Medications Affecting Blood Pressure

- **Hypertension** A common, often asymptomatic disorder in which systolic blood pressure persistently exceeds 140 mm Hg and/or diastolic pressure exceeds 90 mm Hg.

Table 3. Classification of blood pressure for adults

Blood Pressure Classification	SBP mmHg	DBP mmHg
Normal	<120	and <80
Prehypertension	120–139	or 80–89
Stage 1 Hypertension	140–159	or 90–99
Stage 2 Hypertension	≥160	or ≥100

SBP, systolic blood pressure; DBP, diastolic blood pressure

Essential hypertension Elevated systemic arterial pressure for which no cause can be found; also called *primary* or *idiopathic hypertension*.

Secondary hypertension High blood pressure caused by another disease such as renal, pulmonary, endocrine, or vascular disease.

Orthostatic hypotension A common adverse effect of adrenergic blocking drugs involving a sudden drop in blood pressure when a person changes position, especially when rising from a seated or horizontal position.

- Blood pressure may be controlled in a variety of ways with a variety of agents that may be used alone or in combination.

The classifications of medications used to control blood pressure include:

- Thiazide diuretics
- Angiotensin-converting enzyme (ACE) inhibitors
- Angiotensin II receptor blockers (ARBS)
- Calcium channel blockers (CCB)
- Alpha adrenergic blockers
- Centrally acting alpha$_2$ agonists
- Beta adrenergic blockers
- Vasodilators

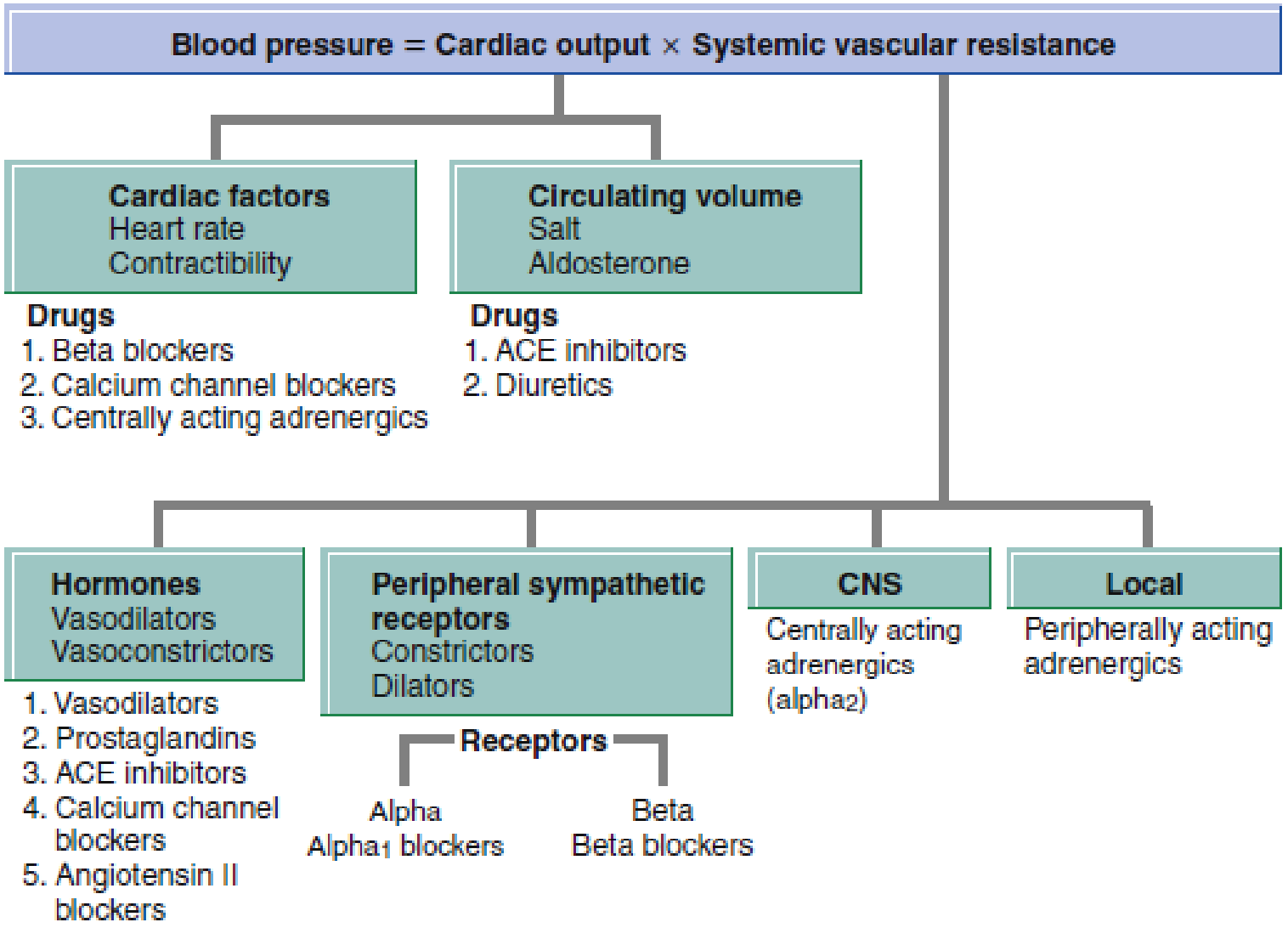

FIGURE 22-1 Normal regulation of blood pressure and corresponding medications. *ACE*, Angiotensin-converting enzyme; *CNS*, central nervous system.

