



Don't Go Breaking My Heart

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Disclosure statement

- ◆ I am sorry to inform you I have no financial ties to disclose, but I am open to discussion later



Objectives

- ◆ Define CHF
- ◆ Understand physiology of heart
- ◆ Recognize CHF in the field
- ◆ Improve skills to diagnose CHF, COPD, Pneumonia
- ◆ Understand pre-hospital treatment options



- ◆ The medical and ethical performance of EMS professionals has never been more important than it is today.
- ◆ We are still in infancy of being a professional
- ◆ Only you can prove we are professionals



The End of the Beginning

- ◆ Innocence is over
- ◆ You are COMPLETELY accountable for what you do
- ◆ Becoming a professional requires you to always be able to explain your actions
- ◆ EMS is ONLY and ALWAYS about patient care



Critical Care Evaluation and Management

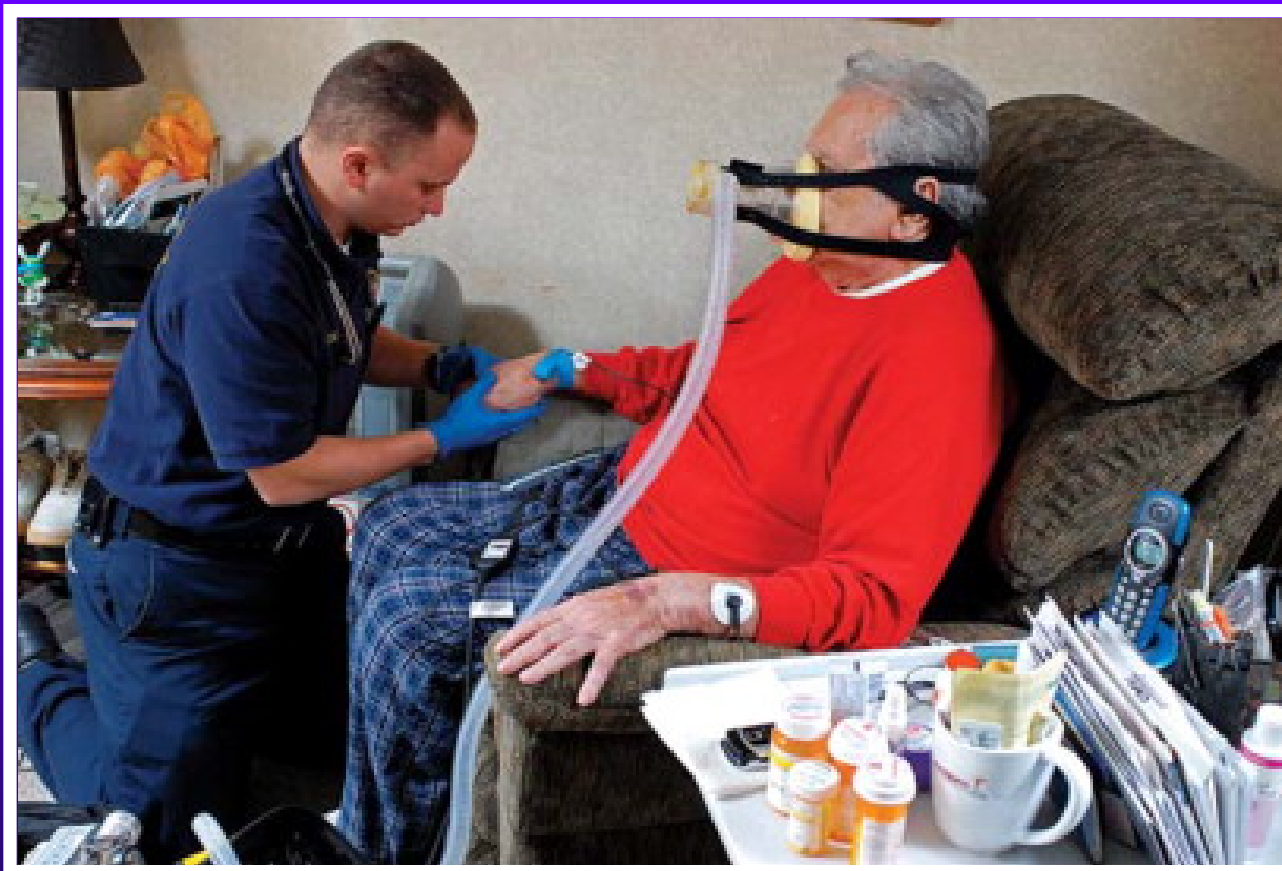
- ◆ The Essence of What Makes a Paramedic a Critical Care Technician



- ◆ Part of excellence in critical care is performing superior medical histories and physical exams
- ◆ 2 Cases.... Meds/ Pul Edema



- ◆ EMS is a great deal about critical care medicine
- ◆ We are the first to the patient
- ◆ We not only offer the cavalry, but must bring the intel to the hospital





What do you notice??

- ◆ Alertness
- ◆ Level of distress
- ◆ Noises
- ◆ Respirations
- ◆ The pulse rate
- ◆ Skin
- ◆ Obvious things



◆ THE ORDER OF ASSESSMENT OF THE CRITICALLY ILL



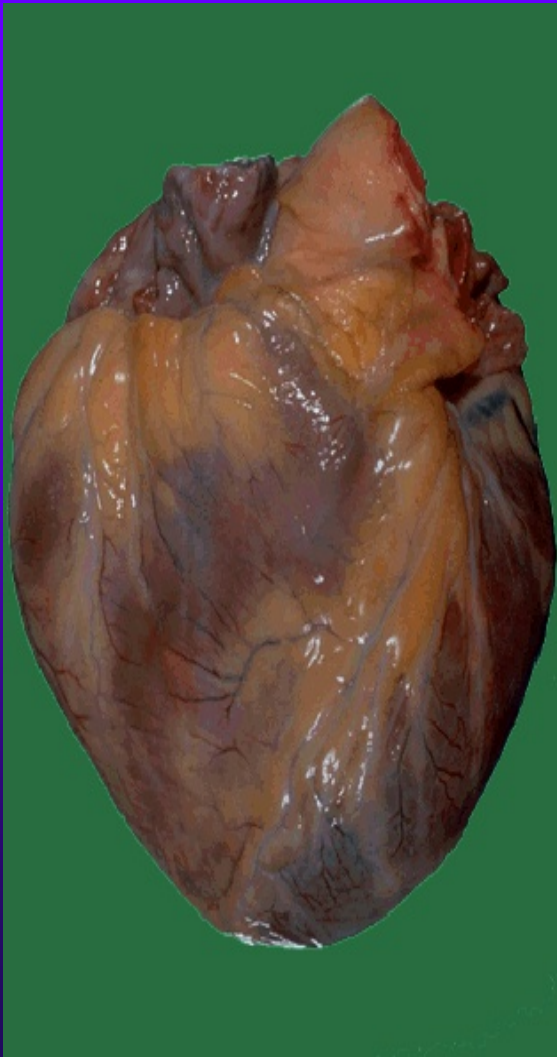
- ◆ As we assess patients, we must quickly determine fundamental parameters of their respiratory and circulatory status



Primary Survey

- ◆ Scene survey/Mechanism/#pts.
- ◆ LOC/Airway/C-spine
- ◆ Respiratory Rate and Labor
- ◆ Pulses/Skin/External Bleeding
- ◆ Neck Appearance/JVD/Trachea
- ◆ Chest Appearance/Breath Sounds
- ◆ Quick survey of
abdomen/pelvis/extremities/back

Normal Heart



- ◆ Size of your fist
- ◆ Cardiac output 4 to 6 L
- ◆ $CO = SV \times HR$
- ◆ Ejection Fraction
Percentage of volume ejected with each contraction
Normal 60 to 70 %



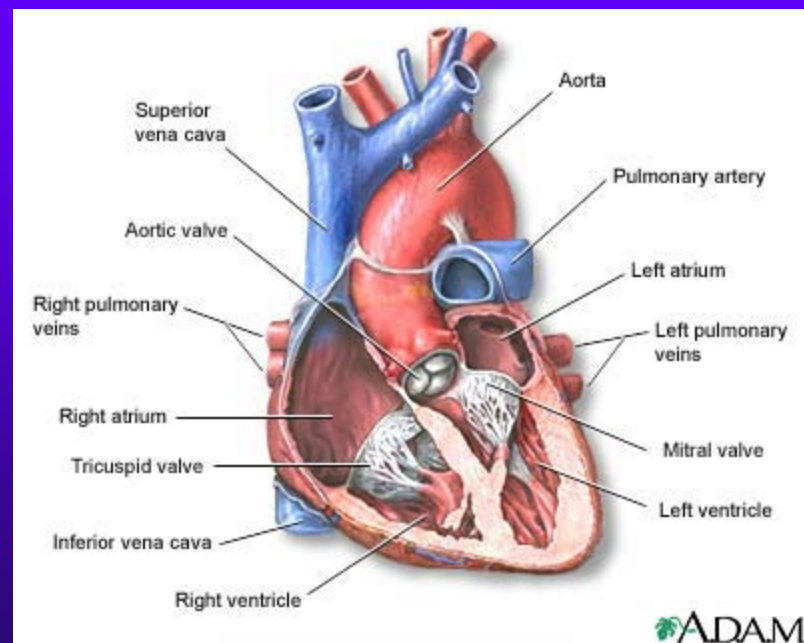
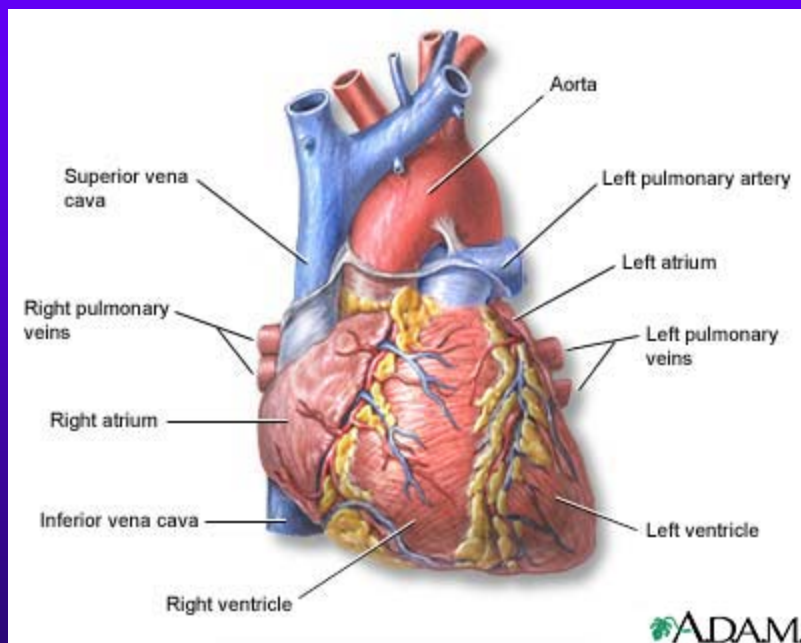
Definition CHF

- ◆ Occurs when the heart muscle is not able to pump enough blood to satisfy the metabolic needs of the tissue

