



## Cardiovascular Meds

N231 Nursing Pharmacology

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### Objectives

- › Identify pharmacokinetics, pharmacodynamics, and physiology:
  - Cardiac glycosides
  - Antianginal
  - Antiarrhythmic agents
  - **Antihypertensive meds**
- › Identify characteristics of cardiac meds
- › Define inotropic, chronotropic, and dromotropic
- › Discuss effects on the failing heart
- › Explain digitalizing process
- › Discuss effects of antianginal on the chest pain
- › Identify significant drugs, laboratory findings associated with positive inotropic drugs

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### Introduction

- › Cardiovascular systems consists of the heart, blood vessels and circulating blood.
- › The system (heart) pumps blood to body tissues and distributes nutrients and oxygen.
- › Drugs that act on the system are used to correct congestive heart failure, pulmonary oedema, hypertension and hypotension.

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### Cardiovascular Disease And Drugs

- › Basic cardiovascular physiology and pathology depends on the control of the:
  - heart rate, cardiac output, blood pressure, blood flow, ionic composition, RAAS, vascular endothelium, regulation of tissue perfusion, hypertension, dyslipidemias, atherosclerosis, blood clotting, ischemic heart disease, cardiomyopathies, cardiac arrhythmias and cardiac failure.
- › Cardiovascular drugs:
  - **cardiac glycosides, antianginal, antiarrhythmic, b blockers, calcium channel blockers, potassium channel blockers**

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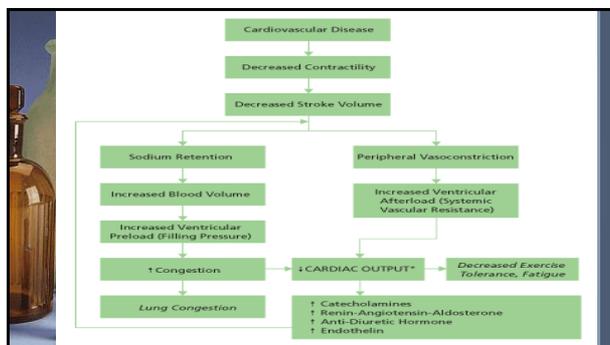
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### Heart Failure

- › Heart failure
  - › Pathophysiology
    - › Preload
    - › Afterload
  - › Right-sided
    - › Blood backs up in periphery
  - › Left-sided
    - › Blood backs up in lungs

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**ACC/AHA Stages of Heart Failure**

<b>Stages</b>	<b>Characteristics</b>
1 (A)	High risk for HF without symptoms or structural disease
2 (B)	Some levels of cardiac changes (e.g., decrease ejection fraction without symptoms of heart failure)
3 (C)	Structural heart disease with symptoms of HF (e.g., fatigue, SOB, edema, decreased physical activity)
4 (D)	Severe structural heart disease and marked symptoms of HF at rest

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**Heart Failure (Cont.)**

- › Non-pharmacologic treatment
  - Limit salt intake.
  - Limit or avoid alcohol intake.
  - Stop smoking.
  - Decrease saturated fat intake.
  - Perform mild exercise as possible.
- › Laboratory tests
  - Atrial natriuretic peptide (ANP)–20 to 77 pg/mL; 20 to 77 ng/L (SI units)
  - Brain natriuretic peptide (BNP)–Desired value: less than 100 pg/mL; positive value: greater than 100 pg/mL

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**Cardiac Glycosides**

- › Digitalis preparations (digoxin)
  - Actions
    - › Positive inotropic
      - Increases myocardial contractility
    - › Negative chronotropic
      - Decreases heart rate
    - › Negative dromotropic
      - Decreases conduction
    - › Increase stroke volume
      - Increases cardiac output

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**Cardiac Glycosides (Cont.)**

- › Atrial fibrillation
- › Atrial flutter
- › Other drugs used if digoxin not effective:
  - Calcium channel blocker: verapamil (Calan)
  - Warfarin (Coumadin)

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**Cardiac Glycosides (Cont.)**

- › Digoxin
  - › Drug interactions
    - › Diuretics
    - › Glucocorticoids
    - › Antacids
    - › Herbal interactions
    - › Hypokalemia
  - › Digitalis toxicity
    - › Anorexia, diarrhea, nausea and vomiting, bradycardia, premature ventricular contractions, cardiac dysrhythmias, headaches, malaise, blurred vision, visual illusions, confusion, and delirium