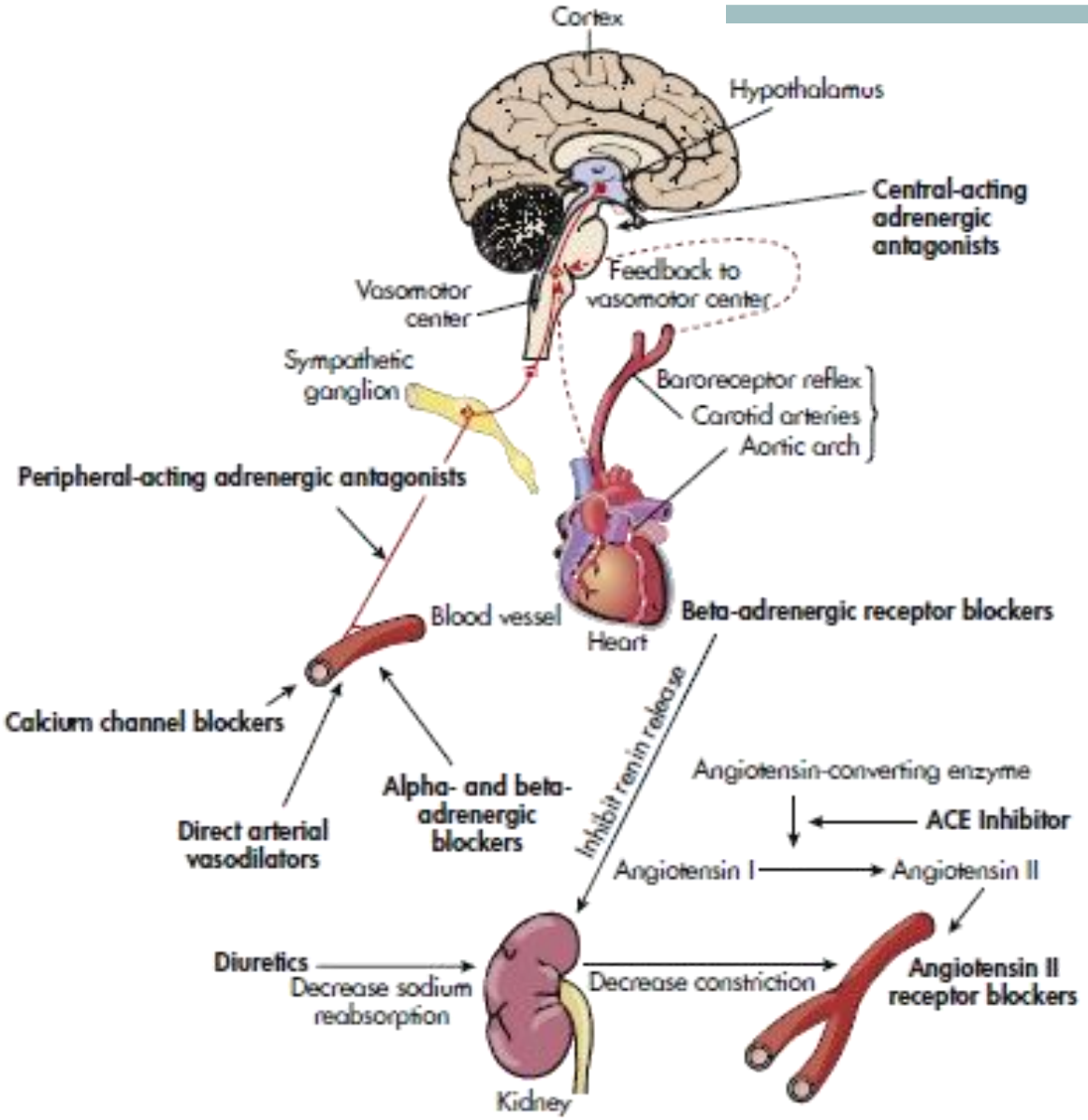

FIGURE 22-3 Site and mechanism of action of the various antihypertensive drugs. (Modified from Lewis SM et al: *Medical-surgical nursing: assessment and management of clinical problems*, ed 8, St Louis, 2011, Mosby.)