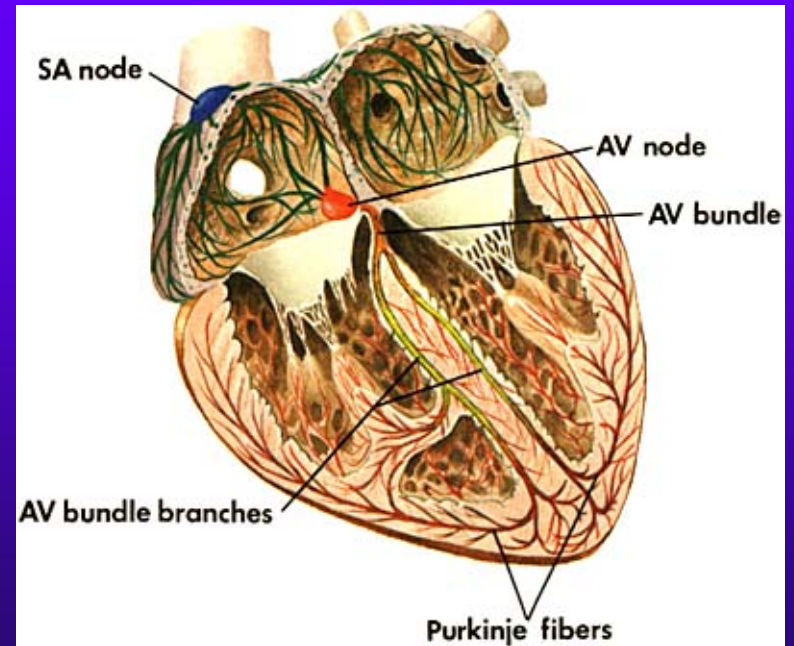
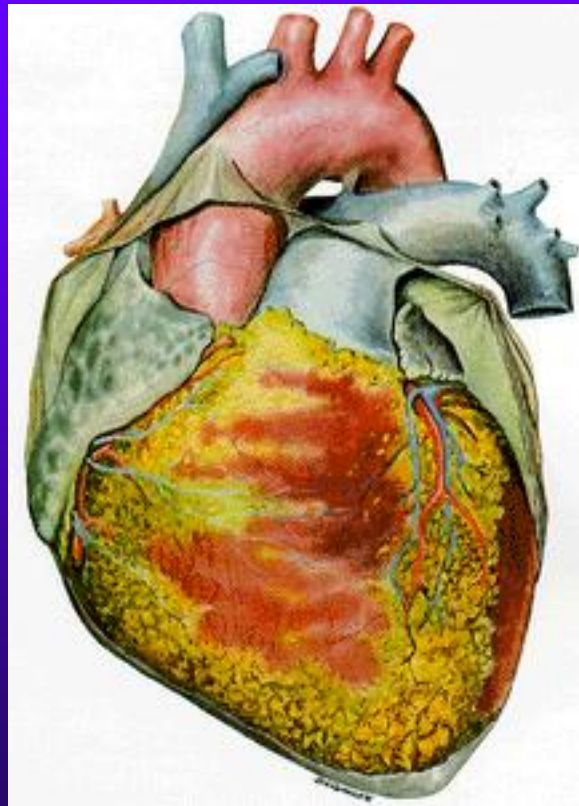


Facts

- CHF affects 5 million people in US
- 550,000 new cases a year in US
- Leading cause of hospitalization in people over 65
- Contributes to 250,000 deaths per year
- Estimated annual cost over 4 billion



Electrical activity





Various Types

- ◆ Left sided heart failure is failure of left ventricle that pumps fluid. This may result in accumulating fluid in lungs.
- ◆ Righted sided heart failure is failure of right ventricle to pump blood to the lungs. Results in edema.
- ◆ Both left and right



CHF

- ◆ Systolic dysfunction abnormality of contraction of the pumping chambers of the heart
- ◆ Diastolic dysfunction when the pumping chamber may be contracting normally but not relaxing



Causes

Hypertension most common

Coronary artery disease

Valvular disease

Cardiomyopathy

Pericarditis

Arrhythmias

Metabolic factors

Important Terminology

– Preload—

- The amount of blood the heart must pump with each beat
- Determined by:
 - Venous return to heart
 - Accompanying stretch of the muscle fibers
- Increasing preload → increase stroke volume in normal heart
- Increasing preload → impaired heart → decreased SV. Blood is trapped → chamber enlargement

– Afterload—

- The pressure that must be overcome for the heart to pump blood into the arterial system.
- Dependent on the systemic vascular resistance
- With increased afterload, the heart muscles must work harder to overcome the constricted vascular bed → chamber enlargement
- Increasing the afterload will eventually decrease the cardiac output.

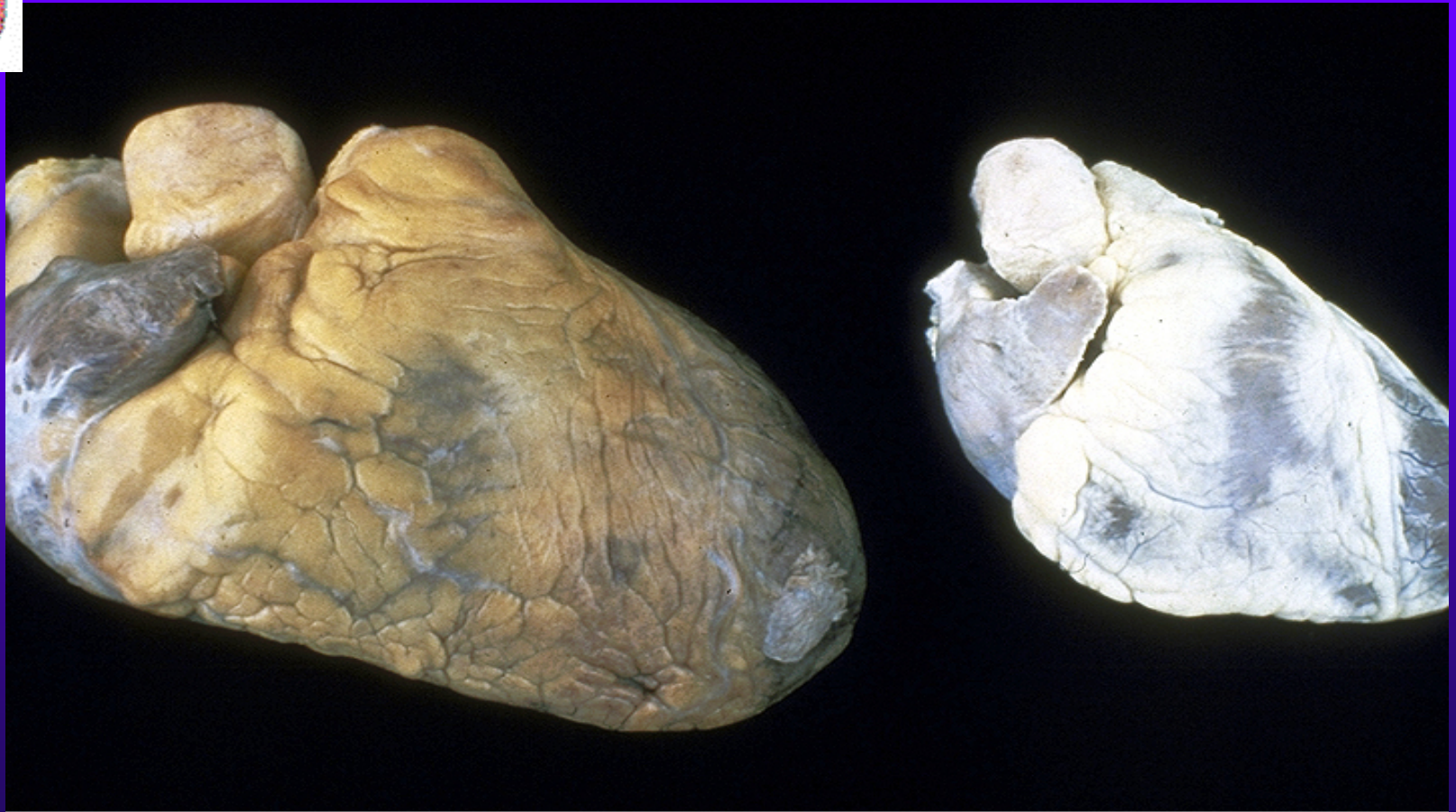
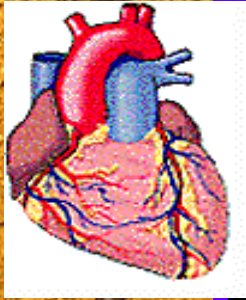




Left Ventricular Failure with PE

- Occurs when the left ventricle fails as an effective forward pump
- → back pressure of blood into the pulmonary circulation
- → pulmonary edema
- Cannot eject all of the blood delivered from the right heart.
- Left atrial pressure rises → increased pressure in the pulmonary veins and capillaries
- When pressure becomes too high, the fluid portion of the blood is forced into the alveoli.
- → decreased oxygenation capacity of the lungs
- AMI common with LVF, suspect

Pathology



Left: Dilated heart, hypertension. Right: Normal size

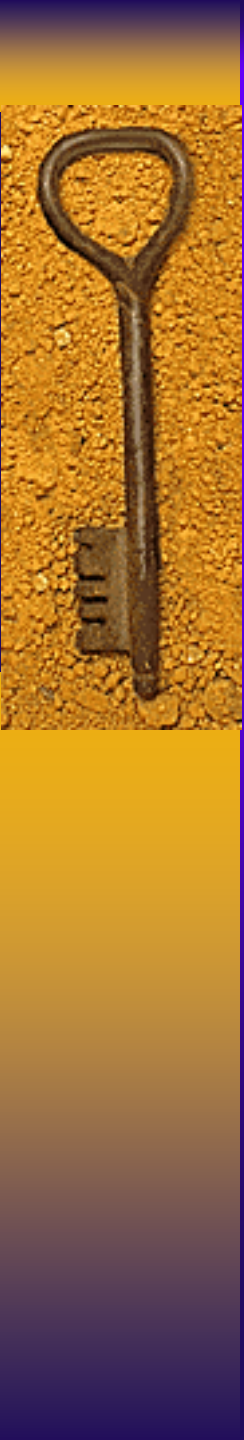
Etiologies

- Coronary artery disease
- HTN
- Valvular heart disease (especially aorta and mitral disease)--chronic
- Infections--acute
- Dysrhythmias--acute
- Alcohol--chronic
- MI--acute
- Diabetes—chronic



CAD

- When cholesterol and fatty deposits build up in the heart's arteries, less blood reaches the heart muscle. This damages the muscle, and the healthy heart tissue that remains has to work harder



MI - Acute and Past

- The ischemic tissue is basically taken out of the equation, leaving a portion of the heart to do the work of the entire heart → decreased SV → CHF.





Hypertension

- Uncontrolled HTN doubles the chances of failure
- With HTN, the chambers of the heart enlarge and weaken.

