

Hypertension

Objectives :

1. To be able to recognize the definition of hypertension
2. To be able to identify the stages of hypertension (ACC/AHA -European society of cardiology/European society of hypertension (ESC/ESH)
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

Done by :

Team leader: Mohammed Alswaiegh

Team members:

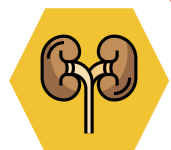
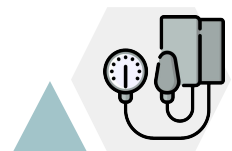
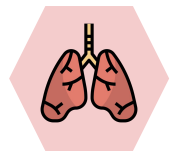
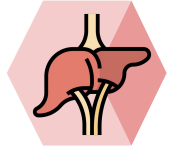
Ebtesam Almutairi Batoul Alruhaimi
Abdullah alzaid Saleh Mahjob

Revised by :

Yazeed Al-Dossare

Resources :

- Doctor 's slides - Team 436
Lecturer: Dr. Jamal Al Wakeel
Same 436 lecture Slides: Yes



Introduction

Case : A 47 years old man came to the clinic with headache for 3 weeks. The nurse measure his blood pressure and was found to be 150/ 95 mmHg .

1. Does he have hypertension?
2. What is the stage of hypertension?
3. What investigation should you perform?
4. What could be your management in his case?
5. Is there any possible prevention to his disease and its complication?

Epidemiology of Hypertension:

- The 4th most common cause of death worldwide.
- The overall prevalence of hypertension in adults is around 30 - 45% .
- The overall prevalence of hypertension in Saudi was 25.5%, Because we are young population and the old population are less, so our percentage is less than international .
- Onset ranges between 25 to 55 years, mainly in 40 to 50. The primary (essential) hypertension but secondary hypertension can occur at any age.
- More common with advancing age. ↑ Age > The blood vessels become stiffer > The vascular resistance increases > Hypertension
- Prevalence of >60% in people aged >60 years, Why? blood vessels become more stiff with age + sedentary life + ↑body weight.
- Only 72% are aware of their disease. Often people are not aware of HTN until they have a complication of HTN such as stroke or IHD. Or it could be incidentally by regular checkups. Hence, we don't count on symptoms for diagnosing hypertension. Instead, we count on screening for diagnosing hypertension.
- 55% of participants on medication for hypertension had their blood pressure uncontrolled, Because they aren't compliance to the medication due to its side effects.
- Risk of hypertension:
 - A)As populations age
 - B) sedentary lifestyles
 - C) increase their body weight

Pathophysiology of Hypertension

Explanation of the image:

-Renin is produced by the kidneys in either two conditions:

1- Decrease in renal perfusion

2- Renal injury

-Angiotensinogen is produced by the liver and is converted to angiotensin 1 by renin

-Angiotensin 1 is converted to angiotensin 2 by angiotensin converting enzyme in the lung

-Angiotensin 2 is the most powerful vasoconstrictor in the world. One droplet can increase BP to 300mmHg

Figure 1: Systems involved in the development and maintenance of hypertension

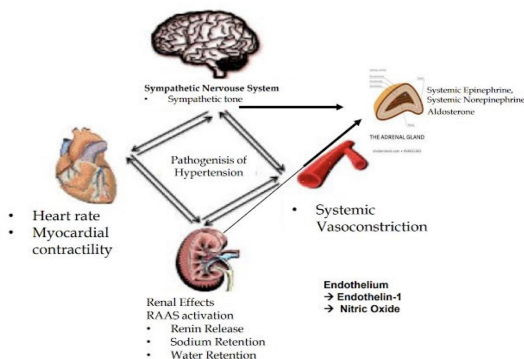
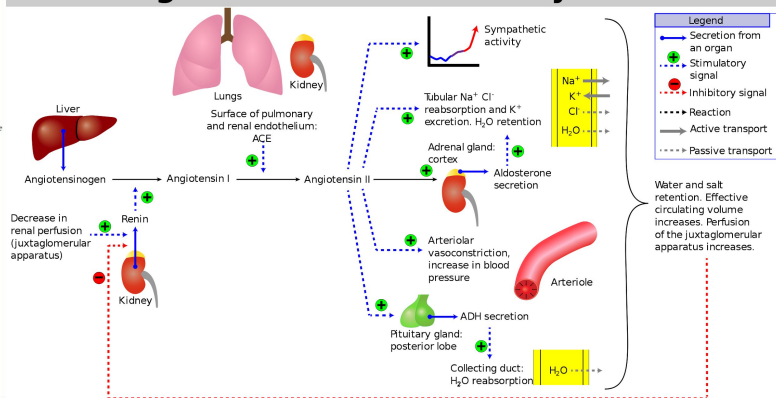


Figure 1: Systems involved in the development and maintenance of hypertension

Renin-angiotensin-aldosterone system



- An overactive Renin angiotensin system leads to vasoconstriction and retention of sodium and water → increase in blood volume → hypertension. (Angiotensin II is the strongest vasoconstrictor)

