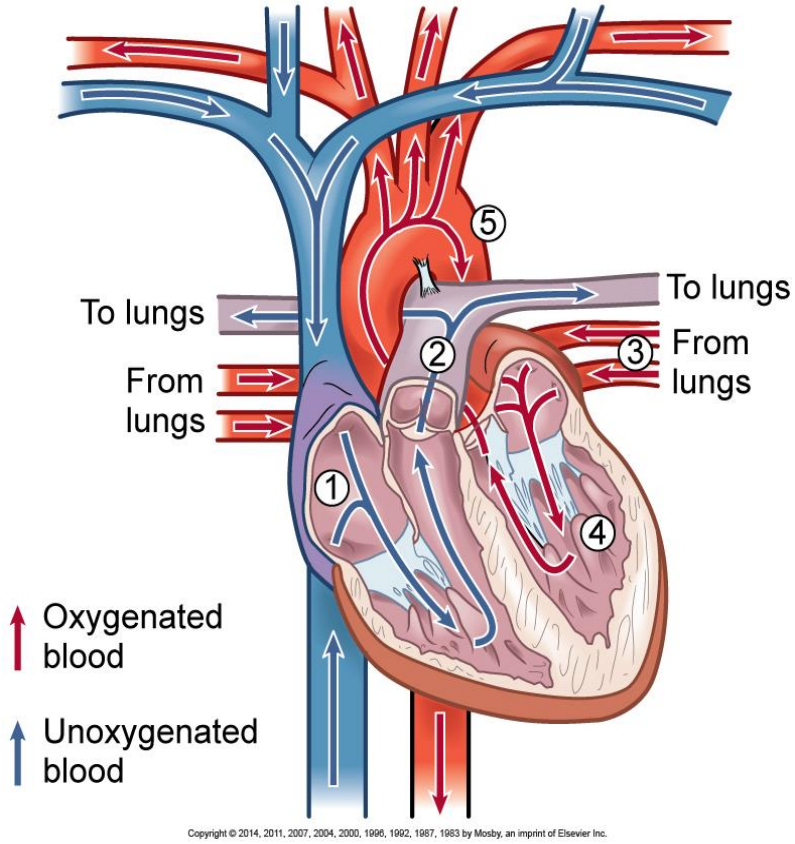
LUCENT NCLEX REVIEW

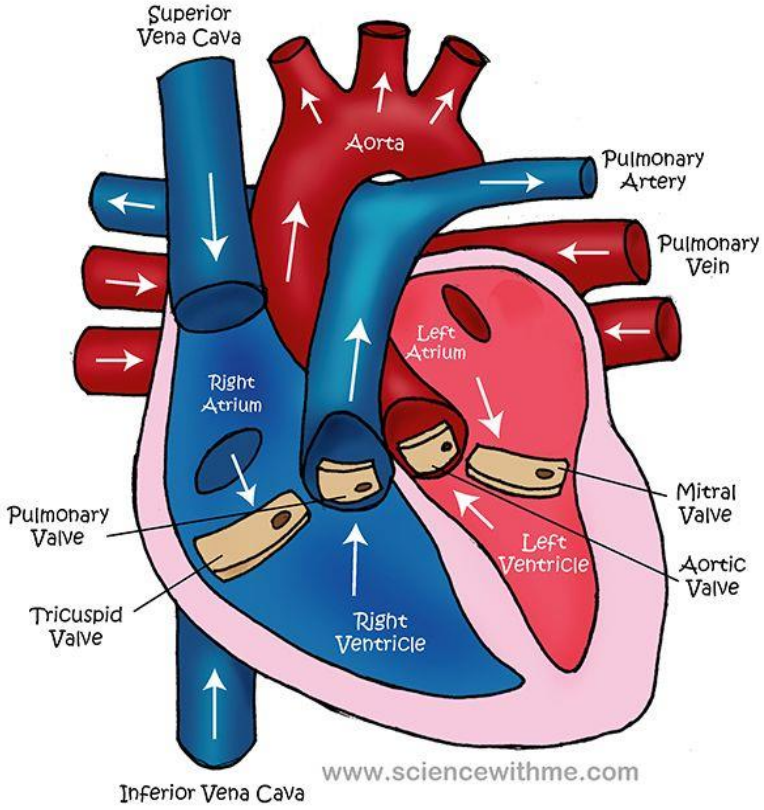
CARDIOVASCULAR I

Structures and Functions of Cardiovascular System

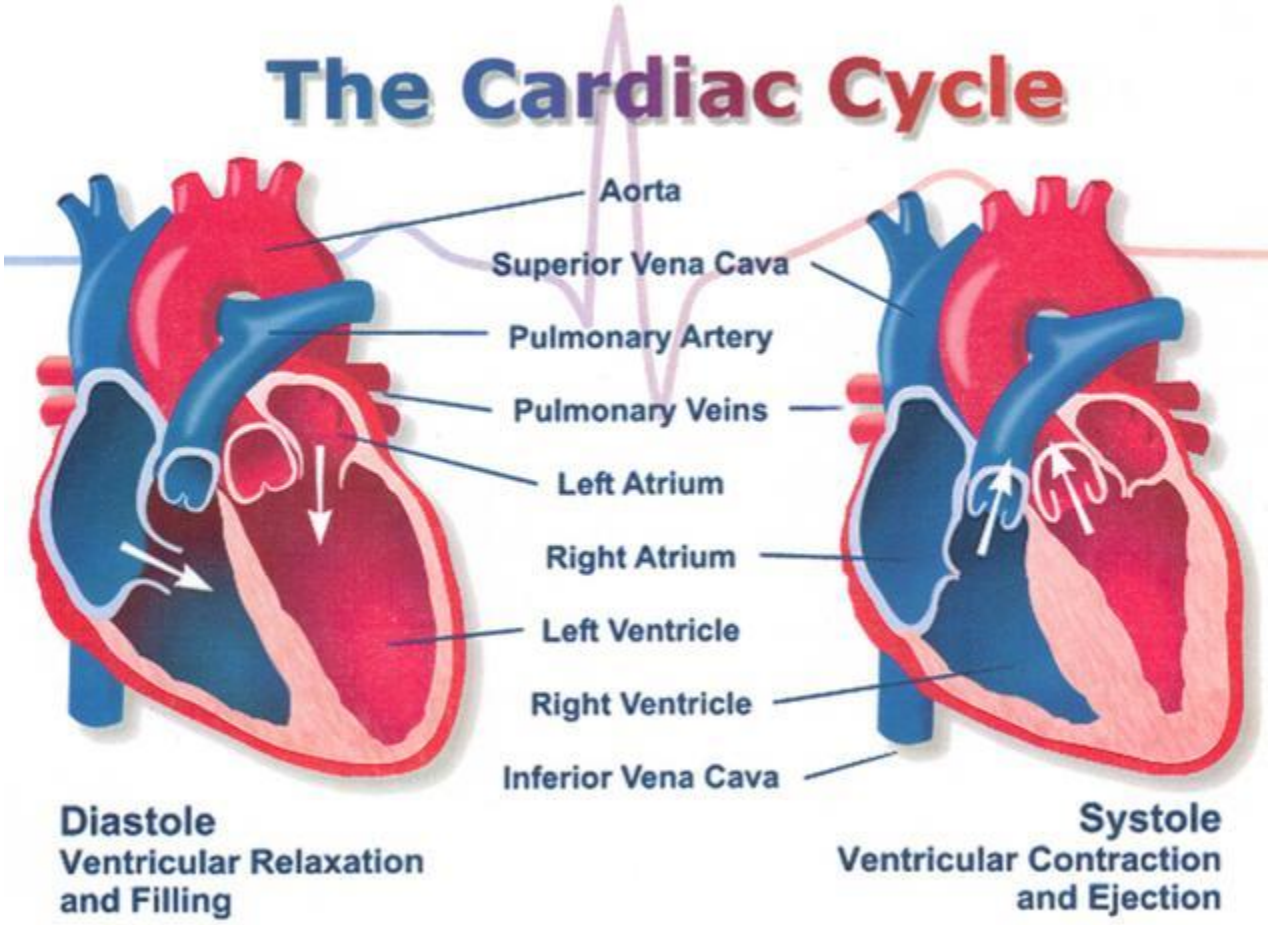
- Heart
  - Four chambers
  - Composed of three layers
    - Endocardium
    - Myocardium
    - Epicardium
  - Pericardium
  - Left ventricular wall 2-3 times thicker than right

Blood Flow Through the Heart





Systole and Diastole



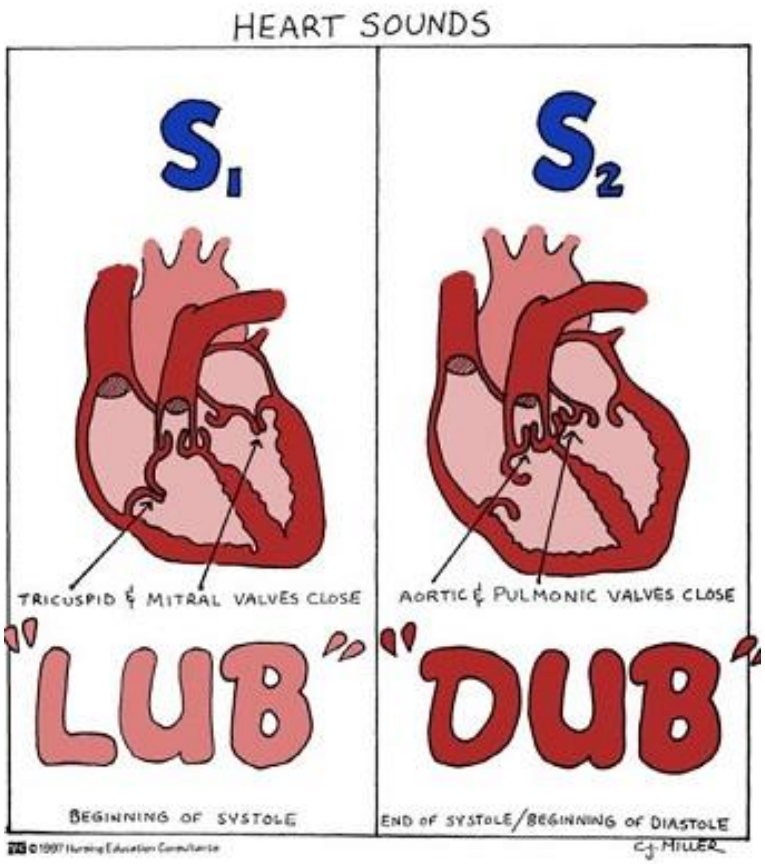
Mechanical System

- ***Systole*: Contraction of myocardium**
- ***Diastole*: Relaxation of myocardium**
- ***Stroke volume:* Amount of blood ejected with each heart beat**

Heart Sounds

- The normal heart sounds are S1 & S2.
- In S1, the tricuspid and mitral valves close, leading to the "LUB" sound. That is the beginning of systole.
- In S2, the aortic and pulmonary valves close leading to the "DUB" sound. That is the end of systole and the beginning of diastole.

