COPD & ASTHMA

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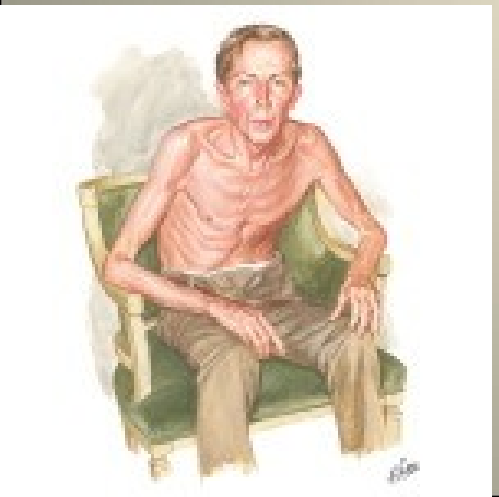
COPD

Characterized by

-Airflow limitation that is not fully reversible

-Generally progressive

-Associated with an abnormal inflammatory response to noxious particles or gases



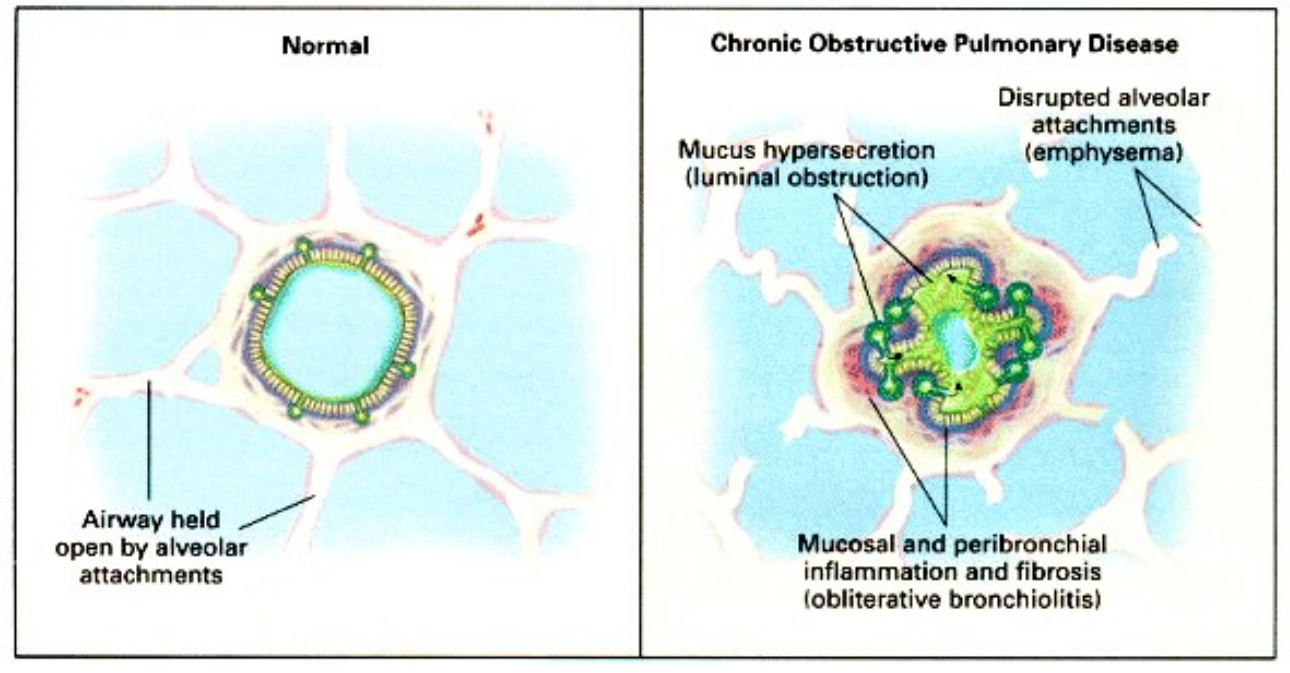
COPD

Chronic bronchitis 85%

Chronic bronchitis is the presence of chronic productive cough for 3 months in each of 2 successive years, where other causes of chronic cough have been excluded