Valvular Heart Disease

- Can result from disease, infection, or be congenital
- Don't open and/or close completely → increased workload → failure





Dysrhythmias

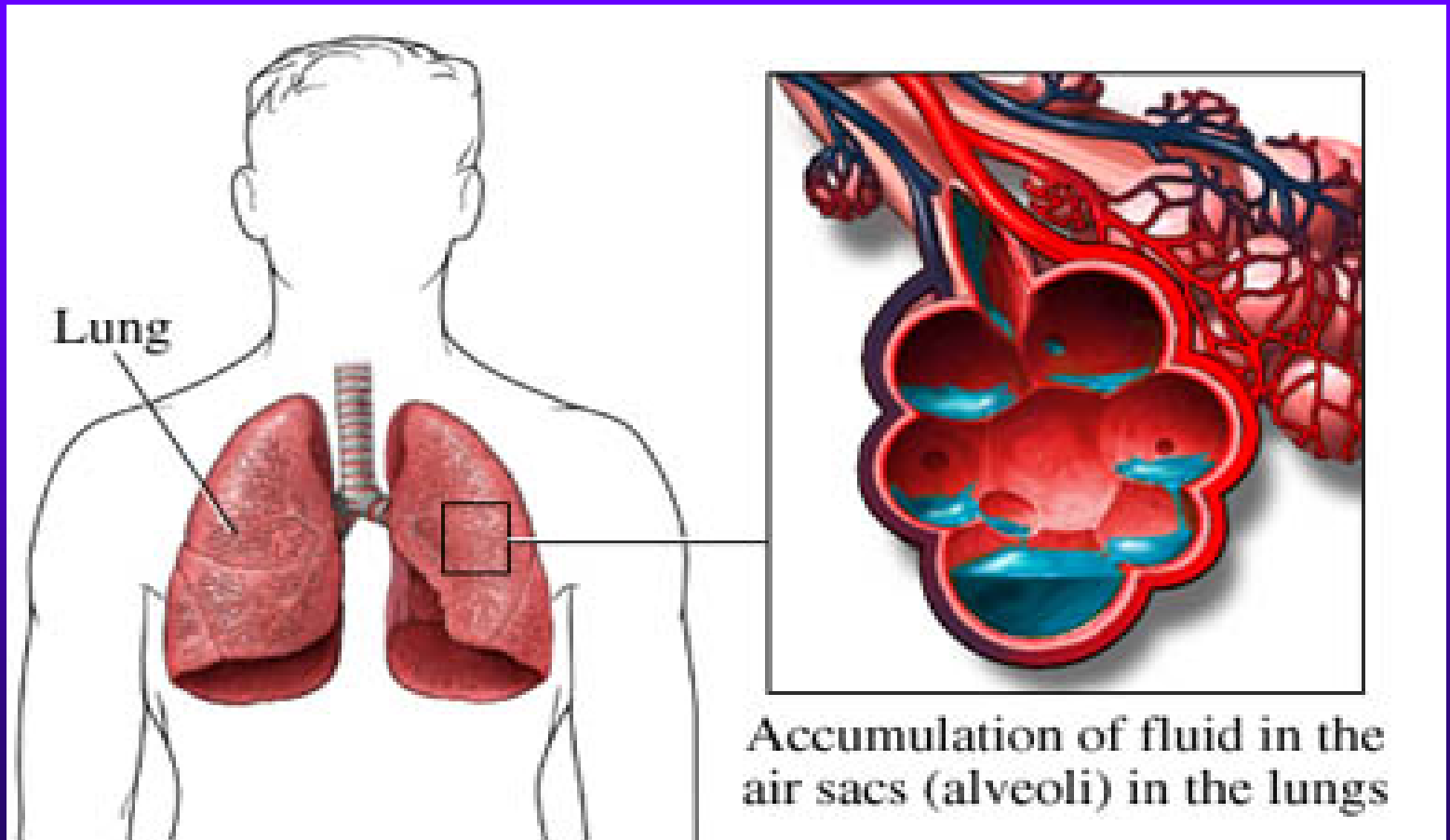
- Tachycardias → decreased diastolic filling time
→ decreased SV.
- Atrial dysrhythmias → as much as 30% reduction in stroke volume



Diabetes

- Tend to be overweight
- HTN
- Hyperlipidemia

Pulmonary edema



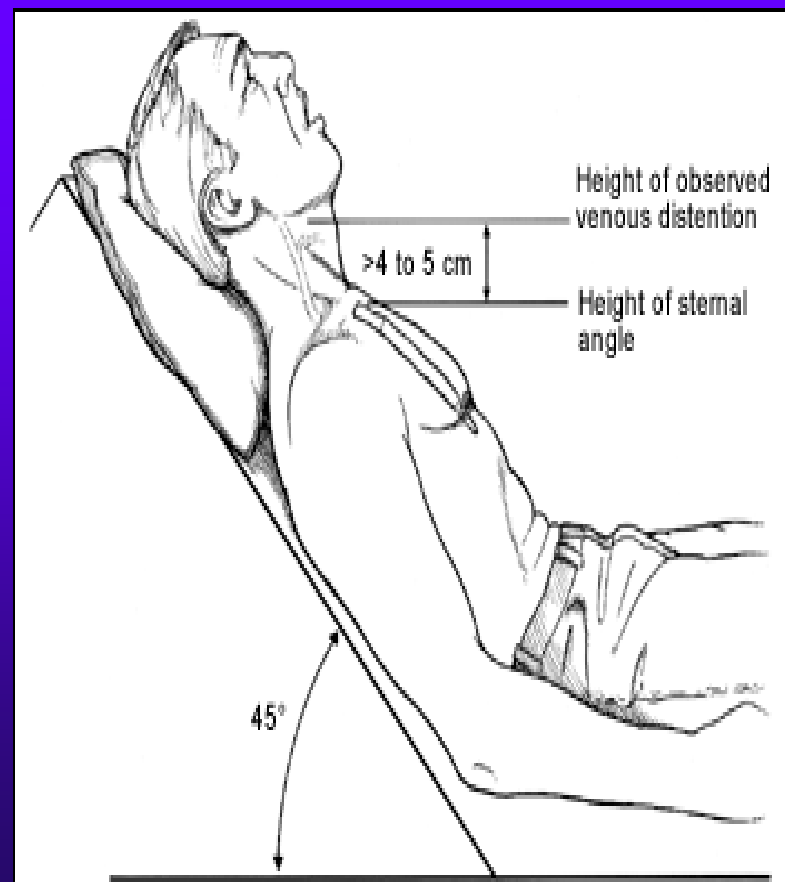


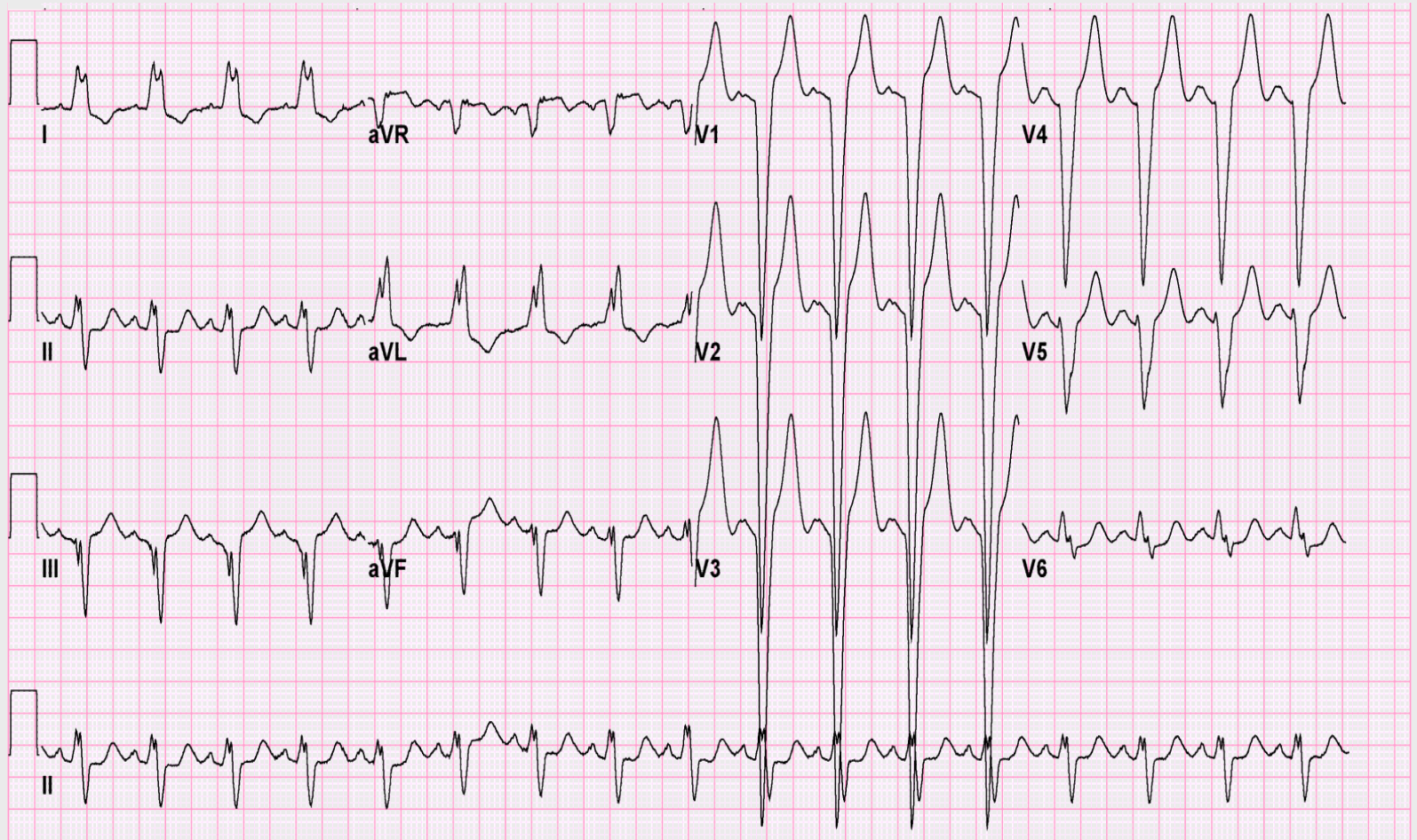
Patient # 1

- 70 yo female with CP for one hour resolved now
- Sitting on edge of bed
- Confused
- Almost combative
- Keeps taking O2 off
- Pouring sweat
- Rales Bilaterally



- Jugular Venous distention.
 - Comes from back pressure building from right heart into venous circulation
- Vital Signs—
- B/P 240/140
- HR 120
- Sats 70%
- What to do???
- EKG







- ◆ You tell me what is happening with this patient



- ◆ Systolic failure or diastolic failure
- ◆ Blood backing up into lungs
- ◆ Increased afterload
- ◆ Hypoxia
- ◆ Knocking
- ◆ Does she have right sided failure
- ◆ Treatment?



