



Shortness of breath



Objectives

- Recognizing respiratory distress
- Initial approach to a patient with respiratory distress
 - Actions to take
 - History
 - Physical examination
- Specific conditions that present with respiratory distress



Case #1

- 24 yo F with hx of asthma presenting with shortness of breath, wheezing, dry cough for two days, worsening today; no fever or chills, no chest pain; no congestion. Tried inhaler every 2 hours at home for past 6 hours without relief.
- What do you do first?



Things you want to know

- What usually triggers your asthma?
- Prior ED visits, hospitalizations, ICU admissions? Prior intubations?
- Current medications
 - Frequency of inhaler use
 - Recent steroids
- Baseline peak flow values
- Fevers, recent infections, and sick contacts



Why is all that so important?

- Risk factors for sudden death from asthma:
 - Past history of sudden severe exacerbations
 - Prior intubation for asthma
 - Prior asthma admission to an ICU
 - In the past year:
 - 2 or more **hospitalizations** for asthma
 - 3 or more **ED visits** for asthma
 - Hospitalization or an ED visit for asthma within the past month



Start with the ABCs

- Airway
- Breathing: How much respiratory distress?
 - Can't speak in complete sentences
 - Tachypnea (if not tachypneic may be getting fatigued)
 - Accessory muscle use
 - Retractions, nasal flaring, grunting
 - Cyanosis
 - Hypoxia (decreased pulse ox)
 - Wheezing (may not hear wheezing if they are not moving any air at all!)
 - Decreased air movement
- Circulation

Differential Diagnosis for SOB

Most Common

- Obstructive: Asthma, COPD
- Congestive heart failure
- Ischemic heart disease
- Pneumonia
- Psychogenic: Panic, anxiety

Urgently Life Threatening

- Upper airway obstruction
 - Foreign body
 - Angioedema/anaphylaxis
- Tension pneumothorax
- Pulmonary embolism
- Neuromuscular weakness
 - Myasthenia gravis
 - Guillain-Barre



Immediate Actions (First 10 minutes)

- ▶ Supplemental oxygen
- ▶ Pulse oximetry with complete vital signs
- ▶ BVM if decreased RR, shallow/weak respirations
- ▶ Decide need for endotracheal intubation
- ▶ IV access, labs, and ABG
- ▶ Portable chest x-ray – STAT
- ▶ EKG if concerned for cardiac etiology
- ▶ Brief history and focused physical exam
- ▶ Form initial differential, begin treatment

Focused Physical Exam

- ▶ Vital signs
 - ▶ RR, HR, BP, temp, O2 Sat
- ▶ Mental Status
 - ▶ Alert, confused, lethargic
- ▶ Heart
 - ▶ JVD, muffled heart sounds, S3, S4
- ▶ Lungs
 - ▶ Rales, wheezing, diminished or absent BS, stridor
 - ▶ Respiratory accessory muscle use
- ▶ Abdomen
 - ▶ Hepatomegaly, ascites
- ▶ Skin
 - ▶ Diaphoresis, cyanosis
- ▶ Extremities
 - ▶ Edema
 - ▶ Unilateral leg swelling
- ▶ Neurologic
 - ▶ Focal neurologic deficits

**Reassess respiratory status frequently especially in the first 15 minutes or so

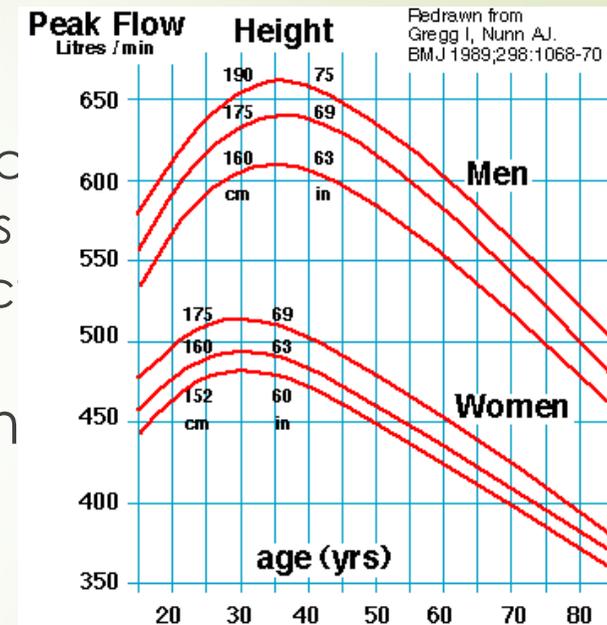


Back to our asthma case....