Emphysema 15%

Emphysema results from destruction of bronchioles and alveoli



General Demographics

COPD is the only major cause of death that is increasing

Prevalence, morbidity&mortality has increased since 1980's

3th leading cause of death in Türkiye

About 2 million E.D. visits in U.S. per year

COPD - Risk Factors

Cigarette smoking

α_1 - antitrypsin deficiency

Solid fuel used for indoor heating or cooking without adequate ventilation

Air pollution

Pathology of Peripheral Airways

- Mucus plugging
- Goblet cell metaplasia
- Fibrosis
- Smooth muscle hypertrophy

Clinical Features

Exertional dyspnea

Tachypnea

Cough

Minor hemoptysis

Sputum

Diagnosis

Spirometry

-FEV1< 80%

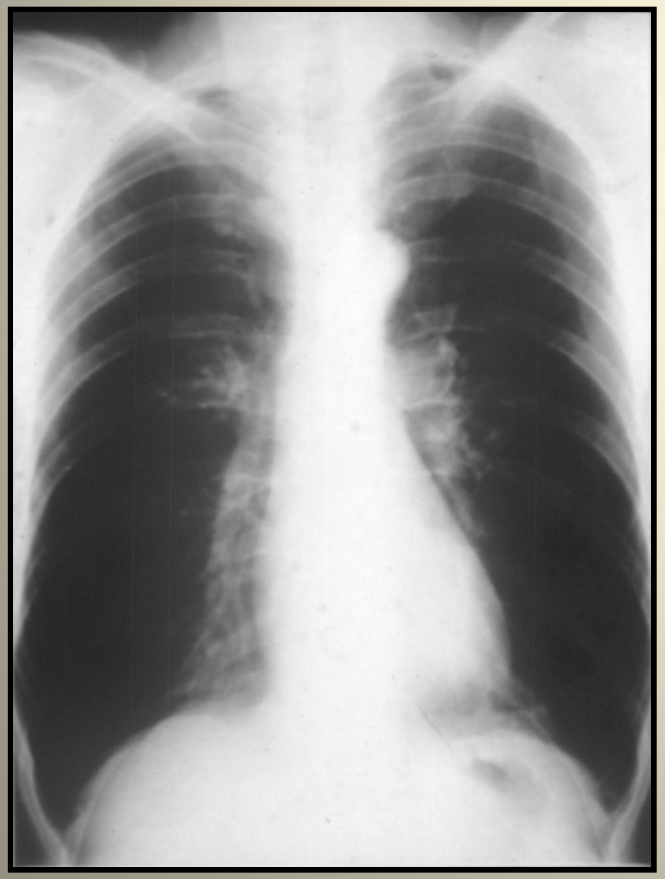
-FEV1/FVC < 70%

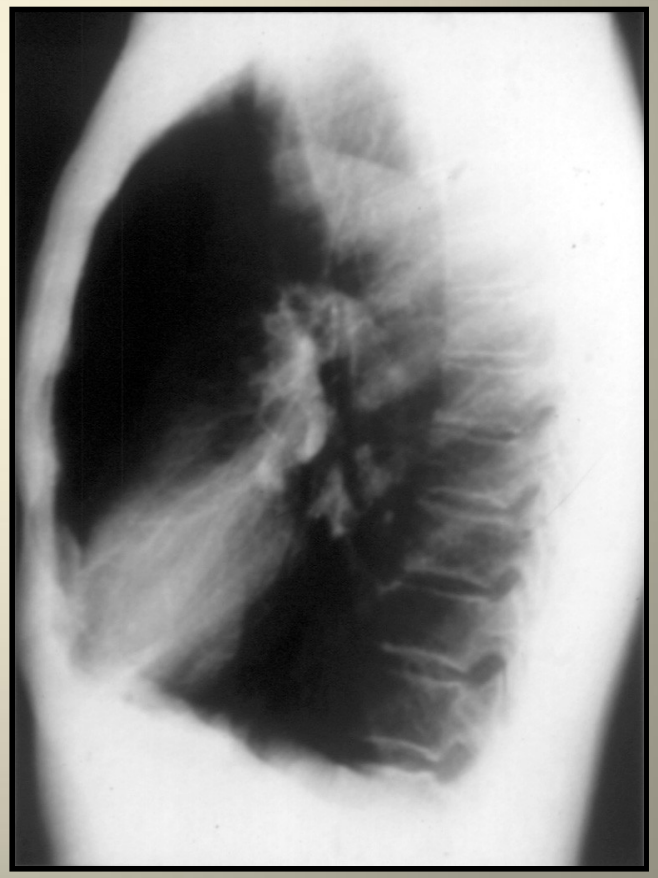
Severity of COPD (GOLD July 2003)