Pre-hospital treatment

- ◆ Sit patient up
- ◆ High flow O₂
- ◆ CPAP
- ◆ Nitroglycerin sublingual
- ◆ Nitroglycerin IV How much
- ◆ Captopril sublingual

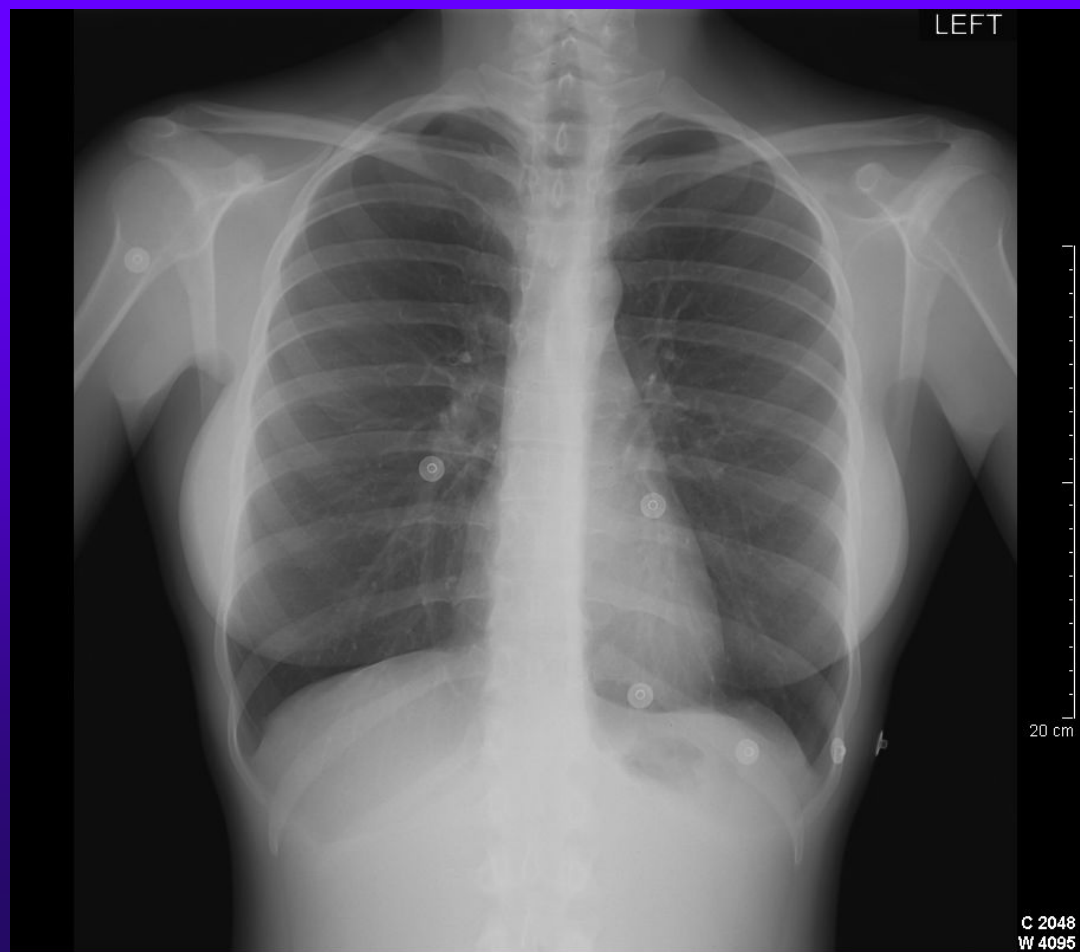


- ◆ REMEMBER LEFT VENTRICULAR FAILURE IS A TRUE LIFE THREATENING EMERGENCY

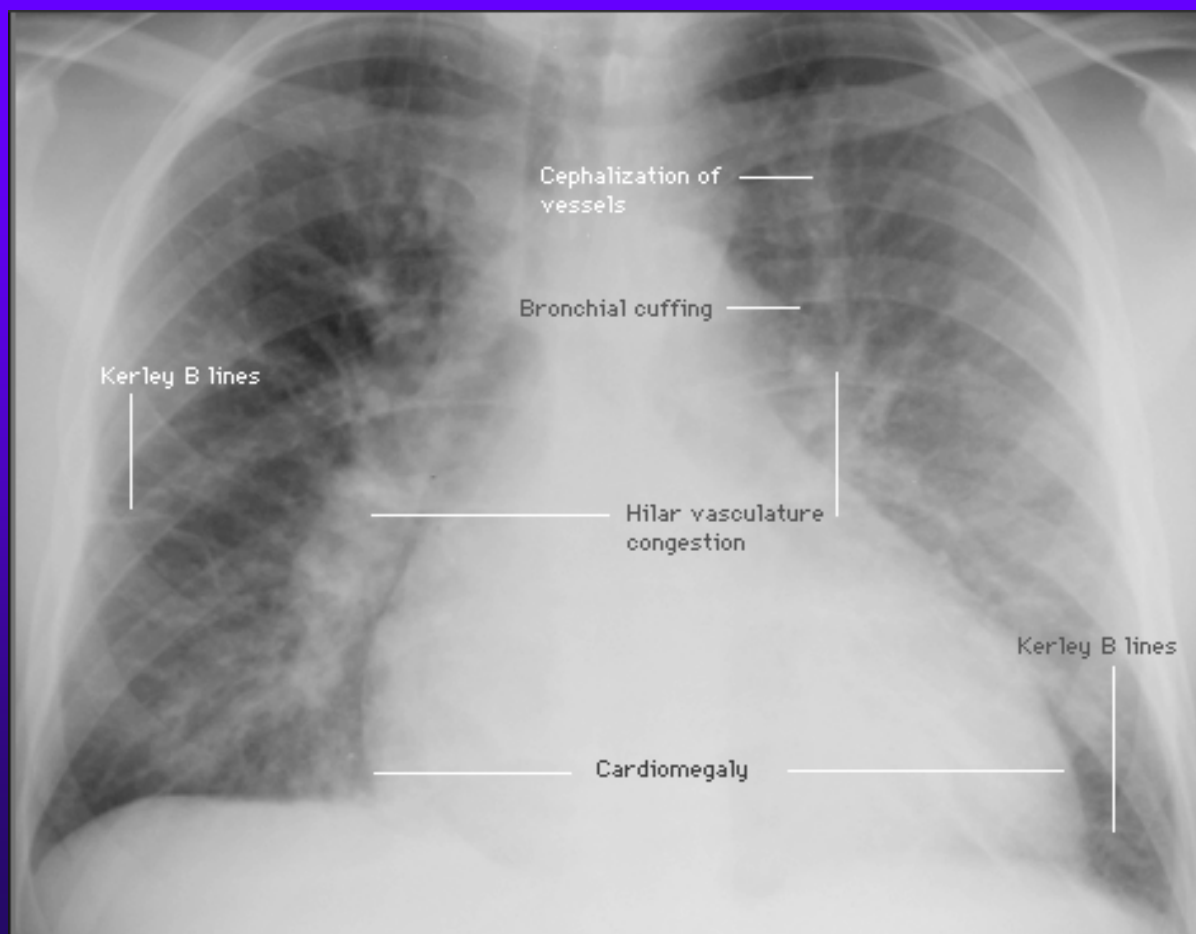


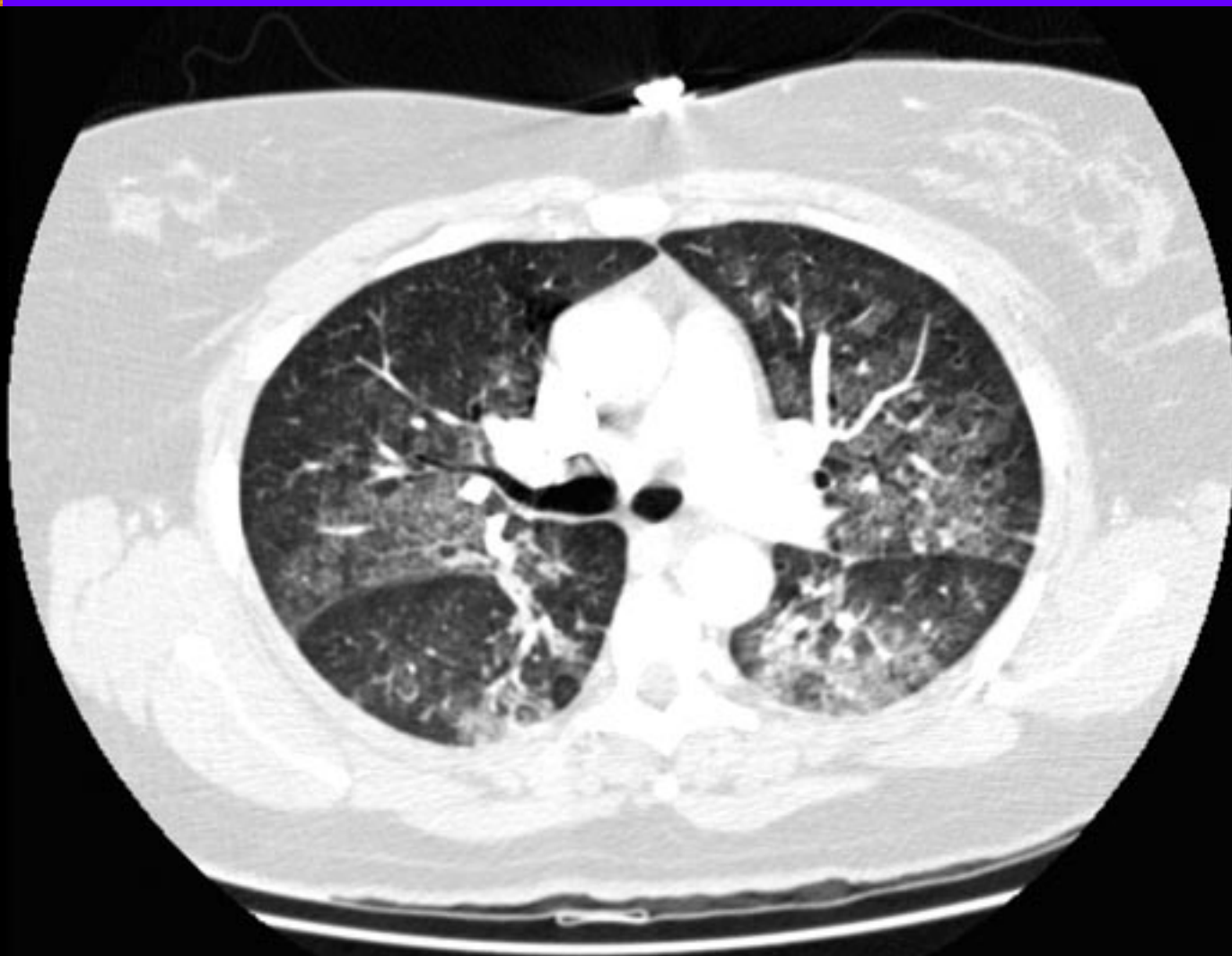
Hospital Course

- ◆ Labs
- ◆ CXR
- ◆ Which one of these is this patient's CXR
- ◆ Admit







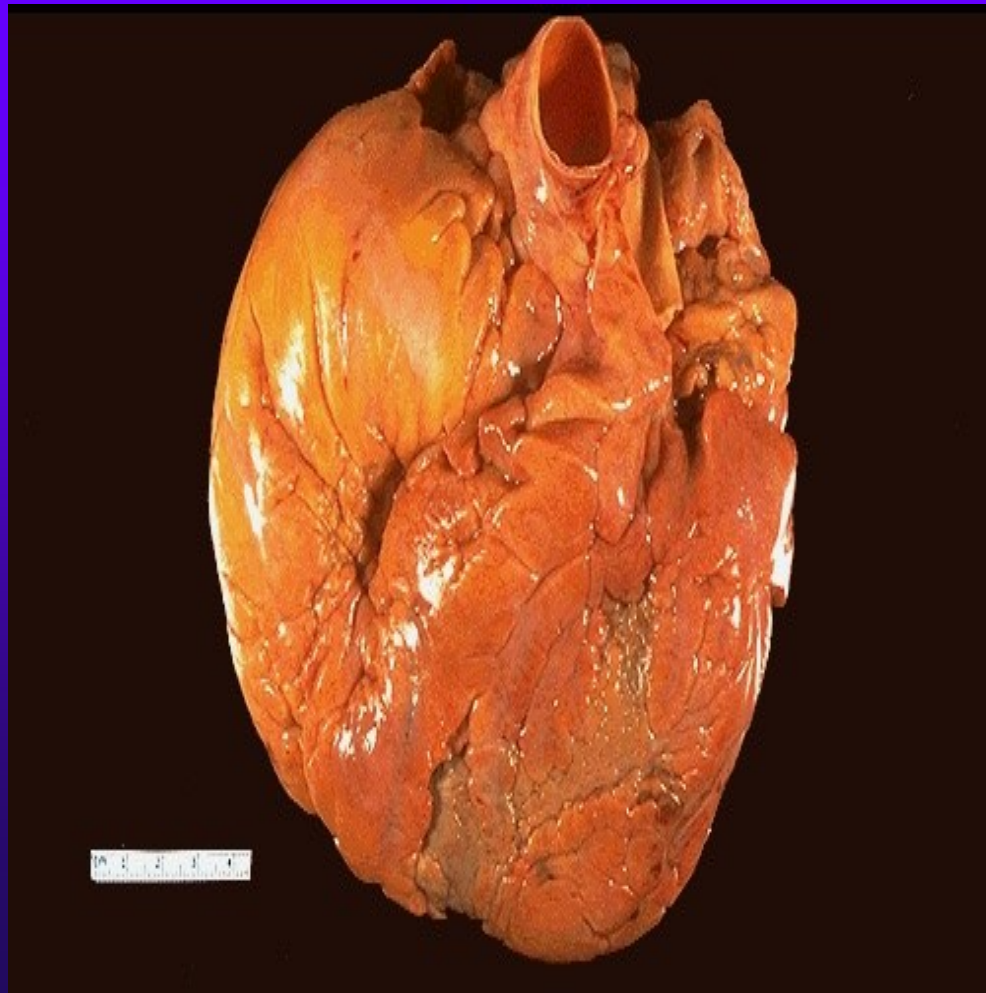


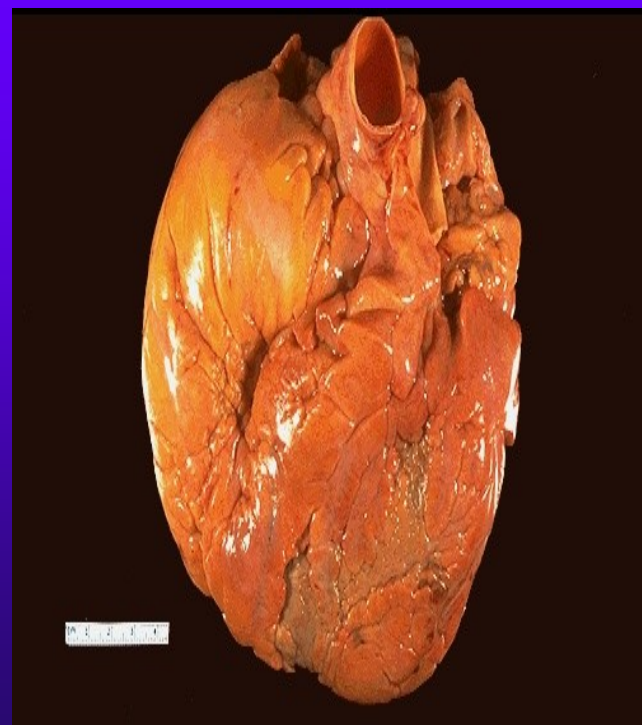
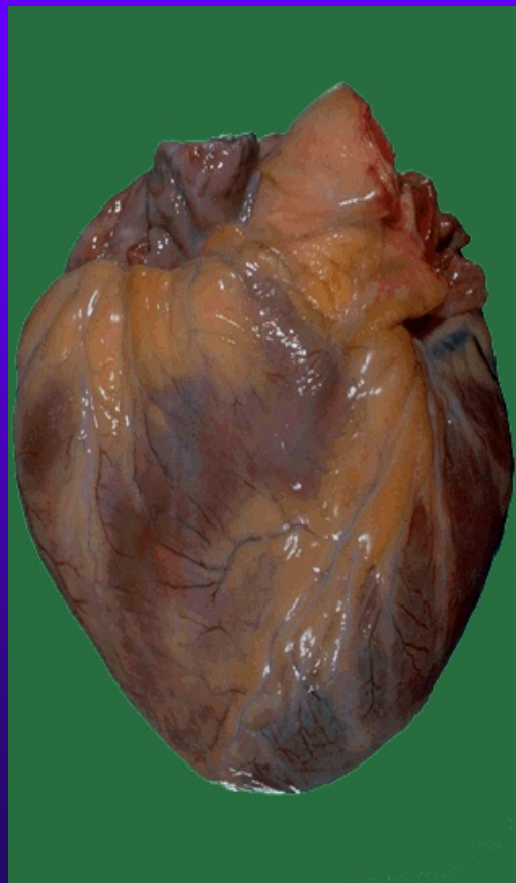


What are chances of death