- What tests do you want?

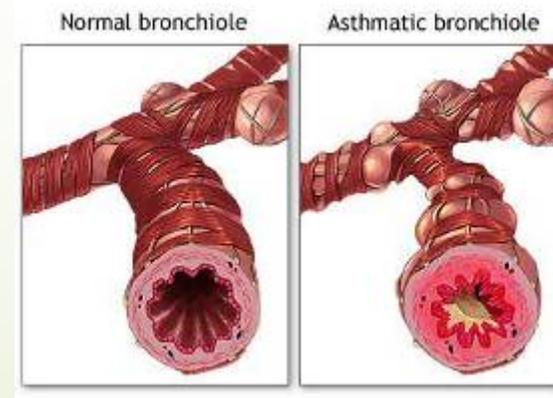
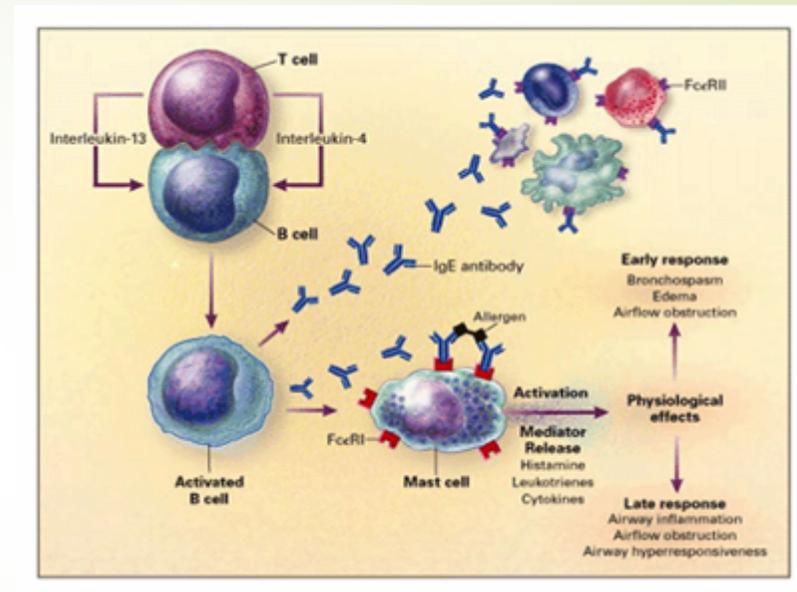
Evaluation of acute asthma

- Peak flows
 - Helpful in determining attack
 - Can follow after treatments
 - Want to be >80% of “predic
- Continuous pulse oximetry
- CXR if you suspect a second
 - Pneumothorax
 - Foreign body
 - Pneumonia
- ABG *might* be helpful in severe attacks
 - Tachypnea should lead to decreased PCO₂, and a normal or high PCO₂ indicates fatigue



Remember pathophysiology

- Asthma is an inflammatory disease
- Bronchospasm is only a symptom
- Many possible causes:
 - Allergies
 - Irritants
 - Infections
- Poiseuille's Law- Radius has a huge affect on flow





What medications and treatments do you want to give?