Angiotensin-Converting Enzyme (ACE) Inhibitors

Angiotensin-Converting Enzyme (ACE) Inhibitors

- Select Prototype Medication: captopril (Capoten)

Other Medications:

- Enalapril (Vasotec)
- Enalaprilat (Vasotec IV)
- Fosinopril (Monopril)
- Lisinopril (Prinivil)
- Ramipril (Altace)

Expected Pharmacological Action

ACE inhibitors produce their effects by blocking the production of angiotensin II, leading to:

1. Vasodilation (mostly arteriole)
2. Excretion of sodium and water, and retention of potassium by actions in the kidneys
3. Reduction in pathological changes in the blood vessels and heart that result from the presence of angiotensin II and aldosterone

Therapeutic Uses

- Hypertension
- Heart failure
- Myocardial infarction (To decrease mortality and to decrease risk of heart failure and left ventricular dysfunction)
- Diabetic and nondiabetic nephropathy
- For clients at high risk for a cardiovascular event, ramipril can be used to prevent MI,stroke, or death.

Side/Adverse Effects

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
First-dose orthostatic hypotension	• If the client is already taking a diuretic, the medication should be stopped temporarily for 2 to 3 days prior to the start of an ACE inhibitor. • Start treatment with a low dosage of the medication. • Monitor the client's blood pressure for 2 hr after initiation of treatment. • Instruct clients to change positions slowly and to lie down if feeling dizzy, lightheaded, or faint.
Cough related to inhibition of kinase II (alternative name for ACE) which results in increase in bradykinin	• Inform clients of the possibility of experiencing a dry cough and to notify the provider. The medication should be discontinued.
Hyperkalemia	• Monitor potassium levels to maintain a level within the expected reference range of 3.5 to 5 mEq/L. • Advise clients to avoid the use of salt substitutes containing potassium.
Rash and dysgeusia (altered taste), primarily with captopril	• Clients should inform the provider if these effects occur. • Symptoms will stop with discontinuation of the medication.

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
Angioedema	• Manifested as swelling of the tongue and oral pharynx. • Treat severe effects with subcutaneous injection of epinephrine. • Medication should be discontinued.
Neutropenia (rare but serious complication of captopril)	• Monitor the client's WBC counts every 2 weeks for 3 months, then periodically. • This condition is reversible when detected early. • Inform clients to notify the provider at the first signs of infection, (fever, sore throat) because medication should be discontinued.

Contraindications/Precautions

- These medications are Pregnancy Risk Category D during the second and third trimester, related to fetal injury.
- ACE inhibitors are contraindicated in clients with renal stenosis when present bilaterally or in a single remaining kidney.
- These medications are contraindicated in clients with a history of angioedema following use of ACE inhibitor.
- Use cautiously in clients with renal impairment and collagen vascular disease because they are at greater risk for developing neutropenia. Closely monitor these clients for signs of infection.

Interactions

MEDICATION/FOOD INTERACTIONS	NURSING INTERVENTIONS/CLIENT EDUCATION
Diuretics can contribute to first-dose hypotension.	Clients should be advised to temporarily stop taking diuretics 2 to 3 days before the start of therapy with an ACE inhibitor.
Antihypertensive medications may have an additive hypotensive effect.	Advise clients that dosage of medication may need to be adjusted if ACE inhibitors are added to the treatment regimen.
Potassium supplements and potassium-sparing diuretics increase the risk of hyperkalemia.	Clients should only take potassium supplements if prescribed by the provider. Clients should avoid salt substitutes that contain potassium.
ACE inhibitors can increase levels of lithium carbonate (Eskalith).	Monitor the client's lithium levels to avoid toxicity.
Use of NSAIDs may decrease the antihypertensive effect of ACE inhibitors.	Avoid concurrent use.

Nursing Administration

- Administer ACE inhibitors orally except enalaprilat, which is the only ACE inhibitor for IV use.
- Advise clients that the medication may be prescribed as a single formulation or in combination with hydrochlorothiazide.
- Advise clients that blood pressure has to be monitored after the first dose for at least 2 hr to detect hypotension.
- Instruct clients that captopril should be taken at least 1 hr before meals. All other ACE inhibitors can be taken with or without food.
- Advise clients to notify the provider if cough, rash, dysgeusia (lack of taste), and/or signs of infection occur.

Angiotensin II Receptor Blockers (ARB s)

- Select Prototype Medication: losartan (Cozaar)

Other Medications:

- Valsartan (Diovan)
- Irbesartan (Avapro)
- Candesartan (Atacand)
- Olmesartan (Benicar)

Expected Pharmacological Action

These medications block the action of angiotensin II in the body. This results in:

1. Vasodilation (mostly arteriole)
2. Excretion of sodium and water, and retention of potassium (through effects on the kidney)

Therapeutic Uses

- Hypertension
- Heart failure and prevention of mortality following MI
- Stroke prevention
- Delay progression of diabetic nephropathy

Side/Adverse Effects

- The major difference between ARBs and ACE inhibitors is that cough and hyperkalemia are not side effects of ARBs.