Stage	Characteristics
0: At Risk	normal spirometry, chronic symptoms (cough, sputum production)
I: Mild COPD	$FEV_1/FVC < 70\%$ $FEV_1 \geq 80\%$ predicted
II: Moderate COPD	$FEV_1/FVC < 70\%$ $50\% \leq FEV1 < 80\%$ predicted
III: Severe COPD	$FEV_1/FVC < 70\%$ $30\% \leq FEV1 < 50\%$ predicted
IV: Very Severe COPD	$FEV_1/FVC < 70\%$, $FEV_1 < 30\%$ predicted or $FEV_1 < 50\%$ predicted plus chronic

Chest Radiography

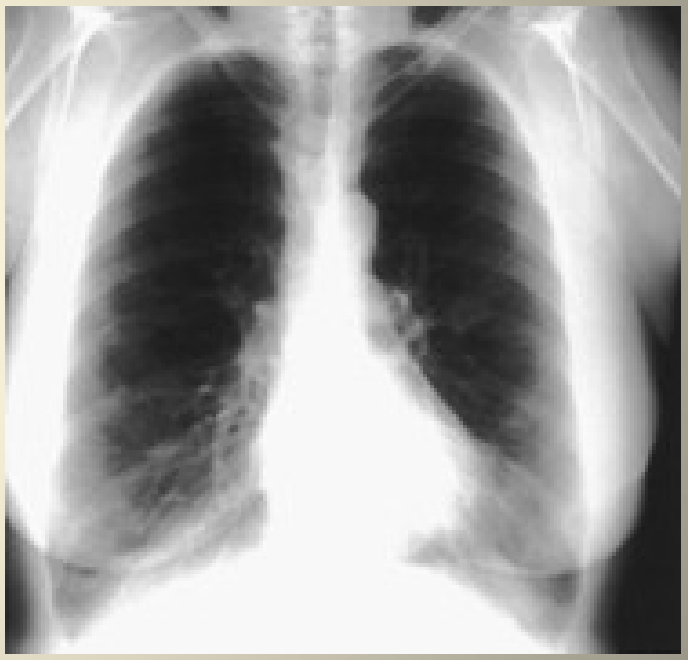
Dominant bronchitic disease is not radiographically apparent, unless bronchiectasis is present





Chest Radiography

- **Emphysema**
  - Attenuation of pulmonary arterial vascular shadows
  - Increased parenchymal lucency,
  - Flattened diaphragms
  - Increased anteroposterior chest diameter



Treatment

-Oxygen

-Pharmacotherapy

-Precautions to decrease mucus secretion

-Smoking cessation

-Pulmonary rehabilitation

Treatment

Pharmacotherapy

Long-acting inhaled β2 agonists

-Salmeterol and Formoterol

Short-acting inhaled β2 agonists

Anticholinergic agents

-Ipratropium Bromid

Combination of β2 agonists and Anticholinergic agents*

Systemic corticosteroids* ?

Vaccination

*COMBIVENT Inhalation Solution Study Group: Routine nebulized ipratropium and albuterol together are better than either alone in COPD. *Chest* 112: 1514, 1997.

Acute Exacerbations of COPD

(GOLD) defines ;

it as "an event in the natural course of the disease characterized by a change in the patient's baseline dyspnea, cough and/or sputum that is beyond normal day-to-day variations, is acute in onset and may warrant a change in medication in a patient with underlying COPD"

Acute Exacerbations of COPD

Primary causes

- Trakeobranchial infections (%50–70)
  - Bacterial infections*(%40–50)*
  - Viral infections *(%30–40)*
  - Atipic bacterial infections *(%5–10)*

- Environmental pollutants (%10)

- Others (%30)
  - Cold weather,
  - β blockers, narcotics, or sedative-hypnotic agents

