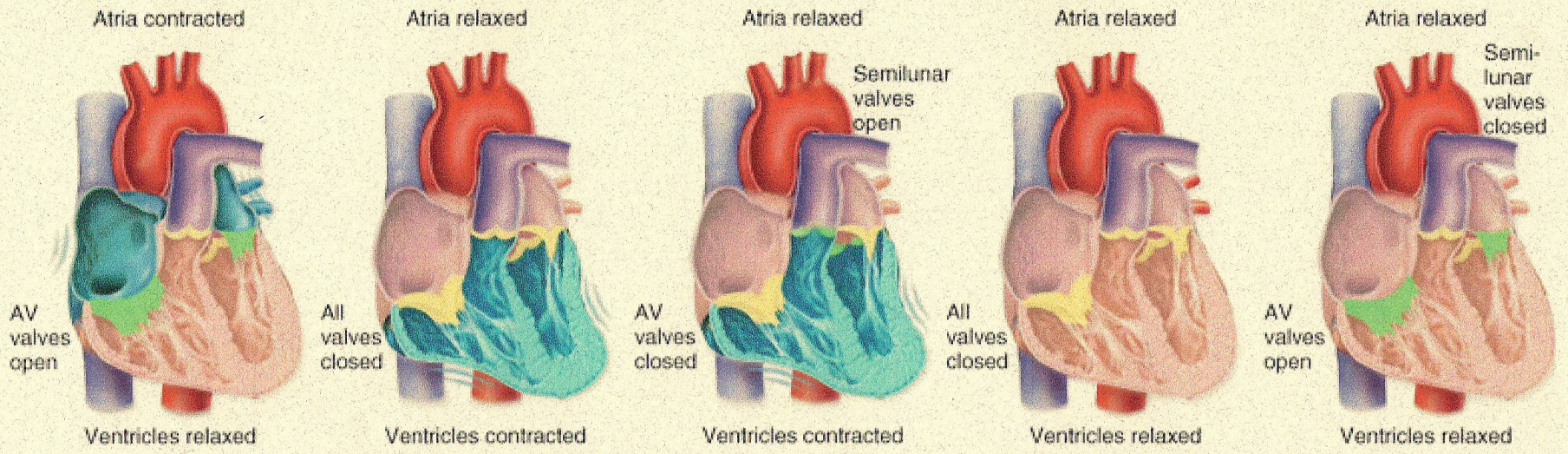
CARDIAC CYCLE

Structure \ Phase	Atrial systole	Early ventricular systole ⟷ Late ventricular systole	Early ventricular diastole ⟷ Late ventricular diastole
Atria	Contract	Relax	Relax
Ventricles	Relax	Contract	Relax
AV valves	Open	Closed	Open
Semilunar valves	Closed	Open	Closed



1. **Atrial systole** — Atria contract, AV valves open, semilunar valves closed
2. **Early ventricular systole** — Atria relax, ventricles contract, AV valves forced closed, semilunar valves still closed
3. **Late ventricular systole** — Atria relax, ventricles contract, AV valves remain closed, semilunar valves forced open
4. **Early ventricular diastole** — Atria and ventricles relax, AV valves and semilunar valves closed, atria begin passively filling with blood
5. **Late ventricular diastole** — Atria and ventricles relax, atria passively fill with blood as AV valves open, semilunar valves closed

Cardiac cycle - systole and diastole- heartbeat. Events that occur in the heart from one heartbeat to the next.

Blood flows through the heart due to changes in chamber pressures and valvular function during atrial and ventricular diastole and systol

During atrial and ventricular diastole, the heart chambers are relaxed, the AV valves are open, the semilunar valves are closed.

Pressures in all of the chambers are lowest during diastole, this facilitates ventricular filling.

Toward end of diastolic period, atrial systole occurs (atrial muscles contract) in response to an electrical impulse initiated by the SA node

Atrial systole ↑s pressure inside the atria, ejecting the remaining blood into the ventricles.

Atrial systole adds to ventricular blood volume by 15% to 25% , called atrial kick

Ventricular systole begins in response to propagation of the electrical impulse that began in the SA node some milliseconds earlier.

