrations except for **Propranolol and Nifedipine**, with breast milk concentrations similar to those in maternal plasma.



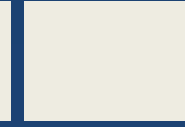
Oral contraceptive pills and hypertension

- OCC pills can be associated with hypertension in 5% of users
- Monitored before and during OCC pills treatment
- It is not contraindicated in women with hypertension



Hypertension in older patients (age ≥ 65 years)

- RCTs has shown that in old and very old patients, antihypertensive treatment substantially reduces CV morbidity and CV and all-cause mortality.
- Treatment has been found to be generally well tolerated
- More comorbidities such as renal impairment, atherosclerotic vascular disease, and postural hypotension
- Start with small dose and up titrate according to tolerance and monitor renal function
- Treated SBP values of <130 mmHg should be avoided.



Summary

Management of Hypertensive Emergencies

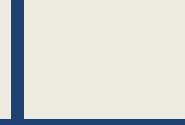


Hypertensive Urgency

- Elevation of systolic blood pressure (SBP) >180 mmHg or diastolic blood pressure (DBP) >120 mmHg
- No *progressive* end organ damage

Hypertensive Emergency

- Elevation of systolic blood pressure (SBP) >180 mmHg or diastolic blood pressure (DBP) >120 mmHg
- **Presence of acute or ongoing end-organ damage**



Target Organs

■ *Cardiac Emergencies*

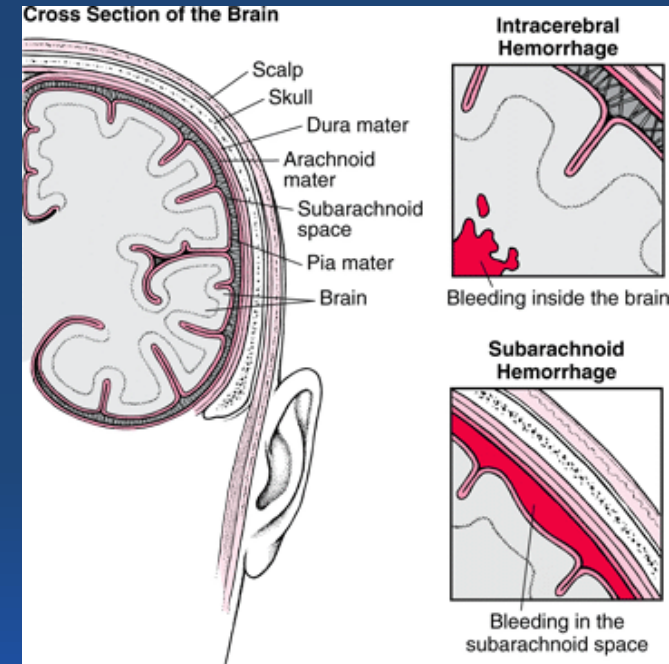
- Acute CHF
- Acute coronary insufficiency
- Aortic dissection
- C/O
 - SOB
 - Chest pain



Hypertensive Emergency Key Points

■ *CNS Emergencies*

- Hypertensive encephalopathy
- Intracerebral or subarachnoidal hemorrhage
- Thrombotic brain infarction with severe HTN
- *C/O*
 - *Headache*
 - *Weakness*
 - *Decreased level of consciousness*