Acute Exacerbations of COPD

Secondary causes

- Pneumonia
- Pneumothorax
- Pulmonary embolism
- Congestive heart failure
- Pulmonary neoplasia

Should be investigated

Clinical Features

-Hypoxemia, the decline of arterial saturation to <90%
-Tachypnea
-Tachycardia
-Systemic hypertension
-Cyanosis
-Change in mental status

Diagnosis

I. Medical history

II. Physical examination

III. Assess Oxygenation and Acid-Base Status

IV. Bedside Pulmonary Function Tests

V. Ancillary Studies

Medical History

Severity of FEV1

Duration of worsening or new symptoms

Number of previous episodes (exacerbations/ hospitalizations)

Comordibities

Present treatment regimen

II. Physical Examination

Use of accessory respiratory muscles
Paradoxical chest wall movements
Worsening or new onset central cyanosis
Development of peripheral edema
Hemodynamic instability
Signs of right heart failure
Reduced alertness

III. Assess Oxygenation and Acid-Base Status

- **Pulse oximetry**
- **Arteriel Blood Gas analysis**

Pulse oximetry may identify hypoxemia, but ABG analysis is needed to identify hypercapnia and acid-base disturbances

III. Assess Oxygenation and Acid-Base Status

Respiratuar Failure:

PaO_2<60mmHg, arterial SaO_2<90%

Respiratuar asidosis:

$PaCO_2$>44mmHg

If the pH is <7.35, there is an acute and uncompensated component of respiratory or metabolic acidosis present

IV. Bedside Pulmonary Function Tests

- If the patient is able to cooperate

- Peak expiratory flow rate (PEFR) of <100 L per minute or an FEV_1 of <1.00 L in a patient without chronic severe obstruction indicates a severe exacerbation

V. Ancillary Studies

- Radiographic Studies
- ECG
- Complete blood cell counts,
- Electrolytes,
- B-type natriuretic peptide,
- CT angiography of the chest,
- D-dimers

should be obtained, based on clinical findings

AIM of TREATMENT

The goals of treatment are to correct tissue oxygenation, alleviate reversible bronchospasm, and treat the underlying cause

Treatment

- OXYGEN

- Administer oxygen to raise the PaO_2 above 60 mm Hg or an SaO_2 above 90%.

β_2 -Adrenergic Agonists

First-line therapy

- Short acting: Fenoterol, Terbutalin, Salbutamol

β2 Agonist agents may be administered every 30 to 60 minutes

Side effects of β2 agonists

- Tremor
- Anxiety
- Palpitations

Anticholinergic agents

- Ipratropium

  -0.5 milligram or 2.5 mL of the 0.02% inhalant solution
- Oksitropium
- Tiotropium?

Side effects

-Dry mouth

-Metallic taste

Corticosteroids

- The use of a short course of systemic steroids improves FEV_1 in acute COPD exacerbations

- Adverse effect: Hyperglycemia

Antibiotics

Antibiotics should be administered

Change in volume of sputum and increased purulence of sputum

There is no specific agent shown to be better

There is little evidence regarding the duration of treatment 3 to 14 days is typical

Best first line agents :

- Azithromycin
- Cefuroxime
- Trimethoprim – sulfametax
- Levofloxacin

Methylxanthines

- Methylxanthines do not improve lung function in acute COPD exacerbations
- Aminophylin
- Theophyllin
- Side effects

  -Nausea

  -Vomiting

NIMV Selection criteria

Moderate to severe dyspnea with use of accessory muscles and paradoxical abdominal motion

Moderate to severe acidosis (pH 7.35) and/or hypercapnia ($PaCO_2$ >6.0 kPa, 45 mm Hg)

Respiratory frequency > 25 breaths/min

Non-invasive mechanical ventilation should be considered

IMV Selection criteria

Severe dyspnea with use of accessory muscles and paradoxical abdominal motion

Respiratory rate >35 breaths/min

Life-threatening hypoxemia: PaO_2<50 mm Hg, PaO_2/fraction of inspired O_2<200 mm Hg

Severe acidosis (pH <7.25) and hypercapnia ($PaCO_2$ >60 mm Hg)

Respiratory arrest

Somnolence

impaired mental status

Cardiovascular complications (hypotension, shock, heart failure)