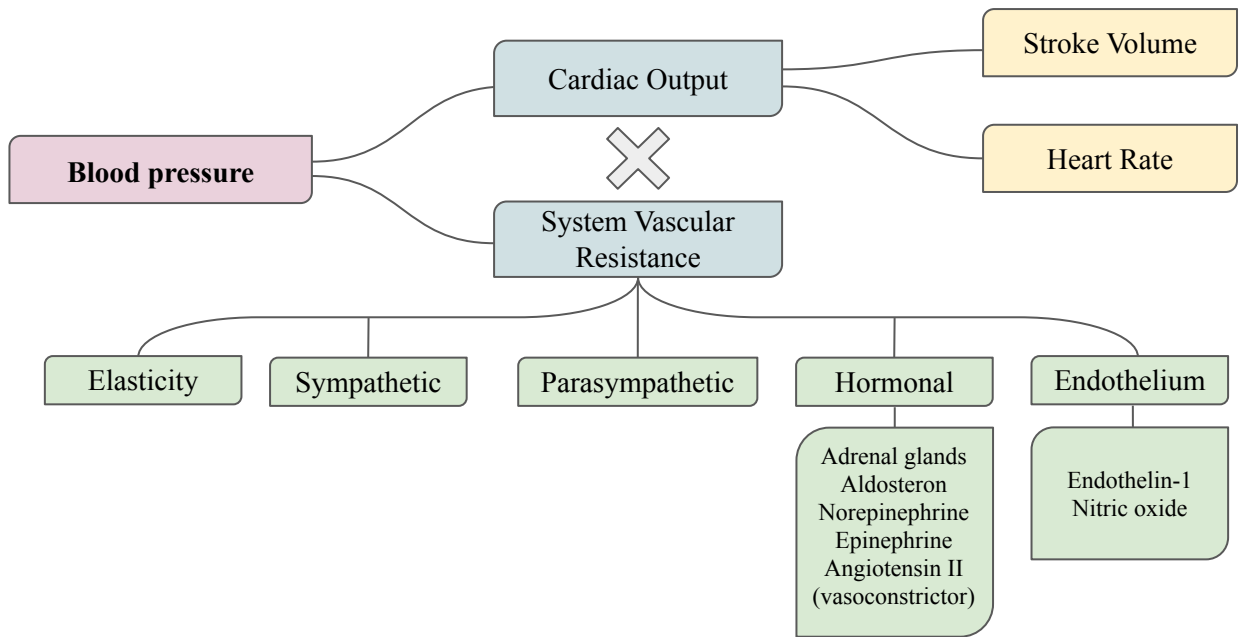
- An overactive sympathetic nervous system → Tachycardia, increase contractility, vasoconstriction of blood vessel and more vasoconstriction by stimulation of adrenal gland to release adrenaline and noradrenaline.

- The Brain, Heart, Blood vessels and Kidney are organs control BP and they also destroyed by hypertension.

- By knowing all these mechanisms, we treat hypertension.

Blood pressure equation:

BP = (cardiac output) x (systemic vascular resistance) → (CO depends on stroke volume x heart rate) x (systemic vascular resistance The ability of BV to dilate).



- Anything \uparrow SV will \uparrow BP e.g. someone with polycythemia “ \uparrow RBCs will \uparrow the volume” also who eat salts there will be water retention and \uparrow in volume.

- Tachycardia \rightarrow increase HR \rightarrow high BP.

- Vascular resistance: it is the flexibility of blood vessels to be dilated. When the **heart contract** it pushes the blood into blood vessels with high pressure and normally it should be dilated, but when it become thick due to atherosclerosis it won't be able to dilate so the **systolic pressure rise and this is the systolic pressure**.

While the diastolic BP, during **relaxation** the blood may go back to the heart so the blood vessels contract to prevent this, and some people have diastolic contractility more than usual e.g. sympathomimetic stress they contract more, and this is diastolic pressure.

Systolic BP during heart contraction Diastolic BP during heart relaxation

What control the vascular resistance?

1. Elasticity of the blood vessel. (\uparrow Elasticity $>$ \downarrow BP) (\uparrow Age $>$ \downarrow Elasticity $>$ \uparrow BP)

2. Neurological (sympathetic+parasympathetic): by baroreceptors (feel the BP if it \uparrow or \downarrow) found in aortic & paraaortic. When baroreceptor feel the BP \downarrow it will stimulate sympathomimetic \rightarrow stimulate B-adrenergic receptor which cause tachycardia \rightarrow increase contractility and BP.

Sympathomimetic also stimulate α -adrenergic receptors in blood vessel \rightarrow vasoconstriction of blood vessel. Sympathomimetic also send signals to adrenal gland stimulate it to release adrenalin and noradrenalin \rightarrow more vasoconstriction.

3. Hormonal (endocrine): RAAS by kidney. Adrenaline & noradrenaline (catecholamine system) by Adrenal gland.

4. Endothelium of BV: release two hormones: 1. endothelin-1 (vasoconstriction) 2. Nitric oxide (vasodilation) “nitroglycerin is a derivative”.

Types of Hypertension:

1) Essential Hypertension "Primary":

In 90%-95% of cases "the most common type", but no cause can be found (primary hypertension). More common in black people. It results from environmental and genetic factors (more than 50 genes). We know the mechanism of how is developed but we do not know why is developed in the first place what is the trigger.

Smoking & Caffeine increases BP acutely but is not a risk factor for the development of chronic essential HTN.

Risk factors:

Modifiable	Non Modifiable
<ul style="list-style-type: none"> ➤ Obesity Usually they have salt and water retention and increased Sympathomimetic, Metabolic Syndrome. 20-30% of obese people will develop HTN ➤ Unhealthy diet (excessive salt intake, low potassium intake, high carbohydrate diet) ➤ Excessive alcohol intake تجنب أصحاب السوء ➤ Lack of exercise. Studies show that exercise can cause vasodilation > ↓ BP ➤ Polycythemia. ↑ RBCs will ↑ the stroke volume so increase BP ➤ Non-steroid anti-inflammatory drugs. It cause salt and water retention so ↑ BP 	<ul style="list-style-type: none"> ➤ Aging By stiffness of BV. ➤ Race. ➤ Genetic. ➤ Family history of essential HTN.

