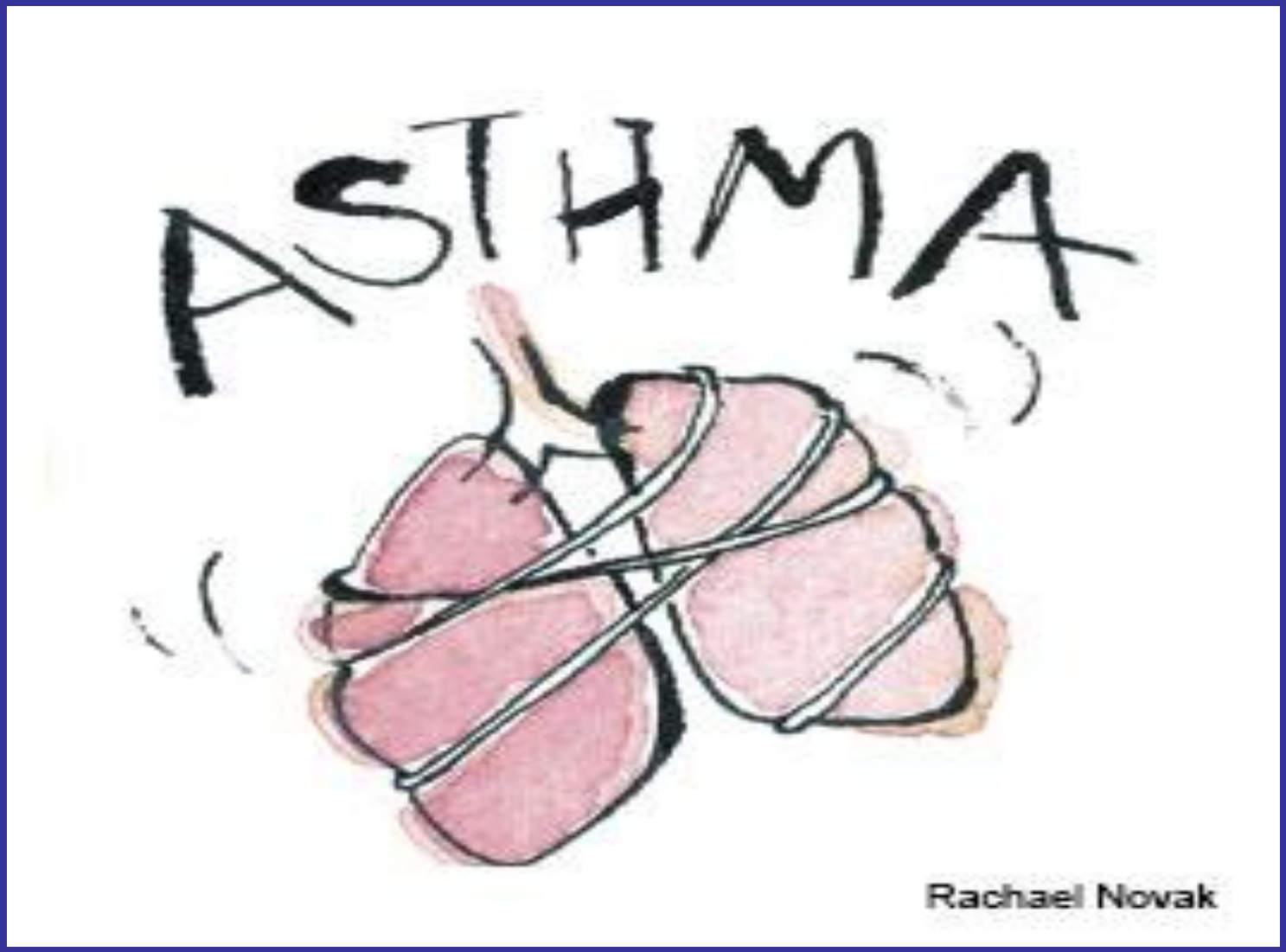
Management of Severe Asthma and COPD

PROF. ABDULAZIZ H. ALZEER


ASTHMA
Rachael Novak

Learning Objectives

Asthma

- Definition
- Pathology and Pathophysiology
- Factors that triggers Asthma
- Manifestation and How To assess the severity of Asthma
- Treatment

ASTHMA

Definition:

- Asthma is a chronic lung disease due to inflammation of the airways resulted into airway obstruction. The obstruction is reversible.
- Asthma is the most common chronic disease particularly among children.

Symptom:

- Cough
- Wheeze
- Tightness in the chest
- Shortness of breath
- Sometimes nocturnal symptoms

