Cardiovascular Unit Hypertension

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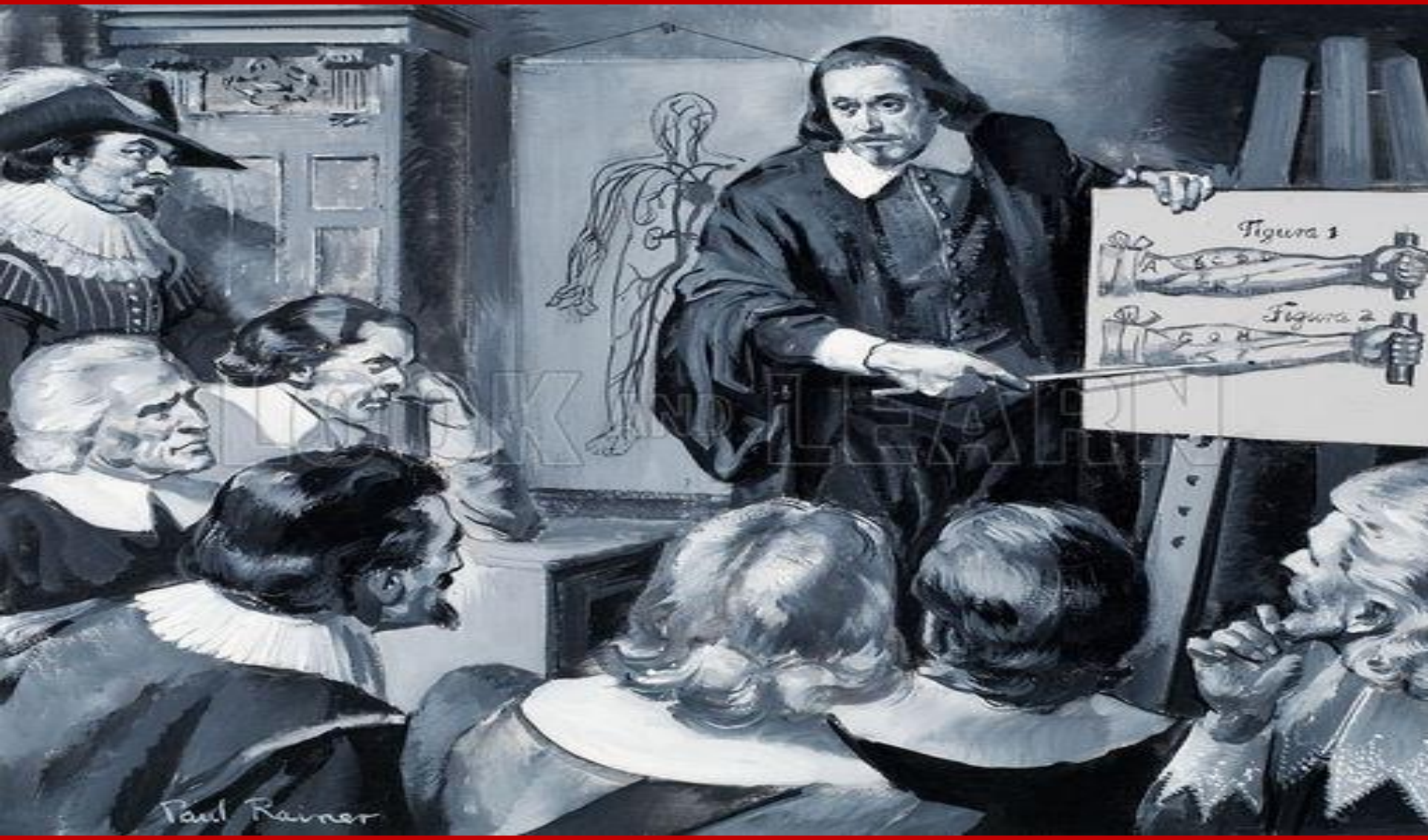
History



Dr. William Harvey in 1600's was the first physician to described in detail the cardiovascular system

Be Attentive and Enjoy Medicine

"The present moment is filled with joy and happiness. If you are attentive, you will see it"