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**Cardiac Glycosides (Cont.)**

- › Antidote for digitalis toxicity: digoxin immune Fab (ovine, Digibind)
- › Treatment cardiotoxicity
  - › Phenytoin
  - › Lidocaine

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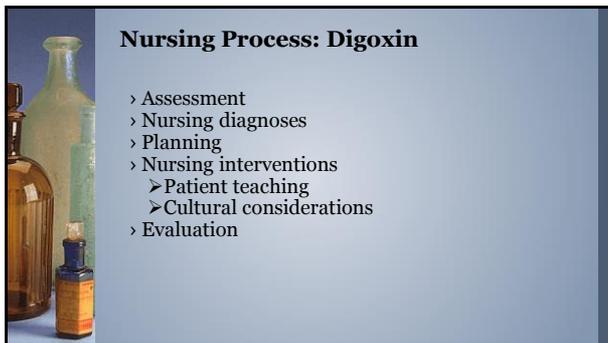
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**Nursing Process: Digoxin**

- › Assessment
- › Nursing diagnoses
- › Planning
- › Nursing interventions
  - › Patient teaching
  - › Cultural considerations
- › Evaluation

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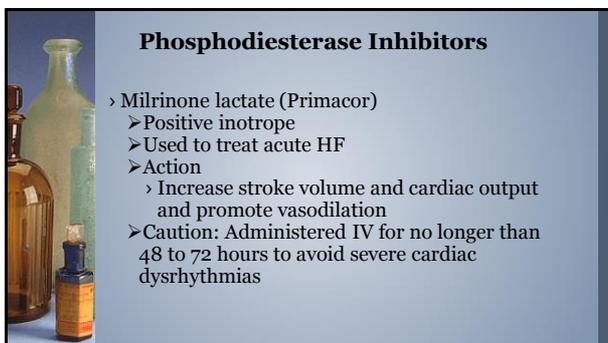
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**Phosphodiesterase Inhibitors**

- › Milrinone lactate (Primacor)
  - › Positive inotrope
  - › Used to treat acute HF
  - › Action
    - › Increase stroke volume and cardiac output and promote vasodilation
  - › Caution: Administered IV for no longer than 48 to 72 hours to avoid severe cardiac dysrhythmias

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**Other Agents Used to Treat Heart Failure**

- › Vasodilators
- › Angiotensin-converting enzyme (ACE) inhibitors
- › Angiotensin II receptor antagonists
- › Diuretics (thiazides, furosemide), spironolactone (Aldactone)
- › Some beta blockers

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**Vasodilators**

- › Decrease venous blood return to the heart
- › Decrease preload
- › Decrease oxygen demand on the heart
- › Arteriolar dilators
  - › Reduce cardiac afterload
  - › Improve renal perfusion
  - › Improve circulation to skeletal muscles

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**ACE Inhibitors and ARBs**

- › ACE inhibitors
  - › Dilate venules and arterioles, improving renal blood flow and decreasing blood fluid volume
  - › Decrease release of aldosterone
- › Angiotensin II receptor blocker (ARB) agents
  - › Valsartan (Diovan) and candesartan (Atacand) approved for HF in patients who cannot tolerate an ACE inhibitor.

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**Diuretics**

- › First-line drug treatment for reducing fluid volume
- › Spironolactone (Aldactone)
  - Blocks production of aldosterone; improves heart rate variability; decreases myocardial fibrosis cardioprotective effect of blocking aldosterone in the heart and blood vessels to promote cardiac remodeling

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**Beta Blockers**

- › Carvedilol (Coreg)
- › Metoprolol tartrate (Toprol-XL)
- › Bisoprolol (Zebeta)
- › Doses should be low initially and gradually increased.
- › Beneficial effect: 1 to 3 months

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**Atrial Natriuretic Peptide**

- › Nesiritide (Natrecor)
  - Inhibits antidiuretic hormone (ADH) by increasing urine sodium loss
  - Promotes vasodilation, natriuresis, and diuresis
  - Used for treatment of acute decompensated HF with dyspnea at rest, dyspnea with little physical exertion

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**BiDil**

- › Combination of hydralazine (for blood pressure) and isosorbide dinitrate (a dilator to relieve heart pain)
- › FDA approval for treating HF, especially in African Americans