- ◆ 10 percent after 1 year
- ◆ Half die within 5 years of diagnosis

Cardiomyopathy







Dilated cardiomyopathy





Patient # 2

- ◆ 65 y/o male C/O severe SOB, diaphoretic
- ◆ Started 20 min ago. No CP. On insulin, bumex, and potassium
- ◆ VS 160/90 RR 28 130
- ◆ Wheezing no rales
- ◆ Tell me treatment?



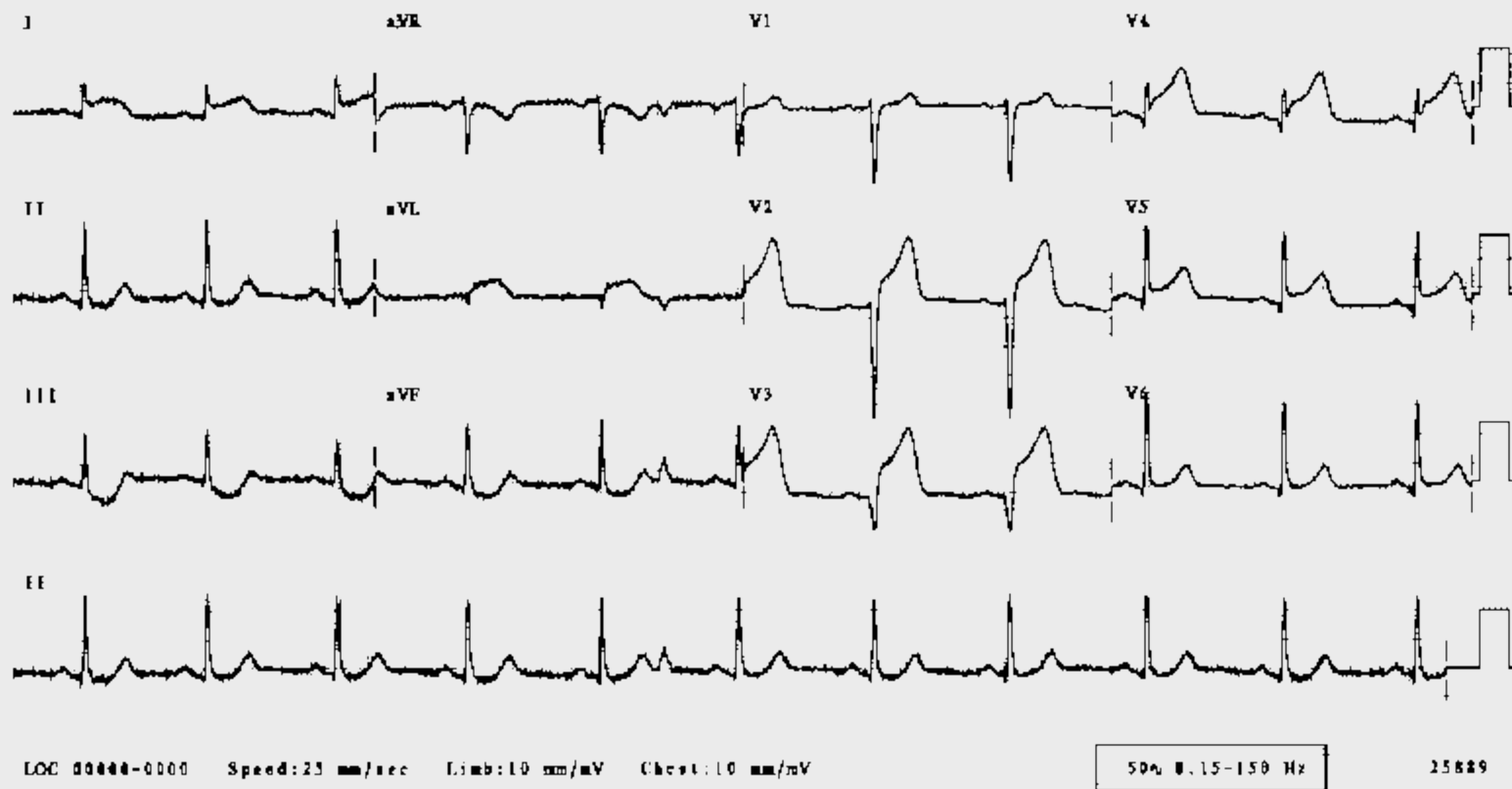
Treatment

- ◆ Albuteral ?
- ◆ Epi ?
- ◆ Anything else



Patient # 3

- ◆ 57 Y/O CP started 3 days ago, comes and goes, present for 2 hours now
- ◆ SOB
- ◆ 120/70 55 18 sats 90
- ◆ Exam Rales Bilaterally. Appears very uncomfortable