Heart Sounds

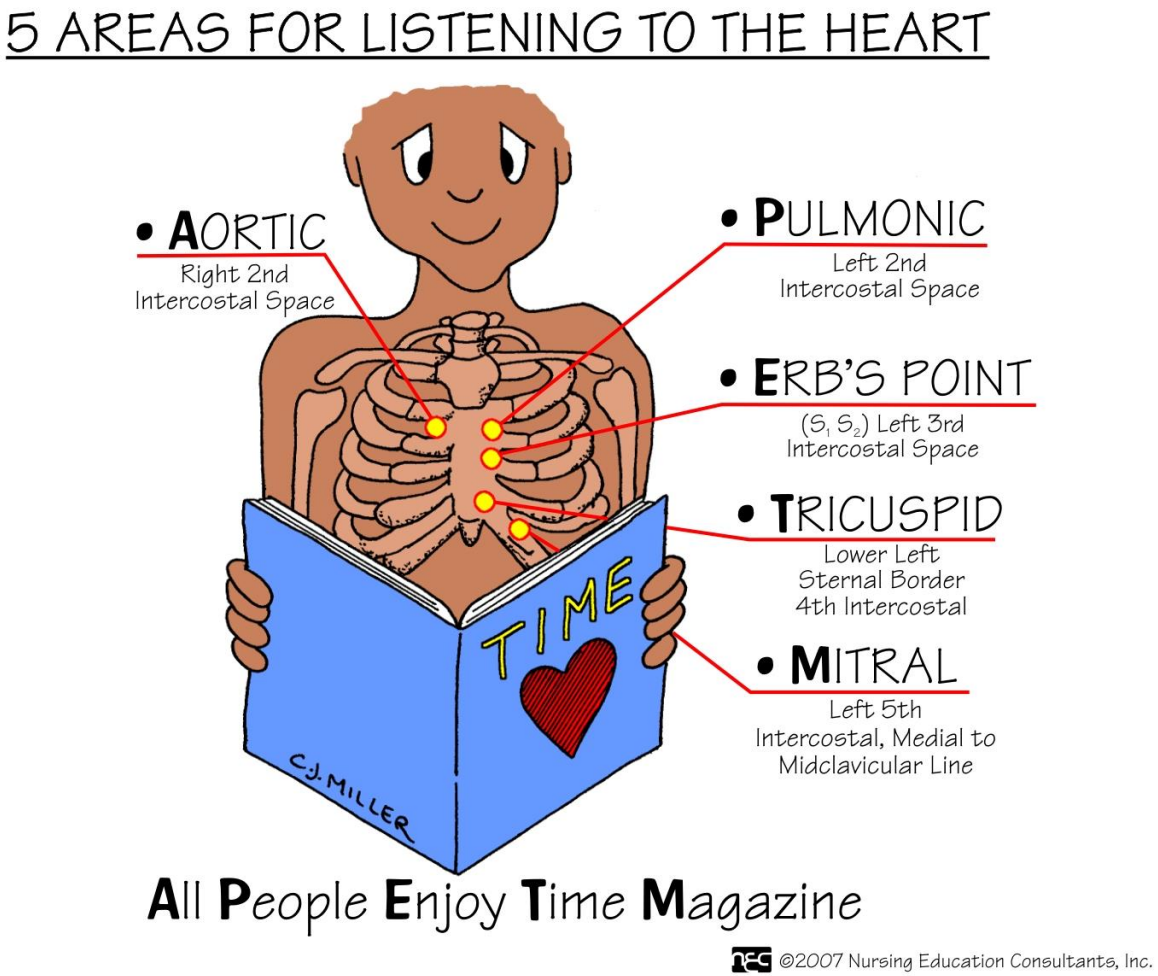


Comparing the 3rd and 4th heart sounds

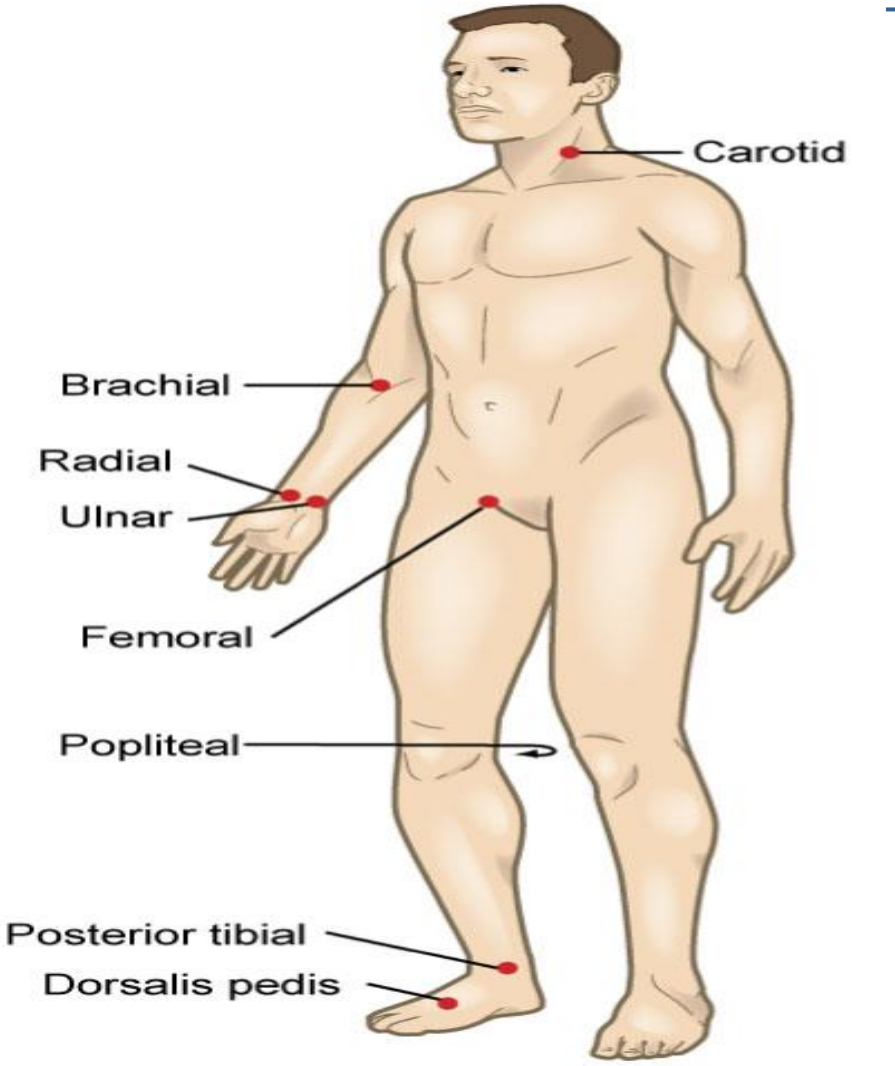
LearnTheHeart.com

S3 - "ventricular gallop"	S4 - "atrial gallop"
Occurs in early diastole	Occurs in late diastole
Occurs during passive LV filling	Occurs during active LV filling
May be normal at times	Almost always abnormal
Requires a very compliant LV	Requires a non-compliant LV
Can be a sign of systolic CHF	Can be a sign of diastolic CHF