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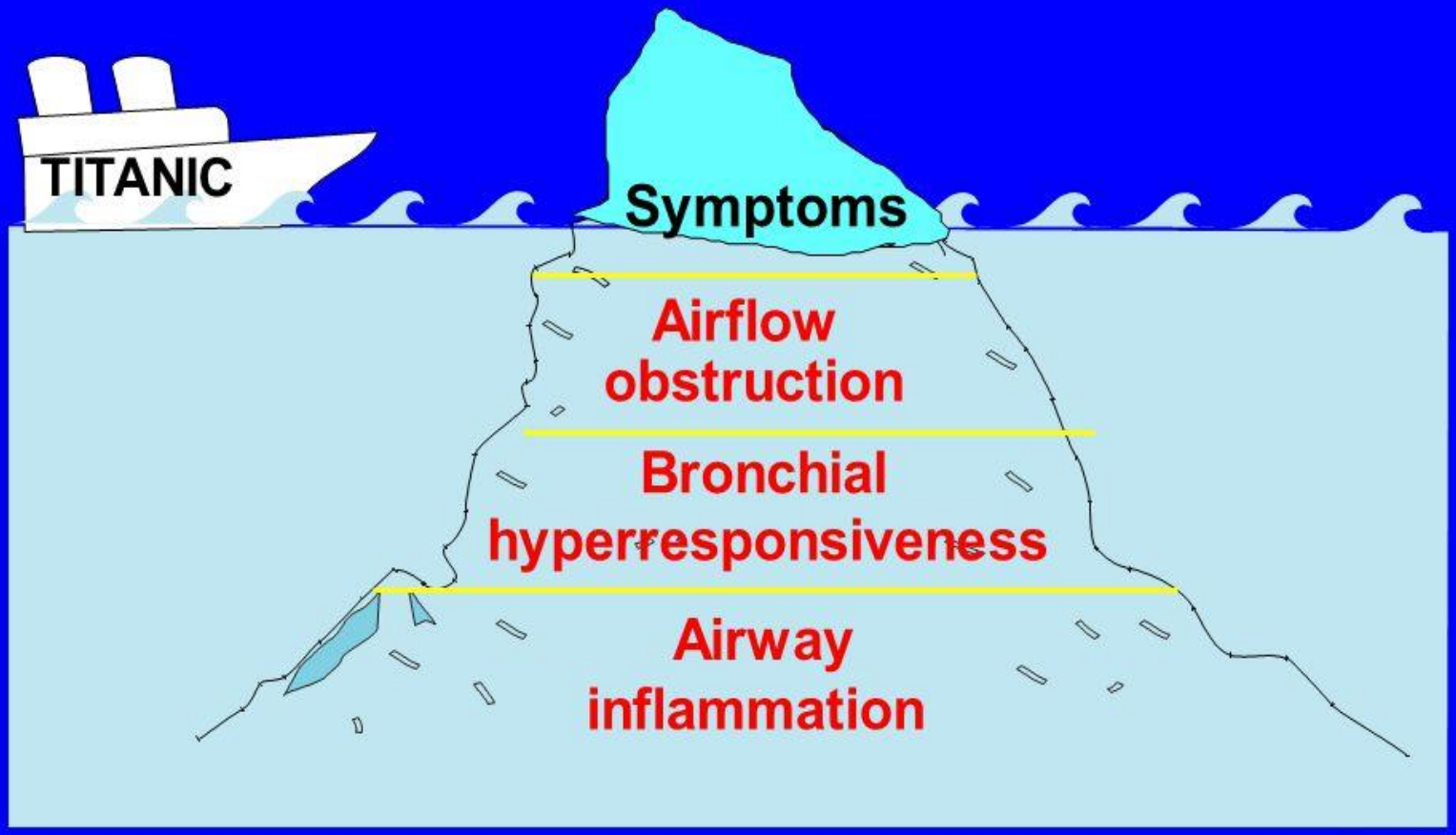
Acute Severe Attack of Asthma (Status Asthmaticus):

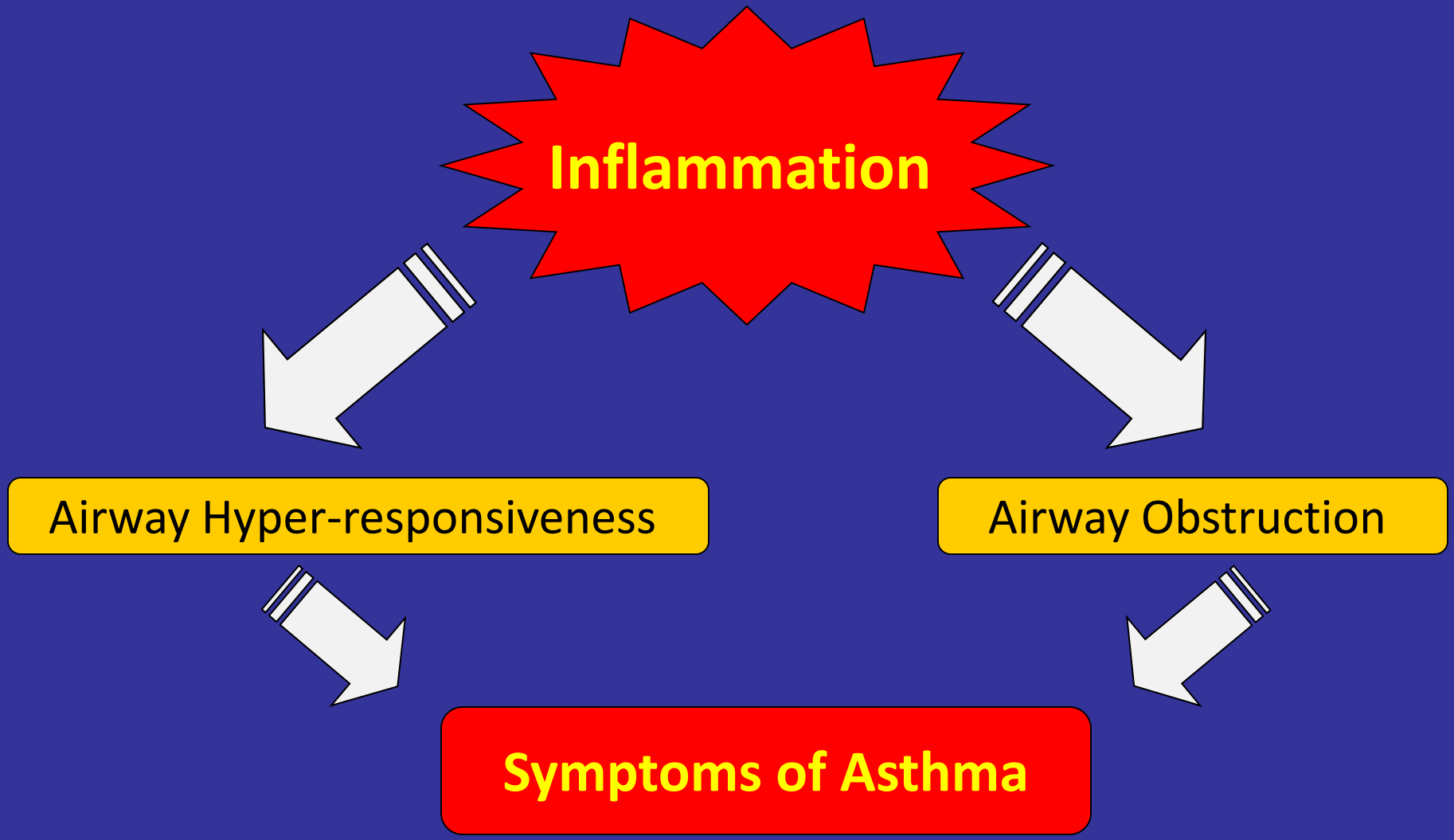
- Severe asthmatic attack unresponsive to repetitive courses of beta-agonist therapy
- A medical emergency that requires immediate recognition and treatment