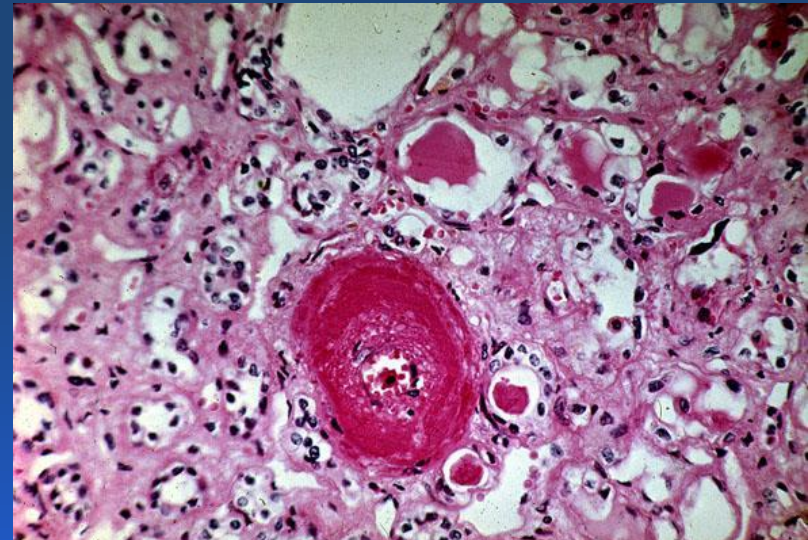
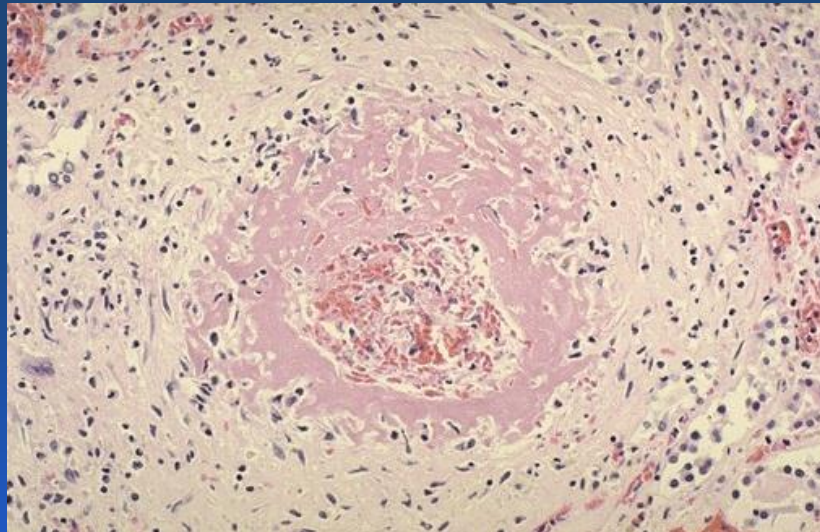
Hypertensive Emergency Key Points

- *Renal Emergencies*

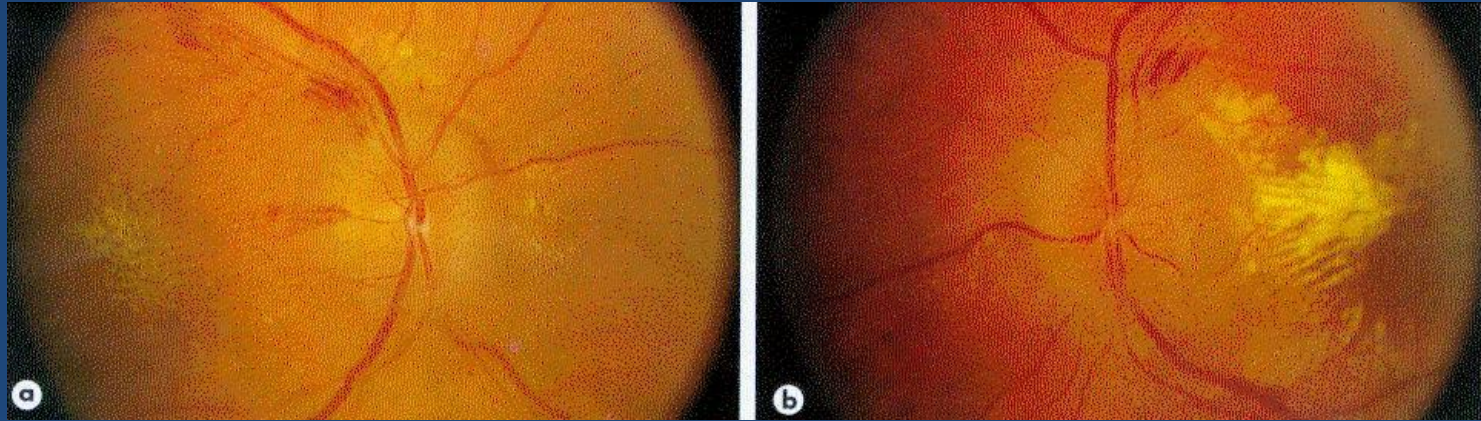
- Rapidly progressive renal failure

- *C/O*

- Decrease urine output, Hematuria and Proteinuria



Eyes



- Hemorrhages
- Exudates
- Papilloedema

- **C/O:**
 - **Blurred vision**
 - **Blindness**



Urgency vs. Emergency

- Distinguishing between hypertensive emergency and urgency is a crucial step in appropriate management