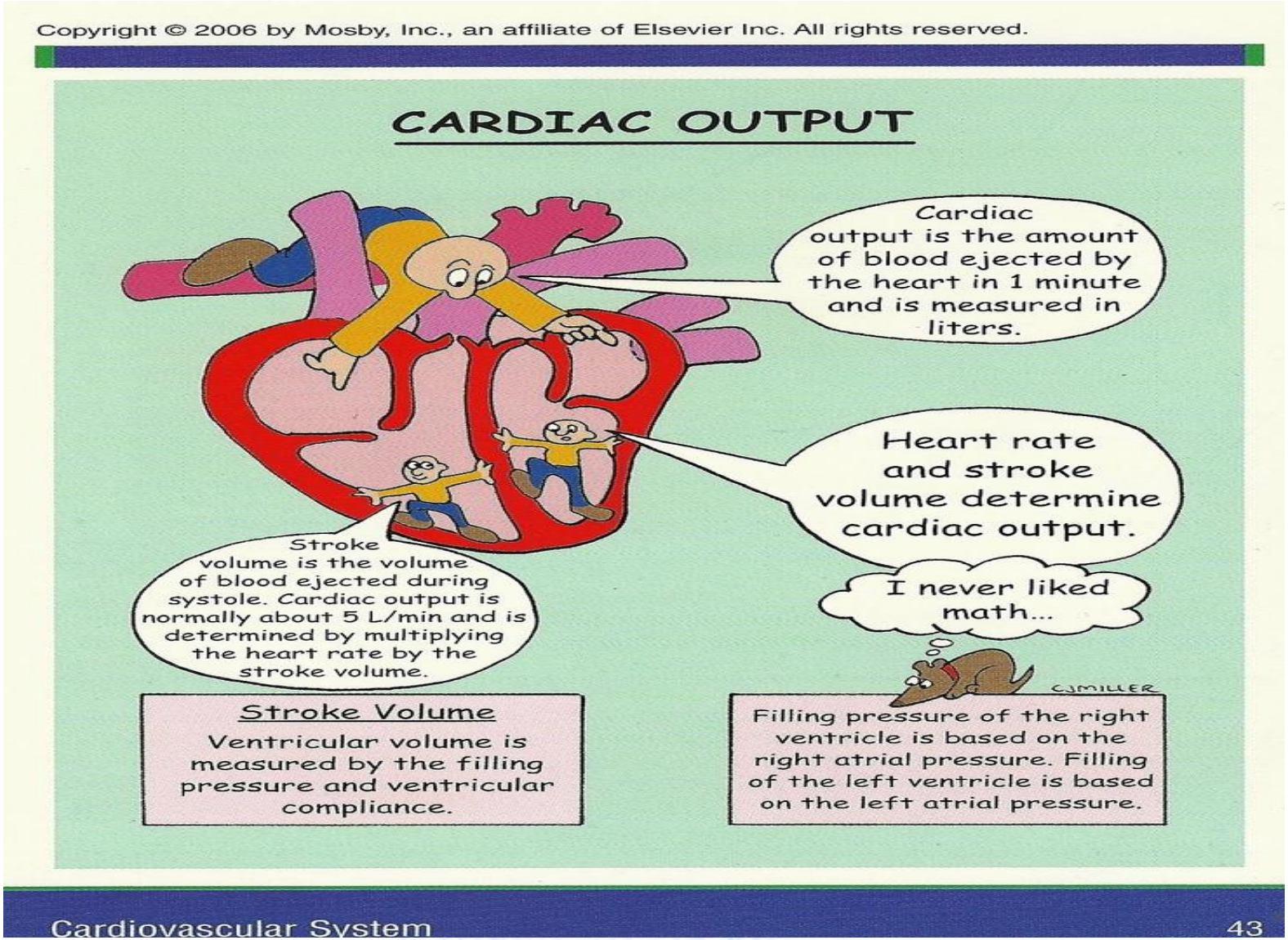
Heart Sounds



8 Common Sites for Palpating Arteries

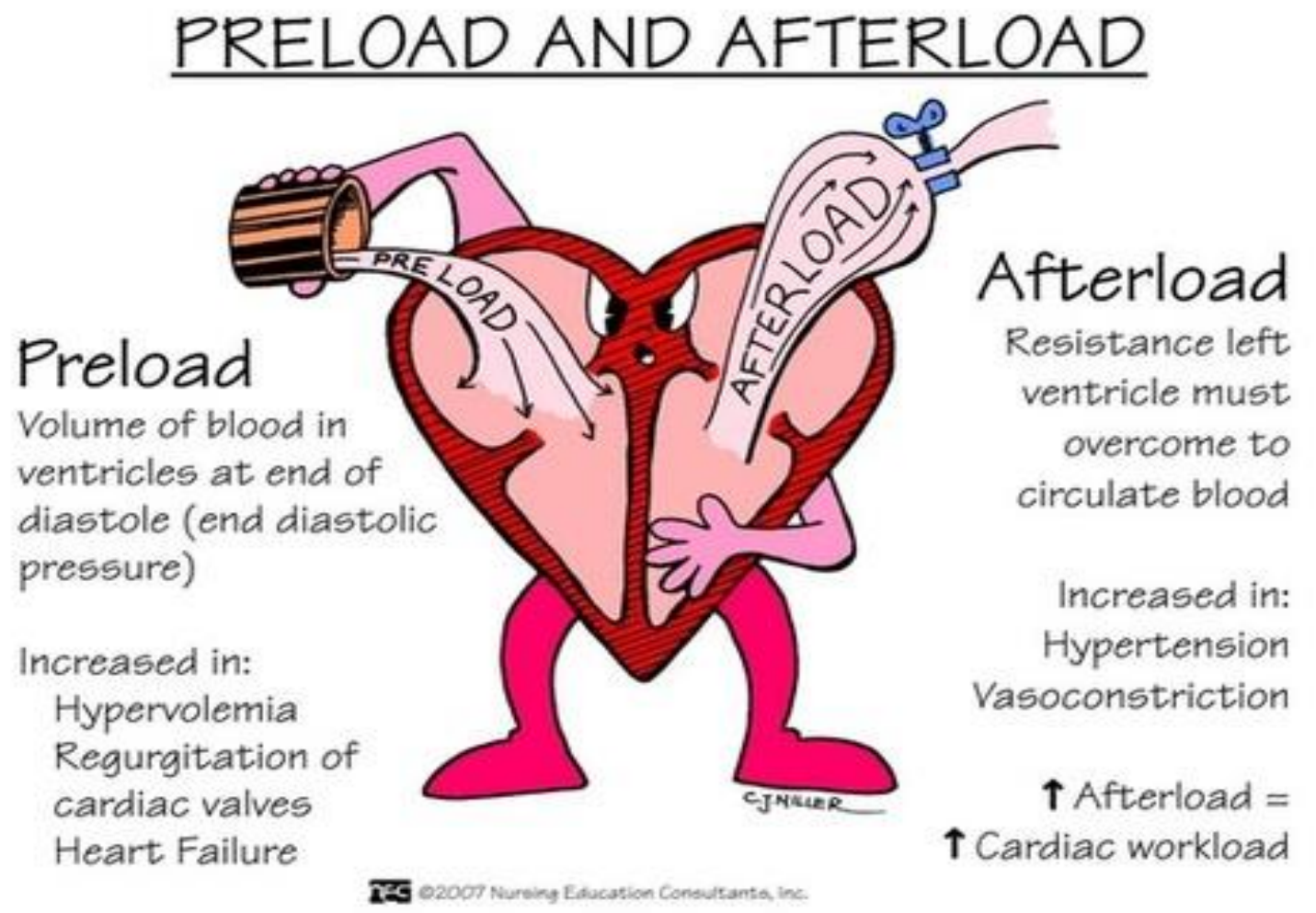


Mechanical System/Cardiac Output



CO = HR x Stroke Volume

Factors Affecting Cardiac Output



Pathophysiology of decreased CO

- Mostly originates from the left ventricles
- If your CO is decreased you will perfuse poorly
  - Brain: LOC will go down
  - Heart: Client complains of chest pain
  - Lungs: SOB and wet lung sounds
  - Skin: Cold and clammy
  - Kidneys: Urine output goes down
  - Peripheral pulses: Weak

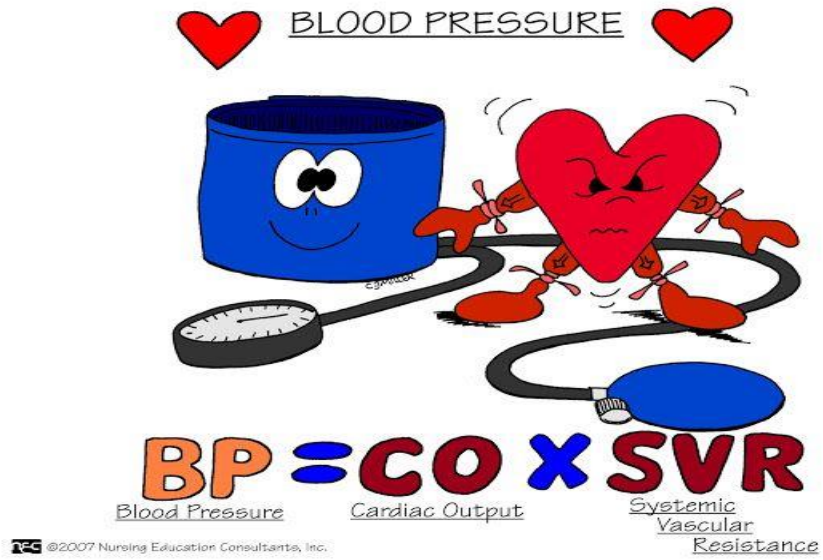
Audience Response Question

A patient is receiving a drug that decreases afterload. To evaluate the patient's response to this drug, what is most important for the nurse to assess?

a. Heart rate
b. Lung sounds
c. Blood pressure
d. Jugular venous distention

Structures and Functions of Cardiovascular System

- Blood pressure
- Systolic blood pressure (SBP)
  - < 120 mm Hg
- Diastolic blood pressure (DBP)
  - < 80 mm Hg
- BP = CO x SVR



Structures and Functions of Cardiovascular System

- Pulse pressure
- Mean arterial pressure

Mean Arterial Pressure

MAP is the average arterial pressure during a cardiac cycle

MAP is considered to be the perfusion pressure seen by organs in the body

MAP that is > 60 mmHg is enough to sustain the organs of the average person

If MAP is < 60 mmHg, then the organs are not being adequately perfused and they will become ischemic

$$MAP \simeq \frac{(2 \times DP) + SP}{3}$$

Diagnostic Studies of Cardiovascular System

- **Cardiac Biomarkers (Enzymnes)**
  - **Troponin:** *Elevates with 3-4 hours and remains increased for up to 3 weeks*
    - Troponin T <0.10 ng/ml
    - Troponin I <0.03 ng/ml
  - **Creatine Kinase (CK-MB**
    - Increased with damaged to cardiac cells
    - Elevates in 3-12 hours and peaks in 24 hrs
  - **Myoglobin**
    - Increase within 1 hr and peaks in 12 hrs
    - Negative results are a good thing

Diagnostic Studies of Cardiovascular System

- **Additional blood studies**
  - **C-Reactive protein**
    - Marker for inflammation
    - Risk factor for coronary artery disease (CAD)
  - **Homocysteine**
    - Elevated levels increased risk for CAD, peripheral vascular disease (PVD), and stroke

Diagnostic Studies of Cardiovascular System

- **Additional blood studies**
  - Cardiac natriuretic peptide markers
    - Three types
      - Atrial natriuretic peptide (ANP)
      - B-type natriuretic peptide (BNP)
    - Increased levels of BNP levels signify heart failure.

Diagnostic Studies of Cardiovascular System

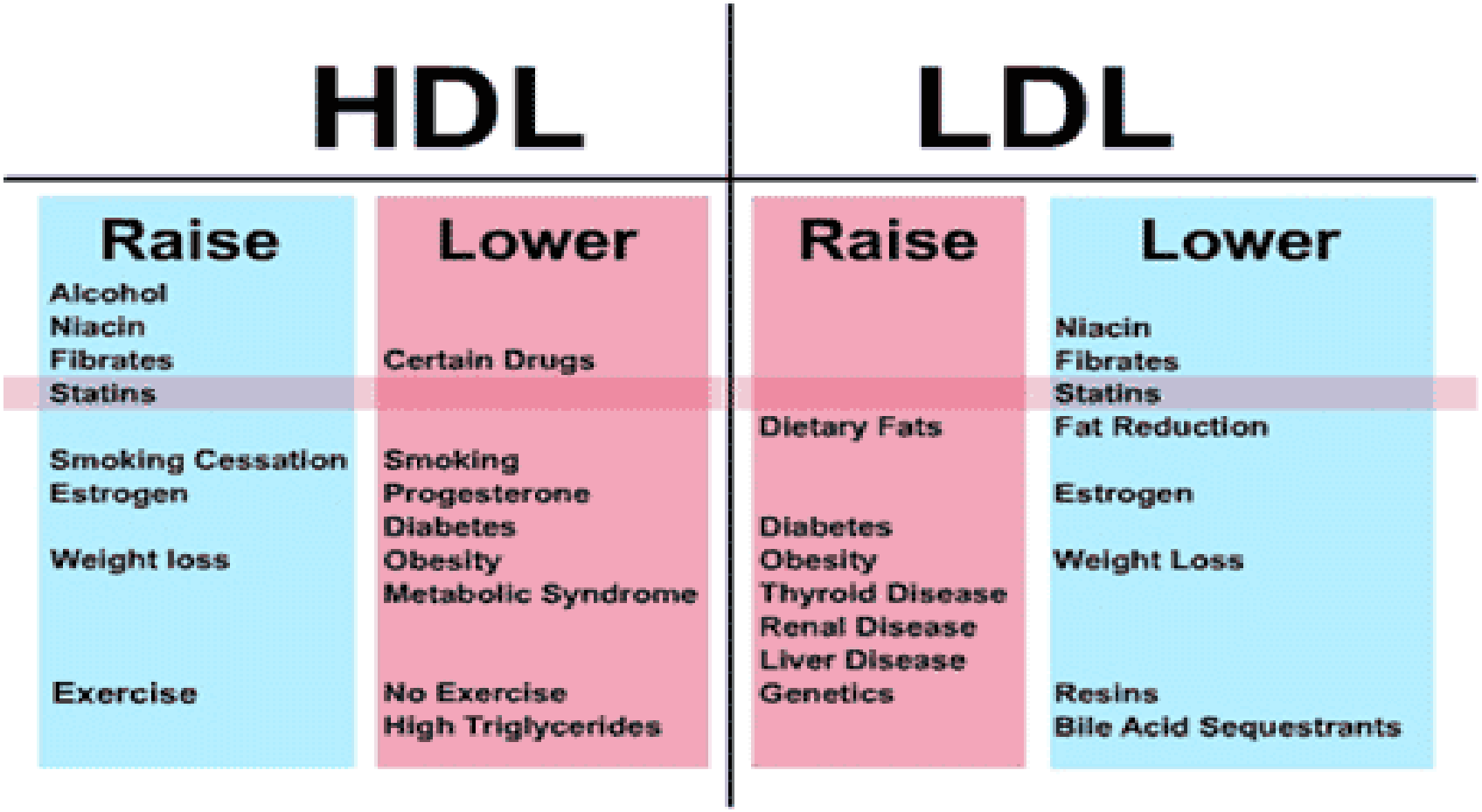
- **Serum Lipids**
  - Triglycerides
  - Cholesterol
  - Phospholipids
- **Lipoprotein**
  - Lipids must bind to protein to circulate in blood.

