

Assignment 2: Antihypertensive Drugs

Part I

1. *Identify mechanisms that control blood pressure.*

Cardiac output = heart rate x stroke volume. So if any of these drastically change, it will affect the blood pressure. Blood pressure will increase if the Stroke Volume, or the amount of blood you have circulating your body, increases. Blood pressure will increase as heart rate increases. Blood pressure will increase as cardiac output increases. Cardiac output increases as artery diameters decrease either due to plaque build up or blood clots. This anything that lowers heart rate, stroke volume, or cardiac output will lower blood pressure.

Hypotension: body will constrict arteries and veins, stimulate beta-adrenergic receptors making heart beat faster, activate the renin-angiotensin-aldosterone system.

Hypertension: kidneys excrete more fluid (increase urine output) making you lose both ECF and ICF thus decreasing blood volume = decreased cardiac output reducing arterial blood pressure.

2. *Develop a table including assigned antihypertensive drugs. Include the drug classification, mechanism of action, nursing considerations and major side effects.*

Drug Name	Classification	Mechanism of Action	Nursing Considerations	Major Side Effects
Captopril (Capoten)	ACE inhibitor	Stops conversion of angiotensin I to angiotensin II. (Angiotensin is a potent vasoconstrictor)	Recommended as first line agents to treat hypertension. Reduce proteinuria and slow progression of renal impairment.	10% of people develop persistent cough. Acute Hypotension. Hyperkalemia may develop in pt with renal impairment, DM, or who are taking NSAIDs. Black Box warning during pregnancy.
Lisinopril (Prinivil, Zestril)	ACE inhibitor	Same	Same	Same
Benazepril (Lotensin)	ACE inhibitor	Same	Same	Same
Losartan (Cozaar)	ARB	Interfere with angiotensin II receptors.	As effective as ACE inhibitors, less likely to cause Hyperkalemia	Black Box Warning for pregnant women: can cause injury and even death to

			and persistent cough,	a developing fetus.
Olmesartan (Benicar)	ARB	Same	Same	Same
Valsartan (Diovan)	ARB	Same	Same	Same
Clonidine (Catapres)	Alpha Agonists	Stimulates presynaptic receptors in brain decreasing release of epinephrine.	Chronic use may result in sodium and fluid retention.	
Prozasin (Minipress)	Alpha-Adrenergic Blocking Agent	Dilates blood vessels and decreases peripheral vascular resistance.	NEED TO TAKE WITH A DIURETIC!	First-Dose Phenomenon: orthostatic hypotension with palpitations, dizziness and perhaps syncope within 1-3 hours after first dose or increased dose.
Atenolol (Tenormin)	Beta-Adrenergic Blocking Agent	Decreases heart rate, force of myocardial contraction, and renin release from kidneys.	First choice for patients younger than 50 with other heart problems.	Black Box warning for patients with CAD. Abrupt withdrawal has resulted in exacerbation of angina, ventricular dysrhythmias, and occurrence of MIs.
Metoprolol (Lopressor)	Beta-Adrenergic Blocking Agent	Same	Same	Same
Labetolol (Trandate, Normodyne)	Alpha-Beta Adrenergic Blockers	Combines effects of alpha and beta blockers.		Same adverse effects as alpha and beta blockers combined.
Amlodipine (Norvasc)	Calcium Channel Blocker	Dilate peripheral arteries and decrease peripheral vascular resistance by	Well absorbed by gastrointestinal tract, highly protein bound, metabolized by liver and	Can cause adverse cardiac vascular events precipitated by a rapid and severe decrease in blood pressure.

		relaxing smooth muscle.	excreted in urine.	
Verapamil (Calan, Isoptin)	Calcium Channel Blocker	Same	Same	Same
Hydrochlorothiazide	Thiazide diuretic	Pee out excess fluid decreasing cardiac output.	Monitor potassium.	Can cause dehydration and electrolyte imbalances.
Furosemide	Loop diuretic	Pee out excess fluid decreasing cardiac output.	Monitor potassium.	Can cause dehydration and electrolyte imbalances.
Spironolactone	Potassium sparing diuretic	Pee out excess fluid, but keep some potassium in kidneys so don't cause as much of an electrolyte imbalance.		Can cause dehydration.

Part II

Construct a table indicating the manifestations of peripheral vascular disease, Raynaud phenomenon, and Buerger disease.

