PHARMACOLOGY FOR NURSING

Second Stage
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Reference (Text Book)

Lehne , Richard A., Pharmacology for Nursing Care . 10th edition . 2019.

Antihypertensive

Hypertension:
Common chronic disorder in which there is sustained elevation of arterial blood pressure above normal value. SBP of > 140 mm Hg or a sustained DBP of > 90 mm Hg. or both. on more than one occasion.

* Blood pressure = Cardiac output (COP) X Total Vascular Resistance (TPR)

* Cardiac output (COP) = Heart Rate (HR) X Strok Volume(SV)

Note: The Optimal healthy blood pressure is (<120/<80).& the American Heart Association
(AHA) defines hypertension *as arterial BP higher than 140/90mmHg* (based on *three measurements at different times*).

- **Signs &Symptoms;**
  - In most cases elevation of blood pressure not associated with significant signs or symptoms (it's a silent killer). However, sometime patients may suffer from number of symptoms as headache , bloody nose , blurred vision, dizziness, fatigue , palpitations and facial flushing .
  - Untreated hypertension increases the risk for development of end organs failure causing coronary artery disease, stroke, heart failure, renal failure and peripheral vascular disease.

Classification of hypertension; Hypertension classified by different ways;

I- according to the etiology or the cause of the disease:

1. Essential, idiopathic , or Primary;
The increase in B.P have no known cause, this type of hypertension occur in about 90-95%of patients.
2. Secondary;
Occur in (5-10%) due to other disorder as renal , endocrine disorders, Pheochromocytoma, side effect sympathetic drugs….Moreover, the Bp may increase during pregnancy, or under stress of fear when the patient visit the hospital and this called (*White coat hypertension*)

II- According to the type :

1. Systolic hypertension,
2. Diastolic hypertension
3. Mixed (systolic& diastolic)

III- According to the grade or stage of hypertension

1- Hypertension has been categorized into stages based on blood pressure measurements:

CATEGORY	SYSTOLIC (MMHG)	DIASTOLIC (MMHG)
Optimal	<120	<80
Pre hypertension	120-140	80-90
Stage I Hypertension	140-160	90-100
Stage 2 Hypertension	160-180	100-110
Stage 3 Hypertension	≥180	≥110

Strategy of treatment of primary hypertension;

I- Non pharmacological measures;

You have to advise the patient to avoid risk factors by minimizing the dietary salt ,

avoid stressful conditions , reduce the smoking and body weight . Special care must be given for hypertensive patients with other disorders as (Diabetes , hyperlipidemia), these

disorders need to be controlled to avoid their complications . In addition hypertensive

patients must be advised to avoid any drug which can increase the blood pressure as sympathomimetic drugs (e.g nasal decongestant) & drugs that cause Na & H_2O retention e.g; corticosteroid

II-Pharmacological treatment

Treatment for essential hypertension does not cure the disease but is aimed at maintaining the blood pressure within normal limits to prevent organ damage caused by hypertension .

The antihypertensive drugs are classified according to the site of action into;

A: Angiotensin converting enzyme inhibitors (ACE I) and Angiotensin Receptor Blockers (ARBs)

B: Beta-Blockers (BBs) and other sympatholytic drugs.

C: Calcium Channel Blockers (CCBs)

D: Diuretics and **D**irect Vasodilators **.**

I- Angiotensin converting enzyme inhibitors (ACE I) and Angiotensin Receptor Blockers (ARBs)

Mechanism of action:

 ACEI as **1-AC EIs e.g** *Captopril , Enalapril , Lisinopril* act to inhibit the formation of vasoconstrictor angoiotensin II and consequent aldosterone secretion.

While ARBs **e.g :***Losartan, Valsartan, Candesartan, Telmisartan***…..** act by blocking angiotensin II receptors at the vascular vascular smooth muscle and in the adrenal cortex to block vasoconstriction and the release of aldosterone.

Pharmacological action

They reduce the formation or the effect of angiotensin II causing arterial dilatation and decrease in TPR or (after load) that suppress the B.P. While diltation of veins decrease the venous return (preload) and consequently reduce the B.P. Moreover . they reduce the secretion of aldosterone , thus enhance sodium and water excretion producing dieresis that reduce the blood volume and B.P.

 All ACEI given orally, Enalapril also can be given by parentral route. Food decrease their absorption , so given on an empty stomach, 1 hr before or 2 hrs after meals.They are metabolized in liver and excreted with urine.