Diagnostic Studies of Cardiovascular System

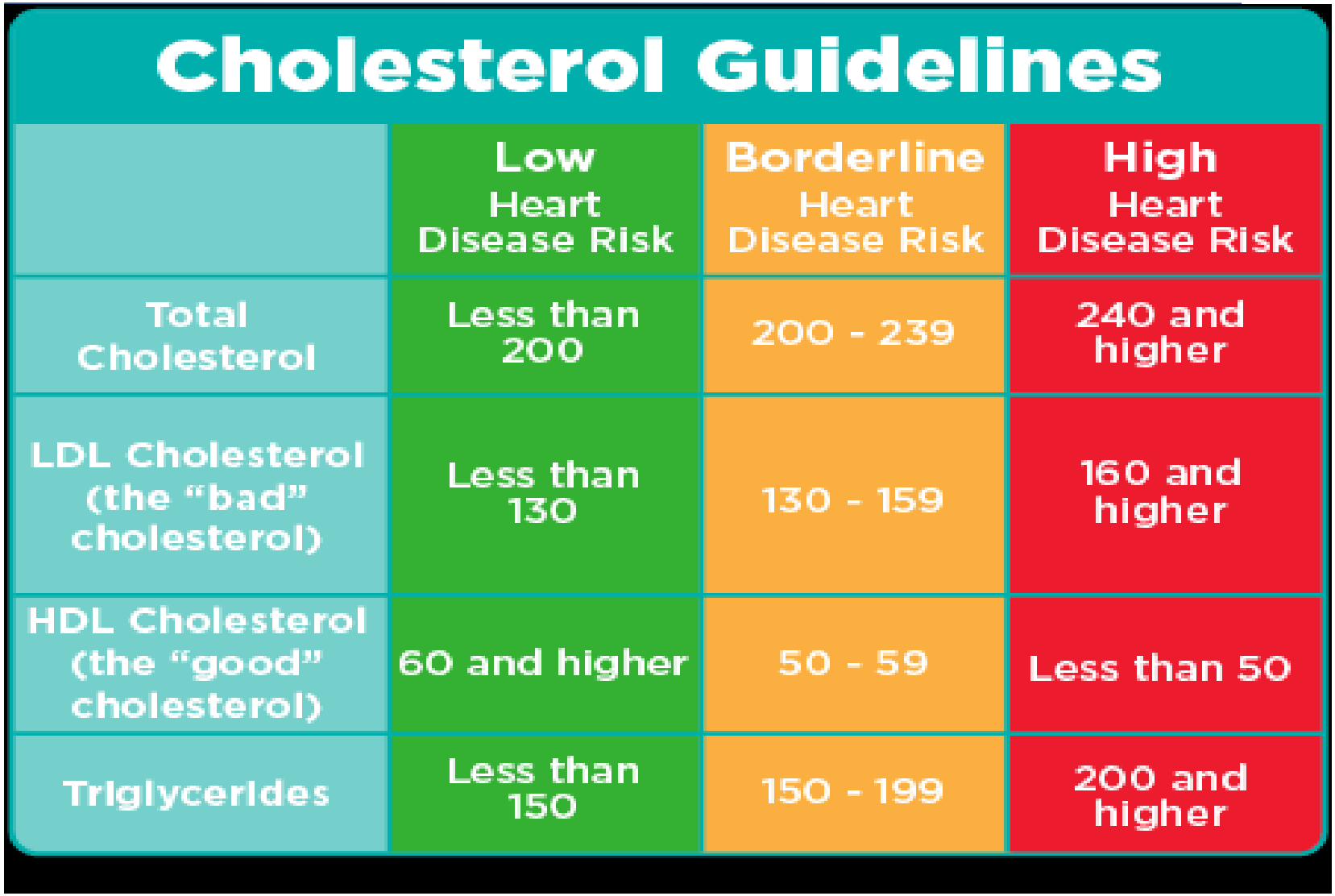
- **Classes of lipoprotein**
  - Low-density lipoproteins (LDLs)
  - High-density lipoproteins (HDLs)
- **Triglycerides and LDL risk factor**
  - ↑ HDL decreases risk
  - ↑ Cholesterol: HDL ratio

Diagnostic Studies of Cardiovascular System

Medscape® www.medscape.com



Diagnostic Studies of Cardiovascular System



Cholesterol Guidelines

	Low Heart Disease Risk	Borderline Heart Disease Risk	High Heart Disease Risk
Total Cholesterol	Less than 200	200 - 239	240 and higher
LDL Cholesterol (the "bad" cholesterol)	Less than 130	130 - 159	160 and higher
HDL Cholesterol (the "good" cholesterol)	60 and higher	50 - 59	Less than 50
Triglycerides	Less than 150	150 - 199	200 and higher

Audience Response Question

A patient arrives at an urgent care center after experiencing unrelenting substernal and epigastric pain and pressure for about 12 hours. The nurse reviews laboratory results with the understanding that at this point in time, a myocardial infarction would by indicated by peak levels of

a. Troponin T.
b. Homocysteine.
c. Creatine kinase-MB.
d. Type b natriuretic peptide.

Diagnostic Studies of Cardiovascular System

- **Electrocardiogram (EKG)**
  - Electrocardiography is a noninvasive test that gives a graphic representation of the heart's electrical activity.
- *Nursing actions*
  - Determine the client's ability to lie still for several minutes.
  - Reassure the client that electrical shock won't occur.
  - Apply the electrodes to clean, dry skin.
  - Interpret the electrocardiogram (ECG) for changes, such as life-threatening arrhythmias or ischemia.

Diagnostic Studies of Cardiovascular System

- **Echocardiogram**
  - **is a noninvasive examination of the heart that uses echoes from sound waves to visualize intracardiac structures and monitor the direction of blood flow.**
- ***Nursing actions***
  - **Determine the client's ability to lie still for 30 to 60 minutes.**
  - **Explain the procedure to the client.**

Diagnostic Studies of Cardiovascular System

- **Blood Chemistry**
  - Blood samples measure blood urea nitrogen (BUN), creatinine, sodium, potassium, bicarbonate, glucose, magnesium, calcium, phosphorus, cholesterol, triglycerides, creatine kinase (CK), CK isoenzymes, aspartate amino-transferase (AST), cardiac troponin levels, myoglobin, lactate dehydrogenase (LD), and LD isoenzymes.

Diagnostic Studies of Cardiovascular System

- **Blood Chemistry**
- *Nursing actions*
  - Note any drugs the client is taking that may alter test results.
  - Restrict the client's exercise before the blood sample is drawn.
  - Withhold I.M. injections or note the time of the injection on the laboratory slip (after CK levels).
  - Withhold food and fluids, as ordered.
  - Assess the venipuncture site for bleeding.

Diagnostic Studies of Cardiovascular System

- **Hematologic Studies**
  - blood samples to analyze and measure red blood cell and white blood cell (WBC) counts, erythrocyte sedimentation rate (ESR), prothrombin time, International Normalized Ratio, partial thromboplastin time, platelet count, hemoglobin (Hb) level, and hematocrit (Hct).
- *Nursing actions*
  - Note any drugs that might alter test results before the procedure.
  - Assess the venipuncture site for bleeding after the procedure.

Diagnostic Studies of Cardiovascular System

- **Cardiac catheterization**
  - Cardiac catheterization and arteriography (also called angiography) involve an injection of radiopaque dye through a catheter, after which a fluoroscope is used to examine the coronary arteries and intracardiac structures. The procedure is also used to monitor major intracardiac pressures, oxygenation, and cardiac output.

Diagnostic Studies of Cardiovascular System

- ***Nursing actions (Before the procedure)***
  - **Withhold the client's food and fluids after midnight.**
  - **Administer daily medications as ordered by the physician.**
  - **Discuss any anxiety the client may have about the procedure.**
  - **Assess and record baseline vital signs and peripheral pulses.**

Diagnostic Studies of Cardiovascular System

- **Nursing actions**
- *(Before the procedure)*
  - Make sure that written, informed consent has been obtained.
  - Inform the client about possible nausea, chest pain, flushing of the face, or a sudden urge to urinate from the injection of radiopaque dye.
  - Note the client's allergies to seafood, iodine, or radiopaque dyes.
- *After the procedure*
  - Monitor vital signs, peripheral pulses, and the injection site for bleeding.

Diagnostic Studies of Cardiovascular System

- *(After the procedure)*
  - Bed rest, flat, Leg straight for 4-6 hours
  - Encourage fluids unless contraindicated.
  - Monitor for complaints of chest pain, and report any complaints immediately.
  - If bleeding occurs at the site, apply manual pressure until the bleeding stops.
  - If pt is on Glucophage (Metformin). Hold med for 48 hrs post procedure. We are worried about the kidneys!!!

Cardiac Rehabilitation

- Smoking Cessation
- Stepped-care plan (increase activity gradually
- Diet changes (low fat, low salt, low cholesterol)
- No isometric exercises ↑ workload of heart
- No Valsalva
- No straining
- Best exercises for MI patients is walking
- Teach s/s of heart failure
  - Weight gain, Ankle edema,
  - SOB, Confusion

Audience Response Question

A patient returns to the cardiac observation area following a cardiac catheterization with coronary angiography. Which of the following assessments would require immediate action by the nurse?

1. Pedal pulses are 2+ bilaterally.
2. Apical pulse is 54 beats/minute.
3. Mean arterial pressure is 72 mm Hg.
4. ST-segment elevation develops on the ECG.

Nursing: Cardiovascular System (part-2)

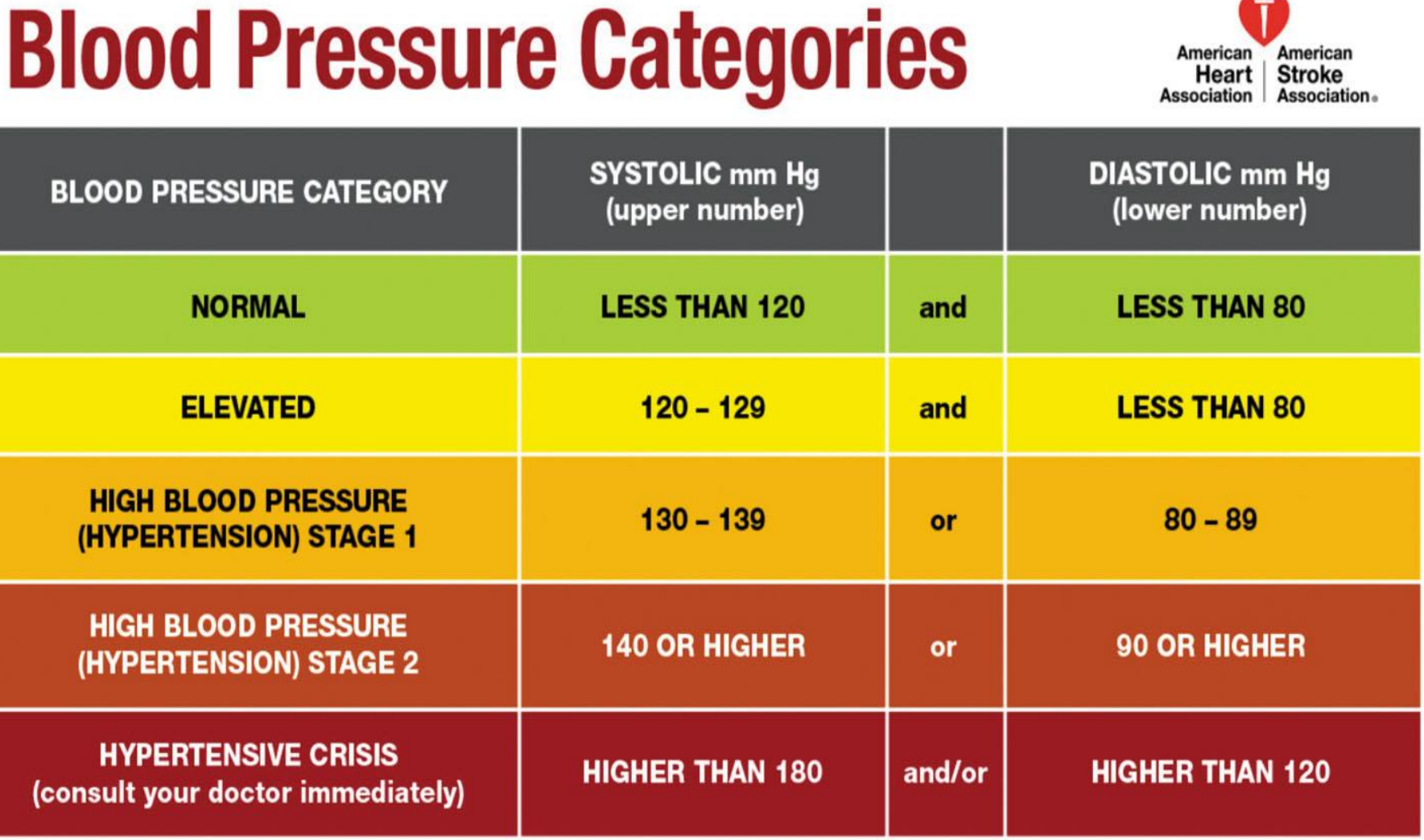
Hypertension, CAD, Angina, ACS, Myocardia Infaction, Heart Failure

Dr. Daniel Ampomah

What is Hypertension?