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
Angioedema	• Advise clients to observe for signs and symptoms (skin wheals, swelling of tongue) and to notify provider. • Treat severe effects with subcutaneous injection of epinephrine. • Medication should be discontinued.
Fetal injury	• Advise women of risk during the second and third trimester of pregnancy.

Contraindications/Precautions

- ARBs are contraindicated in second and third trimester related to fetal injury (Pregnancy Risk Category D).
- These medications are contraindicated in clients with renal stenosis when present bilaterally or in a single remaining kidney
- Use cautiously in clients who experienced angioedema with ACE inhibitor (not an absolute contraindication).

Interactions

MEDICATION/FOOD INTERACTIONS	NURSING INTERVENTIONS/CLIENT EDUCATION
Antihypertensive medications may have an additive effect when used with ARBs.	• Advise clients that dosage of medication may need to be adjusted if ACE inhibitors are added to the treatment regimen.

Nursing Administration

- Administer medications by oral route.
- Advise clients that medication may be prescribed as a single formulation or in combination with hydrochlorothiazide.
- Advise clients that ARBs can be taken with or without food.

Calcium Channel Blockers

Select Prototype Medications:

- Nifedipine (Adalat, Procardia)
- Verapamil (Calan)
- Diltiazem (Cardizem)

Other Medications:

- Amlodipine (Norvasc)
- Felodipine (Plendil)
- Nicardipine (Cardene, Cleviprex)

Expected Pharmacological Action

MEDICATION	EXPECTED PHARMACOLOGICAL ACTION	SITE OF ACTION AT THERAPEUTIC DOSES
Nifedipine	• Blocking of calcium channels in blood vessels leads to vasodilation of peripheral arterioles and arteries/arterioles of the heart.	• Nifedipine acts primarily on arterioles. • Veins are not significantly affected.
Verapamil, diltiazem	• Blocking of calcium channels in blood vessels leads to vasodilation of peripheral arterioles and arteries/arterioles of the heart. • Blocking of calcium channels in the myocardium, the SA node, and the AV node leads to a decreased force of contraction, a decreased heart rate, and slowing of the rate of conduction through the AV node.	• These medications act on arterioles and the heart at therapeutic doses. • Veins are not significantly affected.

Therapeutic Uses

MEDICATION	ANGINA PECTORIS	HYPERTENSION	CARDIAC DYSRHYTHMIAS (ATRIAL FIBRILLATION, ATRIAL FLUTTER, SVT)
Nifedipine	X	X	
Amlodipine	X	X	
Nicardipine	X	X	
Felodipine		X	
Verapamil, diltiazem	X	X	X

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
Nifedipine	
Reflex tachycardia	• Monitor clients for an increased heart rate. • A beta-blocker (metoprolol [Lopressor]) can be administered to counteract tachycardia.
Peripheral edema	• Inform clients to observe for swelling in lower extremities and notify the provider if this occurs. • A diuretic may be prescribed to control edema.
Acute toxicity	• With excessive doses, the heart, in addition to blood vessels, is affected. • Monitor the client's vital signs and ECG. Gastric lavage and cathartic may be indicated. • Administer medications (norepinephrine, calcium, isoproterenol, lidocaine, and IV fluids). • Have equipment for cardioversion and cardiac pacer available.

Verapamil, diltiazem	
Orthostatic hypotension and peripheral edema	• Monitor the client's blood pressure, edema, and weight daily. • Instruct clients to observe for swelling in the lower extremities, and notify the provider if it occurs. • A diuretic may be prescribed to control edema. • Instruct clients about the signs of postural hypotension (lightheadedness, dizziness). If these occur, advise clients to sit or lie down. Can be minimized by getting up slowly.
Constipation (primarily verapamil)	• Advise clients to increase intake of high fiber food and oral fluids, if not restricted.
Suppression of cardiac function (bradycardia, heart failure)	• Monitor the client's ECG, pulse rate, and rhythm. • Advise clients to observe for suppression of cardiac function (slow pulse, activity intolerance), and to notify provider if these occur. Medication may be discontinued.
Dysrhythmias (QRS complex is widened and QT interval is prolonged)	• Monitor the client's vital signs and ECG.
Acute toxicity resulting in hypotension, bradycardia, AV block and ventricular tachydysrhythmias.	• Monitor the client's vital signs and ECG. Gastric lavage and cathartic may be indicated. • Administer medications (norepinephrine, calcium, isoproterenol, lidocaine, and IV fluids). • Have equipment for cardioversion and cardiac pacer available.

Contraindications/Precautions

- Pregnancy Risk Category C
- Use cautiously with women who are lactating.
- These medications are contraindicated in clients who have heart block, hypotension, bradycardia, aortic stenosis, or severe heart failure.
- Use verapamil and diltiazem cautiously in clients receiving digoxin and beta-blockers.
- Use cautiously in older adults and clients who have kidney disorders, liver disorders, or mild to moderate heart failure.