Noninvasive positive pressure ventilation failure

Invasive mechanical ventilation should be considered

Admission Criteria

-Marked increase in intensity of symptoms, such as sudden development of resting dyspnea

-Background of severe chronic obstructive pulmonary disease

-Onset of new physical signs (e.g., cyanosis, peripheral edema)

-Failure of exacerbation to respond to initial medical management

-Significant comorbidities

-Newly occurring arrhythmias

-Diagnostic uncertainty

-Older age

-Insufficient home support

Indications for Intensive Care Admission

-Persistent dyspnea in despite of initial emergency therapy

-Confusion, lethargy, coma

-Persistent or worsening hypoxemia: PaO_2 <50 mm Hg

-Severe or worsening hypercapnia: $PaCO_2$ >70 mm Hg

-Severe or worsening respiratory acidosis (pH <7.30) despite supplemental O_2 and noninvasive positive pressure ventilation

Therapy at Each Stage of COPD

I: Mild	II: Moderate	III: Severe	IV: Very Severe
▪ $FEV_1/FVC < 70\%$ ▪ $FEV_1 \geq 80\%$	▪ $FEV_1/FVC < 70\%$ ▪ $50\% \leq FEV_1 < 80\%$ predicted	▪ $FEV_1/FVC < 70\%$ ▪ $30\% \leq FEV_1 < 50\%$ predicted	▪ $FEV_1/FVC < 70\%$ ▪ $FEV_1 < 30\%$ predicted *or* $FEV_1 < 50\%$ predicted plus chronic respiratory failure

Active reduction of risk factor(s); influenza vaccination

Add short-acting bronchodilator (when needed)

Add regular treatment with one or more long-acting bronchodilators (when needed); ***Add*** rehabilitation

Add inhaled glucocorticosteroids if repeated exacerbations

Add long term oxygen if chronic respiratory failure. ***Consider*** surgical treatments

Treatment

Assess severity of symptoms

Administer controlled oxygen therapy.

Perform arterial blood gas measurement

Administer bronchodilators

- β2 Agonists and/or anticholinergic agents by nebulization or
  Consider adding IV methylxanthine, if needed

Add corticosteroids (PO or IV)

Consider antibiotics

- If increased sputum volume, change in sputum color, fever, or suspicion of infectious etiology of exacerbation

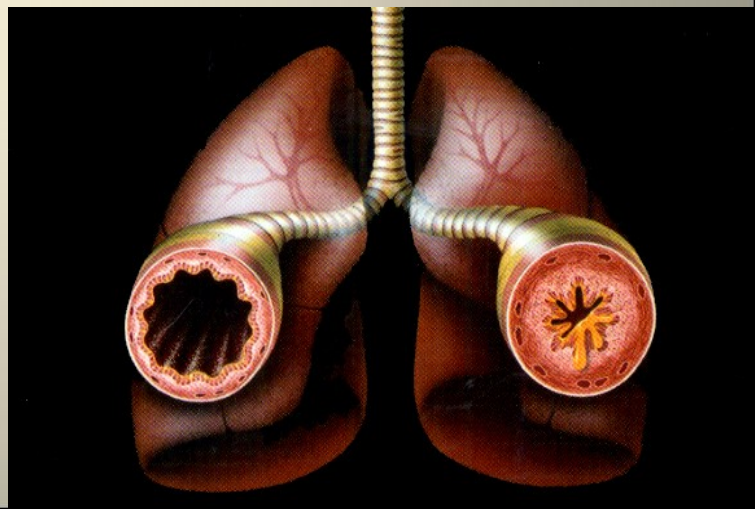
Consider noninvasive mechanical ventilation.