Treatments

- Supplemental oxygen
- β_2 agonists (Albuterol)
 - Nebulized: 2.5- 5 mg nebs q20 minutes, can be continuous if needed
 - MDI with spacer: 6-12 puffs from MDI q20 minutes (4-8 in children)
- Anti-cholinergics (Atrovent)
 - Adding Atrovent has been shown to decrease admissions
 - Albuterol/Atrovent combination for first treatment
 - 500 mcg in adults (250 mcg in kids) q6 hours



Treatments

- Corticosteroids
 - Decrease airway inflammation (takes 4-8 hrs)
 - Reduces the need for hospitalization if administered within 1 hour of arrival in the ED
- Adults:
 - Methylprednisolone 125mg IV/Prednisone 60mg PO
- Pediatrics:
 - Methylprednisolone 1 mg/kg IV or Prednisone 1-2 mg/kg PO
- Continue steroids for 5 day course



Treatments

- Magnesium
 - Bronchodilating properties
 - Shown to help in severe asthma
 - Peak flow < 25% of predicted
 - Relatively safe
 - Adult dose: 1-2 g IV over 30 minutes

Treatments

- Non-invasive Positive Pressure Ventilation
 - Some evidence BiPAP or CPAP may help in severe asthma
 - Temporary until medications start working
 - Can help avoid intubation
 - Pt must be awake and cooperative





Treatments

➤ Intubation

- Mechanical ventilation decreases work of breathing and allows patient to rest
- Indications: Hypercarbia, acidosis, respiratory fatigue
- Complications:
 - High peak airways pressures and barotrauma
 - Hemodynamic impairment
 - Atelectasis and pneumonia from frequent mucus plugging
- Special considerations
 - Increased I:E ratio to help prevent breath stacking
 - Permissive hypoventilation with goal >90% oxygen saturation

➤ Heli-ox



Admit or not?

- ▶ Depends on: Improvement of symptoms, risk factors for death, social situation, compliance, and patient comfort with going home
- ▶ In general:
 - ▶ HOME if complete resolution of symptoms and peak flow $> 70\%$ of predicted
 - ▶ ADMIT if poor response to treatment and peak flow $< 50\%$ of predicted
 - ▶ ALL OTHERS – Depends on combination of above factors, when in doubt ASK THE PATIENT!



Discharge

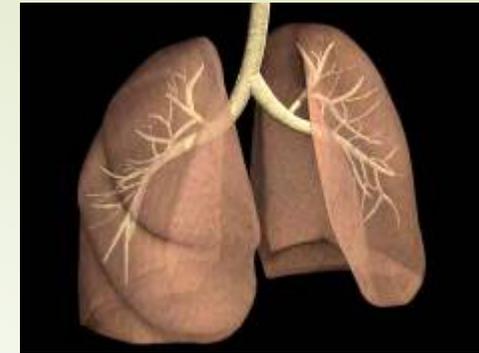
- All patients need steroids for at least 5 days
- All patients need β_2 agonists
- All patients with more than mild intermittent asthma (need inhaler > 2 x week, peak flow < 80% of predicted) need inhaled steroids
- Patients with moderate-to-severe asthma (daily symptoms) should measure daily peak flows
- All patients need close follow up
- All patients need education about asthma
- Smoking cessation counseling



Case #2

- ▶ 65 yo M with shortness of breath for past several hours, getting increasingly worse; now drowsy and difficult to arouse; pt with hx of smoking 2ppd for many years, is on home oxygen.
- ▶ T: 99.9, HR: 98, R: 30, BP: 165/70, O₂sat: 89% room air, 92% 2LNC
- ▶ Physical exam: barrel chest, pursed lips, wheezing, prolonged expirations, diminished breath sounds throughout
- ▶ Likely diagnosis?
- ▶ What else is on your differential diagnosis?

COPD



- Chronic airway inflammation
 - Inflammatory cells and mediators
 - Protease / anti-protease imbalance
 - Oxidative stress
 - Increases in lung compliance
 - Becomes an obstructive process
- Ask patients about:
 - History of COPD
 - Change in cough or sputum
 - Fever, infectious signs
 - Medications (steroids)
 - Environmental exposures
 - Smoking history



Physical exam findings in COPD

- Signs of Hypoxemia
 - Tachypnea
 - Tachycardia
 - Hypertension
 - Cyanosis

- Signs of Hypercapnia
 - Altered mental status
 - Hypopnea

COPD

➤ Chest X-ray

- Hyperinflation
- Flattened diaphragms
- Increased AP diameter

➤ EKG

- Wandering pacemaker
- Multifocal atrial tachycardia (MAT)
- Right axis deviation