Epidemiology of HTN

- 1 in 3 adults, more than 75 million American (32%) have HTN

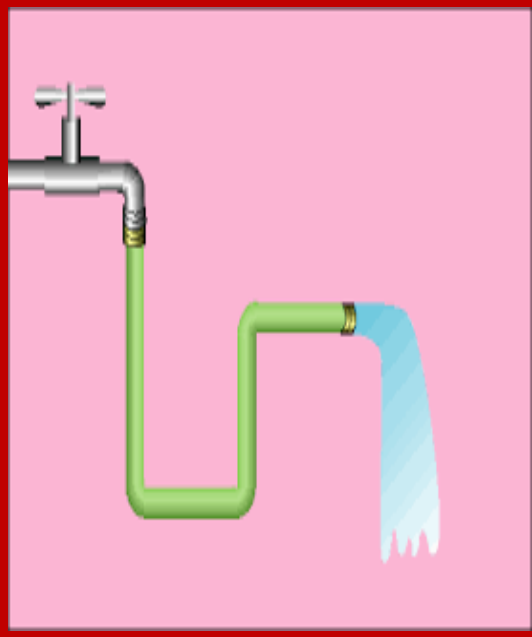
- Occurs in 2/3 of those who are older than 65

- If not treated early or not well treated, it can lead to heart attack, Atrial fibrilation, stroke, and renal failure

Risk Factor

- The Highest risk factor for a stroke is HTN.
- HTN is also a Major risk factors for MI and A.fib, Arteriosclerosis
- The higher the BP, the greater the chance of heart attack, heart failure, stroke, and kidney damage
- African Americans get HTN earlier in life, is more severe and harder to control

Definition/BP Goal



- I use Faucet-Hose Analogy to explain to patients

- **Systolic, top #:** force of blood ejecting from the heart (Turning on the Faucet)

- **Diastolic, bottom #:** BP pushing against Arteries (water running in the hose)

- **BP Goal based on JNC 8**

- All patients < 60 y.o. including DM, CKD <140/90

- ≥ 60 y.o. < 150/90 (except DM, CKD)

JAMA: 2014 Evidence-Based Guideline

Eighth Joint National Committee (JNC 8) *JAMA.* 2014

Abstract …60 years or older BP goal of less than 150/90 …persons younger than 60 years ..BP of less than 140/90. The same goals is recommended for hypertensive adults with diabetes or nondiabetic chronic kidney disease (CKD).

Drug treatment with an ACE, ARB, calcium channel blocker, or thiazide-type diuretic in the nonblack hypertensive population.

In the black hypertensive population, including those with diabetes, a calcium channel blocker or thiazide-type diuretic is recommended as initial therapy. ACE or ARB in persons with CKD to improve kidney fx.

Guidelines Vs Standard of Care

- **Guidelines:** Are optional to follow, but do your best to follow them.
- **Standard of care:** Must be followed. Top reason for suing is not following standard of care.

Case presentation

8o y.o. Male with hx of HTN, diabetes and hyperlipidemia developed pressure like substernal chest pain this am which lasted about half an hour then went away. 45 minutes ago the same pain returned, radiating to left arm 8 out 10 in intensity, minimal nausea and SOB. He walked in to your office . His vitals BP 120/80, pulse 70 and Pulse Ox= 97%. EKG: normal. When you see him his chest pain has went away and now he feels "normal". He indicated that it is his birthday today and had a heavy meal for breakfast and caused him to have indigestion. His physical exam is normal. What is your next step:

A- Prescribe H2 blockers such as Zantac and Tumbs.
B- Arrange for Cardiology consult and have your MA schedule him.
C- Order stress test along with 2-D echo to be scheduled by your MA.
D- Call EMS and send patient to ER.
E- Prescribe Aspirin and inform patient to go ER if symptoms returns.

Diagnosis

- BP high in 3 different visit unless very high then decide. BP varies throughout the day; affected by emotions, pain, caffeine, nicotine, drugs, and activity.

- Should be seated feet touching ground, left arm without constrictive clothing, correct cuff size.

- No one should talk when taking BP.

- Have patient obtain BP monitoring device such as Omron.

- Incorrectly classifying a hypertensive patient as normotensive or vice versa result in harm.

Case presentation

54 y.o. white male new patient presents to your office for the first time for a Complete Physical Exam he has no complaint except his wife says he is stressed and he drinks coffee and ETOH. PMH of uncontrolled diabetes and hyperlipidemia. He is a 30 pack year history of smoking. Family history: brother and father has HTN. Medication: Metformin and Atorvastatin.