Urgency vs. Emergency

- **Urgency**
 - No need to acutely lower blood pressure
 - May be harmful to rapidly lower blood pressure
 - Death **not** imminent
- **Emergency**
 - Immediate control of BP essential
 - Irreversible end organ damage or death within **hours**

Common tests for all potential causes

- Fundoscopy is a critical part of the diagnostic workup
- 12-lead ECG
- Haemoglobin, platelet count, fibrinogen
- Creatinine, eGFR, electrolytes, LDH, haptoglobin
- Urine albumin:creatinine ratio, urine microscopy for red cells, leucocytes, casts
- Pregnancy test in women of child-bearing age

Specific tests by indication for HTN Emergencies

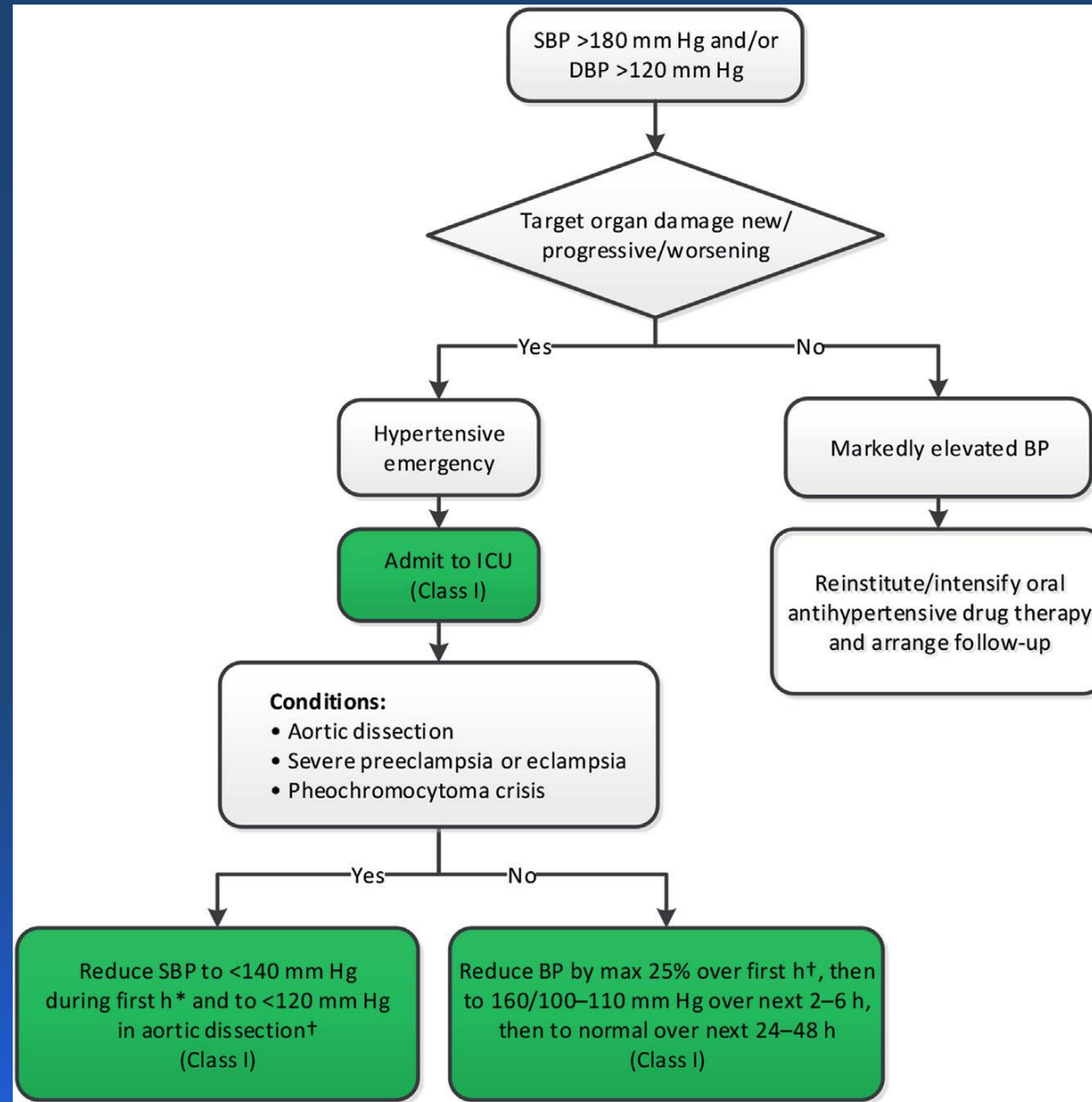
- Troponin, CK-MB (in suspected cardiac involvement, e.g. acute chest pain or acute heart failure) and NT-proBNP
- Chest X-ray (fluid overload)
- Echocardiography (aortic dissection, heart failure, or ischaemia)
- CT angiography of thorax and/or abdomen in suspected acute aortic disease (e.g. aortic dissection)
- CT or MRI brain (nervous system involvement)
- Renal ultrasound (renal impairment or suspected renal artery stenosis)
- Urine drug screen (suspected methamphetamine or cocaine use)