Treatment for COPD

- Supplemental oxygen
 - Careful in patients that are CO₂ retainers
 - Loss of hypoxic drive can result in respiratory arrest
 - Goal: 90-92% oxygen saturation
- Bronchodilators (Albuterol and atrovent)
- Antibiotics
 - (Which antibiotics would be appropriate?)
- Corticosteroids
 - 7-14 day course improves FEV1 in exacerbations
 - Hyperglycemia is common side effect



Treatment for COPD

- ▶ Positive-pressure ventilation
 - ▶ Indicated for respiratory fatigue, acidosis, hypoxia, hypercapnia
 - ▶ Can decrease intubation rates and possibly improves survival
 - ▶ Patient needs to be awake, cooperative, and able to handle secretions



Case #3

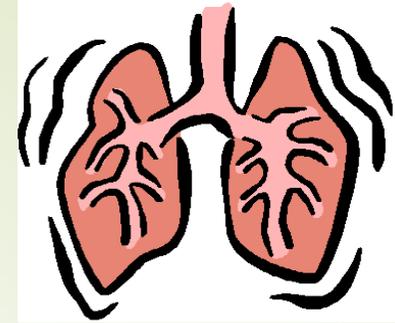
- ▶ 35 yo previously healthy F c/o one week of headache, sore throat and muscle aches, fevers, now with productive cough and increasing fatigue.
- ▶ On physical exam she is febrile and has decreased breath sounds over the RLL.
- ▶ What is your differential and work-up?



Pneumonia

- Clinical features:
- Typically: Cough, dyspnea, sputum production, fever, pleuritic chest pain
- Pneumococcal: sudden onset of fever, rigors, productive cough, tachypnea
- Atypical pneumonia: Coryza, low grade fevers, non-productive cough
- On exam:
- Tachypnea, tachycardia, fever
- Inspiratory rales = Alveolar fluid
- Bronchial breath sounds = Consolidation
- Dullness/decreased BS = Pleural effusion
- Rhonchi = Bronchial congestion

Pathophysiology



- Usually inhaled/aspirated pathogens
 - Risk- Stroke, seizure, intoxication
- Hematogenous spread- Staph. aureus
- Infection within alveoli with intense inflammatory response
 - Filling alveoli with bacteria, WBC, exudate



Which patient groups get which types?

- Pneumococcus
 - Staph aureus
 - Klebsiella
 - Pseudomonas
 - Haemophilus
- Atypical
 - Chlamydia
 - Mycoplasma
 - Legionella
 -



Special populations

- Diabetics
- HIV
 - Pneumonia more common and has higher morbidity than non-HIV population
 - Pneumococcus= Most common bacteria
 - CD4>800: Bacterial more common
 - CD4 250-500: TB, cryptococcus, histoplasma
 - CD4< 200: PCP, CMV
- Elderly/Nursing home
 - Predictors for morbidity: Tachycardia, tachypnea, temp>100.4, somnolence, confusion, crackles, leukocytosis
 - Pathogens: Pneumococcus, gram negatives, Haemophilus, influenza
 - May just present with confusion, weakness

Pneumonia

- Chest X-ray
- Measure O₂ sat, CBC, electrolytes
- Blood cultures for admitted patients (before antibiotics)





Treatment

- ▶ Pneumococcal most common, but atypicals becoming more prevalent
- ▶ Outpatient
 - ▶ Doxycycline
 - ▶ Newer macrolide (Azithromycin)
 - ▶ Fluroquinolone (Levofloxacin)
- ▶ Also consider MRSA for severe infections



Treatment

- ▶ Inpatient
 - ▶ Early antibiotics lowers mortality
 - ▶ 3rd gen cephalosporin (Ceftriaxone) or PCN w/ beta-lactamase inhibitor (Unasyn/Zosyn) **plus** macrolide (Azithromycin)
 - ▶ Fluroquinolone alone (Levofloxacin)
 - ▶ Add pseudomonal coverage (Cefepime) as needed i.e. CF patient



Admission or not?