His BP was 175/106 repeated after few minutes same. Pulse 90 , BMI 30. UA: proteinuria EKG: LVH

What is your next step

A- Weight loss, DASH diet and have him come back for re-evaluation.

B- Decrease stress and stop coffee and ETOH.

C- Initiate hypertension medication.

D- Have him come back for at least 3 visit and document 3 elevated blood pressure

E- Send to ER

Sever Hypertension

- The term Hypertensive crisis or malignant HTN replaced by below
- 1. **Hypertensive urgency:** ≥180/120, no symptoms or no acute end organ damage
- 2. **Hypertensive Emergency:** ≥180/120 with symptoms of acute end organ damage such as: Ischemic heart disease presenting as chest pain, also can get CHF (SOB), blurred vision, neurologic deficit pr. (in ER they use IV Nitrates (Nitroprusside or nitroglycerin), or Labatelol to slowly lower BP.

Presentation of HTN

Usually asymptomatic (silent killer), but severe HTN may present with headaches, dizziness, SOB, wave noise in the ear, or pulsating in neck or blurred vision

Diagnostic Studies

CMP, UA, EKG, Lipid panel

Etiology

1. **1˚ Hypertension (95% of cases)** (essential or benign hypertension). The cause is unknown (idiopathic). Cannot pinpoint a specific cause. There may be multiple factors from kidney, blood vessels, hormones, environmental, and genetic.
2. **2˚ Hypertension (5%):** the cause is identifiable. Think of other causes when you still have high BP despite using 3 medications with maximum doses or in young individuals.

Endocrine: **a-** Hyperaldosteronism (Conn syndrome) from benign adrenal adenoma ↑Aldosterone, ↓Renin, ↓K (causes muscle weakness) b.Hypo and hyper thyroidism,
c-Pheochromocytoma: adrenal gland tumor: ↑adrenalin (check plasma metanephrine): tachycardia, diaphoresis, headache Cushing: ↑cortisol, moon facies and/or stria.
Anatomical: **a-**Renal artery stenosis (RAS) from Atherosclerosis PE: renal bruits, Tests: renal US with Doppler, MRA), b-Sleep apnea
Drugs: Sudafedrine, diet pill, OCP, NSAID, steroids, cocaine and methamphetamine **Diet:** ↑Salt, ETOH, nicotine and caffeine


Compassion

Complications of Chronic HTN

1. **Cardiovascular:**

a: Left Ventricular Hypertrophy (LVH: concentric): ↑afterload, left ventricle has to pump against increased BP, LV becomes stiff, Diastolic dysfunction. End result is CHF.

b: CAD: HTN lead to atherosclerosis, or plaque build-up in the arteries.

c: Aneurysm: constant pressure weakens the walls such as the Aorta.

2. **Brain:**

Stroke: HTN ↑atherosclerosis. It is #1 Risk factor for both ischemic and hemorrhagic stroke.

Causes Vascular dementia and mild cognitive impairment: due to damage for brain's blood vessels

3. **Kidney:** Leads to kidney damage. Showing as renal insufficiency, proteinuria.

4. **Eyes:** ↓vision, double vision, bursting of a blood vessel, papilledema.

Erectile dysfunction (ED): All Hypertensive medications causes ED (>HCTZ, BB).

Treatment

Life style modification:

- **Dash diet**, Low salt, fruits, vegetables, nuts, beans, lean meat, fish, salt.

- **Weight loss** is the most effective life style modification
- Aerobic exercise,
- Smoking cessation
- ↓ETOH
- Stress management

- Don't forget: When the patient changes life style, looses weight etc. decrease the dose. Some of the ER visits are due for not lowering the dose despite weight loss.