- Hypertension results from a narrowing of the arterioles, which increases peripheral resistance, necessitating increased force to circulate blood through the body.

Stages of hypertension



Audience Response Question

The nurse determines that the patient has stage 2 hypertension when the patient's average blood pressure is

a. 120/80 mm Hg.
b. 134/81 mm Hg.
c. 160/90 mm Hg.
d. 189/120 mm Hg.

CAUSES

- Cushing's disease
- No known cause (essential hypertension)
- Hormonal contraceptive use
- Pregnancy
- Primary hyperaldosteronism
- Thyroid, pituitary, or parathyroid disease
- Use of drugs, such as cocaine

CONTRIBUTING FACTORS (ESSENTIAL HYPERTENSION)

- Aging
- Atherosclerosis
- Diet (sodium and caffeine)
- Family history
- Obesity
- Race (more common in blacks)
- Sex (more common in males over age 40)
- Smoking
- Stress

ASSESSMENT FINDINGS

- Asymptomatic
- Cerebral ischemia
- Dizziness
- Elevated blood pressure
- Headache
- Heart failure
- Left ventricular hypertrophy
- Renal failure
- Vision disturbances, including blindness
- Epistasis (nose bleed)

DIAGNOSTIC TEST RESULTS

- Blood chemistry tests show elevated sodium, BUN, creatinine, and cholesterol levels.
- Blood pressure measurements result in sustained readings higher than 140/90 mm Hg.
- Chest X-ray reveals cardiomegaly.
- ECG shows left ventricular hypertrophy.
- Ophthalmoscopic examination shows retinal changes, such as severe arteriolar narrowing, papilledema, and hemorrhage.
- Urinalysis shows proteinuria, RBCs, and WBCs.

MANAGEMENT FOR HYPERTENSION

D-iet Modification

E-xercise

A-nti Hypertensive Meds

L-ifestyle Modification

S-moking Cessation

Lifestyle Modifications to Manage High Blood Pressure

Lifestyle Modification	Recommendation	Approximate SBP Reduction
Weight loss	Maintain normal body weight (body mass index 18.5-24.9 kg/m2).	5-20 mmHg/10 kg weight loss
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and lowfat dairy products with a reduced content of saturated and total fat.	8-14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2-8 mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).	4-9 mmHg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (1 oz or 30 mL ethanol; e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey)	2-4 mmHg

Drug therapy

- **ACE inhibitors**: captopril (Capoten), enalapril (Vasotec), lisinopril (Prinivil)
- **Antihypertensives**: methyldopa, hydralazine, doxazosin (Cardura)
- **Beta-adrenergic blockers**: propranolol (Inderal), metoprolol (Lopressor), penbutolol (Levatol)
- **Calcium channel blockers**: nifedipine (Procardia), verapamil (Calan), diltiazem (Cardizem), nicardipine (Cardene), amlodipine (Norvasc)
- **Diuretics**: furosemide (Lasix), spironolactone (Aldactone), hydrochlorothiazide (Microzide), bumetanide (Bumex)
- **Vasodilator**: nitroprusside (Nitropress)

CALCIUM ANTAGONISTS:

Very Nice Drugs

Action - Blocks Calcium Access To Cells

Causing: ↓ Contractility + ↓ Conductivity of the Heart

↓ Demand For Oxygen

Side Effects:
- ↓ BP
- Bradycardia
- May Precipitate A-V Block
- Headache
- Abdominal Discomfort (Constipation, Nausea)
- Peripheral Edema

Peripheral Edema

Dry Cough

Ace (Angiotensin Converting Enzyme) Inhibitors: (Ends In April)

Action-↓ Peripheral Vascular Resistance Without:

- Ø · ↑ Cardiac Output
- Ø · ↑ Cardiac Rate
- Ø · ↑ Cardiac Contractility

Effects:
- Dizziness
- Orthostatic Hypotension
- GI Distress
- Nonproductive Cough
- Headache

INTERVENTIONS AND RATIONALES

- Administer medications as prescribed to lower blood pressure.
- Assess blood pressure reading in the lying, sitting, and standing positions to monitor for orthostatic hypotension (observe for pallor, diaphoresis, or vertigo).
- Assess neurologic status and observe for changes that may indicate an alteration in cerebral perfusion (stroke or hemorrhage).
- Monitor and record intake and output and daily weight to detect fluid volume overload
- Encourage the client to express feelings about daily stress to reduce anxiety.

Complications of Hypertension

5 "C"

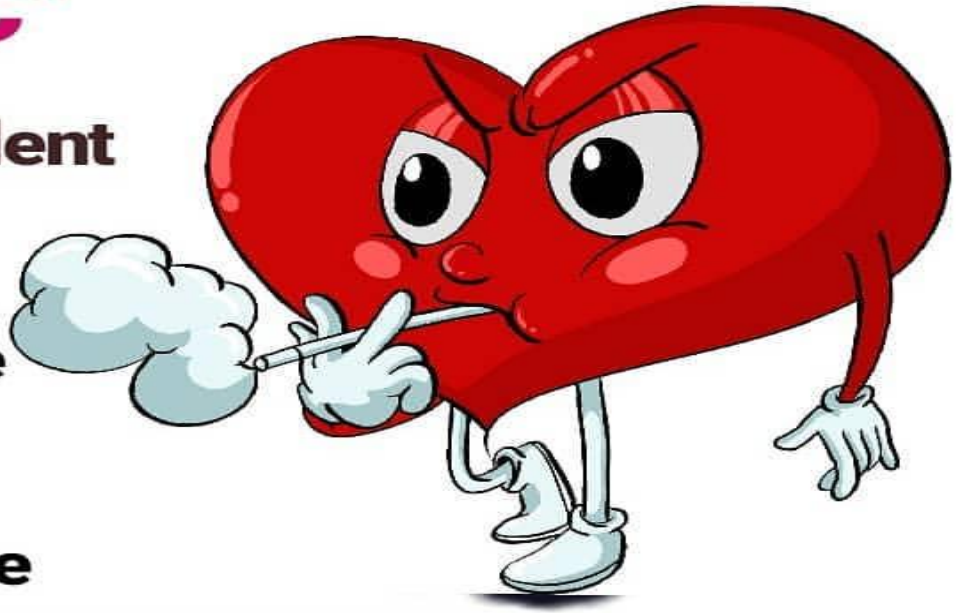
Cerebrovascular accident

Cardiac arrest

Coronary artery disease

Chronic renal failure

Congestive heart failure



Hypertensive Crisis

- **Hypertensive emergency**
  - Occurs over hours to days
  - BP >220/140 with target organ disease
- **Hypertensive urgency**
  - Occurs over days to weeks
  - BP >180/110 with no clinical evidence of target organ disease
- Rate of rise more important than absolute value

Hypertensive Crisis
Clinical Manifestations

- **Hypertensive encephalopathy**
  - Headache, n/v, seizures, confusion, coma
- **Renal insufficiency**
- **Cardiac decompensation**
  - MI, HF, pulmonary edema
- **Aortic dissection**

Hypertensive Crisis
Nursing/Collaborative Management

- **Hospitalization**
  - IV drug therapy: titrated to MAP
  - Monitor cardiac and renal function
  - Neurologic checks
  - Determine cause
  - Education to avoid future crisis

Audience Response Question

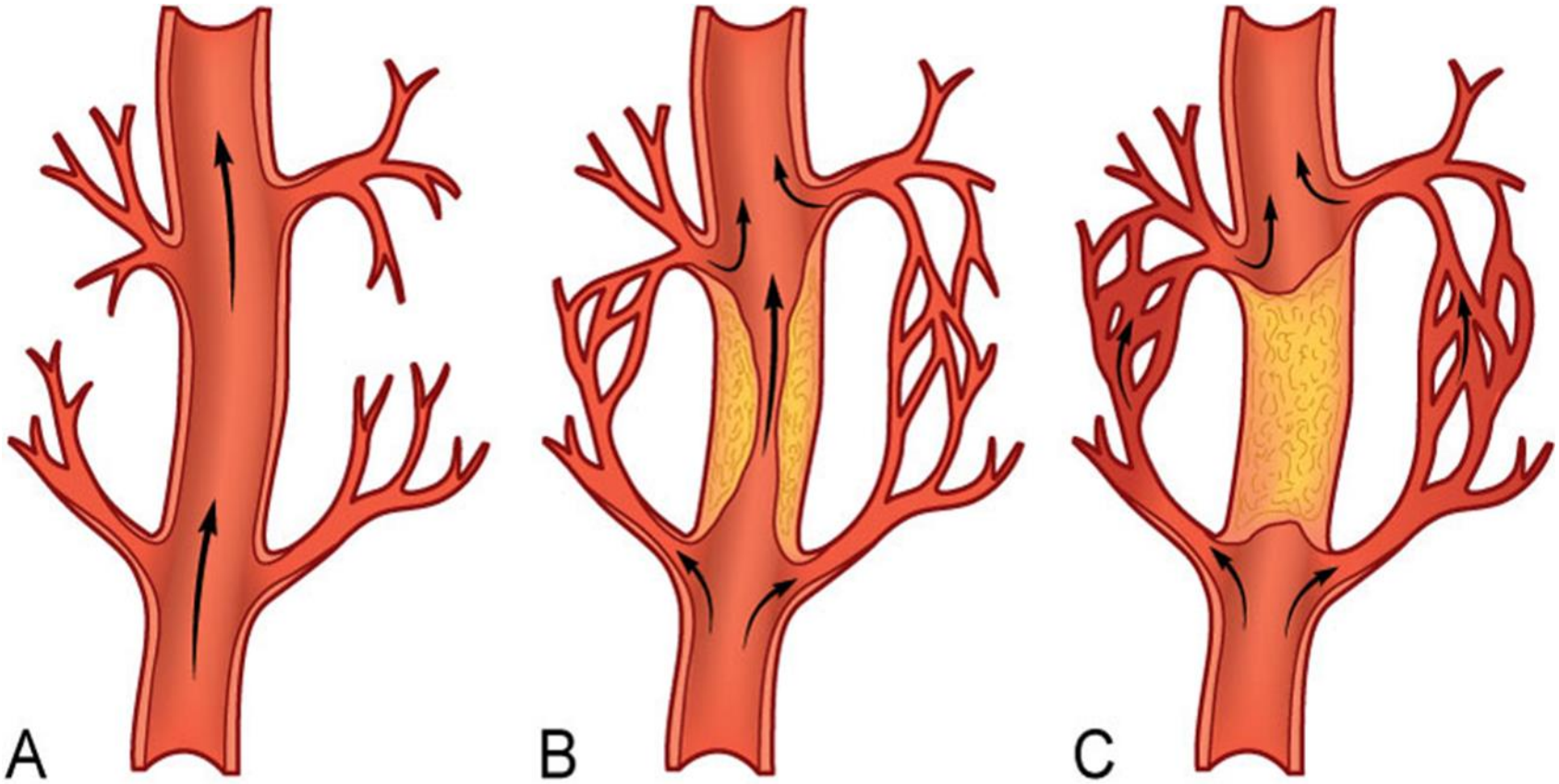
The nurse takes blood pressures at a health fair. The nurse identifies which person as most at risk for developing hypertension?