Interactions

MEDICATION/FOOD INTERACTIONS	NURSING INTERVENTIONS/CLIENT EDUCATION
Nifedipine	
Beta-blockers, such as metoprolol (Lopressor), are used to decrease reflex tachycardia.	• Monitor clients for excessive slowing of heart rate.
Consuming grapefruit juice and nifedipine can lead to toxicity.	• Monitor clients for signs of decrease in blood pressure, increase in heart rate, and flushing. • Advise clients to avoid drinking grapefruit juice.
Verapamil, diltiazem	
Verapamil can increase digoxin (Lanoxin) levels, increasing the risk of digoxin toxicity. Digoxin can cause an additive effect and intensify AV conduction suppression.	• Digoxin levels should be monitored to maintain therapeutic range between 0.5 to 2.0 ng/mL. • Monitor vital signs for bradycardia and for signs of AV block, such as a reduced ventricular rate.
Concurrent use of beta-blockers can lead to heart failure, AV block, and bradycardia.	• Allow several hours between administration of IV verapamil (Calan) and beta-blockers.
Consuming grapefruit juice and verapamil or diltiazem can lead to toxicity.	• Monitor clients for signs of constipation, a decrease in blood pressure, a decrease in heart rate, and AV block. • Advise clients to avoid drinking grapefruit juice.

Nursing Administration

- Advise clients not to chew or crush sustained-release tablets.
- For intravenous administration, administer injections slowly over a period of 2 to 3 min.
- Advise clients who have angina to record pain frequency, intensity, duration, and location. The provider should be notified if attacks increase in frequency, intensity, and/or duration.
- Teach clients to monitor blood pressure and heart rate, as well as keep a blood pressure record.

Alpha Adrenergic Blockers (Sympatholytics)

Alpha1 blockers Drugs that primarily cause arterial and venous dilation through their action on peripheral sympathetic neurons.

- Select Prototype Medication: prazosin (Minipress)
- Other Medication: doxazosin mesylate (Cardura)

Expected Pharmacological Action

Selective alpha1 blockade results in:

- Venous and arterial dilation
- Smooth muscle relaxation of the prostatic capsule and bladder neck

Therapeutic uses

- Primary hypertension.
- Doxazosin mesylate (Cardura) may be used to decrease symptoms of benign prostatic hypertrophy (BPH), which include urgency, frequency, and dysuria.

Side/Adverse Effects

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
First-dose orthostatic hypotension	• Start treatment with low dosage of medication. • First dose may be given at night. • Monitor blood pressure for 2 hr after the initiation of treatment. • Instruct clients to avoid activities requiring mental alertness for the first 12 to 24 hr. • Instruct clients to change positions slowly and to lie down if feeling dizzy, lightheaded, or faint.

Contraindications/Precautions

- Pregnancy Risk Category C
- Contraindicated in clients with hypersensitivity to medication

Interactions

MEDICATION/FOOD INTERACTIONS	NURSING INTERVENTIONS/CLIENT EDUCATION
Antihypertensive medications may have an additive hypotensive effect	• Instruct clients to observe for signs of hypotension (dizziness, lightheadedness, faintness). • Instruct clients to lie down if these symptoms occur, and to change positions slowly.
NSAIDs and clonidine may decrease the antihypertensive effects of prazosin.	• Advise clients to avoid OTC NSAIDs.

Nursing Administration

- Obtain baseline blood pressure and heart rate.
- Instruct clients that the medication can be taken with food.
- Recommend that clients take the initial dose at bedtime to decrease “first-dose” hypotensive effect.

Centrally Acting Alpha2 Agonists

- **Centrally acting adrenergic drugs** Drugs that modify the function of the sympathetic nervous system in the brain by stimulating alpha2 receptors.
- Alpha2 receptors are inhibitory in nature and thus have a reverse sympathetic effect and cause decreased blood pressure.

- Select Prototype Medication: clonidine (Catapres)
- Other Medications: guanfacine HCl (Tenex), methyldopa (Aldomet)

Expected Pharmacological Action

- These medications act within the CNS to decrease sympathetic outflow resulting in decreased stimulation of the adrenergic receptors (both alpha and beta receptors) of the heart and peripheral vascular system.
- Decrease in sympathetic outflow to the myocardium results in bradycardia and decreased cardiac output (CO).
- Decrease in sympathetic outflow to the peripheral vasculature results in vasodilation, which leads to decreased blood pressure.