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**Angina**

- › Classic (stable): Occurs with predictable stress or exertion
- › Unstable (preinfarction): Occurs frequently with progressive severity unrelated to activity; unpredictable regarding stress/exertion and intensity
- › Variant (Prinzmetal, vasospastic): Occurs during rest

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**Types of Antianginal Drugs**

- › Nitrates: reduction of venous tone, decreased workload of the heart, vasodilation
- › Beta blockers: decrease the workload of the heart and decrease oxygen demands
- › Calcium channel blockers: decrease the workload of the heart and decrease oxygen demands

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**Nitrates**

- › First agents used to relieve angina
- › Action: Generalized vascular and coronary vasodilation
- › Side effects and adverse reactions: Headache, hypotension, dizziness, weakness, and faintness
- › Sublingual, topical (ointment, transdermal patch), buccal extended-release tablet, oral extended-release capsule and tablet, aerosol spray (inhalation), and IV

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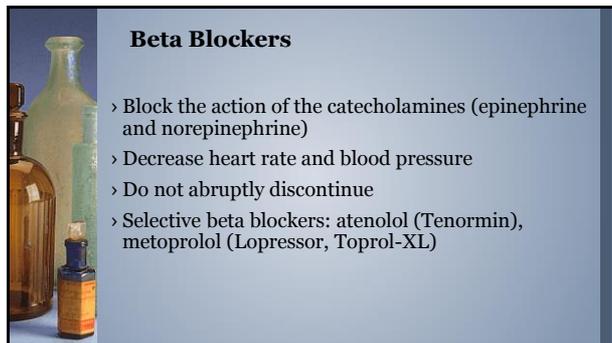
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**Beta Blockers**

- › Block the action of the catecholamines (epinephrine and norepinephrine)
- › Decrease heart rate and blood pressure
- › Do not abruptly discontinue
- › Selective beta blockers: atenolol (Tenormin), metoprolol (Lopressor, Toprol-XL)

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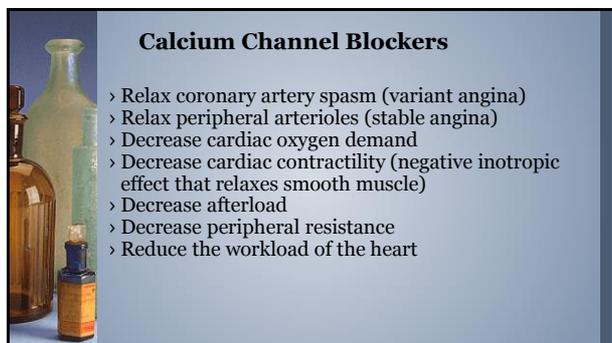
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**Calcium Channel Blockers**

- › Relax coronary artery spasm (variant angina)
- › Relax peripheral arterioles (stable angina)
- › Decrease cardiac oxygen demand
- › Decrease cardiac contractility (negative inotropic effect that relaxes smooth muscle)
- › Decrease afterload
- › Decrease peripheral resistance
- › Reduce the workload of the heart

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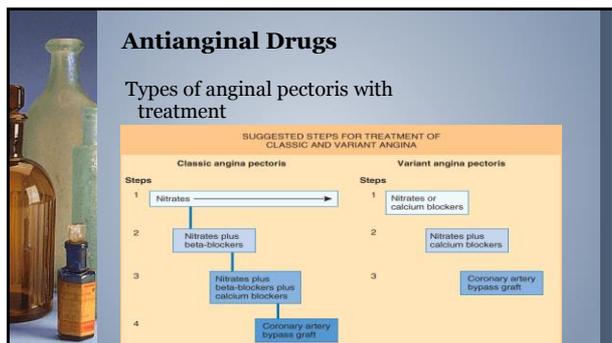
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**Antianginal Drugs**

Types of anginal pectoris with treatment

SUGGESTED STEPS FOR TREATMENT OF CLASSIC AND VARIANT ANGINA

Steps	Classic angina pectoris	Variant angina pectoris
1	Nitrates	Nitrates or calcium blockers
2	Nitrates plus beta-blockers	Nitrates plus calcium blockers
3	Nitrates plus beta-blockers plus calcium blockers	Coronary artery bypass graft
4	Coronary artery bypass graft	