2) Secondary hypertension: (If the primary cause is treated, the hypertension will disappear)

- Account for 5 to 10 %.
- The Possible etiologies are :
 - **Primary renal disease (The most common cause of 2ry HTN 70%)** . (CKD) by two mechanism: injury in kidney lead to high RAAS stimulation and when there is ↓ in filtration no Na excreted so high Na water retention = high BP. Renal artery stenosis will decrease renal perfusion that will activate RAS system.
 - **Oral contraceptives.** Estrogen compounds causes salt and water retention, they also increase Angiotensinogen from liver.
 - **Sleep apnea syndrome.** Any scenario of obese with hypertension and snoring at night we should rule out SAS The mechanism is that they have snoring; suddenly they get desaturation → relax muscles in the neck usually it happened in obese people and this muscles lead to obstruction of respiratory system → they wake up from night. This can happen for many times in night. If not treated properly they can get: Car accident (daytime sleeping) or Arrhythmias. 25% of HTN patients have SAS
 - **Primary hyperaldosteronism (conn's syndrome).** Causes hypernatremia and hypokalemia.
 - **Renovascular disease.** Narrow renal artery > no flow to kidney > RAAS stimulation
 - **Cushing syndrome.** When you see the manifestation of the syndrome, rule out hypertension due to the syndrome.
 - **Pheochromocytoma.** Suprarenal gland release adrenaline and noradrenaline suddenly as bolus " characterized by sudden attacks of headache, palpation, anxiety and anger"
 - **Other endocrine disorders.** Hyperparathyroid → high calcium → vasoconstriction / Hyperthyroid
 - **Coarctation of the aorta.** As an example, narrowing of descending aorta would cause ↑ BP in upper limbs and ↓BP in lower limbs.Happen In young pt. Lead to radio radial or radio femoral delay.

Types of BP apparatuses :

Half automated device



**Non automated device
(non-AOBP)**

- AOBP is the preferred method of performing in- office BP measurement.
- $AOBP \geq 135$ or more than 85.

Is absolutely contraindicated because it harms the environment and it is toxic

Mercury type



Aneroid type



Automated device

Digital type



Finger and/or wrist BP measuring devices are not recommended because are not accurate



Type of Instrument of Blood Pressure Measurement



BP measurement “ is very important to know the proper way for measuring BP because it is the ideal screening tool for diagnosing hypertension. Not only for the sake of exams, for you as physicians. Besides HTN is very common worldwide”

- Observe the following to obtain an accurate BP reading :

- Apply to adults on no antihypertensive medications and who are not acutely ill. *Pt come to ER with pneumonia and high BP I can't tell he is hypertensive.*
- If there is a disparity in category between the systolic and diastolic pressures, the higher value determines the severity of the hypertension. *If only diastolic or only systolic or both are high we consider it hypertension.*
- Measure blood pressure to arm the high reading. *Normally there is difference of less than 5 between both arms.*

Office blood pressure measurement

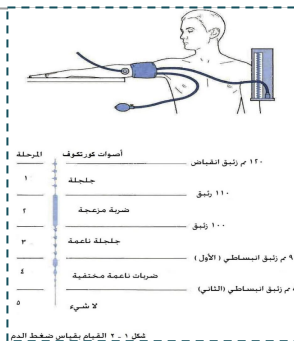
- To allow the patients to sit for 3–5 minutes before beginning BP measurements.
- The Back should be straight and the arm should be at heart level (whatever the position of the patient), and the patient should be seated comfortably. *When pt come for first time we should measure BP in standing and sitting position for postural hypertension.*
- 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

1. Place the cuff at the heart level, whatever the position of the patient.
2. 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.
3. Measure BP in sitting and standing position” *postural hypotension, mainly for the first visit”* in elderly subjects and diabetic patients
4. Use phase I and V (disappearance) Korotkoff sounds to identify systolic and diastolic BP, respectively.

- The diagnosis of mild hypertension should not be made until the blood pressure has been measured on **at least two times in three visits.**
- Average of 10 to 15 mmHg decrease between visits 1 and three.

Korotkoff sounds		
Phase	Korotkoff sounds	Pressure
I	▲ fluid	120 mmHg systolic
II	▲ blowing noise	110 mmHg
III	▲ softer fluid	100 mmHg
IV	▲ disappearing blowing noise	90 mmHg diastolic (1st)
V	Nothing	80 mmHg diastolic (2nd)

Korotkoff sounds
The sounds heard by the stethoscope are due to blood turbulence. Normally, the blood flow is called laminar flow which does not produce sounds.



Instrument of Blood Pressure Measurement:

Device			To Dx HTN		Notes
			Systolic	Diastolic	
Office BP	Non-automated device [non-AOBP]	Mercury Type	≥140	≥90	Not used anymore
		Aneroid Type			Still accepted
		Half automated device			
	Automated Device	Digital Type			This is what use in hospital. Measure the pressure by ultrasonic and it is very accurate. Finger and/or wrist BP measuring devices are not recommended.
Ambulatory BP		Daytime	≥135	≥85	For 24 hours during daytime as well as in nighttime. Then it Ambulatory BP will calculate the mean.
		Nighttime	≥120	≥70	
		Mean (24h)	≥ 130	≥80	
Home BP Monitoring (HBPM)		Arm	≥135	≥85	Among the home devices the arm device is the best. Recommended for people who has high BP, small devices and easy to use, the pt measure the pressure 2 time in the morning and 2 time in the night documented and bring it hospital to make sure it is controlled.
		Wrist			
		Finger			
AOBP (Automated office blood pressure)			≥135	≥85	Recommended method. (is the preferred method of performing in-office BP measurement)

Digital Sphygmomanometer



Mercury Sphygmomanometer

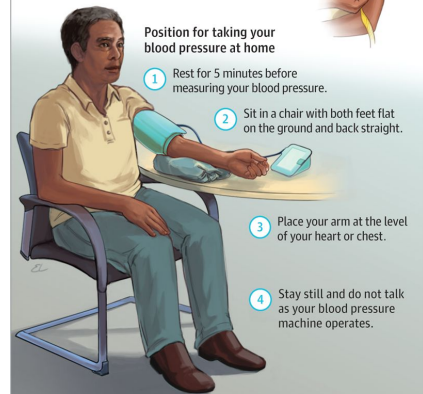
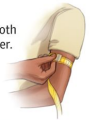


Aneroid Sphygmomanometer



Choosing the correct blood pressure cuff size

Measure the circumference of your upper arm with a cloth measuring tape midway between the elbow and shoulder. Choose a cuff size that includes this measurement.



Position for taking your blood pressure at home

- 1 Rest for 5 minutes before measuring your blood pressure.
- 2 Sit in a chair with both feet flat on the ground and back straight.
- 3 Place your arm at the level of your heart or chest.
- 4 Stay still and do not talk as your blood pressure machine operates.