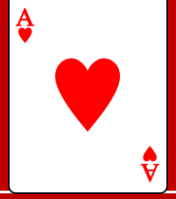
Scott Hall

DO NO HARM

Medications

- Antihypertensive medication (ABCDE):
- Choose any group from A-D
- Individualize, choosing BP medication is based on current diseases, ethnicity, and life style,
- https://youtu.be/GA9GVvIFUYQ

A ACE



Class	Mechanism	Indications	Adverse Effects
A **ACE-Inhibitor** (-pril) Lisinopril 2.5,5,10, 20,40 mg Enalapril, Captopril Combo: Lisinopril/HCTZ	Inhibit ACE angiotensin converting enzyme, ↓angiotensin II, vasoconstrictor	Use in diabetics to prevent kidney damage. Prevents remodeling (↓size and ↓damage to heart from MI) ↓ preload and afterload	Cough, Hyperkalemia, Angioedema. ↓GFR ∴ May increase Cr (if have RAS) if less than 20% decrease just monitor Contraindicated if creatinine > 3 Avoid in bilateral Renal Artery Stenosis

A ARB

ARB **(-sartan)** **Losartan** Use if cough to ACE) (12.5, 25, 50,100mg) Comb: Losartan/HCTZ	Angiotensin Receptor Blocker Blocks binding of angiotensin II to its receptor	Use same indication as ACE No cough Same protection as ACE	Same as ACE Hyperkalemia. Do Not Use ACE & ARB together: you will get severe hyperkalemia. Cannot use if angioedema to ACE

B Beta Blocker

Beta Blocker(-lol)BB **Metoprolol:** 25-100 2 kinds of Metoprolol **Metoprolol Succinate:** **(**Toprol Xl) Long acting, QD **Metoprolol Tartrate:** Lopressor Short acting, BID Atenolol(Tenormin) Combo: Atenolol/Chlorthalidone	cardio selective (Block β 1 Receptors in heart) ↓ HR, ↓ myocardial O2 consumption ↓sympathetic tone	For Atrial Fibrillation: block AV node Post MI (along with statins, ASA, ACE)	Bradycardia (↓if < 50) Broncho-spasm in Asthma/COPD Masks hypoglycemia symptom, caution in depression Increases Triglycerides Don't stop abruptly
Propranolol (Inderal)	non-cardioselective	migraine prophylaxis, Hyperthyroidism Stage fright, avoid in heart block	
Carvedilol, Labatalol	non cardio selective (β&α blocker)	Carvedilol used by cardiologist in CAD and post MI	

C Calcium Channel Blocker

Calcium Channel Blockers (CCB)-dipine Dihydropyridine **Amlodipine: (Norvasc)** 2.5,5,10 Combo: CCB : ACE	Block calcium channels Acts on vascular smooth muscle	Use in African American Raynaud Worsens CHF (are negative ionotrpes) Avoid in heart block	Peripheral edema Constipation AV block: bradycardia can cause reflex tachycardia don't use in Chest pain Flushing, dizzy gingival hyperplasia
NonDihydropyridine CCB: cardioselective Diltiazem(Cardizem) Verapamil (Calan)	Acts on the heart Cardio selective	↓HR in A. fib, Used in chest pain, & coronary spasm (prinzmetal angina).Worsens CHF	Same as above

D Diuretics "Water Pill"

Loop Diuretic Furosemide (Potent diuretic) Lasix 20, 40, 80 mg	↑Na & water excretion in urine. "Lasix works for six hours"	Used for leg edema, CHF, pulmonary edema	Side effects Hypokalemia, Ototoxicity Can increase Cr
Thiazide (weak) **HCTZ** 12.5, 25 Hydrochlorothiazide	↑Na & water excretion in urine	**Also used in Ca+ kidney stones** by decreasing **Ca+** in urine this help in osteoporosis, avoid in Gout	**Hyper GLUC** HyperGlycaemia, HyperLipidemia, HyperUricemia, HyperCalcemia, Can increase Cr
Spironolactone **(Potassium sparing** **diuretics or aldosterone** **blockers**	**Blocks aldosterone receptors,** **↓Na reabsorption**	**Used for Hyperaldosteronism (Conn's Syndrome)** **CHF**	causes **Gynecomastia** Hyperkalemia Amiloride in the same family does not gynecomastia

Extra: 2nd Line HTN Medications

Second line Clonidine (Catapres)	Clonidine Central α agonist ↓sympathetic	Used as second line for HTN also Clonidine used for Alcohol and opiate (narcotic) withdrawal	Orthostatic hypotension
Hydralazine	Vasodilator Given with BB to prevent reflex tachycardia	Used for sever resistant HTN, CHF, hypertensive Emergency and pregnancy	Headache, reflex tachycardia Lupus (SLE) like symptoms

Board Pearls

HTN with BPH: Peripheral α blockers –zosin (Doxazosin).