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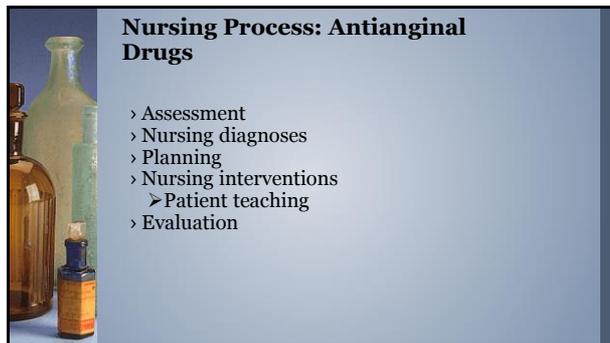
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**Nursing Process: Antianginal Drugs**

- › Assessment
- › Nursing diagnoses
- › Planning
- › Nursing interventions
  - Patient teaching
- › Evaluation

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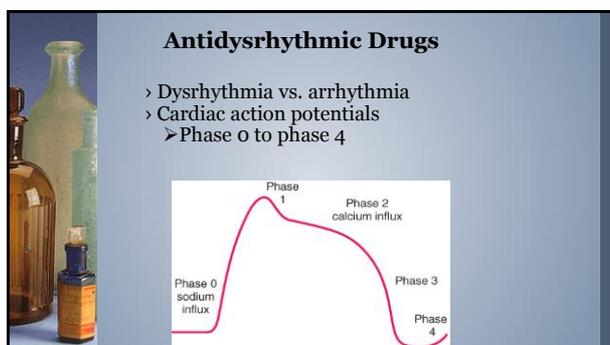
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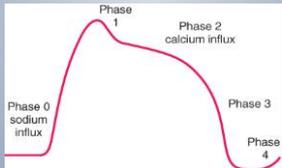
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**Antidysrhythmic Drugs**

- › Dysrhythmia vs. arrhythmia
- › Cardiac action potentials
  - Phase 0 to phase 4



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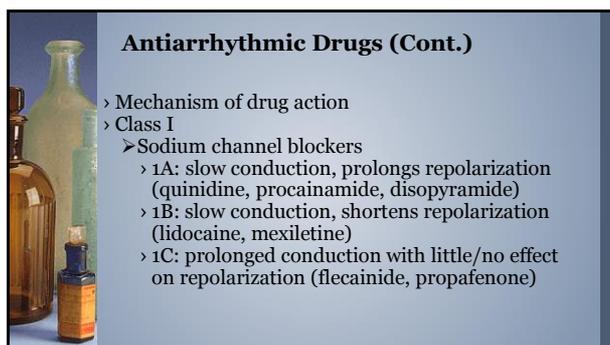
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**Antiarrhythmic Drugs (Cont.)**

- › Mechanism of drug action
- › Class I
  - Sodium channel blockers
    - › 1A: slow conduction, prolongs repolarization (quinidine, procainamide, disopyramide)
    - › 1B: slow conduction, shortens repolarization (lidocaine, mexiletine)
    - › 1C: prolonged conduction with little/no effect on repolarization (flecainide, propafenone)

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**Antidysrhythmic Drugs (Cont.)**

- › Class II
  - Beta-adrenergic blockers
  - Reduce calcium entry, decrease conduction velocity, automaticity, and recovery time
  - Propranolol (Inderal)
  - Acebutolol (Sectral)
  - Esmolol (Brevibloc)
  - Sotalol (Betapace)

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**Antiarrhythmic Drugs (Cont.)**

- › Class III
  - Prolong repolarization
  - Amiodarone (Cordarone)
- › Class IV
  - Block calcium influx (calcium channel blockers)
  - Verapamil (Calan, Isoptin)
  - Diltiazem (Cardizem)

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**Nursing Process: Anti-arrhythmic**

- › Assessment
- › Nursing diagnoses
- › Planning
- › Nursing interventions
  - Patient teaching
- › Evaluation

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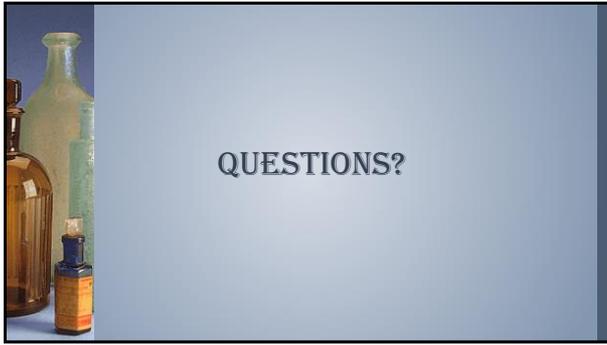
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