Measure your blood pressure in the morning right after you wake up or in the evening before you go to bed.

Try to measure your blood pressure at the same time every day.

Stages of Hypertension:

European Society of Nephrology Classification of Blood Pressure Levels		
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 <small>found mainly in elderly</small>	>140	<90

*within 6 months to 2 years they will develop hypertension. Also the risk of CVD is high in this group..

Is not Hypertension. But the studies show that the risk of HTN increases at this stage. That's why is considered elevated rather than normal.

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	or	80–89 mm Hg
Stage 2	≥140 mm Hg	or	≥90 mm Hg

*Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.
BP indicates blood pressure (based on an average of ≥2 careful readings obtained on ≥2 occasions, as detailed in DBP, diastolic blood pressure; and SBP systolic blood pressure.

Definitions:

<p>Hypertensive Emergency:</p>	<p>If pt left with untreated HTN he will present with stroke or sudden MI or Arrhythmia and sudden death. Severe hypertension (systolic BP >180-220 mm Hg or diastolic blood pressure above 120 mmHg) with + end organ damage (MI,STROKE,AKI,CHF) Admitted to ICU and treat with IV administration, you have to lower the BP during minutes or hours</p>
<p>Malignant (accelerated) hypertension: <small>Need for ICU and treat with IV</small></p>	<ul style="list-style-type: none"> ● Hypertensive emergency. ● systolic BP >180-220 mm Hg or diastolic blood pressure above 110-120 mmHg + with encephalopathy & + retinal hemorrhages, exudates, or papilledema ● Hypertensive Crises necessitate immediate therapy to decrease BP within minutes to hours ● usually admitted to an intensive care unit for continuous cardiac monitoring
<p>Hypertensive Urgency: hypertension without end organ damage</p>	<ul style="list-style-type: none"> ● Severe hypertension (systolic BP >180-220 mm Hg or diastolic blood pressure above 110- 120 mmHg) in asymptomatic patients with no evidence of target organ damage. ● 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. ● The goal of therapy is with these cases is to reduce BP within 24 hours. ● Treatment is oral antihypertensive. Do not drop the BP rapidly, because it can increase cerebral blood flow causing cerebral edema and brain damage. Usually the BP reduction over 2-3 days. The causes may be because of: the patient skip a dose or emotional. You just ask the patient to be relaxed and take the medication. Then measure the BP after 1 to 2 hours. No admission needed
<p>Masked hypertension (border line):</p>	<ul style="list-style-type: none"> ● Office blood pressure (Hospital readings) (BP) level is <140/90 mm Hg but ambulatory or home BP readings are in the hypertensive range. So you will do an ambulatory blood pressure monitoring. ● In adults with untreated office BPs that are consistently between 120 mm Hg and 129 mm Hg for SBP or between 75 mm Hg and 79 mm Hg for DBP, screening for masked hypertension with home BPM (or ABPM) is reasonable. ● The prevalence about 1 in 7 or 8 persons.
<p>White Coat Hypertension (Pseudo-HTN): <small>يرتفع الضغط بالعيادة بسبب التوتر</small></p>	<ul style="list-style-type: none"> ● a phenomenon in which patients exhibit a blood pressure level above the normal range, in a clinical setting, though they do not exhibit it in other settings ● Approximately 20 to 25% of patients with mild office hypertension ● More common in elderly. ● The diagnosis of mild hypertension should not be made until the blood pressure has been measured on at least three to six visits. To overcome this phenomenon

Complication of Hypertension

HTN is a very strong silent killer.
 Our aim of treatment not only to reduce BP, rather we are concerned with reducing risks/complications of HTN.
 The most important strategy for controlling numbers of HTN is to prevent at first place” prevention”

★ Without treatment, high BP can lead to:

(the mechanism is BV layers become thick > fat deposition > narrow > thrombosis and ischemia).

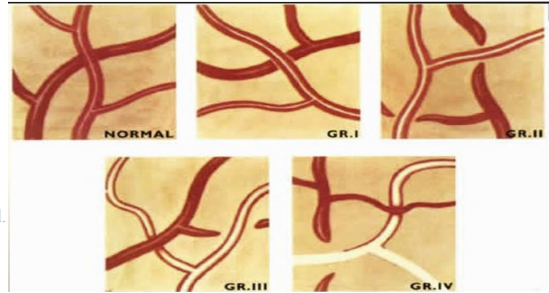
- Stroke , Ischemia, Alzheimer’s Disease (↓cognitive function), retinal hemorrhage
- CAD, arrhythmia (atrial fibrillation), sudden death.
- Congestive heart failure, left ventricular hypertrophy
- Aortic dissection.
- Renal disease. continuous hypertension > vasoconstriction > nephrosclerosis.

Common causes of renal disease in Saudi are DM and HYPERTENSION. 35% of pt on dialysis due to hypertension.

- Peripheral vascular disease.
- Hypertensive Emergency And Increase Emergency Morbidity.

★ These diseases account for significant disability, loss of productivity, and decreased quality of life.

★ Hypertensive retinopathy can be graded as the following:



Normally in eye: the vein is more red and larger than the artery which is transparent.
 Retina can be used in hypertensive patients to differentiate whether HTN is controlled or uncontrolled.

Grade	Description	Picture
I	- Minimal narrowing of retinal arteries.	
II	- Narrowing of retinal arteries in conjunction with regions of focal narrowing and arteriovenous nicking (AV, or arteriovenous nicking (also known as arteriovenous nipping in the UK) is the phenomenon where, on examination of the eye, a small artery (arteriole) is seen crossing a small vein (venule), which results in the compression of the vein with bulging on either side of the crossing). - (yellow arrow) Arteriovenous nicking	
III	- Abnormalities seen in Grade 1 and II, as well as retinal hemorrhages, hard exudates and cotton wool spots. - (yellow arrow) Flame-shaped hemorrhage	
IV	- Abnormalities encountered in Grades I through III, as well as swelling of the optic nerve head and macular star (The lipid-rich component of the exudate is further able to penetrate into the outer plexiform layer, creating what is clinically seen as a macular star pattern). - There is blurring of the borders of the optic disk with hemorrhages (yellow arrows) and exudates (white arrow).	