Wolff-Parkinson white syndrome **(WPW):** BB, CCB and Digoxin are contraindicated.
2° Hypertension in pediatrics**,** coarctation of aorta, fibromuscular dysplasia which is narrowing of arteries of the kidney (causing RAS)
Complications of HTN: **EYES** - Fundi show AV nicking and "copper-wire appearance".

HTN in pregnancy: Use α-methyl dopa, Labetalol (β&α blocker) or hydralazine.

ACE in pregnancy: Teratogenic --->fetal renal agenesis (no kidneys)

BB Overdose TX: Give Glucagon

Patient Education

Choose	Avoid
▪ **Exercise at least 30 minutes a day, five times a week, such as walking, jogging, cycling, or swimming.**	▪ **Avoid physical inactivity. Too much weight around waist poses greater risk of high blood pressure.**
▪ **Lose weight if you are overweight or obese. Waist measurement should be less than 35 inch**	▪ **Avoid excessive caffeine beverage such as coffee, soda, energy drinks.**
▪ **Follow DASH diet: low salt, eat more fruits, vegetables, whole grains, nuts, fish, chicken, and low-fat dairy.**	▪ **Avoid high sugar, salt, fried, fatty food or processed canned food.**
▪**Reduce Stress. Practice relaxation, meditation**	▪ **Avoid uncontrolled anger, agitation, or anxiety.**
▪ **Sleep 7-8 hours per night. If you snore or have sleep apnea, get sleep study.**	▪ **Avoid alcohol.**
▪ **Take your blood pressure at home. Keep log of blood pressure reading with Omron blood pressure monitor.**	▪ **Avoid Smoking. Nicotine contributes to increased blood pressure and heart rate.**
▪ Compliance: Take your pills every morning. Seek support from family, friends.	▪ **Avoid use of cold, cough medicines, diet and birth control pills and limit NSAIDS such as Motrin, Advil or Aleve.**

All Hypertensive Medications in the Market

ACE	Lisinopril (Privivil), Enalpril (Vasotec),Benazepril (Lotensin), Captopril (Capoten), Ramipril (Altace), Quinapril (Accupril)
ARBs	Losartan (Cozaar), Valsartan (Diovan), Olmesartan (Benicar), Candesartan (Atacand), Telmisartan (Micardis), Irbesartan (Avapro)
Beta blocker	Atenolol (Tenormin), Metoprolol Tartrate (Lopressor), Metoprolol Succinate (Toprol-XL), Nebivolol (Bystolic), Carvedilol (Coreg), Labetolol (Trandate), Propranolol (Inderal)
Calcium Channel Blocker	Dihydropyridine: Amlodipine (Norvasc), Nifedipine (Procardia) Non-dihydropyridine: Diltiazem (Cardizem), Verapamil (Covera-HS)
Diuretics: **K+ sparing & Aldosterone antagonist**	Spironolactone (Aldactone)
K+ sparing only	Amiloride (Midamor), Triamterene (Dyrenium)
Aldosterone antagonist only	Eplerenone (Inspra)
Thiazides	HCTZ, Chlorthalidone (Thalitone), Indapamide (Lozol)
Loops	Furosemide (Lasix), Torsemide (Demadex), Bumetanide (Bumex), Ethacrynic Acid (Edecrine)
Peripheral α antagonist	Doxazosin (Cardura)
Central α2 agonist	Clonidine (Catapres), Methyldopa (Aldomet)
Peripheral arterial vasodilator	Hydralazine (Apresoline), Minoxidil (Loniten)
Renin inhibitor	Aliskiren (Tekturna)
Combinations	Lisinopril/HCTZ (Zestoretic), Amlodipine/Benazepril (Lotrel), Atenolol/Chlorthalidone (Tenoretic), Bisoprolol/HCTZ(Ziac), Triamterene/HCTZ (Maxzide, Dyazide), Telmisartan/HCTZ (Micardis HCT), Amlodipine/Valsartan (Exforge)

Homework questions for Hypertension, print them and turn in all 5 sections: your Name_____

Part one 20 points Circle the best answer

1. Which of the following statements about the causes of secondary hypertension is NOT true?

A) Causes of secondary hypertension occur more frequently than do those of essential hypertension
B) Cocaine and methamphetamine use may cause secondary hypertension
C) Dietary factors that may cause secondary hypertension include excessive intake of caffeine, licorice, or alcohol
D) Medications associated with secondary hypertension include corticosteroids and oral contraceptives
E) Potential causes of secondary hypertension include hyperthyroidism, Cushing's syndrome, and primary aldosteronism