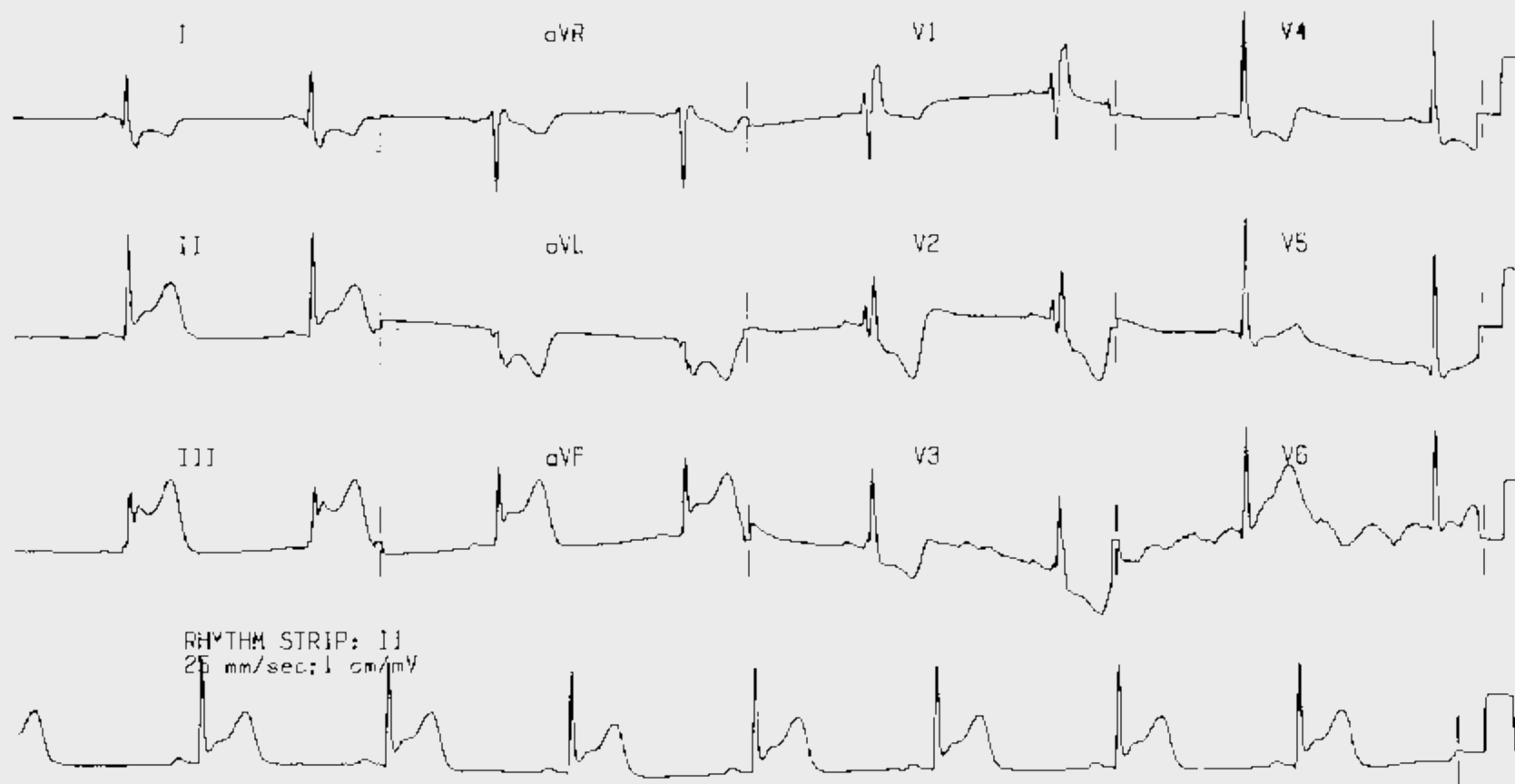
Treatment

- ◆ Cath lab
- ◆ Fluid bolus
- ◆ ASA
- ◆ NTG???



Patient 4

- ◆ 55 y/o male with CP, nausea, and diaphoresis
- ◆ VS 110/60 HR 60 RR 18
- ◆ Sats 98 %
- ◆ EKG



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Treatment

- ◆ 02
- ◆ Cath lab
- ◆ Fluid if needed
- ◆ ASA
- ◆ Ntg??

Right Heart Failure

– Etiology—

- Acute MI—
 - Inferior MI
- Pulmonary disease
 - COPD, fibrosis, HTN
- Cardiac disease involving the left or both ventricles
- Results from LVF
- Pulmonary embolism

– Pathophysiology—

- Decreased right-sided cardiac output or increased pulmonary vascular resistance
→ increased right vent. Pressures.
- As pressures rise, this
→ increased pressure in the right atrium and venous system
- Higher right atrium pressures → JVP





- In the peripheral veins, pressures rise and the capillary pressures increase, hydrostatic pressure exceeds that of interstitial pressure
- Fluid leaks from the capillaries into the surrounding tissues causing peripheral edema
- Lungs are clear due to left ventricular pressures are normal

Signs and Symptoms

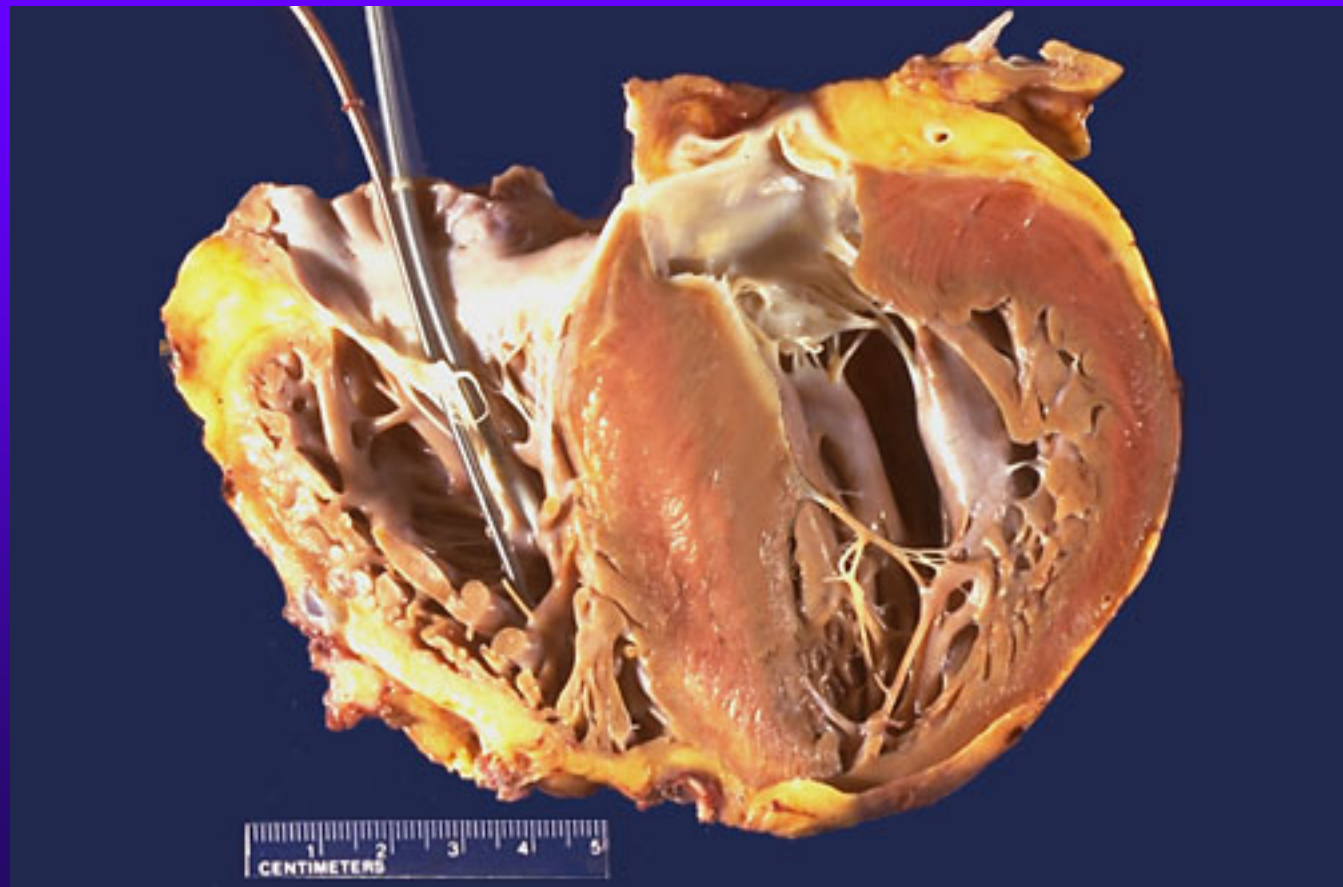
- Marked JVD
- Clear chest
- Hypotension
- Marked peripheral edema
- Ascites, hepatomegaly
- Poor exercise tolerance
- Often will be on Lasix, Digoxin,
- Have chronic pump failure
- The first three are for an inferior MI, describe cardiac tamponade.



Ventricular Hypertrophy

- Long term compensatory mechanism
- Increases in size due to increase in work load ie skeletal muscle







How good are we at diagnosis

- ◆ Some studies state EMS miss diagnosis up to 42 percent of the time
- ◆ What is differential dx



- ◆ COPD
- ◆ Pulmonary embolism
- ◆ Pneumonia
- ◆ Asthma



Comparison of COPD, CHF Pneumonia

Comparison of COPD, CHF Pneumonia

	COPD	CHF	Pneumonia
Cough	Frequent	Occasional	Frequent
Wheeze	Frequent	Occasional	Frequent
Sputum	Thick	Thin/white	Thick/yellow/ brown
Hemoptysis	Occasionally	Pink frothy	occasionally
PND	Sometimes after a few hours	Often within 1 hour	Rare
Smoking	Common	Less common	Less common
Pedal edema	Occasional	Common with chronic	none



	COPD	CHF	Pneumonia
Onset	Often URI with cough	Orthopnea at night	Gradual with fever, cough
Chest Pain	pleuritic	Substernal, crushing	Pleuritic, often localized
Clubbing	Often	Rare	Rare
Cyanosis	Often and severe	Initially mild but progresses	May be present
Diaphoresis	May be present	Mild to heavy	Dry to moist
Pursed Lips	Often	Rare	Rare unless COPD



	COPD	CHF	Pneumonia
Barrel Chest	Common	Rare	Rare unless COPD
JVD	May be present with RVF	Mild to severe	Rare
BP	Usually normal	Often high	Normal
Dysrhythmia	Occasional	May precipitate CHF	Common
Wheeze	Common	Less common	Common
Crackles	Coarse, diffuse	Fine to coarse, begin in gravity dependent areas	Localized to diffuse, coarse



Patient # 5

- ◆ 78 year old with complaints of chronic SOB, increased edema, JVD.
- ◆ On digoxin and lasix
- ◆ VS B/P 70/40 HR 55 RR 18
- ◆ Lungs CTA



What's the most likely diagnosis

◆ Treatment?