The Clinical Features and The Diagnosis of HTN

Clinical Presentation of Hypertension:

- **Asymptomatic** “ we don’t depend on symptoms for diagnosing HTN”
- **Headache** wake up in the morning with occipital headache
- **Epistaxis**
- **Chest discomfort** “ \uparrow BP > \uparrow Afterload > \uparrow Cardiac muscle size > \uparrow Oxygen Demand > Angina
- **Symptoms of complications.**(stroke and its symptoms, Retinopathy related symptoms and Heart related symptoms).

Physical Examination:

- Confirm the diagnosis of hypertension.
- Detect causes of secondary hypertension.
- Assess CV risk.
- Organ damage.
- Concomitant clinical conditions.

Screening: we don’t depend on the symptoms so we have to screen the pt. Symptoms are complications and we don’t want to wait till they appear
Age of screening is 32 years and above.

- Every one years for persons with systolic and diastolic pressures below < 120 mmHg and 80 mmHg
- Every 3-6 months for persons with systolic and diastolic pressures higher >120 mmHg and 80 mmHg

And people above 40 age, If patient presented to the clinic with mild to moderate elevation of blood pressure, we can’t diagnose this patient with hyper directly. Mild to moderate elevation need 3 visits at least and each visit 2 readings of BP, While if patient presented to the clinic with severe elevation of his BP, mostly he is hypertensive.

Laboratory Tests

- **Routine Tests**
 - Electrocardiogram
 - Urinalysis Proteinuria or hematuria. To check whether HTN causes renal dysfunction or not.
 - Serum sodium (if \downarrow K and \uparrow Na it mean hyperaldosteronism), serum 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**
 - Measurement of urinary albumin excretion or albumin/creatinine ratio
- More extensive testing for identifiable causes is not generally indicated unless BP control is not achieved

Important aspects of the physical examination in the hypertensive patient

Accurate measurement of blood pressure

General appearance

Distribution of body fat

Skin lesions

Muscle strength

Alertness

Funduscopy

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

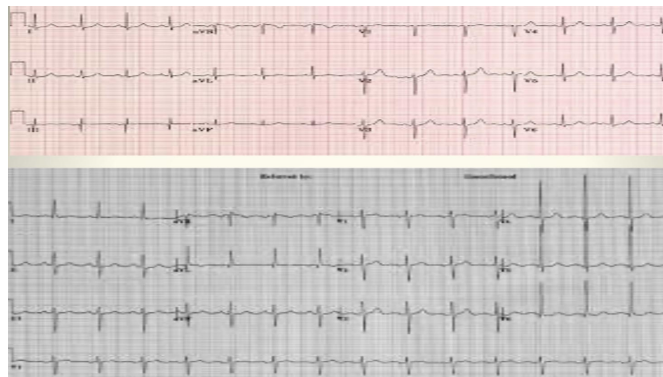
Edema

Neurologic assessment

Visual disturbance

Focal weakness

Confusion



BP Thresholds and Recommendations for Treatment and Follow-up

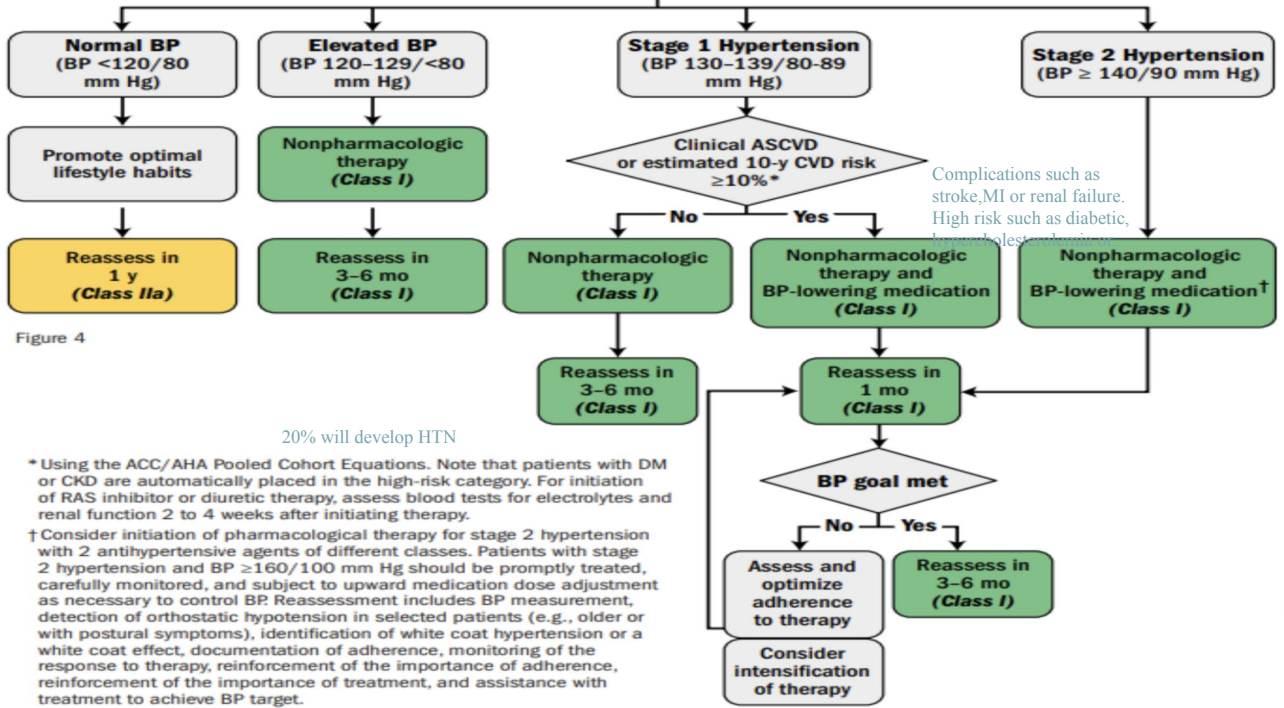


Figure 4

Management of Hypertension

Treatment of hypertension depend on the type of hypertension, comorbidity, the cause and the age of pt