Therapeutic Uses

- Primary hypertension (administered alone, with a diuretic, or with another antihypertensive agent)
- Severe cancer pain (administered parenterally by epidural infusion)

Investigational use

- Migraine headache
- Flushing from menopause
- Management of ADHD and Tourette's syndrome
- Management of withdrawal symptoms from alcohol, tobacco, and opioids

Side/Adverse Effects

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
Drowsiness and sedation	• Drowsiness will diminish as use of medication continues. • Advise clients to avoid activities that require mental alertness until symptoms subside.
Dry mouth	• Advise clients to be compliant with medication regimen. • Reassure clients that symptoms usually resolve in 2 to 4 weeks. • Encourage clients to chew gum or suck on hard candy, and to take small amounts of water or ice chips.
Rebound hypertension	• Advise clients not to discontinue treatment without consulting the provider. • Clonidine should be discontinued gradually over the course of 2 to 4 days.

Contraindications/Precautions

- Clonidine is Pregnancy Risk Category C.
- Avoid use during lactation.
- This medication is contraindicated for clients taking anticoagulant medications
- Avoid use of transdermal patch on affected skin in scleroderma and systemic lupus erythematosus (SLE).
- Use cautiously in clients with cerebrovascular disease, recent MI, diabetes mellitus, major depressive disorder, or chronic renal failure.

Interactions

MEDICATION/FOOD INTERACTIONS	NURSING INTERVENTIONS/CLIENT EDUCATION
Antihypertensive medications may have an additive hypotensive effect.	• Instruct clients to observe for signs of hypotension (dizziness, lightheadedness, faintness). • Instruct clients to lie down if feeling dizzy, lightheaded, or faint, and change positions slowly.
Concurrent use of prazosin (Minipress), MAOIs, and tricyclic antidepressants can counteract the antihypertensive effect of clonidine.	• Monitor clients for therapeutic effect. Monitor blood pressure. Do not use concurrently.
Additive CNS depression can occur with concurrent use of other CNS depressants, such as alcohol.	• Advise clients of additive CNS depression with alcohol, and encourage clients to avoid use.

Nursing Administration

- Administer medication by oral, epidural, and transdermal routes.
- Medication is usually administered twice a day in divided doses. Take larger dose at bedtime to decrease the occurrence of daytime sleepiness.
- Transdermal patches are applied every seven days. Advise clients to apply patch on hairless, intact skin on torso or upper arm.

Beta Adrenergic Blockers (Sympatholytics)

Select Prototype Medications:

Cardioselective: Beta1

- Metoprolol (Lopressor)
- Atenolol (Tenormin)
- Metoprolol succinate (Toprol XL)
- Esmolol HCL (Brevibloc)

Nonselective: (Beta1 and Beta2)

- Propranolol (Inderal)
- Nadolol (Corgard)
- Labetalol (Normodyne)

Expected Pharmacological Action

In cardiac conditions, the primary effects of beta-adrenergic blockers are a result of beta1-adrenergic blockade in the myocardium and in the electrical conduction system of the heart.

- Decreased heart rate (chronotropic [rate] action)
- Decreased myocardial contractility (inotropic [force] action)
- Decreased rate of conduction through the AV node

Therapeutic Uses

- Primary hypertension (Exact mechanism unknown: may be related to long-term use causing reduction in peripheral vascular resistance)
- Angina, tachydysrhythmias, heart failure and myocardial infarction.

Other uses may include:

- Treatment of hyperthyroidism, migraine headache, stage fright, pheochromocytoma, and glaucoma

SIDE/ADVERSE EFFECTS

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
Beta$_1$ Blockade – metoprolol, propranolol	
Bradycardia	• Monitor the client's pulse. If below 60/min, hold medication, and notify the provider. • Use cautiously in clients with diabetes. This medication can mask tachycardia, an early sign of low blood glucose in clients with diabetes. Advise clients to monitor blood glucose to detect hypoglycemia.
Decreased cardiac output	• Use cautiously with clients in heart failure. Doses are started very low and titrated to the desired level. • Advise clients to observe for signs of worsening heart failure (shortness of breath, edema, fatigue). • The provider should be notified if symptoms occur.
AV block	• Obtain a baseline ECG and monitor.
Orthostatic hypotension	• Advise clients to sit or lie down if experiencing dizziness or faintness. • Clients should avoid sudden changes of position and rise slowly.
Rebound myocardium excitation	• The myocardium becomes sensitized to catecholamines with long-term use of beta-blockers. • Advise clients not to stop taking beta-blockers abruptly, but to follow the provider's instructions. • Use of beta-blockers should be discontinued over 1 to 2 weeks.

SIDE/ADVERSE EFFECTS

Beta$_2$ Blockade – propranolol	
Bronchoconstriction	• Avoid in clients with asthma. • Clients with asthma should be administered a beta$_1$ selective agent.
Glycogenolysis is inhibited	• Clients with diabetes rely on the breakdown of glycogen into glucose to manage low blood glucose (can happen with insulin overdose). • In addition, a decreased heart rate can further mask symptoms of impending low blood glucose level. Clients with diabetes should be administered a beta$_1$ selective agent.