Management: All Stages

- Avoidance of noxious exposures
  - SMOKING CESSATION (Evidence: A)
  - Avoid occupational/environmental exposures (Evidence: B)
- Vaccination
  - Influenza
  - Pneumovax

ASTHMA

- Asthma is a chronic inflammatory disorder characterized by increased responsiveness of the airways to multiple stimuli



Development of Asthma

Risk factors

Predisposing: atopy, gender

Causal: allergens, aspirin, chemicals

Contributing: respiratory infections, diet, air pollution, smoking

Factors that exacerbate asthma - triggers

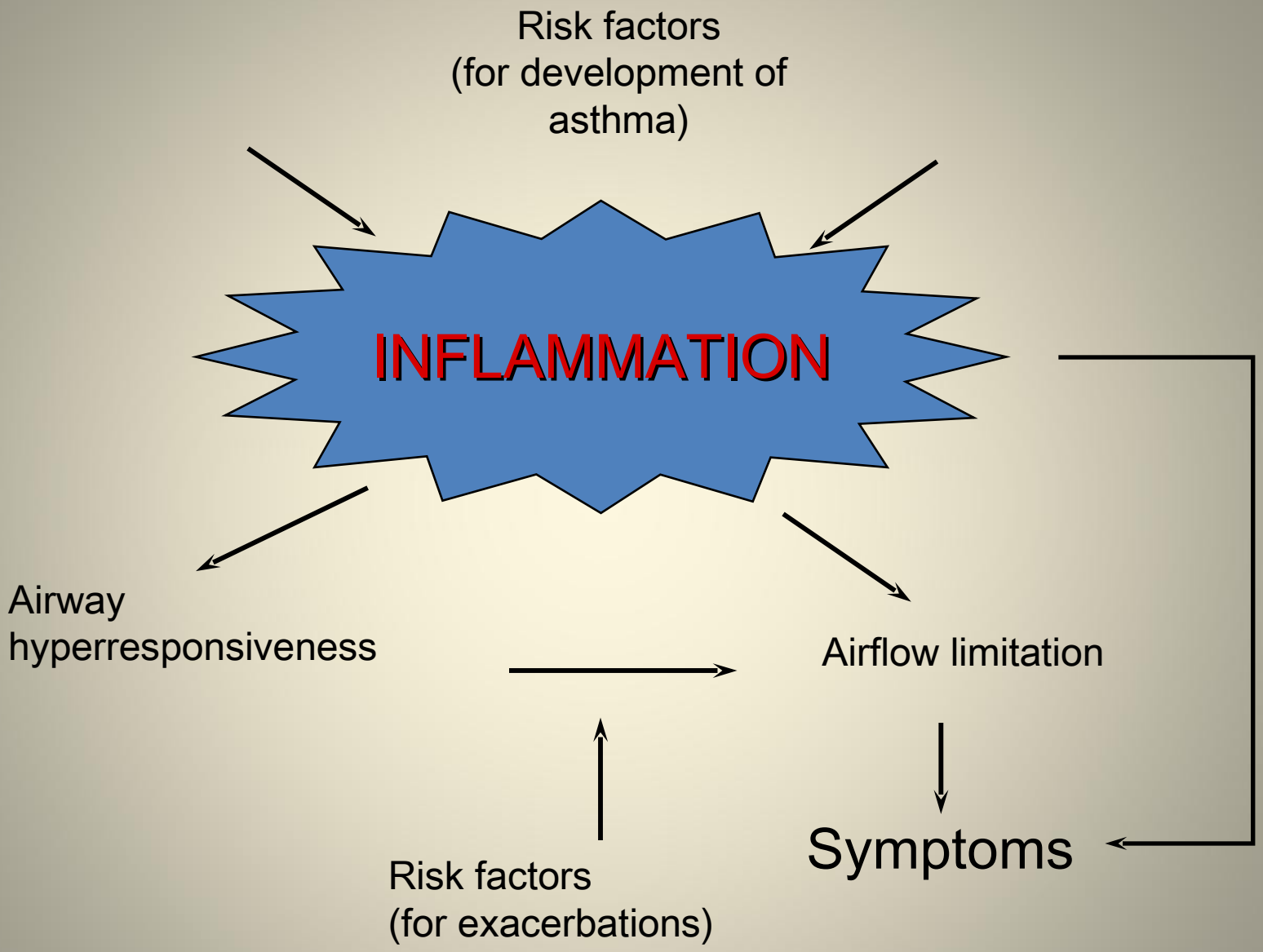
Allergens, respiratory infections, exercise, emotions

TRIGGERS

Mechanisms of Asthma

Airway inflammation

- Recruitments of inflammatory cells from circulation
- Endothelial adhesion molecules
- Activation of T lymphocytes (Th_2 clone)
  - ↑ production of IgE, leukotriens, prostanoids
  - cytokines (CD4+ Th subtype)