Lifestyle Intervention	Pharmacological Therapy
-High normal (SBP >130–139 mmHg, DBP 85–89 mmHg). -In high risk patients.	If blood pressure is more than 140/90 mmHG
-Diet : high consumption of vegetables and fruits , low-fat diet (As 7 to 8 servings per day of grain or grain products, 4 to 5 vegetable and 4 to 5 fruit) -Vit D replacement	Thiazide diuretics
Regular physical exercise : 30 min of moderate-intensity aerobic exercise 5-7 days/week	B-Blocker
Reduction of alcohol intake	ACE inhibitors
Reduction of dietary sodium intake: (5-6g/day) and use of low sodium salt	Angiotensin II receptor blockers (ARBs)
Smoking cessation	Calcium channel blockers
Weight reduction : BMI 25 kg/m	Vasodilators

High Risk Group Therapy

- CHF – Thiazide, ACE-1, Aldosterone, BB.
- Post Myocardial Infarction – BB, ACEi.
- Diabetes Mellitus – proteinuria ACEi, ARB, NO
- Non Proteinuria Thiazide, CCB, ARB, ACEi.
- CKD – ACEi, ABB, Thiazide
- Stroke – CCB +ACEi
- Pregnancy Aldomet, labetalol, Ca channel blocker
- Start in >130/80(130 – 139)/(85 – 89) mmHg Lifestyle change +Medication
- **BP target of less than 130/80 Hg is recommended” To reduce risks of complications”**

Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Weight loss Loss of 5Kg would decrease BP by 10 mmHg	Weight/body fat	Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for every 1-kg reduction in body weight.	-5 mm Hg	-2/3 mm Hg
Healthy diet	DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	-11 mm Hg	-3 mm Hg
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg	-2/3 mm Hg
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	-4/5 mm Hg	-2 mm Hg

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension. DASH indicates Dietary Approaches to Stop Hypertension, and SBP, systolic blood pressure. Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH? Available at: <https://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-how-to>. Top 10 Dash Diet Tips. Available at: http://dashdiet.org/dash_diet_tips.asp



Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension* (cont.)

	Nonpharmacological Intervention	Dose	Approximate Impact on SBP	
			Hypertension	Normotension
Physical activity	Aerobic	<ul style="list-style-type: none"> ● 90–150 min/wk ● 65%–75% heart rate reserve 	-5/8 mm Hg	-2/4 mm Hg
	Dynamic resistance	<ul style="list-style-type: none"> ● 90–150 min/wk ● 50%–80% 1 rep maximum ● 6 exercises, 3 sets/exercise, 10 repetitions/set 	-4 mm Hg	-2 mm Hg
	Isometric resistance	<ul style="list-style-type: none"> ● 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk ● 8–10 wk 	-5 mm Hg	-4 mm Hg
Moderation in alcohol intake	Alcohol consumption	In individuals who drink alcohol, reduce alcohol† to: <ul style="list-style-type: none"> ● Men: ≤2 drinks daily ● Women: ≤1 drink daily 	-4 mm Hg	-3 mm

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension. †In the United States, one “standard” drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol).



Summary of Antihypertensive drugs :

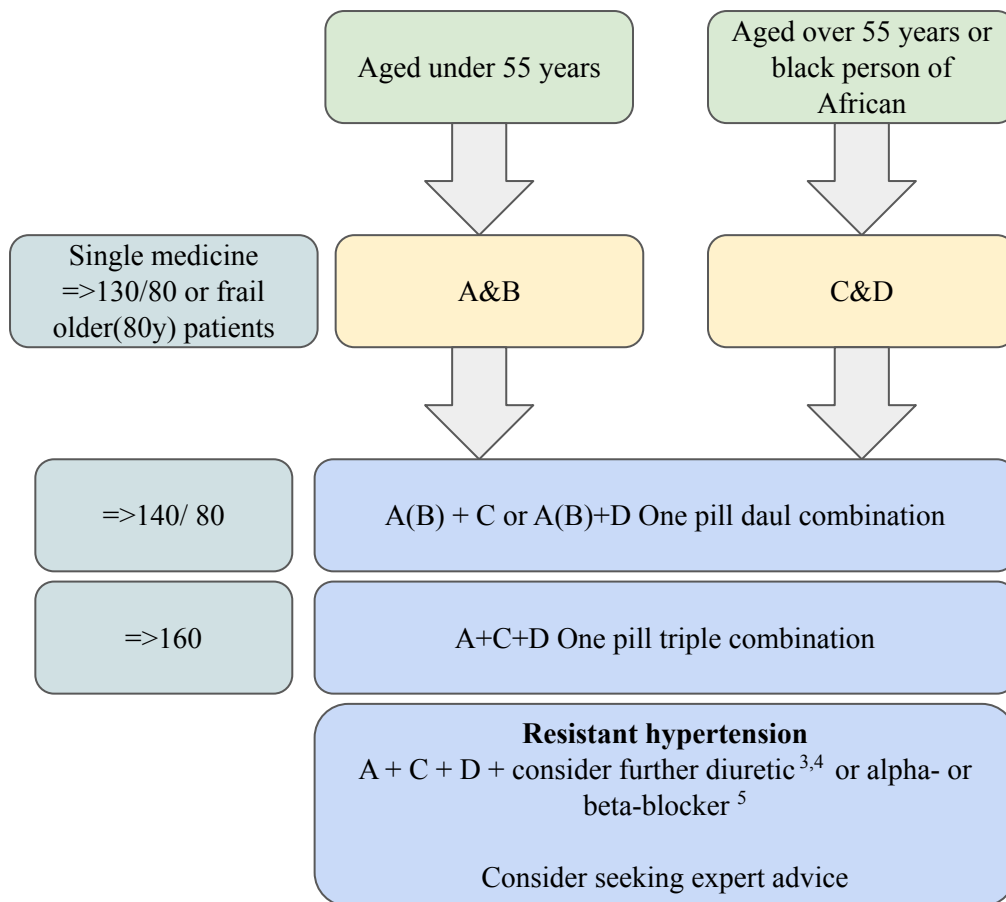
Key

A – ACE inhibitor

B— Angiotensin II receptor blocker (ARB)¹

C – Calcium- channel blocker (CCB)²

D – Thiazide-like diuretic



- **Step 1** (BP > 130/80) : If pt age under 55 years, use Single medication either A or B. but if pt age over 55, or african, use either C or D.
- **Step 2** (BP > 140/80) : One pill dual combination "A(B) + C " OR "A(B) + D". This combination will increase the compliance + less side effect.
- **Step 3** (BP > 160): One pill triple combination A+C+D OR B +C+D.