Disease	Causes	Manifestations
Peripheral Vascular Disease	Systemic atherosclerosis distal to arch of the aorta. Vessels become occluded. Cigarette smoking and diabetes mellitus are the strongest risk factors. 80% of people with PAD are current or former smokers.	Primary symptom is pain with walking. Calf pain, vague aching, or feeling of numbness. Thinning of the skin. The foot is often cool, pedal and popliteal pulses are weak or absent, limb color blanches with elevation of the leg. Eventually blood flow is reduced so that it can't meet the needs of the resting muscle and nerves so ulceration and gangrene develop resulting in severe pain made worse at night.
Raynaud Phenomenon	Intense vasospasms of arteries and arterioles in fingers and sometimes toes. Primary: Often is precipitated by exposure to cold or strong emotions.	Skin color changes progressing from pallor to cyanosis, sensation of cold, numbness and tingling. After ischemic episode there is a period of hyperemia with intense redness, throbbing,

	Secondary: previous vessel injury (frostbite, trauma due to heavy vibrating tools). Happens to all people with scleroderma.	and Paresthesias. Fingers then return to normal color. Eventually, nails may become brittle, skin on fingertips may thicken, ulceration and superficial gangrene of fingers may develop.
Buerger Disease (Thromboangiitis Obliterans)	Clots form blocking Medium sized arteries usually plantar and digital vessels in foot and lower leg. Typically in males 25-40 who are heavy smokers but increased number of female smokers are reported having this now too.	Pain is predominant symptom related to distal ischemia. Impaired circulation increases sensitivity to cold, peripheral pulses are diminished or absent, and there are color changes in the color of the extremity. In advanced cases the extremity becomes cyanotic, digits may turn reddish blue, skin becomes thick, shiny and lack hair growth.

Part III

Develop a discharge teaching plan for a patient recently diagnosed with hypertension being discharged on Lasix and Lisinopril. Include safety measures and patient education. Also include nonpharmacological measures to control hypertension and a discussion on how the patient should monitor blood pressure at home.

You have recently been diagnosed with hypertension. This simply means you have high blood pressure. This can come about for a number of reasons. Either there is plaque build up in the arteries making the amount of blood that can go through them smaller so your heart has to work harder, there is an increased amount of fluid in your body making your heart have to pump more to circulate all your blood, or your heart is simply not pumping the amount of blood you have efficiently.

The two drugs you are currently on, Lasix and Lisinopril are often prescribed in combination to attack this problem from multiple angles. Lasix is a diuretic, this means it will make you pee out extra fluid. SO if the reason you have hypertension is because there is excess fluid in your body, this will get rid of some of that fluid. Be careful when you are taking this medication to monitor your potassium levels because it is not a potassium sparing diuretic.

The Lisinopril is an ACE-inhibitor. This acts by interfering with the rennin-angiotensin-aldosterone system (RAAS). When your body has low sodium levels, which happens due to

diuretic, it activates the RAAS system to keep sodium in the body and keep fluids in the body. This medicine will stop interfere with that system and help decrease the amount of fluid in your body, effectively decreasing your high blood pressure.

It is important that while you are on this medication, you monitor your blood pressure at home. There are numerous blood pressure cuffs you can purchase for \$30 or less to do this, or you can go to almost any grocery store or pharmacy and utilize the automatic blood pressure machines there.

Blood pressure can be controlled by a number of nonpharmacological measures. Regular exercise has been shown to dramatically reduce high blood pressure. Also if you smoke, ceasing smoking will lower your blood pressure as will reducing your sodium intake. Sodium is in very large quantities in all processed foods. This includes pre-packaged meats, dips, and sweets. Large quantities are also in cheeses so you should monitor how much of these you eat.

Also be careful of using nasal decongestants, these often will increase blood pressure.

Part IV

Using the internet research an article explaining the rationale for using combination drugs for hypertension management.

We often prescribe combination drugs for hypertension because it has been shown to be more effective than one drug by itself. "In fact, several large randomized trials have found that two or more antihypertensive medications are required for patients to reach their goals...with at least one being a Thiazide diuretic" (p. 886). Thiazide diuretics lower blood pressure by inhibiting sodium chloride reabsorption by the sodium chloride transporter in the distal convoluted tubule. This sodium depletion however, activates the rennin-angiotensin-aldosterone system (RAAS). So combining a diuretic with a blocker of the RAAS, such as an angiotensin-converting-enzyme (ACE inhibitor) or an angiotensin II receptor blocker (ARB) results in additive antihypertensive properties.

Calcium channel blockers are also often prescribed to reduce hypertension. The problem with these is that again, they stimulate the RAAS system so an additional antihypertensive medication would need to be prescribed for the maximum control of high blood pressure.

Resources

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