Beginning w/ ventricular systole, pressure inside ventricles rapidly ↑s, forcing the atrioventricular valves to close (S1)

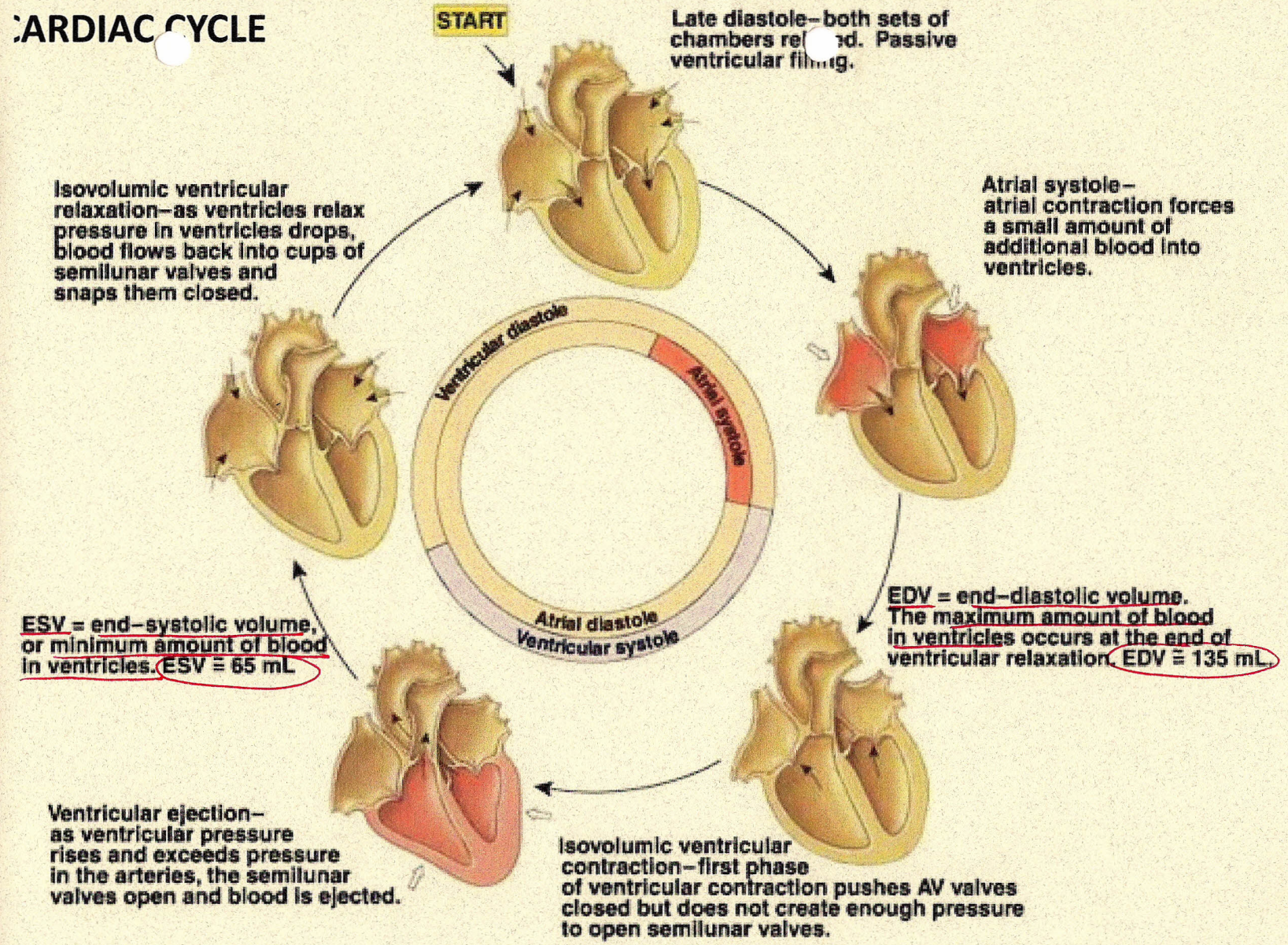
The rapid increase of pressure inside the right and left ventricles forces pulmonic & aortic valves to open, and blood is ejected

Exit of blood is rapid at first; then, as pressure in each ventricle and its corresponding artery equalizes, the flow of blood gradually ↓s

At the end of systole, pressure w/in the ventricles rapidly ↓s, pulmonary arterial and aortic pressures ↓, semilunar valves close (S2)

These events mark the onset of diastole and the cardiac cycle is repeated.