Risk factors
(for development of
asthma)
INFLAMMATION
Airway
hyperresponsiveness
Airflow limitation
Symptoms
Risk factors
(for exacerbations)

Prevalence of Asthma

- 7% of all Americans have current Asthma[1]
- Estimates of 300 million persons worldwide[2]
- M>F prior to puberty
- F>M after puberty[3]

1) The state of asthma in America. http://www.asthmainamerica. 2009
2) Pearce etal. Thorax 2007;62:758-66.
3) "Morbidity and Mortality Report," National Center for Health Statistics (NCHS), U.S. CDC, 2003

DIAGNOSIS- HISTORY

-History of disease

- Age of onset and method of diagnosis
- Course of disease
- Present management and medications
- History of corticosteroid use (chronic and/or intermittent)
- Intensive care admissions
- History of intubation for asthma exacerbation
- Other medical diseases

Symptoms of Asthma

- Coughing 
- Wheezing, a whistling sound 
- Shortness of breath
- Chest tightness
- Sneezing & runny nose
- Fever

DİAGNOSES

- Rapid breathing, loud wheezing
- Paradoxical respiration
- End-expiratory wheezing
- Diaphragmatic fatigue
- Alteration in the mental status

-Hyper-resonance to percussion

-Tachycardia

- Tachypnea

-Decreased intensity of breath sounds

-Silent chest

Diagnosis and Patient Monitoring

Bedside spirometry:

(FEV_1/FVC, FEV_1, PEF)

Asthma Severity

	Symptoms	Nighttime Symptoms	Lung Function
Step 4 Subset Life-Threaning	• Continual Symptoms • Too dyspneic to speak; perspiring • Frequent exacerbations	Frequent	• Fev1 or PEF < 40% predicted • PEF variability >50% • Minimal or no relief from frequent inhaled SABA
Step 3 Severe	• Daily Symptoms • Daily use of short acting B2 agonist • Exacerbations affect activity • Exacerbations>2 times/week	> 1 time/week	• FEV1or PEF >40%-<60% predicted • PEF variability>30% • Partial relief from frequent inhaled SABA. Symptoms for 3 d after oral corticosteroids begun.
Step 2 Moderate	• Symptoms >2times/week • But <1 times/day) • Dyspnea interferes with or limits usual activity	>2 times/month	• FEV1 or PEF >60%-<80% predicted • PEF variability 20-30% • Relief from frequent inhaled SABA. Symptoms for 1–2 d after oral corticosteroids begun
Step 1 Mild	• Symptoms <2 times/week • Dispnea only with activity	<2 times/month	• FEV1 or PEF >80% predicted • PEF variability<20% • Prompt relief with inhaled SABA

NAEPP Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma

Diagnosis and Patient Monitoring

- Pulse oximetry
- Arterial blood gas
- Routine radiography ?
- Routine complete blood cell count?
- Serum theophylline level
- Routine ECG?
- Cardiac monitoring

Goal of Treatment of Acute Asthma

Reverse airflow obstruction rapidly by repetitive or continuous administration of inhaled β2 agonists, provide adequate oxygenation, and relieve inflammation

Drugs for Asthma Exacerbations

-β2 adrenergic agonists
-Anticholinergics,
-Corticosteroids
-Magnesium

-Heliox
-Theophylline
-Ketamine and Halothane
-Mast Cell Modifiers
-Leukotriene Modifiers

Drugs for Asthma Exacerbations

- **β2 Agonists**
- **Inhaled B2 agonists**
- Albuterol: 2.5–5 milligrams every 20 min for three doses. MDI:one to two puffs q 20 minutes X 3 or
- Bitolterol: 2.5–5 milligrams every 20 min for three doses
- Levalbuterol: 1.25–2.5 milligrams every 20 min for three doses

- **Systemic (Injected) β2 agonists**
- Epinephrine: 1:1000 0.3–0.5 milligram every 20 min for three doses SC.
- Terbutaline: 0.25 milligram every 20 min for three doses SC.