Drugs you can't combine:

1- ACEi and ARBs

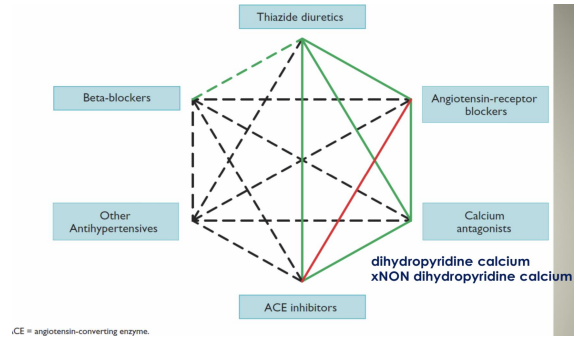
2- Beta blockers and NONdihydropyridine calcium channels blockers.

★ In old aged patients, the drop in blood pressure should be slowly to avoid any dizziness or confusion.

★ Our aim in hypertensive patient with DM and Hyperlipidemia is to keep the BP below 130/80

- 1) Choose a low-cost ARB.
- 2) A CCB is preferred but consider a thiazide-like diuretic if a CCB is not tolerated or the person has edema, evidence of heart failure or a high risk of heart failure.
- 3) Consider a low dose of spironolactone or higher doses of a thiazide-like diuretic.
- 4) At the time of publication (August 2011), spironolactone did not have a UK marketing authorization for this indication. Informed consent should be obtained and documented.
- 5) Consider an alpha- or beta- blocker if further diuretic therapy is not tolerated, or is contraindicated or ineffective.

- Possible combinations of classes of antihypertensive drugs.
 - Green continuous** lines: preferred combinations.
 - green dashed** line: useful combination (with some limitations).
 - black dashed** lines: possible but less well-tested combinations.
 - red** continuous line: not recommended combination.
- Although verapamil and diltiazem are sometimes used with a beta-blocker to improve ventricular rate control in permanent atrial fibrillation, only dihydropyridine calcium antagonists should normally be combined with beta-blockers.



High Risk Group

Start Lifestyle changes + medication in patient with BP of (130 – 139)/(85 – 89) mmHg.

- Congestive heart failure : Thiazide, ACE-1, Aldosterone antagonist , BB
- Post Myocardial Infarction : BB, ACEi
- Diabetes Mellitus proteinuria : ACEi, ARB,NO / Non-proteinuria : Thiazide, CCB,ARB, ACEi
- Chronic kidney disease : ACEi, ARBs, Thiazide
- Stroke : CCB +ACEi Pregnancy: Aldomet ,labetalol, Ca channel blocker

Antihypertensive Medications and Complications

- Diuretics → Hypokalemia
- β-Adrenergic Blocking Agents → Bradycardia
- Angiotensin-Converting Enzyme Inhibitors → Hyperkalemia + cough
- Angiotensin II Receptor Blockers → Hyperkalemia
- Calcium Channel Blocking Agents → Edema + Tachycardia + Bradycardia
- α-Adrenoceptor Antagonists → 1st dose hypotension
- Drugs with Central Sympatholytic Action → Drowsiness
- Arteriolar Dilators → Tachycardia + Edema

Benefits of Lowering BP:

- Stroke incidence will reduce 35 to 40%
- Myocardial infarction will reduce 20 to 25%
- Heart failure will reduce 50%
- Renal failure will reduce 35 to 50%
- 2 mmHg decrease in mean systolic BP will lead to:
 - 7% reduction in risk of ischemic heart disease mortality
 - 10% reduction in risk of stroke mortality.
 - Reduce the risk of cardiovascular events up to 10%

Threshold & Targeted BP

BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

Clinical Condition(s)	BP Threshold, mm Hg	BP Goal, mm Hg
General		
Clinical CVD or 10-year ASCVD risk $\geq 10\%$	$\geq 130/80$	$< 130/80$
No clinical CVD and 10-year ASCVD risk $< 10\%$	$\geq 140/90$	$< 130/80$
Older persons (≥ 65 years of age; noninstitutionalized, ambulatory, community-living adults)	≥ 130 (SBP)	< 130 (SBP)
Specific comorbidities		
Diabetes mellitus	$\geq 130/80$	$< 130/80$
Chronic kidney disease	$\geq 130/80$	$< 130/80$
Chronic kidney disease after renal transplantation	$\geq 130/80$	$< 130/80$
Heart failure	$\geq 130/80$	$< 130/80$
Stable ischemic heart disease	$\geq 130/80$	$< 130/80$
Secondary stroke prevention	$\geq 140/90$	$< 130/80$
Secondary stroke prevention (lacunar)	$\geq 130/80$	$< 130/80$
Peripheral arterial disease	$\geq 130/80$	$< 130/80$

- An SBP target range of 130–139 mmHg is recommended for people older than 80 years, if tolerate
- ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

Summary :

- The overall prevalence of hypertension in adults is around 30 - 45%
- Need proper technique in measurement
- Lead cause coronary death or myocardial infarction, CHF or fatal or nonfatal stroke, CKD
- Threshold of treatment start 130/80 mm Hg
- **Target treatment < 130/80 mm Hg**
- nonpharmacological and antihypertensive drug are effective to reduce all complications in all ages
- Hypertension is the fourth most common cause of death worldwide.
- **Blood pressure equation:** cardiac output (SV x HR) x systemic vascular resistance
- **Pathogenesis of HTN:** - An overactive renin angiotensin - An overactive sympathetic nervous system

- **Types of hypertension:**

- **Essential Hypertension:** In 90%-95% of cases, but no cause can be found (primary hypertension)

Risk factors: Obesity, metabolic syndrome, DM , Excessive salt intake, low potassium intake, Excessive alcohol intake. Polycythemia , Lack of exercise , Family history of essential HTN, Vitamin D deficiency, aging, Race, Genetic, Polycythemia.