Captopril has shortest t1/2 given in multiple doses(3times daily).They are classified as pregnancy category C in first trimester and as category D drugs in second or third trimester. They can be excreted with milk

Therapeutic uses

• These drugs are effective drugs used as first line in the treatment of both hypertension
with or without heart failure either alone or in combination with other drugs as diuretic or CCBs .
• They provide protective effect on the heart after MI and may reduce mortality and the risk of LV hypertrophy . As well as they provide protection against diabetic nephropathy
can delay renal injury in diabetic patients.

Drug interactions

• Non steroidal anti-inflammatory drugs (NSAIDs) when used with these drugs can reduce the antihypertensive effect.
• ACEIs can increase the level of blood potassium therefore when used with Potassium supplements and potassium-sparing diuretics may increase the risk of hyperkalemmia.

Adverse Effects	Nursing Interventions
Hypotension	• Start treatment with a low dose, preferred to be taken at bed time. • Monitor patient's B.p 2 hrs. after initiation of treatment. • Instruct patients to change positions slowly or lie down if feeling lightheaded, or faint.
Persistent dry non productive cough →↑ in bradykinin	• Inform patients about dry cough and advise to sleep with head elevated. • The medication should be discontinued, if the cough worsens and notify the provider. .

Hyperkalemia	• Monitor potassium levels to be within reference range of (3.5 to 5 mEq/L). • Advise patients to avoid the use of salt substitutes containing potassium.
Neutropenia (rare but serious complication of captopril)	• Monitor the client's WBC counts /2 weeks for 3 months, then periodically. • This condition is reversible when detected early. • Inform the provider at the first signs of infection, (fever, sore throat) and medication should be discontinued. .
Hypersensitivity(rash) and angiodema	• Stop medication and inform the prescriber,

Contraindications:
Allergy , impaired hepatic and renal function, pregnancy and Lactation

II- Blocking of adrenergic neurotransmission

1- Centrally acting ; -*Methyldopa* (indicated to treat hypertension during pregnancy)

- Alpha2 agonists: Clonidine (↓ NE release)

2- Beta blockers;

Their antihypertensive effects are related to their reduction of the heart rate through beta1- receptor blockade. Furthermore, they also cause a reduction in the secretion of renin, which in turn reduces vasoconstriction. Long term use of beta-blockers also reduces *peripheral vascular resistance.*

 Non selective beta blockers block all beta receptors e.g; propranolol ↓ cardiac work

• Non selective drugs that block alpha1 and beta receptor blockers; (labetalol, carvidelol)
(↓ cardiac work & vasodiltation)

• Selective (Beta1 receptors) e.g Atenolol (↓ cardiac work and ↓renin release)

• Drugs that block α1 of blood vessels Doxazocin, prazocin result in vasodiltation

- **Adverse effects**
  - Drowsiness, sedation (centrally acting)
  - Bronchospasm, muscle weakness and metabolic disturbances (non selective)
  - Bradycardia (selective & non selective beta blockers)
  - Alpha blockers → orthostatic hypotension (first dose) , nasal congestion, tachycardia & Sexual dysfunction

- **III- Calcium Channel Blockers (CCBs)**

1- Dihydropyridine; e.g., Nifedipine , Nicardipine ,

Amlodipine,.....

2- Non-dihydropyridine; e.g., Verapamil, Diltiazem

➢ The CCBs are well absorbed orally , exposed to first pass effect, bound to plasma protein , metabolized in the liver and excreted in urine .
Amlodipine has longest duration of action

➢ **Mechanism of action:**

Calcium channel blockers inhibit calcium channels across the membranes of myocardial and arterial muscle cells and/or blood vessels, and blocking muscle cell contraction. This effect reduce myocardial contractility, and dilates arteries, causing a fall in blood pressure and a decrease in venous return.

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  - Dihydropyridine drugs as Nefidipine block the Ca+2 channels of BV result in vasodilatation and reduce TPR & BP
  - Verapamil block the Ca+2 channels of cardiac cells reducing the cardiac contractility and venous return that lower the BP.
  - Diltiazem act on both muscles of the heart and BV .
  - **Clinical indications**
  - Hypertension
  - Angina (dilate coronary arteries & reduce myocardial O2 consumption)
  - PVD (Raynud's disease)
  - Arrhythmia &supraventicular tachycardia (depress SA node) Verapamil & Diltiazem