Drugs for Asthma Exacerbations

Anticholinergics/Combinations

Ipratropium bromide : 0.5 milligram every 20 min for three doses

Ipratropium with albuterol : 3 mL every 20 min for three doses

Drugs for Asthma Exacerbations

- **Systemic Corticosteroids**

  Prednisone : oral "burst," use 40–80 milligrams/d in one or two divided doses

  Methylprednisolone : IV: 1 milligram/kg every 4–6 h.

  Prednisolone : 1–2 milligrams/kg/d for 5–10 d

- **İnhale Steroidler**

  -Budesonid, Flunosilid Flutikazon, Mometazon

Drugs for Asthma Exacerbations

- Magnesium

Possible inhibition of calcium influx into airway smooth muscle

Inhibits cholinergic neuromuscular transmission

Stabilization of mast cells and T lymphocytes

Stimulation of NO and prostacyclin

Magnesium sulfate i.v 1-2 gr.

- Heliox

Mixture of 80% helium , 20% oxygen

Drugs for Asthma Exacerbations

- Theophylline?
- Side effects
  - Nervousness
  - Nausea
  - Vomiting
  - Anorexia
  - Headache

- Ketamine and Halothane

Drugs for Asthma Exacerbations

- Mast Cell Modifiers?
  - Cromolyn
  - Nedocromil
- Leukotriene Modifiers
  - Montelukast
  - Zafirlukast
  - Zileuton

Xolair: What is That?

Xolair (Omalizumab) Is an recombinant monoclonal anti-IgE antibody designed to treat moderate to severe allergy associated asthma

- Inadequate control with inhaled steroids
- Reduce the need for systemic and inhaled glucocorticoids.
- Reduce the number of exacerbations, especially severe exacerbations*
- No effect on FEV1 values.
- Given via SubQ route q 2 to 4 weeks

*Hanania, et al;Ann Intern Med 2011;154:573

Co-Morbid Illness

Allergic rhinitis

– treat with nasal GC's if surgical disease refer to ENT

GERD

– treat with PPI if patient is symptomatic from GERD

Vocal cord dysfunction

- referral to qualified speech therapist

OSA

– study in sleep lab and treat as indicated

Pregnancy and Asthma

- Asthma complicates approximately 4% of pregnancies
- β2 Agonists and inhaled corticosteroids are considered safe during pregnancy and are recommended as a routine part of asthma management
- Remember:
  - Hyperventilation is normal in pregnancy
  - PAO2 of <70 represents severe hypoxemia
  - PACO2 of >35 represents respiratory failure

Guidelines for the Management of Asthma

	Days with symptoms	Nights with symptoms	PEF or FEV1	PEF Variability	Long-term control
Step 4	Continual Persistant	Frequent	Less than 60%	More than 30%	inhaled steroid (high dose) and long-acting inhaled beta2-agonist, consider the addition of methylxanthines end/or leukotriene modifiers, low-dose systemic steroids may be required in extreme cases
Step 3	Daily	More or equal 5/month	60-80%	More than 30%	inhaled steroid (low to medium dose) or inhaled steroid (low to medium dose) + long-acting inhaled heta2-agonist, consider the addition of methylxanthines and/or leukotriene modif
Step 2	3 to 6/week	3 to 4/month	More or equal 80%	20-30%	inheled steroid (low dose), cromolyn, nedocromil or leukotriene modifiers
Step 1 Mild Intermittent	More or equal to 2/week	More or equal 2/month	More or equal 80%	Less than 20%	All Patients: Shart-acting hronchodilator: inhaled heta2-agonist (2 to 4 puffs) as needed far symptoms, intensity of treatment will depend on severity of exacerhation

Asthma vs. COPD

- Sensitizing agent
  ↓
- Inflammation
- CD4 T-lymphocytes
- Eosinophils
  ↓
- Completely reversible airflow limitation

- Noxious agent
  ↓
- Inflammation
- CD8 T-lymphocytes
- Macrophages, PMNs
  ↓
- Irreversible airflow limitation

Differential Diagnosis: COPD and Asthma

COPD

- Onset in mid-life
- Symptoms slowly progressive
- Long smoking history
- Dyspnea during exercise

ASTHMA

- Onset early in life (often childhood)
- Symptoms vary from day to day
- Symptoms at night/early morning
- Allergy, rhinitis, and/or eczema also present
- Family history of asthma

THANKS FOR YOUR ATTENTION