- ▶ 75% CAP do not require admission, can be discharged with follow up
- ▶ Admission: Elderly, HIV pts, tachypnea, oxygen requirement
- ▶ ICU: Markedly tachypneic, high oxygen requirement, evidence of shock



Case #4

- ▶ 65 yo M with hx of CAD s/p CABG with increasing dyspnea on exertion, orthopnea, increasing swelling in feet and ankles, now today with acute shortness of breath and respiratory distress. No chest pain, no fevers; ROS otherwise negative
- ▶ Pt in moderate respiratory distress on exam with diffuse crackles in all lung fields
- ▶ What is your differential diagnosis and approach to this patient?

Congestive Heart Failure

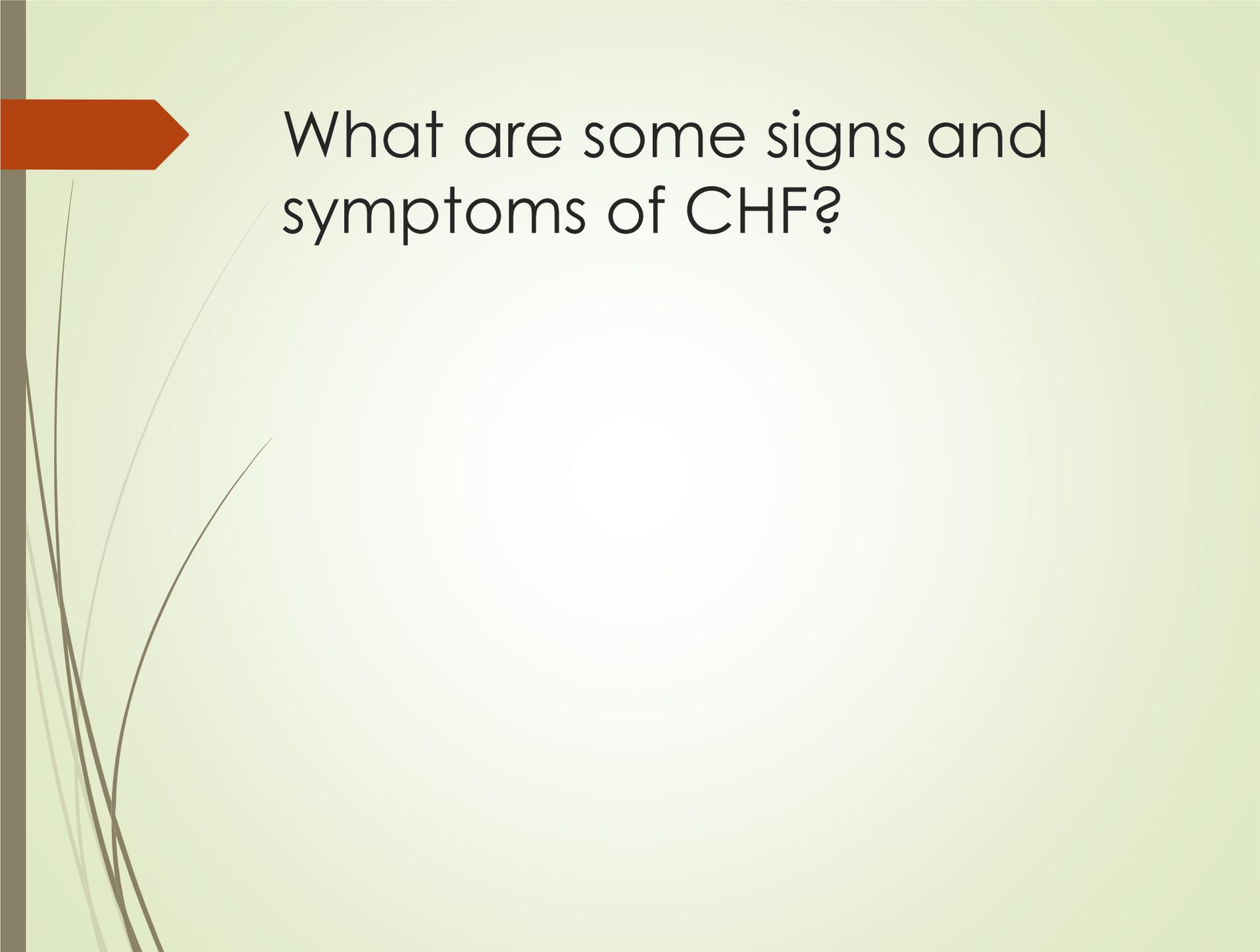
- ▶ Can present with acute pulmonary edema and with respiratory distress
- ▶ Due to decreasing CO and rising SVR
- ▶ Sympathetic nervous system and renin-angiotensin-aldosterone system are activated
- ▶ Result: Volume overload, pulmonary edema, resp distress