1. A 52-year-old male who smokes and has a parent with hypertension
2. A 30-year-old female advertising agent who is unmarried and lives alone
3. A 68-year-old male who uses herbal remedies to treat an enlarged prostate gland
4. A 43-year-old female who travels extensively for work and exercises only on weekends

Coronary Artery Disease

Coronary Artery Disease

- CAD results from the buildup of atherosclerotic plaque in the arteries of the heart. This causes a narrowing of the arterial lumen, reducing blood flow to the myocardium
- Dietary changes are a key for clients with CAD. Try something from our low-sodium, low-fat, and low-cholesterol



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Monounsaturated

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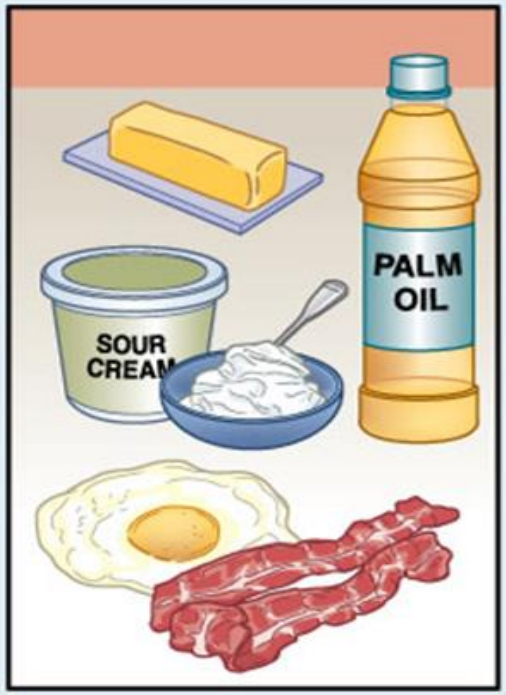
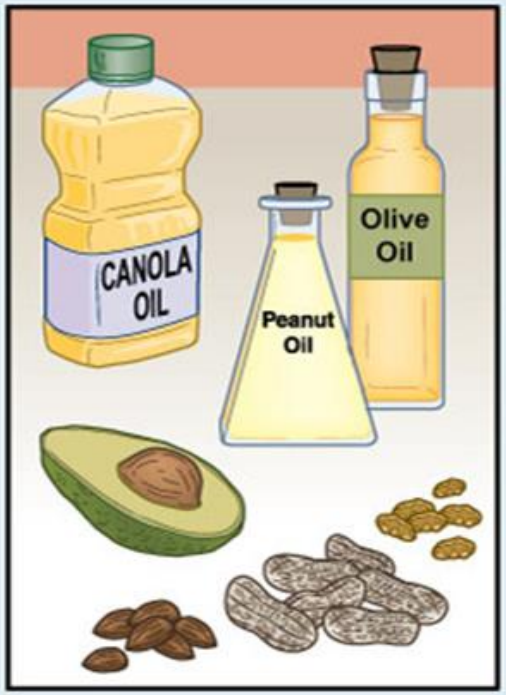
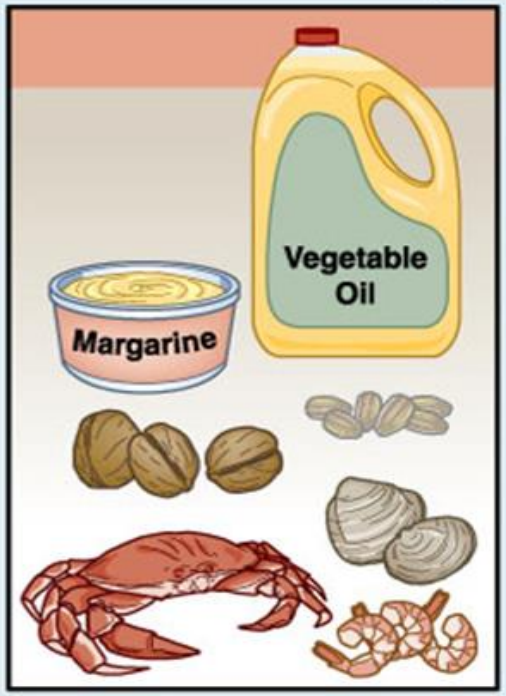
(Use primarily)



- Animal fat (bacon, lard, egg yolk, dairy fat)
- Oils (coconut, palm oil)
- Butter
- Cream cheese
- Sour cream



- Fish oil
- Oils (canola, peanut, olive)
- Avocado
- Nuts (almonds, peanuts, pecans)
- Olives (green, black)



- Vegetable oils (safflower, corn, soybean, flaxseed, cottonseed)
- Some fish oil, shellfish
- Nuts (walnuts)
- Seeds (pumpkin, sunflower)
- Margarine

CAUSES

- Aging
- Arteriosclerosis
- Atherosclerosis
- Depletion of estrogen after menopause
- Diabetes
- Genetics
- High-cholesterol High fat diet
- Hyperlipidemia
- Hypertension
- Obesity
- Sedentary lifestyle
- Smoking
- Stress

Risk Factors for CAD

Non Modifiable

- Age
- Gender
- Ethnicity
- Family history
- Genetic disposition

Modifiable

- Elevated serum lipids
- Physical inactivity
- Obesity
- Diabetes
- Metabolic syndrome
- Psychologic states
- Homocysteine level
- Substance abuse

ASSESSMENT FINDINGS

- Angina (chest pain) that may be substernal, crushing, or compressing; may radiate to the arms, jaw, or back;
- Usually lasts 3 to 5 minutes;
- Usually occurs after exertion, emotional excitement, or exposure to cold but can also develop when the client is at rest.

DIAGNOSTIC TEST RESULTS

- Blood chemistry tests show increased cholesterol levels (decreased high-density lipoproteins, increased low-density lipoproteins).
- Coronary arteriography shows plaque formation.
- ECG or Holter monitoring shows ST- segment depression and T-wave inversion during anginal episode.
- Stress test reveals ST-segment changes, multiple premature ventricular contractions, and chest pain.

TREATMENT

- Activity changes, including weight loss, if necessary
- Atherectomy
- Coronary artery bypass surgery
- Coronary artery stent placement
- Dietary changes, including establishing a low-sodium, low-cholesterol, and low-fat diet with increased dietary fiber (low-calorie only if appropriate)

Drug therapy

- Analgesic: morphine I.V.
- Anticoagulants: heparin, dalteparin (Frag-min), enoxaparin (Lovenox)
- Antilipemic agents: cholestyramine (Questran), Statins - lovastatin (Mevacor), simvastatin (Zocor), nicotinic acid (Niacor), gemfibrozil (Lopid), colestipol (Colestid)
- Beta-adrenergic blockers: metoprolol (Lopressor), propranolol (Inderal), nadolol (Corgard)

Drug therapy

- Calcium channel blockers: nifedipine (Procardia), verapamil (Calan), diltiazem (Cardizem)
- Low-dose aspirin therapy
- Nitrates: nitroglycerin, isosorbide dinitrate (Isordil)

INTERVENTIONS AND RATIONALES

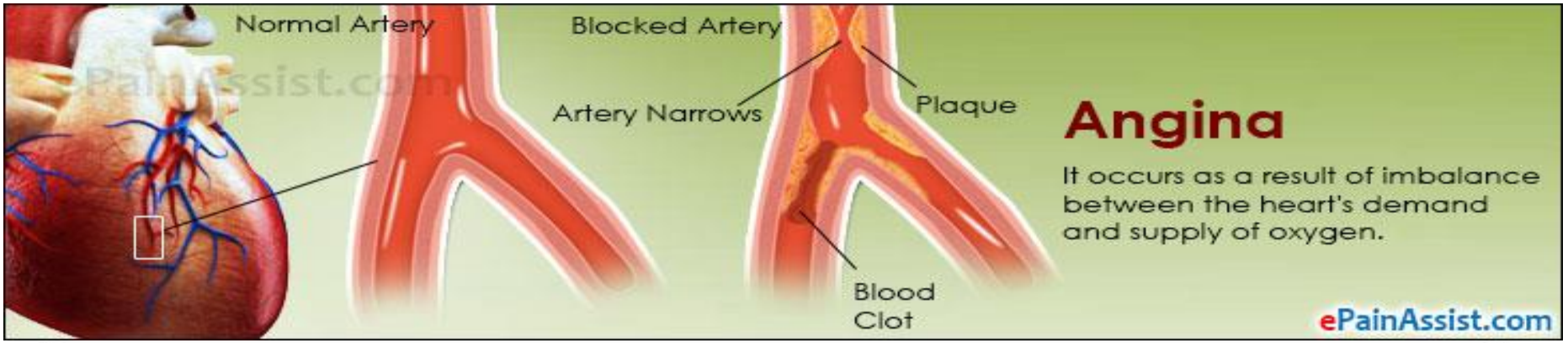
- Obtain an ECG during anginal episodes to detect evidence of ischemia.
- Assess cardiovascular status, vital signs, and hemodynamic variables to detect evidence of compromise.
- Administer sublingual nitroglycerin and oxygen for anginal episodes to provide pain relief.
- Monitor intake and output to detect changes in fluid status.

INTERVENTIONS AND RATIONALES

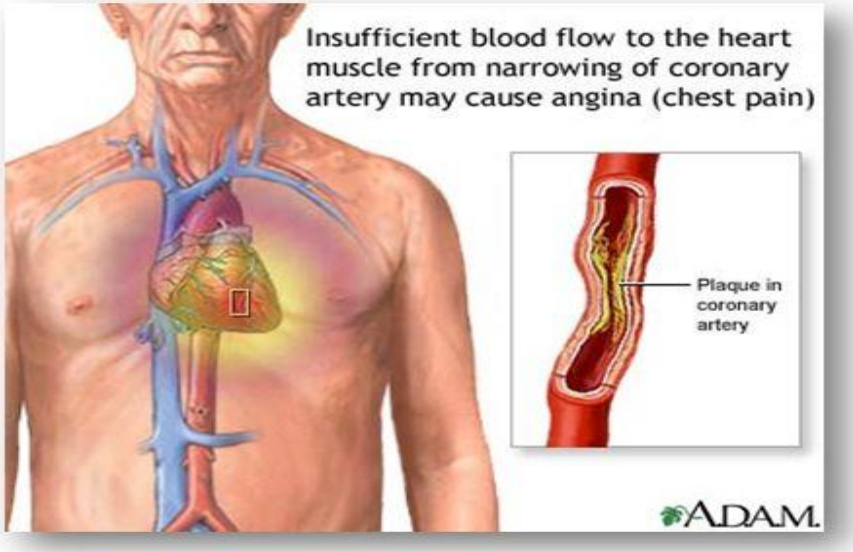
- Monitor laboratory studies. *Evaluate cardiac enzymes to rule out MI. Obtain lipid panel to determine need for diet changes and lipid-lowering drugs.*
- Encourage the client to express anxiety, fears, or concerns *to help him cope with his illness.*
- Limiting activity, alcohol intake, and dietary fat
- Smoking cessation, if appropriate

Angina

- Angina is chest pain caused by inadequate myocardial oxygen supply. It's usually caused by narrowing of the coronary arteries, which results from plaque accumulation in the intimal lining.
- Angina is generally categorized as one of three main forms:
- Stable,
- Unstable (an acute coronary syndrome),
- Prinzmetal's (variant).