Contraindications/Precautions

- Beta-adrenergic blockers are contraindicated in clients with AV block and sinus bradycardia.
- Nonselective beta-adrenergic blockers are contraindicated in clients with asthma, bronchospasm, and heart failure.
- Use cardioselective beta-adrenergic blockers cautiously in clients with heart failure, asthma, bronchospasm, diabetes, with history of severe allergies, and depression.

Interactions

MEDICATION/FOOD INTERACTIONS	NURSING INTERVENTIONS/CLIENT EDUCATION
Beta$_1$ Blockade – metoprolol, propranolol	
Calcium channel blockers (CCB): verapamil (Calan) and diltiazem (Cardizem) intensify the effects of beta-blockers • Decreased heart rate • Decreased myocardial contractility • Decreased rate of conduction through the AV node	• Monitor ECG and blood pressure. • Monitor clients closely if taking a CCB and beta-blocker concurrently. Reduce dose if needed.
Concurrent use of antihypertensive medications with beta-blockers can intensify the hypotensive effect of both medications.	• Monitor clients for a drop in blood pressure.
Beta$_2$ Blockade – propranolol	
Propranolol use can mask the hypoglycemic effect of insulin and prevent the breakdown of fat in response to hypoglycemia.	• Monitor blood glucose levels.

Nursing Administration

- Administer medications orally, usually once or twice a day.
- Administer the following medications by IV route: atenolol, metoprolol, labetalol, propranolol.
- Advise clients not to discontinue medication without consulting the provider.
- Advise clients to avoid sudden changes in position to prevent occurrence of orthostatic hypotension.
- Instruct clients not to crush or chew extended release tablets.
- Teach clients to self monitor heart rate and blood pressure at home on a daily basis.

Nursing Evaluation of Medication Effectiveness

- Absence of chest pain.
- Absence of cardiac dysrhythmias.
- Normotensive blood pressure readings.
- Control of heart failure signs and symptoms.

Medications for Hypertensive Crisis

- Select Prototype Medication: nitroprusside sodium (Nitropress)

Other Medications:

- Nitroglycerin (Nitrostat IV)
- Nicardipine (Cardene)
- Clevidipine (Cleviprex)
- Enalaprilat (Vasotec IV)
- Esmolol HCL (Brevibloc)

Expected Pharmacological Action

- Direct vasodilation of arteries and veins resulting in rapid reduction of blood pressure (decreased preload and afterload).

Therapeutic Uses

- Hypertensive emergencies

Side/Adverse Effects

SIDE/ADVERSE EFFECTS	NURSING INTERVENTIONS/CLIENT EDUCATION
Excessive hypotension	• Administer medication slowly because rapid administration will cause blood pressure to go down rapidly. • Monitor the client's blood pressure and ECG.
Cyanide poisoning (headache and drowsiness, and may lead to cardiac arrest)	• Clients who have liver dysfunction are at increased risk. • Risk of cyanide poisoning may be reduced by administering medication at a rate of 5 mcg/kg/min or less, and giving thiosulfate concurrently. Medication should be discontinued if cyanide toxicity occurs.
Thiocyanate poisoning	• This effect can be manifested as altered mental status. • Avoid prolonged use of nitroprusside. Monitor plasma levels if used for more than 3 days. Level should be maintained at less than 0.1 mg/mL.

Contraindications/Precautions

- Pregnancy Risk Category C
- Use cautiously in clients who have liver and kidney disease or fluid and electrolyte imbalances, and in older adults.

Interactions

- Nitroprusside should not be administered in the same infusion as any other medication.

Nursing Administration

- Prepare medication by adding to diluent for IV infusion.
- Note color of solution. Solution may be light brown in color. Discard solution of any other color.
- Protect IV container and tubing from light.
- Discard medication after 24 hr.
- Monitor vital signs and ECG continuously.

Nursing Evaluation of Medication Effectiveness

- Decrease in blood pressure and maintenance of normotensive blood pressure.
- Improvement of heart failure such as ability to perform activities of daily living, improved breath sounds, absence of edema.
- Improvement in renal function and delay of further progression of renal disease.

CASE STUDY

Hypertension was diagnosed in G.S., who is 30 years old. Both her mother and sister have hypertension, and both were also in their thirties when it was diagnosed.

G.'s most current blood pressure reading is 150/96 mm Hg, and for this reason the nurse practitioner has recommended therapy with captopril (Capoten), light exercise in the form of walking, and relaxation therapy. After 1 month of therapy, G.'s blood pressure is 145/86 mm Hg.

Stress reduction has been the biggest obstacle in her treatment, because she is a lawyer with a prominent law firm and has found that her blood pressure is consistently elevated (160/100 mm Hg) whenever she measures it at work. At this follow-up visit, she is also given a prescription for a diuretic to help with her blood pressure control.