Causes of acute decompensation in CHF

- Non-compliance
 - Medications: diuretics
 - Diet: excessive salt
- Cardiac
 - Arrhythmia
 - ACS
 - Uncontrolled HTN
- Other
 - Volume overload due to renal failure
 - PE
 - Exacerbation of other co-morbidity (ex. COPD)



What are some signs and symptoms of CHF?



Signs & Symptoms of CHF

➤ Symptoms

- Respiratory distress
- Cool / diaphoretic skin
- Weight gain
- Peripheral edema
- Orthopnea
- Paroxysmal nocturnal dyspnea
- Abdominal pain

➤ Signs

- Elevated JVD
- S3
- Hypertension
- Rales
- +/- peripheral edema
- +/- RUQ tenderness (congested liver)
- Tachypnea

Evaluation of CHF

- CXR (portable)
 - Cardiomegaly
 - Vascular congestion
 - Pulmonary edema
- Labs
 - CBC, electrolytes, cardiac enzymes, BNP
- EKG
- Search for cause of decompensation





What is the BNP and why do we care?

- ▶ Natriuretic peptide released by RA when heart is stretched i.e. volume overload
- ▶ Level correlates with CHF severity, rate of re-hospitalization, and risk of death
 - ▶ BNP > 480 = 40% risk of re-hospitalization or death within 6 months
- ▶ Helps to distinguish between other causes of SOB i.e. COPD



Differential Diagnosis

- ▶ Pulmonary:

- ▶ Asthma/COPD exacerbation
- ▶ Pulmonary embolus
- ▶ Pneumothorax
- ▶ Pleural effusion
- ▶ Pneumonia

- ▶ Cardiac:

- ▶ ACS, arrhythmia
- ▶ Acute valvular insufficiency
- ▶ Pericardial tamponade

- ▶ Fluid retentive states:

- ▶ Liver failure, portal vein thrombosis
- ▶ Renal failure
- ▶ Nephrotic syndrome
- ▶ Hypoproteinemia

- ▶ High output states:

- ▶ Sepsis
- ▶ Anemia
- ▶ Thyroid dysfunction



Treatment

- Control airway and maintain ventilation
- Supplemental oxygen
- Cardiac monitoring
- Pulse oximetry
- Establish IV access
- +/- ABG
- Frequent vital signs



Which medications are used to treat CHF?



Treatment of CHF

- Preload reduction
 - Vasodilators
 - Inotropic support if needed
- 



Treatment of CHF

- Reduce preload and afterload:
 - Nitroglycerin by sublingual or IV route
- Volume reduction
 - Lasix- Diuresis starts in 15-20 minutes
 - If no prior use: 40 mg IV
 - Outpatient use: Double last 24 hour usage
 - If no effect by 30 minutes, repeat a doubled dose
- Clinical endpoint- Rapidly lower filling pressures to prevent need for endotracheal intubation
- Place foley catheter and monitor UOP



NIPPV

- Noninvasive Positive Pressure Ventilation
 - Controversial but worth a try in severe respiratory distress
 - Temporizes while medical therapy is working
 - BiPAP may decrease need for intubation
 - Patient cooperation is required