2. Which of the following statements regarding drugs used to treat hypertension is NOT true?

A) Angiotensin- converting enzyme inhibitors can worsen renovascular disease
B) β Blockers are contraindicated in patients with congestive heart failure
C) β- Blockers are relatively contraindicated in patients with heart block
D) Calcium channel blockers can worsen congestive heart failure
E) Diuretics can exacerbate gout

3. Which of the following is the most common cause of death in patients whose hypertension is under control?

A) Aortic dissection B) Coronary artery disease C) Left ventricular dysfunction D) Renal failure E) Stroke

4. Which of the following statements is INCORRECT regarding the diagnosis of hypertension?

A) About 30% of people diagnosed with hypertension are unaware that they have the disease
B) Blood pressure should be accurately measured twice daily on 3 separate days before the diagnosis is made
C) Hypertension is usually an asymptomatic disease
D) Only approximately 10% of patients on medical therapy for hypertension have their blood pressure controlled to less than 140/90 mm Hg
E) Small blood pressure cuffs tend to overestimate blood pressure

5. A 55 year old male with type 2 DM presented with HTN on more than 3 readings and was initiated on Lisinopril 10 mg 1 wk. ago. His GFR had decreased from 90 ml/min at that time to 81ml/min. Which of the following is the best next step in management?

A) Switch to Candesartan 4mg B) Switch to a diuretic C) Initiate Dialysis D) Continue treatment with Lisinopril

6. A 58 year old male presented to the ER with acute chest pain and was diagnosed with ST elevation myocardial infarction. He was discharged 10 days later on medications. Two years later he was found dead in his apartment without obvious reason. The autopsy showed dilated ventricular chambers of the heart with increased cardiac diameters. Which of the following would prevent the subsequent complication if given before?

A) Atenolol 100 mg B) Aspirin 81 mg C) Captopril 50 mg D) HCTZ 12.5 mg E) Simvastatin 20 mg

7. A 1 hour neonate born to a 33 year old female presented with respiratory distress. His mother had oligohydramnios during her pregnancy. Which of the following scenario was likely present during the pregnancy?

A) Diabetes treated with metformin B) HTN treated with alpha methyldopa.
C) DVT treated with Coumadin D) Infection treated with tetracycline. E) HTN treated with Lisinopril.

8. A 58 year old male presented to the ER with headache and confusion for 3 hours. His past medical history is significant for HTN. His vital signs: BP 118/112, HR: 90, Temp 98, Respiration: 12. Which of the following is the best treatment?

A) Sublingual Nifedipine B) IV labetalol C) Oral Atenolol D) IV furosemide.

9. A 47-year-old man with a history of hypertension presents to the ED complaining of continuous left-sided chest pain that began while snorting cocaine 1 hour ago. The patient states he never experienced chest pain in the past when using cocaine. His BP is 170/90 mm Hg, HR is 101 beats per minute, RR is 18 breaths per minute, and oxygen saturation is 98% on room air. Which of the following medications is best to treat this patient?

A) Metoprolol B) Amlodipine C) Lisinopril D) Lorazepam E) B and C

10. A 35 year old female non smoker presented to your office complaining for intermittent change in color of her finger worse in the winter what is the best medication?

1- A) ACE/ARB B) BB C) CCB D) Nitroglycerin E) Non of the above

<u>Part 2 (20):</u> Draw a table (write do not type or copy and paste): From the category A,B,C,D,E
Medications listed, dosage of prototype, Mechanism, Side effect or any relevant information mentioned in the table in this chapter

<u>Part 3 (20 Pt):</u> At your work or daily life mention three scenario you have encountered where the above chapter was relevant
Example: Your aunt called you and mentioned that she has been coughing and her doctor switched her ACE to ARB

<u>Part 4 (20 Pt</u>): What is the values of the following:
BP less than 60 year old_____ BP Greater than 60 year old
Diabetics_____ CKD_____

Hypertensive urgency_____ Hypertensive ER_____

<u>Part 5</u> (20 Pt) Write a life style modification very detailed script for a hypertensive patient (advice you would give and would put it in writing)