1. What type of diuretic was probably prescribed for G.S. at this time? Explain your answer.
2. What possible adverse effects does G. need to be aware of while taking captopril?
3. G. tells you that she uses an over-the-counter pain reliever for occasional headaches. What potential interaction is of concern?
4. G.S. states that she and her husband are planning to start a family in 1 year. What will you, as her nurse, tell her about pregnancy and therapy with these drugs?
5. What lifestyle changes would you, as her nurse, recommend that she make, and, even more important, what information would you give her to help her change her lifestyle and more effectively reduce the stress in her life?

CASE STUDY

A 56-year-old man started antihypertensive drug therapy 3 months earlier and is in the office for a follow-up visit. While the nurse is taking his blood pressure, he informs the nurse that he has had some problems with sexual intercourse. Which would be the most appropriate response by the nurse?

A. “Not to worry. Eventually, tolerance will develop.”
B. “The physician can work with you on changing the dose and/or drugs.”
C. “Sexual dysfunction happens with this therapy, and you will learn to accept it.”
D. “This is an unusual occurrence, but it is important to stay on your medications.”

DOSAGES

Selected Antihypertensive Drugs: Adrenergic Agonists and Antagonists

DRUG (PREGNANCY CATEGORY)	PHARMACOLOGIC CLASS	USUAL DOSAGE RANGE	INDICATIONS/USES
carvedilol (Coreg) (C)	Peripherally acting alpha$_1$, beta$_1$, and beta$_2$ receptor antagonist (blocker)	PO: 3.125-25 mg bid	Hypertension (also used in heart failure)
♦ clonidine (Catapres, Catapres-TTS) (C)	Centrally acting alpha$_2$ receptor agonist	PO: 0.2-0.6 mg/day Transdermal patch: 0.1, 0.2, or 0.3 mg/24 hr, applied weekly	Hypertension (may have other unlabeled uses including treatment of psychiatric, cardiovascular, and gastrointestinal problems)
doxazosin (Cardura) (C)	Peripherally acting alpha$_1$ receptor antagonist	PO: Initial dose 1 mg/day; may titrate up to maximum of 16 mg/day	Hypertension

DOSAGES

Selected Antihypertensive Drugs: ACE Inhibitors and Angiotensin II Receptor Blockers

DRUG (PREGNANCY CATEGORY)	PHARMACOLOGIC CLASS	USUAL DOSAGE RANGE	INDICATIONS
♦ captopril (Capoten) (C, first trimester; D, second and third trimesters)	ACE inhibitor	**Adult** PO: 25-150 mg bid-tid	Hypertension, heart failure
enalapril (Vasotec) (C, first trimester; D, second and third trimesters)	ACE inhibitor	**Adult** PO: 10-40 mg/day as a single dose or in 2 equal doses PO: 2.5-20 mg bid IV: 1.25-5 mg q6h over a 5-min period	Hypertension Heart failure Hypertension
♦ losartan (Cozaar) (C, first trimester; D, second and third trimesters)	Angiotensin II receptor blocker	**Adult** PO: 25-100 mg as a single dose or divided bid	Hypertension, heart failure

ACE, Angiotensin-converting enzyme; *IV,* intravenous; *PO,* oral.

DOSAGES

Selected Antihypertensive Drugs: Vasodilators

DRUG (PREGNANCY CATEGORY)	PHARMACOLOGIC CLASS	USUAL DOSAGE RANGE	INDICATIONS
♦ hydralazine (Apresoline) (C)	Direct-acting peripheral vasodilators	**Pediatric** PO: 0.75-7.5 mg/kg/day to a max of 200 mg/day **Adult** PO: 10-25 mg 2-4 times/day × 7 days, then increase to 50 mg bid-qid. Titrate to effect to max dose of 300 mg/day IV: 20-40 mg prn	Hypertension
sodium nitroprusside (Nipride, Nitropress) (C)		**Pediatric and adult** IV: 0.3-0.5 mcg/kg/min, titrate to desired effect. Max of 10 mcg/kg/min	

IV, Intravenous; *PO,* oral.

DOSAGES

Miscellaneous Antihypertensive Drugs

DRUG (PREGNANCY CATEGORY)	PHARMACOLOGIC CLASS	USUAL DOSAGE RANGE	INDICATIONS
bosentan (Tracleer) (X)	Endothelin receptor antagonist	**Adult only** PO: 62.5 mg bid	Pulmonary artery hypertension in patients with moderate to severe heart failure
eplerenone (Inspra) (B)	Aldosterone receptor antagonist	**Adult only** PO: Initial dose of 50 mg once/day ×4 wk, then increase as tolerated to max dose of 50 mg bid	Hypertension and post-MI status (to improve post-MI survival in patients with stable heart failure)
treprostinol (Remodulin) (B)	Vasodilator and platelet aggregation inhibitor	**Adult only** Continuous subcutaneous infusion: 1.25-2.5 ng/kg/min	Pulmonary artery hypertension in patients with severe heart failure

MI, Myocardial infarction; *PO,* oral.