Types of Angina



- **Stable** –chest pain precipitated by exertion or stress. Myocardial oxygen demands increased.
- **Unstable** (preinfarction) chest pain occurring at rest.
- **Intractable** – severe
- **Silent ischaemia** – diabetics
- **Prinzmetal Angina (varient)** – vasospasm

http://www.nlm.nih.gov/medlineplus/ency/images/ency/fullsize/18054.jpg

CAUSES

- Activity or disease that increases metabolic demands
- Aortic stenosis
- Atherosclerosis
- Pulmonary stenosis
- Small-vessel disease (associated with rheumatoid arthritis, radiation injury, or lupus erythematosus)
- Thromboembolism
- Vasospasm

ASSESSMENT FINDINGS

- Anxiety
- Diaphoresis
- Dyspnea
- Epigastric distress
- Palpitations
- Pain that may be substernal, crushing, or compressing; may radiate to the arms, jaw, or back; usually lasts 3 to 5 minutes; usually occurs after exertion, emotional excitement, or exposure to cold but can also develop when the client is at rest; in women, may manifest as atypical symptoms of pain, such as indigestion, back pain, and less severe complaints of substernal pain.
- Tachycardia

DIAGNOSTIC TEST RESULTS

- Blood chemistry shows increased cholesterol levels.
- Cardiac enzymes are within normal limits.
- Coronary arteriography shows plaque accumulation.
- ECG shows ST-segment depression and T-wave inversion during anginal pain.
- Holter monitoring reveals ST-segment depression and T-wave inversion.
- Stress test results include abnormal ECG findings and chest pain.

TREATMENT

- Diet: low fat, low sodium, and low cholesterol (low calorie if necessary)
- Coronary artery bypass grafting
- Oxygen therapy (typically 2 to 4 L)
- Percutaneous transluminal coronary angioplasty (PTCA), stent placement
- Semi-Fowler's position

Drug therapy

- **Anticoagulants**: heparin, aspirin
- **Beta-adrenergic blockers**: propranolol (Inderal), nadolol (Corgard), atenolol (Tenormin), metoprolol (Lopressor)
- **Calcium channel blockers**: verapamil (Calan), diltiazem (Cardizem), nifedipine (Procardia), nicardipine (Cardene)
- **Low-dose aspirin therapy**
- **Nitrates:** nitroglycerin, isosorbide dinitrate (Isordil), topical nitroglycerin, transdermal nitroglycerin (Transderm-Nitro)

INTERVENTIONS AND RATIONALES

- Anginal pain can be difficult to identify. It's usually shorter in duration than pain from MI.
- Administer oxygen to increase oxygenation supply.
- Assess for chest pain and evaluate its characteristics. Assessment allows for care plan modification as necessary.
- Administer medications, as prescribed, to increase oxygenation and to reduce cardiac workload. Hold nitrates and notify physician

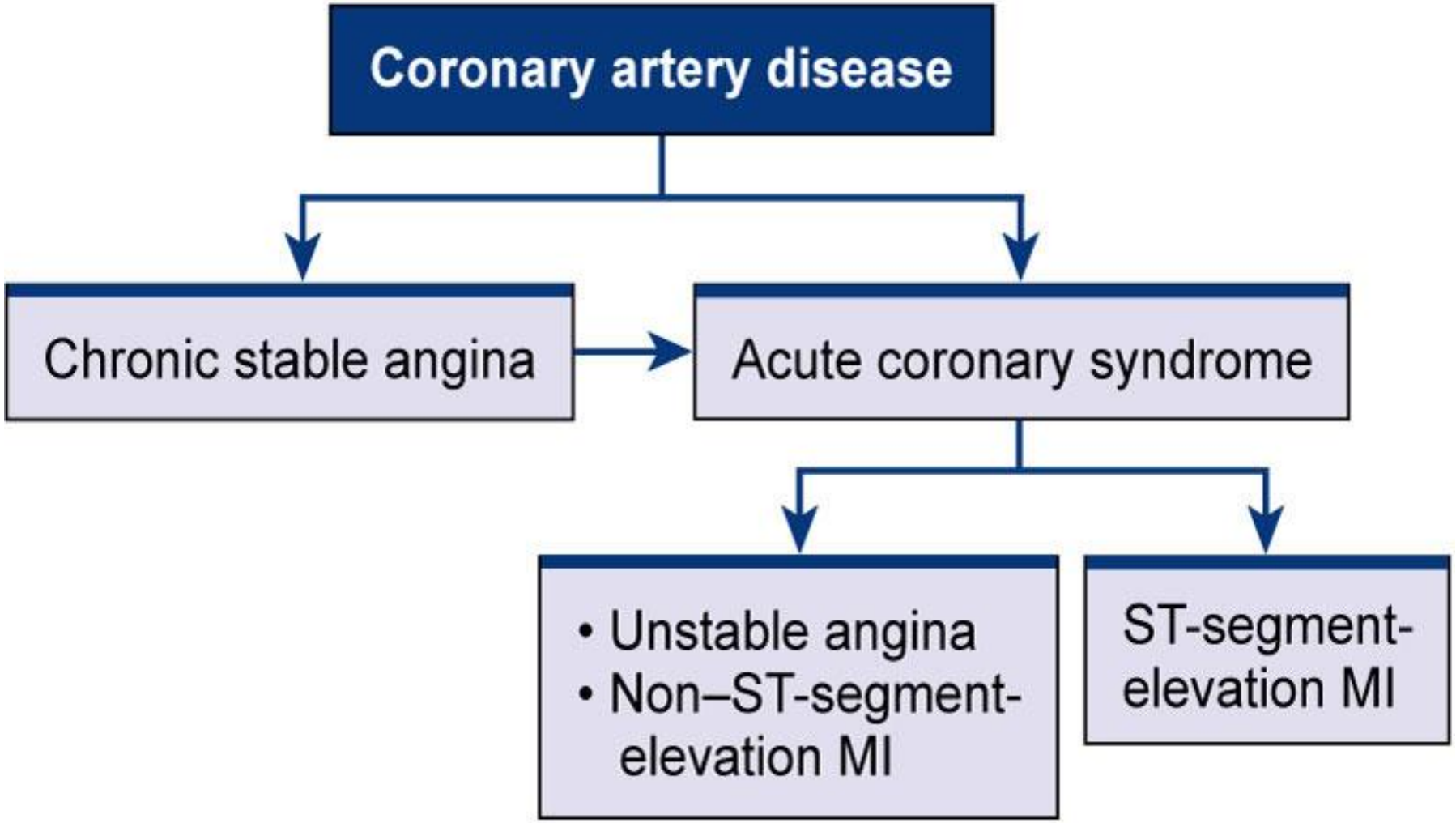
INTERVENTIONS AND RATIONALES

- for systolic blood pressure less than 90 mm Hg. Hold beta-adrenergic blocker and notify the physician for heart rate less than 60 beats/ minute to prevent complications that can occur as a result of therapy.
- Advise the client to rest if pain begins to reduce cardiac workload.
- Encourage weight reduction, if necessary, to reduce risk of CAD.
- Encourage the client to express anxiety, fears, or concerns because anxiety can increase oxygen demands.

INTERVENTIONS AND RATIONALES

- Obtain 12-lead ECG during an acute attack
- *to assess for ischemic changes.*
- Keep the client in semi-Fowler's position *to promote chest expansion and ventilation.*
- Monitor and record intake and output *to monitor fluid status.*
- Maintain the client's prescribed diet (low-fat, low-sodium, and low-cholesterol; low-calorie, if necessary) *to reduce risk*

Acute Coronary Syndrome

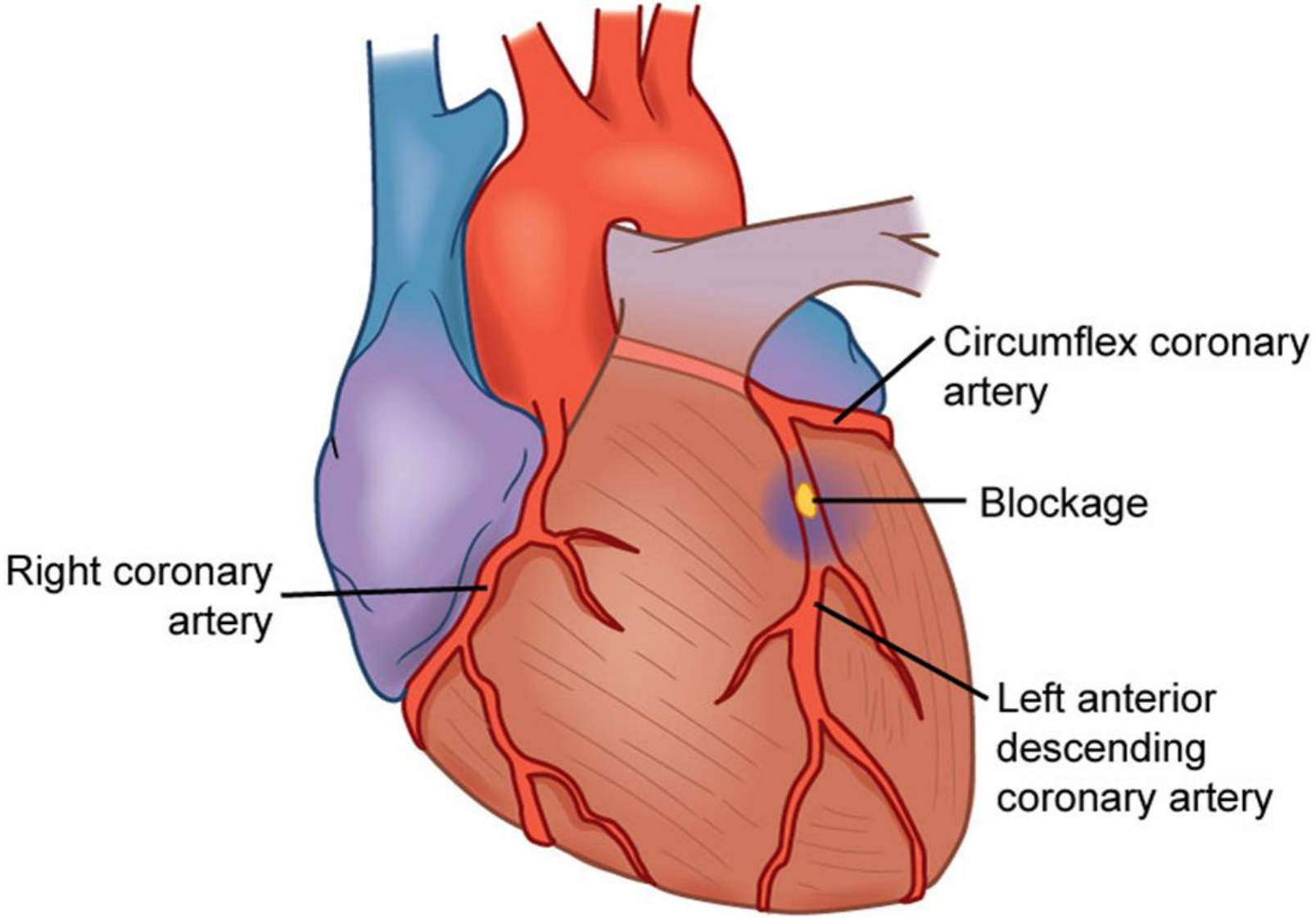


Worry About The STEMI patient

- **STEMI**: ST-Segment Elevation Myocardial Infarction . This indicates that the patient is having a heart attack and the goal isn to get them to the cath lab for PCI in less than 90 mins.
- **NSTEMI**: Non –Elevation ST Segment Myocardial Infarction – these clients or patients are usually less worrisome.
- **ACS Patients**:
  - The patient doesn't have to do anything to bring the pain on
  - Rest or Nitro doesn't relieve the pain.

Myocardial infarction

Myocardial Infarction From Occlusion



What is an MI?

- In MI (an acute coronary syndrome), reduced blood flow in one of the coronary arteries leads to myocardial ischemia, injury, and necrosis.
- In transmural MI, tissue damage extends through all myocardial layers. In subendocardial MI, usually only the innermost layer is damaged.