ASTHMA

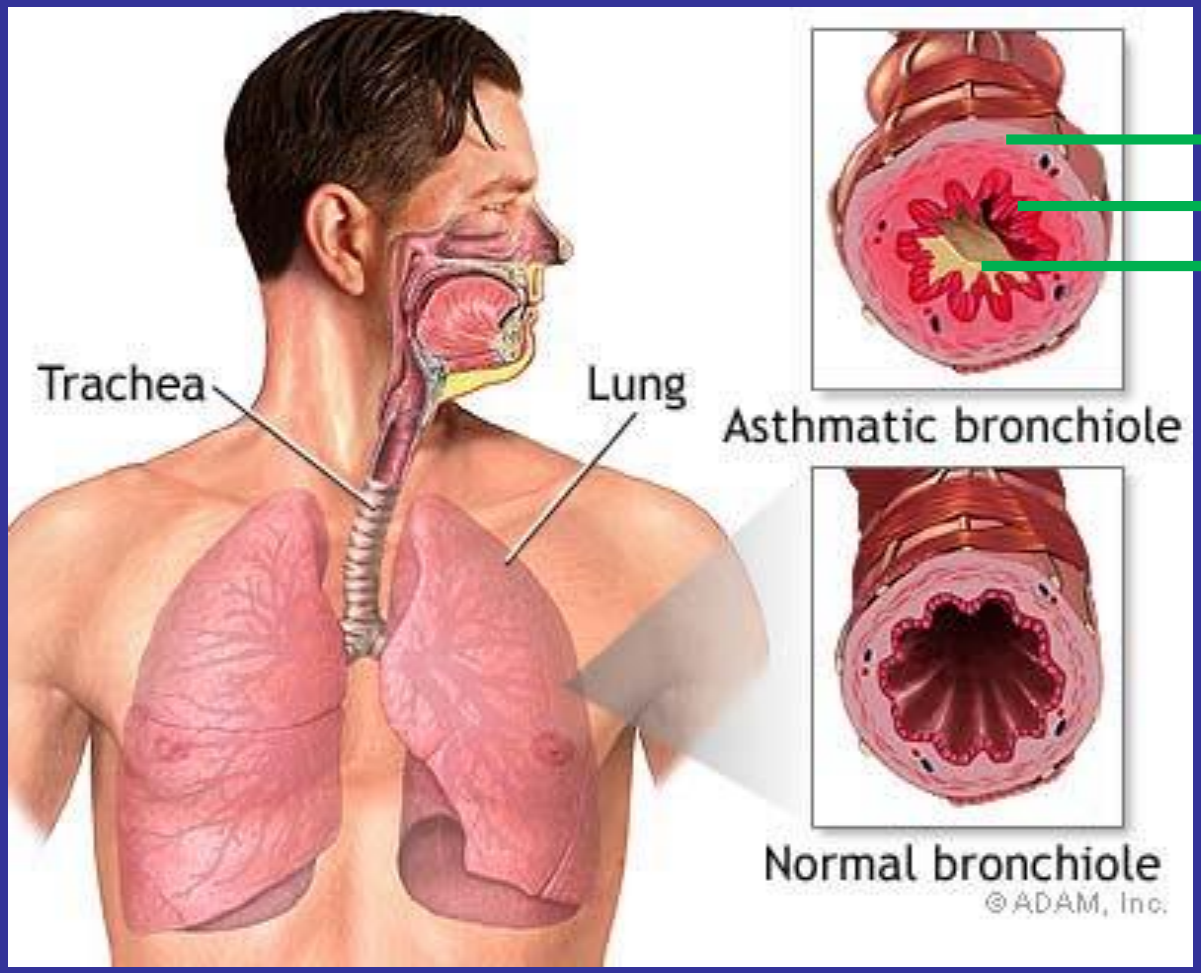
The "Tip" of the Iceberg



Pathology of Asthma



ASTHMA

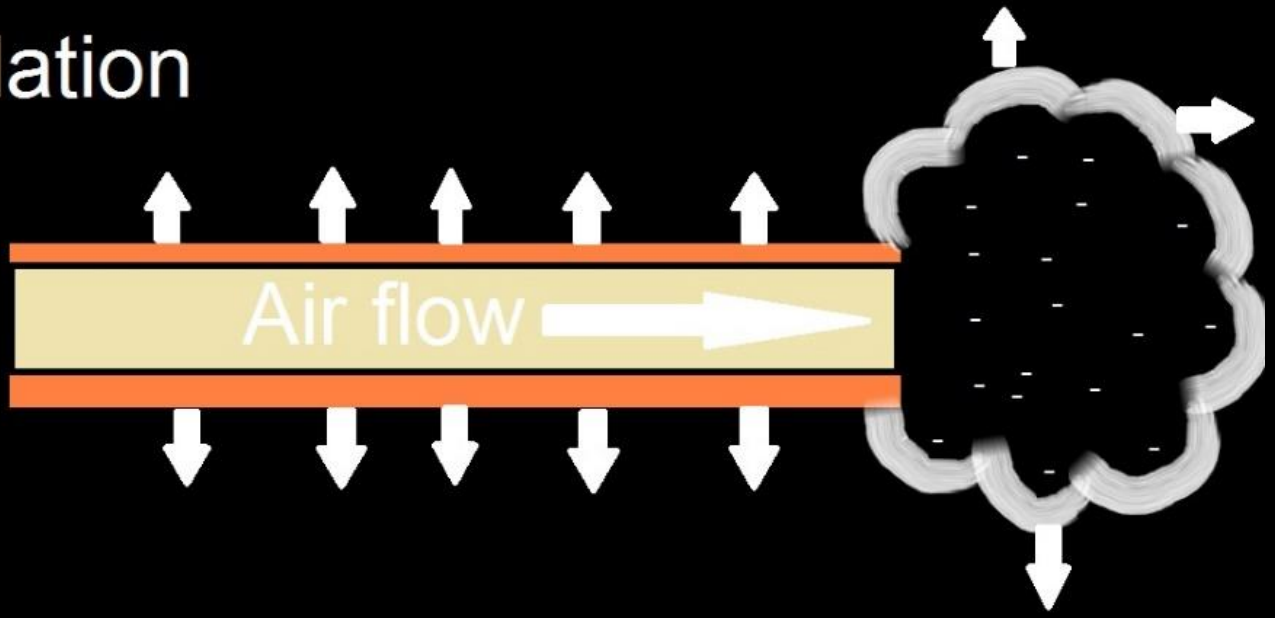


Smooth muscle contraction

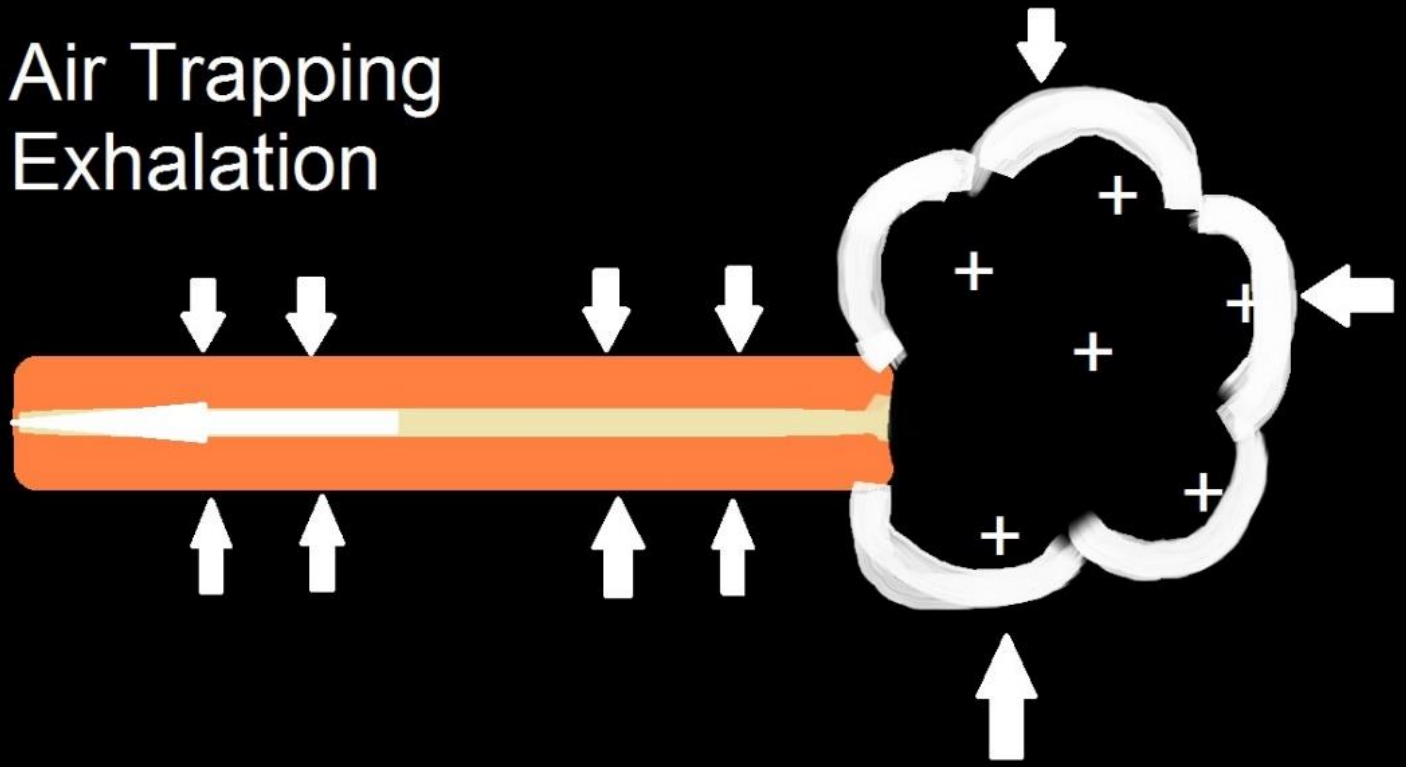
Mucosal edema

Excessive secretions

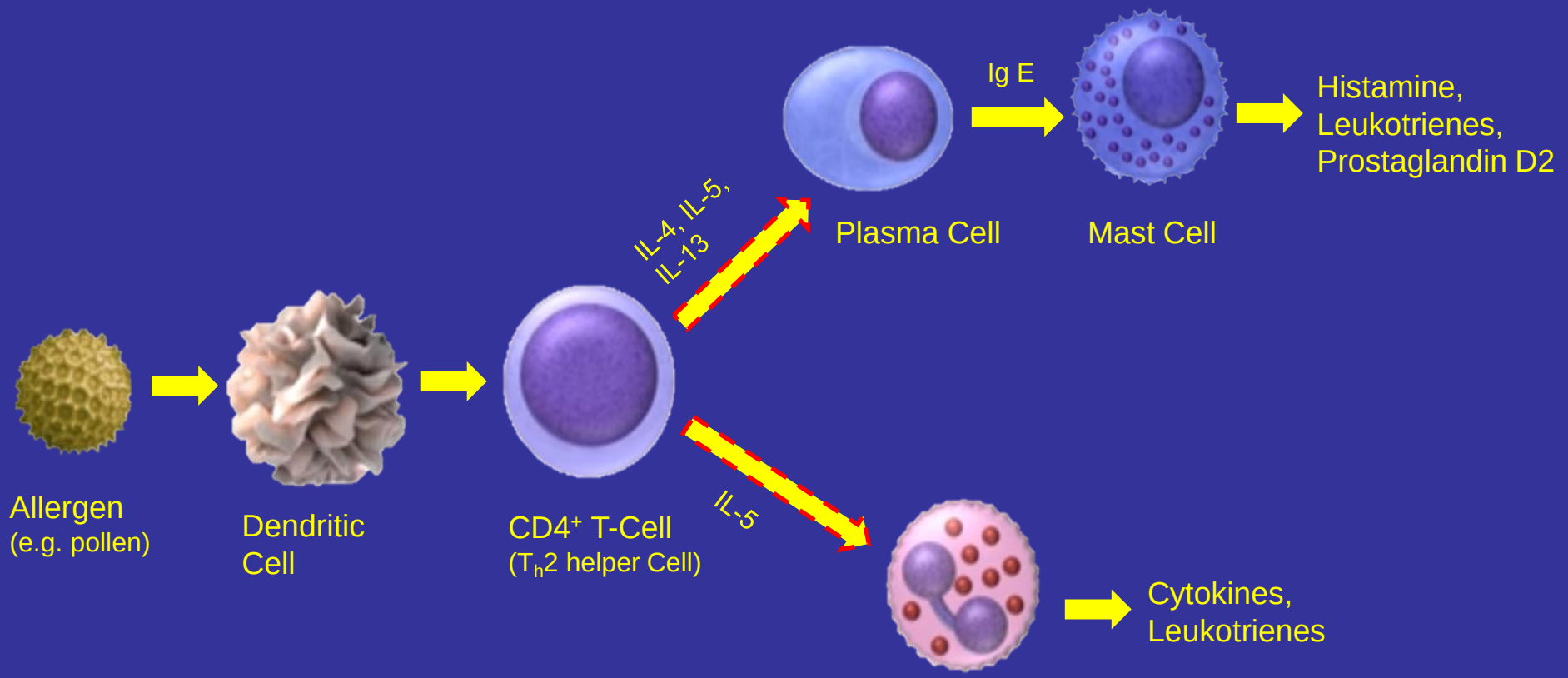
Inhalation



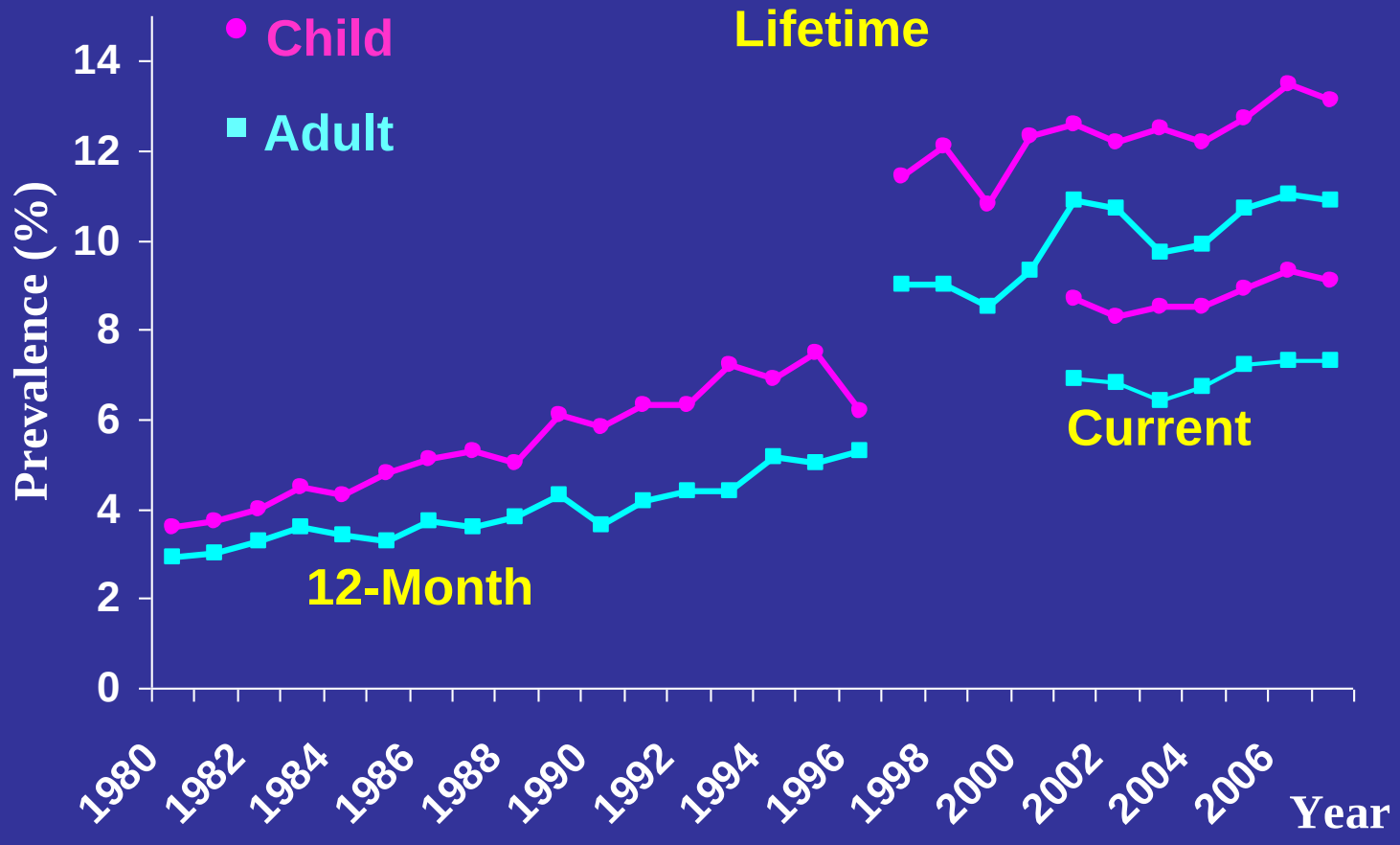
Air Trapping
Exhalation



Pathogenesis of Asthma

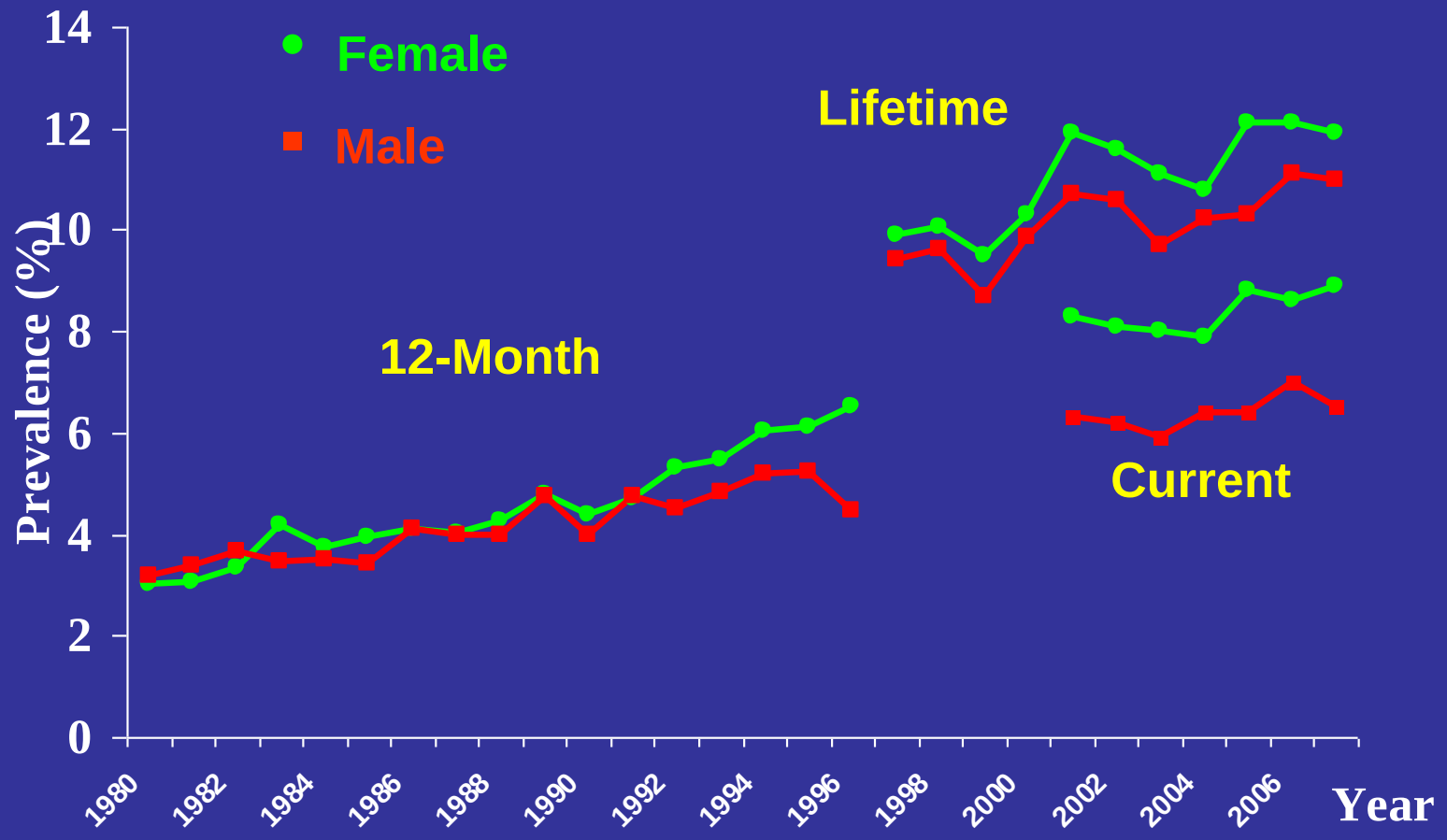