Treatment

- ◆ Dopamine
- ◆ Dobutamine
- ◆ Fluid bolus

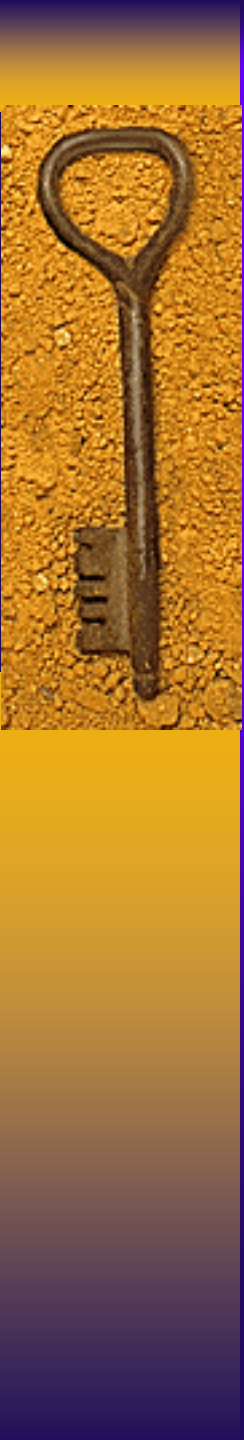
Drug Therapy

- Aimed at diminishing the compensatory mechanisms of low cardiac output and also improving contractility
- Vasodilators—ACE inhibitors
- Diuretic agents
- Inotropic agents



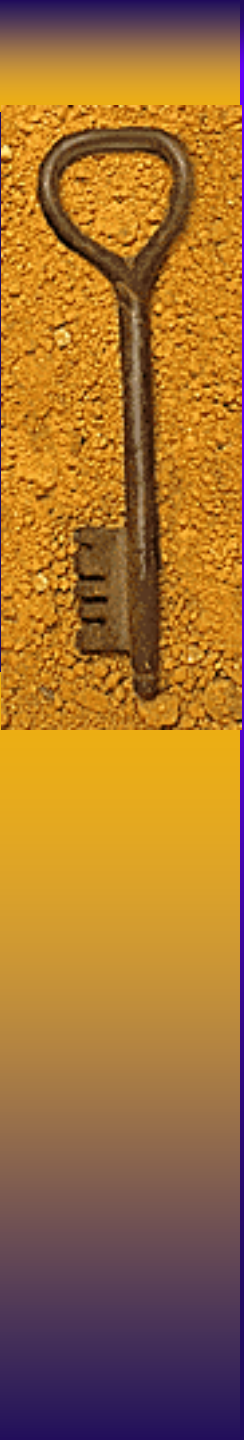
Vasodilators

- Dilate blood vessels
- Often constricted due to activation of the sympathetic nervous system and the renin-angiotensin-aldosterone system.
- Aka—ACE inhibitors
- Common ACE inhibitors
 - Captopril
 - Lisinopril
 - Vasotec
 - Monopril
 - Accupril



ACE Inhibitors

- Prevent the production of the chemicals that causes blood vessels to narrow
- Resulting in blood pressure decreasing and the heart pumping easier
- Nitrates



Nitrates

- Relaxation of smooth muscle
- Widens blood vessels
- Lowers systolic blood pressure



Diuretics

- Lasix
- Hydrochlorothiazide(HCTZ)
- Spironolactone
- Bumex

- ◆ These inhibit reabsorption of Na^+ into the kidneys
- ◆ Can be overused in acute setting
- ◆ Takes 30 to 120 minutes to work



Diuretics

- Decrease the body's retention of salt and water
- Reduces blood pressure
- Probably will be on potassium



Inotropic Agents

- Digoxin
- Lanoxin

- ◆ Increases the contractility of the heart → increasing the cardiac output
- ◆ Not as good acute for acute exacerbations



Beta Blockers

- Metoprolol
 - Atenolol
 - Propranolol
 - Amiodarone
- Useful by blocking the beta-adrenergic receptors of the sympathetic nervous system, the heart rate and force of contractility are decreased → could actually worsen CHF



Hydralazine

- Widens the blood vessels, therefore allowing more blood flow



Prehospital Treatment

- The prehospital goals for managing CHF
 - How about anxiety?
 - Decreasing cardiac workload
 - Attainment of normal tissue perfusion



Promotion of Rest

Promotion of Rest

- DO NOT make these patient's walk
- Could start a fluid “rush” into the alveoli
- Try to get them to sit still if they appear agitated and hypoxic





Relief of Anxiety

- Anxiety often experienced - why
- Leads to increase in O₂ demand and cardiac workload
- Explain what you are doing
- Morphine? Or Benzos?

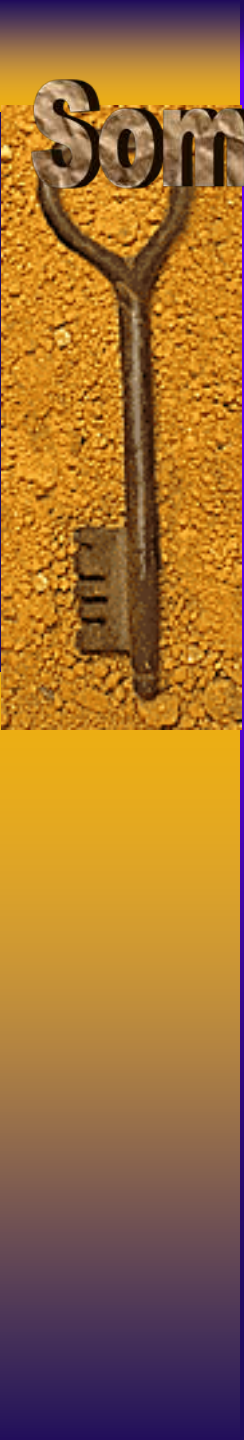
Decreasing Cardiac Workload

- CPAP YES!!!
- NTG YES!!!
- Benzo Probably
- MS Maybe!! But probably not
- Lasix Maybe!! But probably not
- O2—High flow O2



Some drugs your patients may be on

- ACE Inhibitors
- Digitalis
- Diuretics
- Hydralazine
- Nitrates



Diagnostic Challenges

- Particularly difficult in elderly
- Atypical presentations
- Predominant symptoms include:
 - Anorexia
 - Generalized weakness
 - Fatigue
 - Mental disturbances
 - Anxiety



Lung Sounds Associated with CHF

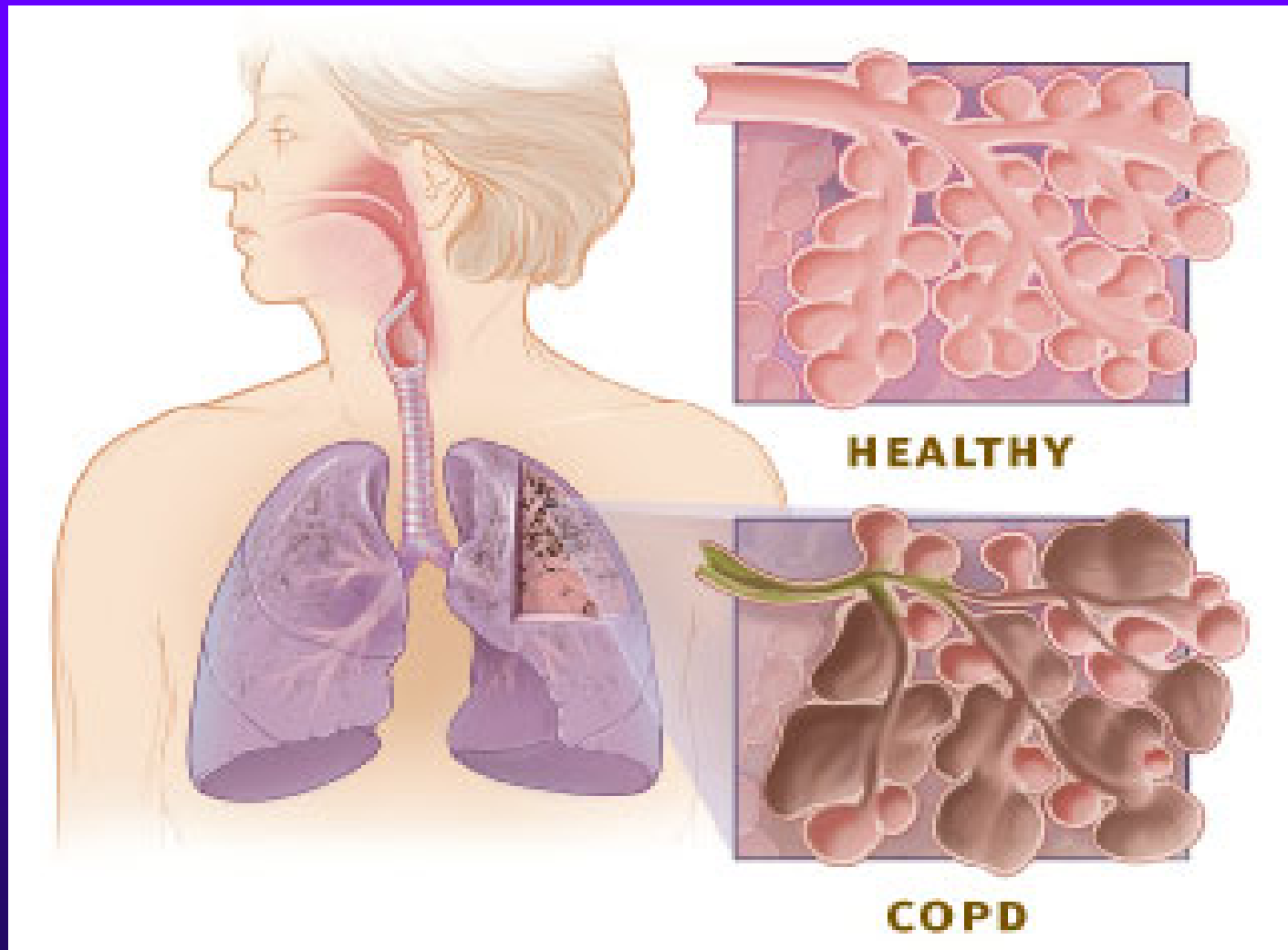
- 
- 🔊 Bubbling Rhonchi
 - 🔊 Coarse Crackles
 - 🔊 Fine Crackles
 - 🔊 Gurgling Rhonchi
 - 🔊 Rales