Acute management of hypertensive emergencies

- Establishing the target organs that are affected
- Precipitating cause for the acute rise in BP that might affect the treatment plan (e.g. pregnancy)
- The timescale and magnitude of BP lowering required for safe BP reduction
- The type of BP-lowering treatment required.

Management of a Hypertensive Crisis



HTN Urgencies: Goals of Therapy

- No proven benefit of rapid BP reduction in asymptomatic patients
- Goal BP <160/110 mm Hg over several hours, oral therapy
- Initial BP fall less than 25% in first six hours
 - can be managed using oral antihypertensive agents in an outpatient or same-day observational setting
- Ensure follow-up: Long-term management

Hypertensive Emergency

- ICU with close monitoring
- IV and Short acting medications
 - Avoid sublingual or IM
- Prevent end organ damage



Goals of Treatment

- Reduce BP by max 25% over 1st hour
- Then to 160/100–110 mm Hg over next 2–6 h,
- Last to normal over next 24–48 h



Complications of rapid BP Reduction

- Widening Neurologic Deficits
- Retinal ischemia and Blindness
- Acute MI
- Deteriorating renal function

Hypertensive emergencies requiring immediate blood pressure lowering with intravenous drug therapy

Clinical presentation	Timeline and target for BP reduction	First-line treatment	Alternative
Malignant hypertension with or without acute renal failure	<ul style="list-style-type: none"> •Several hours •Reduce MAP by 20–25% 	<ul style="list-style-type: none"> •Labetalol •Nicardipine 	<ul style="list-style-type: none"> •Nitroprusside •Urapidil
Hypertensive encephalopathy	Immediately reduce MAP by 20–25%	Labetalol, nicardipine	Nitroprusside
Acute coronary event	Immediately reduce SBP to <140 mmHg	Nitroglycerine, labetalol	Urapidil
Acute cardiogenic pulmonary oedema	Immediately reduce SBP to <140 mmHg	Nitroprusside or nitroglycerine (with loop diuretic)	Urapidil (with loop diuretic)
Acute aortic dissection	Immediately reduce SBP to <120 mmHg AND heart rate to <60 bpm	Esmolol and nitroprusside or nitroglycerine or nicardipine	Labetalol OR metoprolol
Eclampsia and severe pre-eclampsia/HELLP	Immediately reduce SBP to <160 mmHg AND DBP to <105 mmHg	Labetalol or nicardipine and magnesium sulfate	Consider delivery



Final step in the management

- Many of the cases are related to poor adherence to medications.
- Upon discharge, the patient should be scheduled for close follow-up and detailed education

Questions