Child and Adult Asthma Prevalence United States, 1980-2007



Source: National Health Interview Survey; CDC National Center for Health Statistics

Asthma Prevalence by Sex United States, 1980-2007



Source: National Health Interview Survey; CDC National Center for Health Statistics

ASTHMA

Causes:

- Genetic
- Atopy
- Childhood respiratory infections
- Exposure to allergens
- Drugs

ASTHMA

Asthma Triggers:

Types of substance	Example
Air pollutants	Tobacco smoke, perfumes, wood dusts, gases, chemicals, solvents, paints
Pollen	Trees, flowers, weeds, plants
Animal dander	Birds, cats, dogs
Medication	Aspirin, anti-inflammatory drugs, B-blockers
Food	Eggs, nuts, wheat

ASTHMA

MANIFESTATION OF SEVERE ASTHMA

History of

- Past history of sudden severe exacerbation
- prior intubation and mechanical ventilation for asthma
- prior admission to ICU due to severe attack of asthma
- three or more emergency visits for asthma in the past year
- use of more than 2 canisters per month of inhaled short acting β2 agonist
- current use or recent withdrawal from systemic corticosteroids

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SEVERE ASTHMA:

Physical Examination

- HR > 115/min
- RR > 30/min
- Pulsus paradoxus > 10 mmHg
- Unable to speak
- Cyanosis
- Silent chest
- change in mental status
- peak expiratory flow meter >200 L/min