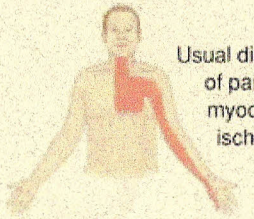
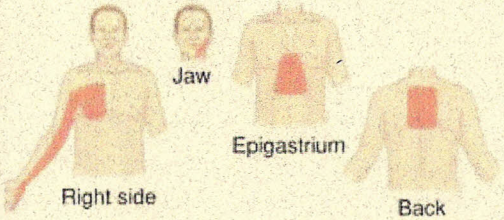
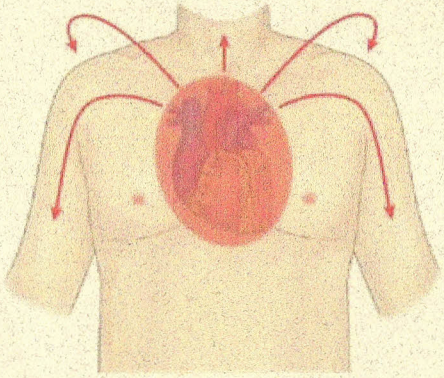
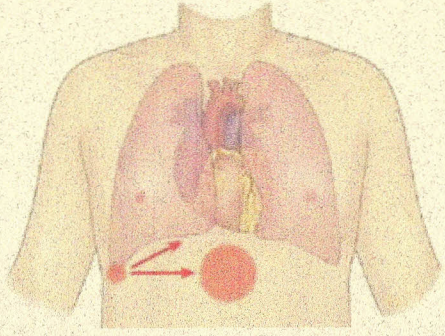
CARDIAC CYCLE



Coronary Arteries

originate from the aorta just above the aortic valve leaflets.
heart has high metabolic requirements, using ~ 70% to 80% of the O_2 delivered (other organs ~25%).
Unlike other arteries, the coronary arteries are perfused during diastole. *
If normal heart rate there is ample time during diastole for myocardial perfusion.
Tachycardia: diastolic time shortened, may not allow adequate time for myocardial perfusion,
↑ risk for **myocardial ischemia** (inadequate oxygen supply), especially patients with CAD.

Assessing Chest Pain

ocation	Character	Duration	P…pitating Events and Aggravating Factors	Alleviating Factors
ngina pectoris *cute coronary syndrome* (ACS) (unstable angina, myocardial infarction [MI])  Usual distribution of pain with myocardial ischemia	Angina: Uncomfortable pressure, squeezing, or fullness in substernal chest area Can radiate across chest to the medial aspect of one or both arms and hands, jaw, shoulders, upper back, or epigastrium Radiation to arms and hands, described as numbness, tingling, or aching	Angina: 5–15 min	Angina: Physical exertion, emotional upset, eating large meal, or exposure to extremes in temperature	Angina: Rest, nitroglycerin, oxygen
 Jaw Epigastrium Right side Back ess common sites of pain with myocardial ischemia	ACS: Same as angina pectoris Pain or discomfort ranges from mild to severe Associated with shortness of breath, diaphoresis, palpitations, fatigue, and nausea or vomiting	ACS: >15 min	ACS: Emotional upset or unusual physical exertion occurring within 24 hr of symptom onset Can occur at rest or while asleep	ACS: Morphine, reperfusion of coronary artery with thrombolytic agent or percutaneous coronary intervention
'ericarditis 	Sharp, severe substernal or epigastric pain Can radiate to neck, arms, and back Associated symptoms include fever, malaise, dyspnea, cough, nausea, dizziness, and palpitations	Intermittent	Sudden onset Pain increases with inspiration, swallowing, coughing, and rotation of trunk	Sitting upright, analgesia, anti-inflammatory medications
'ulmonary disorders (pneumonia, pulmonary embolism) 	Sharp, severe substernal or epigastric pain arising from inferior portion of pleura (referred to as pleuritic pain) Patient may be able to localize the pain	≥30 min	Follows an infectious or noninfectious process (MI, cardiac surgery, cancer, immune disorders, uremia) Pleuritic pain increases with inspiration, coughing, movement, and supine positioning Occurs in conjunction with community-acquired or nosocomial lung infections (pneumonia) or deep vein thrombosis (pulmonary embolism)	Treatment of underlying cause

SYMPTOM CLUSTERS ACUTE MI

Chest discomfort; sho…r, arm, or hand pain; weakness (43%)

Chest discomfort; shoulder, arm, or hand pain (23%)

Chest discomfort; shoulder, arm, or hand pain; nausea or vomiting; shortness of breath; sweating; dizziness/lightheadedness; weakness; fatigue (17%)

Shoulder, arm, or hand discomfort; abdominal pain; indigestion (8%)

No symptoms (6%)

GENETIC Cardiovascular Disorders

Some examples are:

Familial hypercholesterolemia
Hypertrophic cardiomyopathy
Long QT syndrome
Hereditary hemochromatosis
Elevated homocysteine levels

Assess all pts with CV symptoms fo

CAD, regardless of age
family history of sudden death (esp early onset, esp asymptomatic)

family members w/ biochemical or neuromuscular conditions: Hemochromatosis, musc. dystrophy

DNA mutation or other genetic testing done on an affected family member.

Patient Assessment

Assess for S&S of hyperlipidemias (xanthomas, corneal arcus, abdominal pain of unexplained origin).

Assess for muscular weakness.