Clinical Manifestations of ACS
Myocardial Infarction (MI)

- Result of sustained ischemia (>20 minutes), causing irreversible myocardial cell death (necrosis)
- Decreased blood flow to myocardium
- Ischemia starts in subendocardium
- Necrosis of entire thickness of myocardium takes 4 to 6 hours
- Loss of contractile function

CAUSES

CONTRIBUTING FACTORS

- Aging
- Decreased serum high-density lipoprotein levels
- Diabetes mellitus
- Elevated serum triglyceride, low-density lipoprotein, and cholesterol levels
- Excessive intake of saturated fats, carbohydrates, or salt
- Hypertension
- Obesity

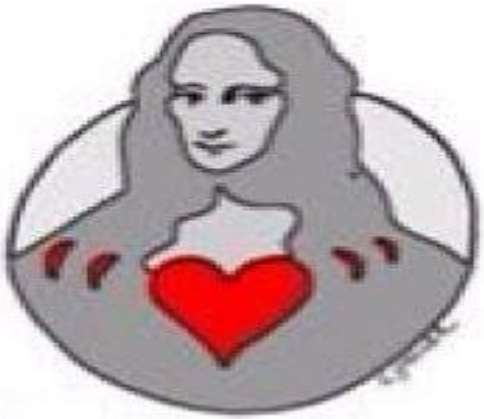
ASSESSMENT FINDINGS

- Anxiety
- Arrhythmias
- Crushing substernal chest pain that may radiate to the jaw, back, and arms; lasts longer than anginal pain; is unrelieved by rest or nitroglycerin;
- Diaphoresis
- The #1 sign of an MI in the elderly is Dyspnea/SOB
- Elevated temperature
- Nausea and vomiting
- Pallor

DIAGNOSTIC TEST RESULTS

- ECG shows an enlarged Q wave, an elevated or depressed ST segment, and T-wave inversion.
- Blood chemistry studies show increased CK, AST, and lipids; positive CK-MB fraction; and increased troponin T.
- Blood studies show increased WBC count.

IMMEDIATE TREATMENT OF AN M.I.



M Morphine

O Oxygen

N Nitroglycerine

A ASA or Plavix

TREATMENT

- Bed rest with bedside commode
- Coronary artery bypass graft
- Low-calorie, low-cholesterol, low-fat diet
- Monitoring vital signs, urine output, ECG, and hemodynamic status
- Ongoing laboratory studies: ABG levels, CK with isoenzymes, electrolyte levels, cardiac troponins
- Oxygen therapy
- Coronary artery stent placement
- Pulmonary artery catheterization (to detect left- or right-sided heart failure)

Drug therapy

- **Analgesic**: morphine I.V.
- **ACE inhibitors**: captopril (Capoten), enalapril (Vasotec)
- **Antiarrhythmics**: amiodarone (Cordarone), lidocaine (Xylocaine), procainamide
- **Anticoagulants**: aspirin, dalteparin (Fragmin), enoxaparin (Lovenox), heparin I.V. after thrombolytic therapy
- **Calcium channel blockers**: nifedipine (Procardia), verapamil (Calan), diltiazem (Cardizem)

- **Antihypertensive**: hydralazine
- **Beta-adrenergic blockers**: propranolol (Inderal), nadolol (Corgard), metoprolol (Lopressor); beta-adrenergic blockers contraindicated if client also has hypotension, asthma, or chronic obstructive pulmonary disease
- **I.V. atropine** or pacemaker for symptomatic bradycardia or heart block

- **Nitrate**: nitroglycerin I.V.
- **Thrombolytic therapy**:
  - alteplase (Activase),
  - streptokinase (Streptase),
  - reteplase (Retavase); should be given within 6 hours of onset of symptoms but most effective when started within 3 hours

INTERVENTIONS AND RATIONALES

- Monitor ECG to detect ischemia, injury, new or extended infarction, arrhythmias, conduction defects.
- Assess cardiovascular and respiratory status to watch for signs of heart failure, such as an S3 or S4 gallop, crackles, cough, tachypnea, and edema.
- Administer oxygen, as ordered, to improve oxygen supply to heart muscle
- Maintaining a low-cholesterol, low-fat, low-sodium diet
- Stopping smoking, if appropriate

- Obtain an ECG reading during acute pain to detect myocardial ischemia, injury, or infarction.
- Monitor and record vital signs and hemodynamic variables to monitor response to therapy and detect complications.
- Monitor and record intake and output to assess renal perfusion and possible fluid retention.
- Thrombolytic therapy is most effective when started within 3 hours of onset of MI symptoms.
- Follow laboratory values to detect myocardial damage, electrolyte abnormalities, drug levels, renal function, and coagulation.
- Maintain bed rest to reduce oxygen demands on the heart.

Audience Response Question

A patient is admitted to the coronary care unit following a cardiac arrest and successful cardiopulmonary resuscitation. When reviewing the health care provider's admission orders, which order should the nurse question?

a. Oxygen at 4 L/min per nasal cannula
b. Morphine sulfate 2 mg IV every 10 minutes until the pain is relieved
c. Tissue plasminogen activator (t-PA) 100 mg IV infused over 3 hours
d. IV nitroglycerin at 5 mcg/minute and increase 5 mcg/minute every 3 to 5 minutes

Peripheral Artery Disease

- In peripheral artery disease, the obstruction or narrowing of the lumen of the aorta and its major branches causes an interruption of blood flow, usually to the legs and feet.
- Peripheral artery disease may affect the carotid, vertebral, innominate, subclavian, mesenteric, and celiac arteries. Occlusions may be acute or chronic and commonly cause severe ischemia, skin ulceration, and gangrene.

CAUSES

- Atherosclerosis
- Emboli formation
- Thrombosis
- Trauma or fracture

CONTRIBUTING FACTORS

- Age
- Diabetes
- Family history of vascular disorders, MI, or stroke
- Hyperlipidemia
- Hypertension
- Smoking

ASSESSMENT FINDINGS

Femoral, popliteal, or innominate arteries

- Mottling of the extremity
- Pallor
- Paralysis and paresthesia in the affected arm or leg
- Pulselessness distal to the occlusion
- Sudden and localized pain in the affected arm or leg (most common symptom)
- Temperature change that occurs distal to the occlusion

DIAGNOSTIC TEST RESULTS

- Arteriography demonstrates the type (thrombus or embolus), location, and degree of obstruction and collateral circulation.
- Doppler ultrasonography shows decreased blood flow distal to the occlusion.
- EEG and a computed tomography scan may be necessary to rule out brain lesions.

TREATMENT

- Light exercise such as walking
- Surgery (for acute occlusion): atherec- tomy, balloon angioplasty, bypass graft, embo- lectomy, laser angioplasty, patch grafting, stent placement, thromboendarterectomy, or amputation

- ***Drug therapy***
  - Anticoagulants: heparin, dalteparin (Fragmin), enoxaparin (Lovenox), warfarin (Coumadin)
  - Antiplatelets: aspirin, pentoxifylline (Trental)
  - Thrombolytic agents: alteplase (Activase), streptokinase (Streptase)

INTERVENTIONS AND RATIONALES

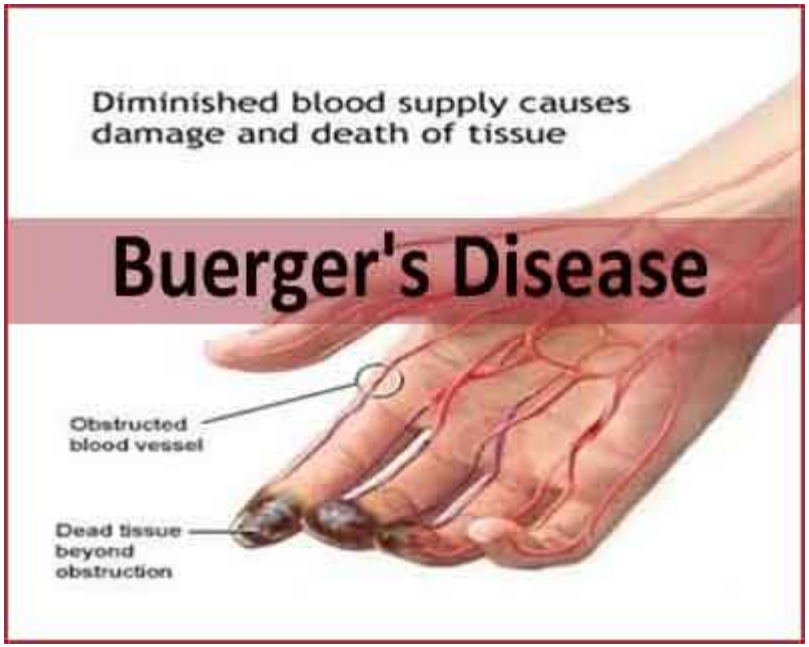
- Advise the client to stop smoking and to follow the prescribed medical regimen to modify risk factors and promote compliance.
- Assess the client's circulatory status by checking for the most distal pulses and by inspecting his skin color and temperature. Decreased tissue perfusion causes mottling; skin also becomes cooler and skin texture changes.
- Provide pain relief as needed to help decrease ischemic pain.
- Administer I.V. heparin as needed to prevent thrombi. Use an infusion pump to ensure the proper flow rate.

- When preparing the client for discharge, instruct him to watch for signs of recurrence (pain, pallor, numbness, paralysis, absence of pulse) that can result from graft occlusion or occlusion at another site.
- Warn him against wearing constrictive clothing.
- These measures enable the client to join actively in his care, and allow him to make more informed decisions about his health status.

Buerger's Disease

What is it?

- BD is an occlusive disease of the median and small arteries and veins.
- The distal upper and lower limbs are affected most commonly



Thromboangiitis Obliterans
Buerger's Disease

- Peripheral artery inflammatory disease
- Young men who smoke cigarettes

Symptoms

- Intermittent claudication
- Ischemic pain occurring in the digits while at rest
- Aching pain that is more severe at night
- Cool, numb, or tingling sensation
- Diminished pulses in the distal extremities.

Interventions

- Reinforce instructions to the client to stop smoking
- Monitor pulses
- Reinforce instructions to avoid injury to the upper and lower extremities.
- Administer vasodilators as prescribed
- Reinforce instructions to the client regarding medication therapy.

Audience Response Question

A 24 year old man seeks medical attention for complaints of claudication in the arch of the foot. The nurse also notes superficial thrombophlebitis of the lower leg. The nurse should check the client for which next?

a. Pneumonia
b. Pulmonary edema
c. Pulmonary embolism
d. Myocardial infarction

Raynauld's Disease

- Raynaud's disease is characterized by episodic vasospasm in the small peripheral arteries and arterioles, precipitated by exposure to cold or stress.
- This condition occurs bilaterally and usually affects the hands or, less often, the feet.
- Attacks are intermittent
- Causes are unknown

Assessment Findings

- Blanching of the extremity, followed by cyanosis during vasoconstriction
- Reddened tissue when the vasospasm is relieved.
- Numbness, tingling, swelling, and a cold temperature at the affected body part.

TREATMENT

- **Activity changes**: avoidance of cold
- **Smoking cessation** (if appropriate)
- **surgery** (used in fewer than one-quarter of clients): sympathectomy

Drug therapy

- **Calcium channel blockers**: diltiazem (Card- izem), nifedipine (Procardia)
- **Vasodilators**: phenoxybenzamine (Dibenzyline)

INTERVENTIONS

- Monitor pulses
- Reinforce instructions to the client regarding medication therapy.
- Assist client to identify and avoid precipitating factors such as cold and stress.
- Reinforce instructions to the client to avoid smoking, and injuries to fingers and hands
- Reinforce instructions to the client to wear warm clothing, socks, and gloves in cold weather or the freezer.

Audience Response Question

The nurse has reinforced instructions to the client with Raynauld's disease about self-management of the disease process. The nurse determines that the client needs further teaching if the client states that?

a. Smoking cessation is very important
b. Moving to a warmer climate should help
c. Sources of caffeine should be eliminated from the diet
d. Taking nifedipine (Procardia) as prescribed will decrease vessel spasms.

End Cardiovascular Part 1