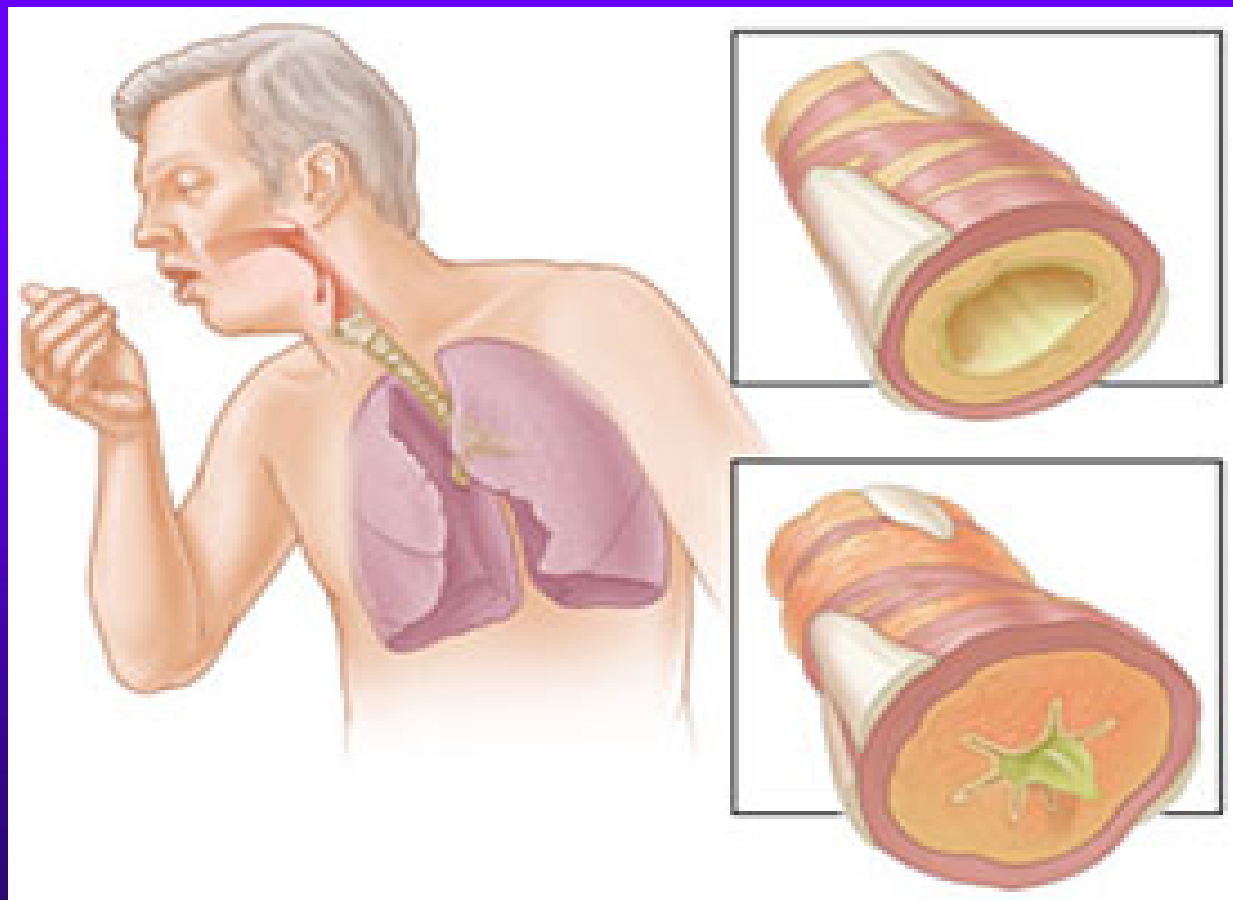


Patient # 6

- ◆ 73 y/o female with SOB. No edema. No fever. Has cough. Smoker.
- ◆ VS 140/90 98 30 sats 92%
- ◆ What questions do you want to ask?
- ◆ What is your treatment

COPD

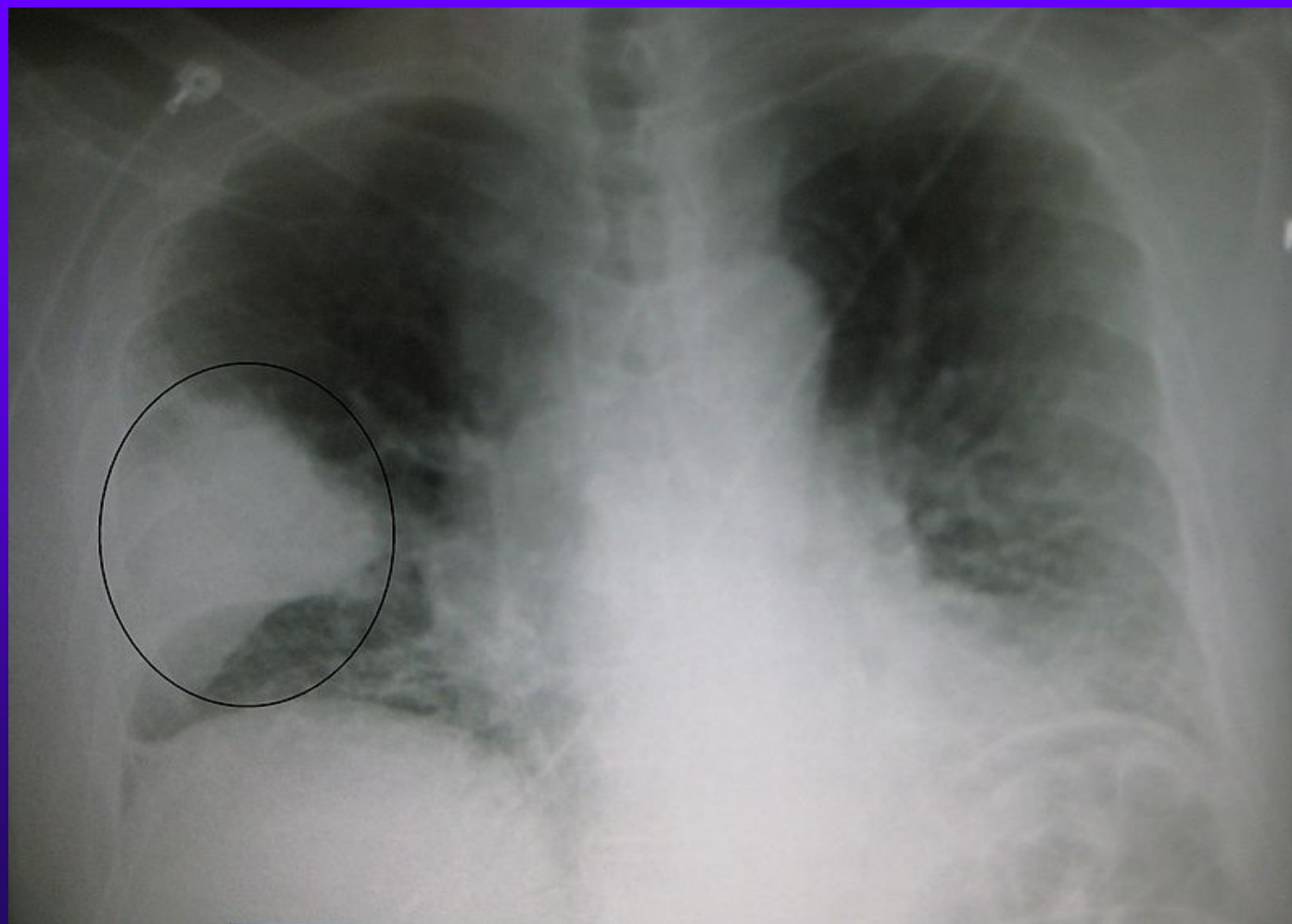






Patient #7

- ◆ 77 y/o male with cough, fever, chills, and aches.
- ◆ VS 80/60 138 26 sats 89%
- ◆ Lungs sounds course rhonchi
- ◆ What is your diagnosis
- ◆ What is your treatment





Treatment

- ◆ IVF
- ◆ O2



Last Patient

- ◆ 59 y/o female with CP relieved now. CP, SOB, N/V, diaphoresis all resolved. No ST elevation on EKG
- ◆ VS 130/80 88 16 sats 98
- ◆ Treatment?



- ◆ ASA
- ◆ O2?

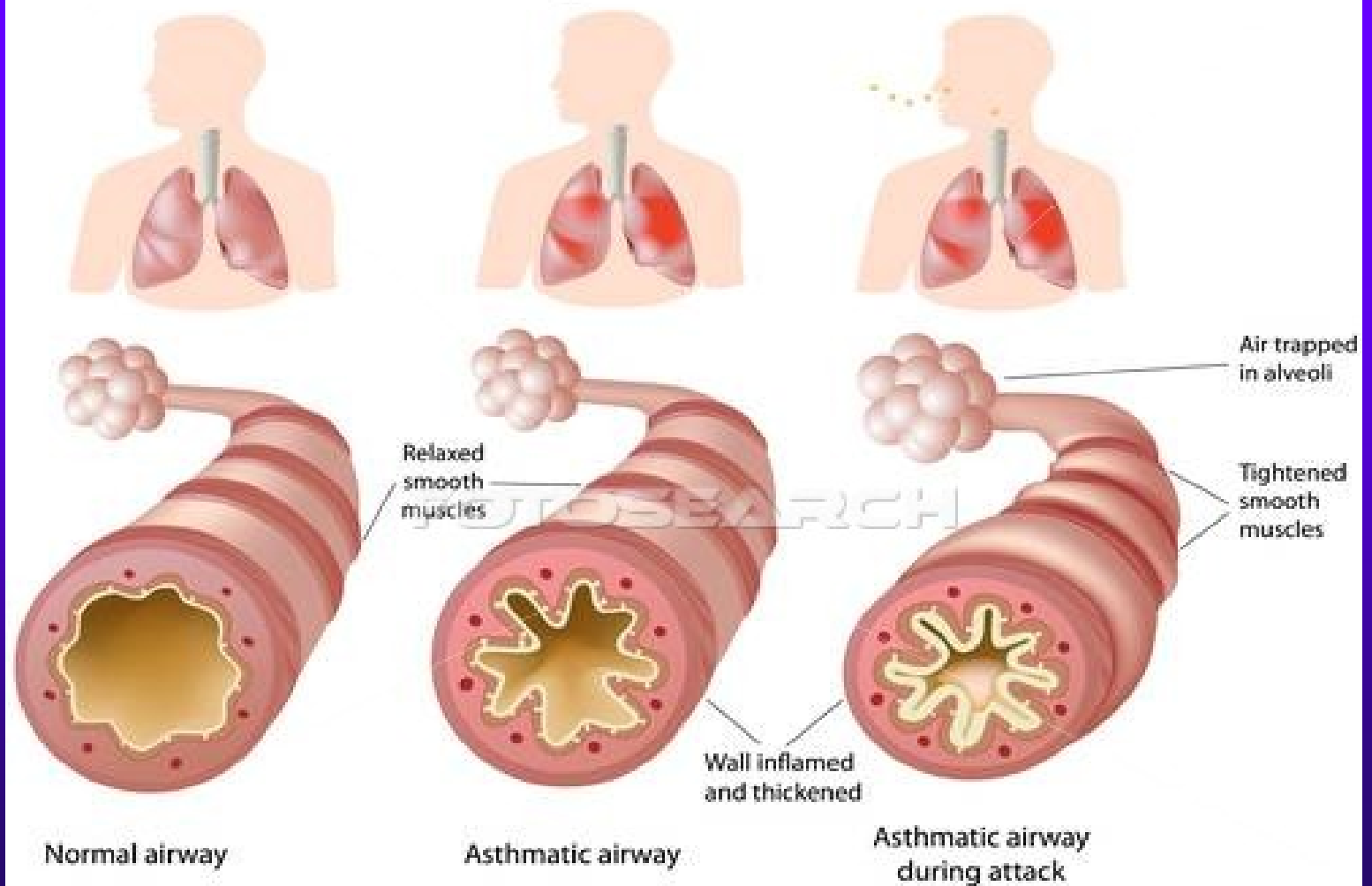


Case #8

- ◆ 45 y/o running marathon
- ◆ Coughing, SOB, Wheezing
- ◆ On albuterol
- ◆ 140/90 64 sats 86 % with RR of 38
- ◆ Now what



Pathology of Asthma





Tidbits of New Research

- ◆ Small study... Using King Airway results in reduce venous return during cardiac arrest
- ◆ Epi early.... Early reports state Epi early is more beneficial
- ◆ Need 2 tone metronome for CPR
- ◆ Only 1 to 2 minutes then rotate compressors
- ◆ 10 secs max for defib



Tidbits Continued

- ◆ During intubation use nasal cannula at 15 LPM
- ◆ Keep head up 20 degrees gives more time before desat to intubate
- ◆ Pain has physiological consequences
- ◆ Up to 2 hour delay or more if wait for ED to give



In Summary

- ◆ Do a good history and physical
- ◆ Look at your meds for clues
- ◆ Be the professional critical care team player

THANK YOU





Questions or Comments