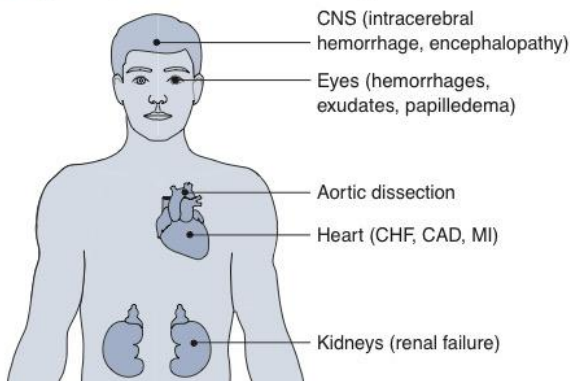
- **Secondary hypertension:** Account for 5 to 10 % .

The Possible etiologies are : Primary renal disease, Oral contraceptive , Sleep apnea syndrome, Primary hyperaldosteronism , Renovascular disease, Cushing syndrome , Pheochromocytoma, Other endocrine disorder, Coarctation of the aorta.

FIGURE

12-1

Complications of uncontrolled hypertension.



Pic From step up

Summary :

Diagnosis	Management
<p>1) BP measurement.</p> <p>2) laboratory tests:</p> <p>- Urinalysis, Serum sodium , serum potassium , creatinine, or the corresponding estimated GFR, calcium, uric acid , Fasting glucose , hematocrit, lipid profile .</p> <p>3) If the history and physical examination or laboratory test suggest a secondary cause of HTN, order appropriate test.</p> <p>4) Before starting treatment for hypertension, it is useful to evaluate the patient more thoroughly :</p> <p>- Risk factors by using Framingham Risk Score, Asymptomatic organ damage.</p>	<p>1) Nonpharmacological (Lifestyle modification):</p> <p>In patient with High normal (SBP >130–139 mmHg, DBP 85–89 mmHg)</p> <p>- Healthy Diet, Weight reduction, smoking cessation, reduction of dietary salt and physical exercise.</p> <p>2) Pharmacological Intervention:</p> <p>If blood pressure is more than 140/90 mmHG.</p> <ul style="list-style-type: none">→ Thiazide diuretics→ B-Blocker→ ACE inhibitors→ Angiotensin II receptor blockers (ARBs)→ Calcium channel blockers→ Vasodilators

Master The Boards

JNC 8 Management of hypertension:-

- Blood pressure goal in diabetes is 140/90.
- Initial management is with either thiazides or calcium blockers or ACE inhibitor or angiotensin receptor blocker.
- Diuretics are not considered specifically better as the initial therapy.
- The main point is to control the blood pressure. The specific agent is not as important.
- With age above 60, the goal of BP is 150/90.

Pregnancy safe hypertension drugs:

- BB - use first
- CCB
- Hydralazine
- Alpha methyl dopa

Questions:

1- Which of the following is a risk factor of an Essential Hypertension?

- A) Primary hyperaldosteronism
- B) Coarctation of the aorta
- C) Polycythemia
- D) Pheochromocytoma

2- A 48-year-old woman was diagnosed with essential hypertension and was commenced on treatment three months ago. She presented to you with a dry cough which has not been getting better despite taking anti-hypertensive and antibiotics. You assess the patient's medication history. Which of the following antihypertensive medications is responsible for the patient's symptoms ?

- A) Bendroflumethiazide
- B) Lisinopril
- C) Furosemide
- D) Amlodipine

3- A 57-years-old male is admitted complaining of headaches and blurring of vision. His blood pressure is found to be 240/150 mmHg and he has bilateral papilloedema, but is fully orientated and coherent. He had been known to be hypertensive for about 5 years and his blood pressure control had been good on three drugs. However, he had decided to stop all medication two months before this event. Which of the following would be your preferred parenteral medication at this point?

- A) Glyceryl trinitrate
- B) Hydralazine
- C) Labetalol
- D) Sodium nitroprusside

4- A patient is diagnosed with primary hypertension. When taking the patient's history, the healthcare provider anticipates the patient will report which of the following?

- A) "Every once in awhile I wake up at night covered in sweat"
- B) "Sometimes I get pain in my lower legs when I take my daily walk"
- C) "I have not noticed any significant changes in my health"
- D) "I'm starting to get out of breath when I go up a flight of stairs"

Questions:

5- A 44-years-old woman presents with episodes of headaches, associated with anxiety, sweating and a slow pulse rate. At the time of her initial consultation, her blood pressure was 150/95 mmHg seated, but 24 hour ambulatory monitoring shows a peak of 215/130 mmHg, associated with the symptoms described above. Which of the following would be your initial diagnostic procedure?

- A) Glucose tolerance test
- B) MRI scans of the abdomen and pelvis
- C) Measurement of random plasma catecholamines
- D) Measurement of urinary metanephrines over several 24 hour periods

6- A patient presents to the emergency department with a blood pressure of 180/130 mmHg, headache, and confusion. Which additional finding is consistent with a diagnosis of hypertensive emergency?

- A) Retinopathy
- B) Urinary retention
- C) Jaundice
- D) Bradycardia

7- In which grade of hypertensive retinopathy will be a “Narrowing of retinal arteries in conjunction with regions of focal narrowing and arteriovenous nipping” ?

- A) Grade I
- B) Grade II
- C) Grade III
- D) Grade IV

8- Which of the following is a combination that can't be used?

- A) ACEI + CCB
- B) Thiazide-like diuretic + ARB
- C) ARB + ACEI
- D) None of the above