Assessing Chest Pain

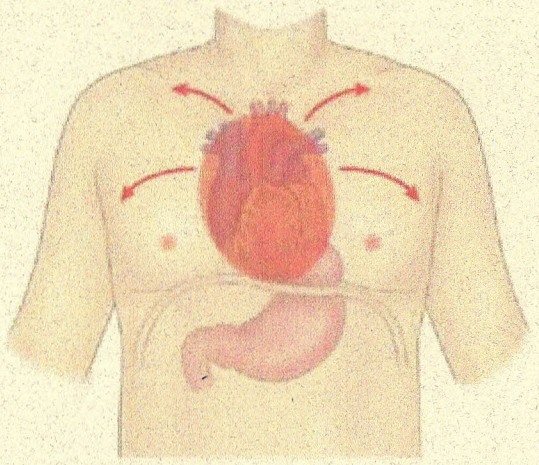
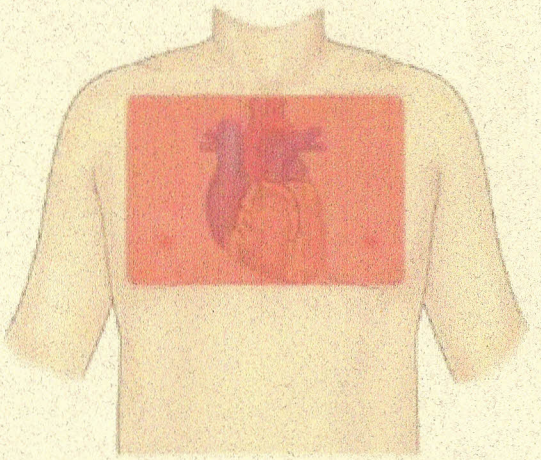
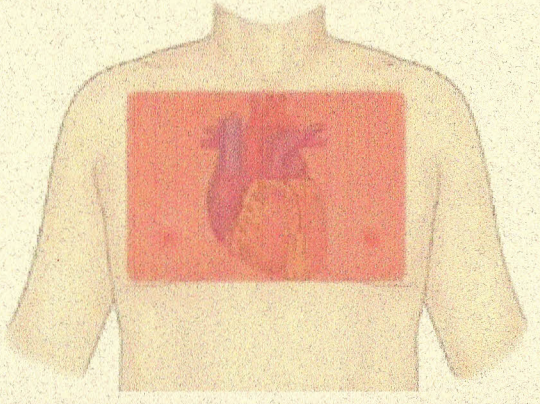
Esoph[illegible]eal disorders (hiatal hernia, reflux esophagitis or spasm) 	Substernal pain described as sharp, burning, or heavy Often mimics angina Can radiate to neck, arm, or shoulders	5–60 min	Recumbency, cold liquids, exercise	Food or antacid Nitroglycerin
Anxiety and panic disorders 	Pain described as stabbing to dull ache Associated with diaphoresis, palpitations, shortness of breath, tingling of hands or mouth, feeling of unreality, or fear of losing control	Peaks in 10 min	Can occur at any time including during sleep Can be associated with a specific trigger	Removal of stimulus, relaxation, medications to treat anxiety or underlying disorder
Musculoskeletal disorders (costochondritis) 	Sharp or stabbing pain localized in anterior chest Most often unilateral Can radiate across chest to epigastrium or back	Hours to days	Most often follows respiratory tract infection with significant coughing, vigorous exercise, or posttrauma Some cases are idiopathic Exacerbated by deep inspiration, coughing, sneezing, and movement of upper torso or arms	Rest, ice, or heat Analgesic or anti-inflammatory medications

Table 31-1 Characteristics of Arterial and Venous Insufficiency and Resulting Ulcers

haracteristic	Arterial	Venous
General Characteristics		
Pain	Intermittent claudication to sharp, unrelenting, constant	Aching, cramping
Pulses	Diminished or absent	Present, but may be difficult to palpate through edema
Skin characteristics	Dependent rubor—elevation pallor of foot; dry, shiny skin; cool-to-cold temperature; loss of hair over toes and dorsum of foot; nails thickened and ridged	Pigmentation in gaiter area (area of medial and lateral malleolus), skin thickened and tough, may be reddish blue, frequently with associated dermatitis
Ulcer Characteristics		
Location	Tip of toes, toe webs, heel or other pressure areas if confined to bed	Medial malleolus; infrequently lateral malleolus or anterior tibial area
Pain	Very painful	Minimal pain if superficial or may be very painful
Depth of ulcer	Deep, often involving joint space	Superficial
Shape	Circular	Irregular border
Ulcer base	Pale to black and dry gangrene	Granulation tissue—beefy red to yellow fibrinous in chronic long-term ulcer
Leg edema	Minimal unless extremity kept in dependent position constantly to relieve pain	Moderate to severe