ASTHMA

Flowmeter

Asthma

Arterial Blood Gases

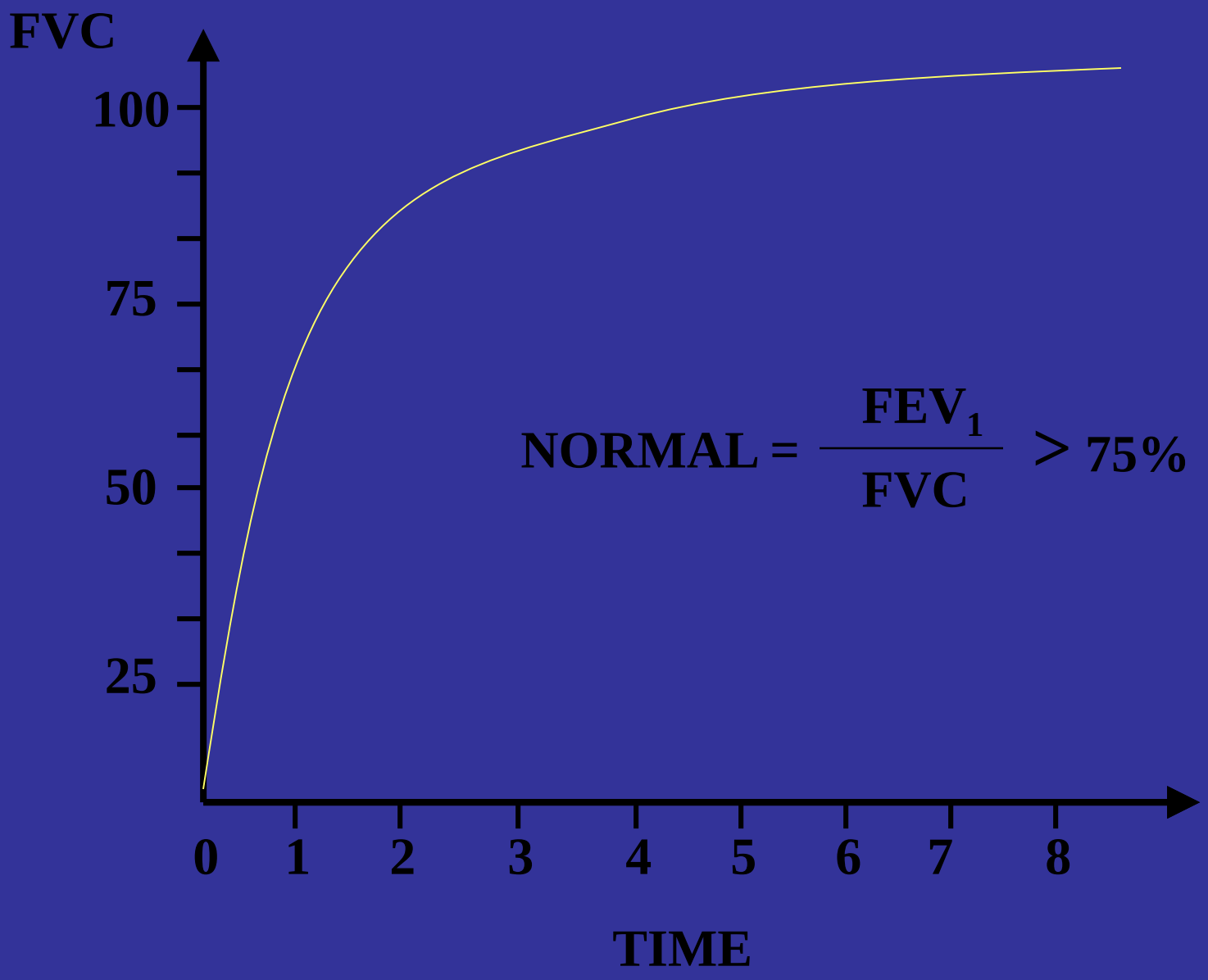
Acideamia

Hypoxiamia

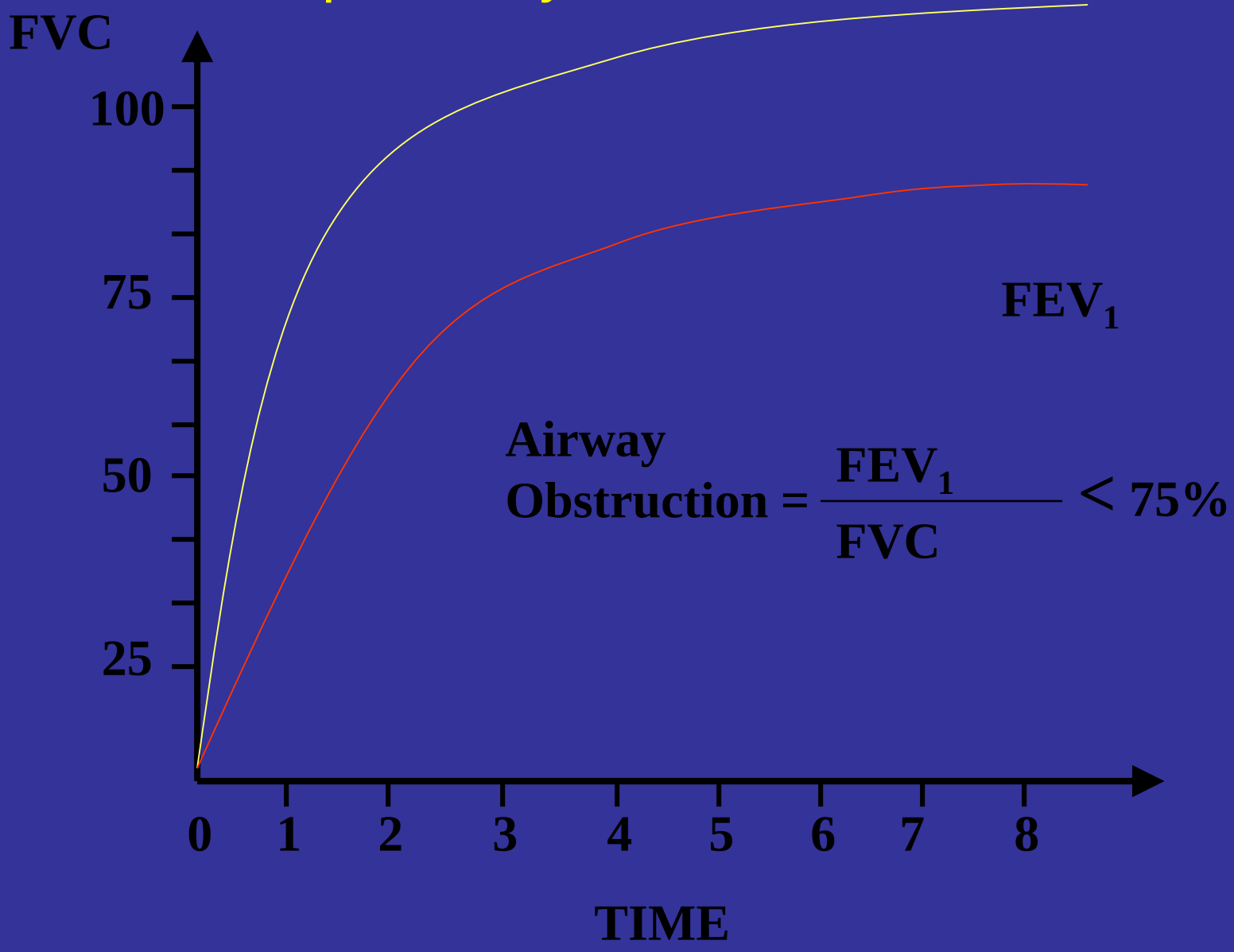
Hypercarpia

	pH	PCO_2	PO_2
1.	↑	↓	N or ↓
2.	N	N	↓
3.	↓	↑	↓↓

Spirometry Performed for Stable Asthmatics



Spirometry for Stable Asthmatics



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Treatment for Stable Patient:

Patient/Doctor Relationship

- Educate continually
- Include the family
- Provide information about asthma
- Provide training in self-management skills

ASTHMA

Treatment for Stable Patient:

Exposure Risk

- Reduce exposure to indoor allergens
- Avoid tobacco smoke
- Avoid vehicle emission
- Identify irritants in the workplace

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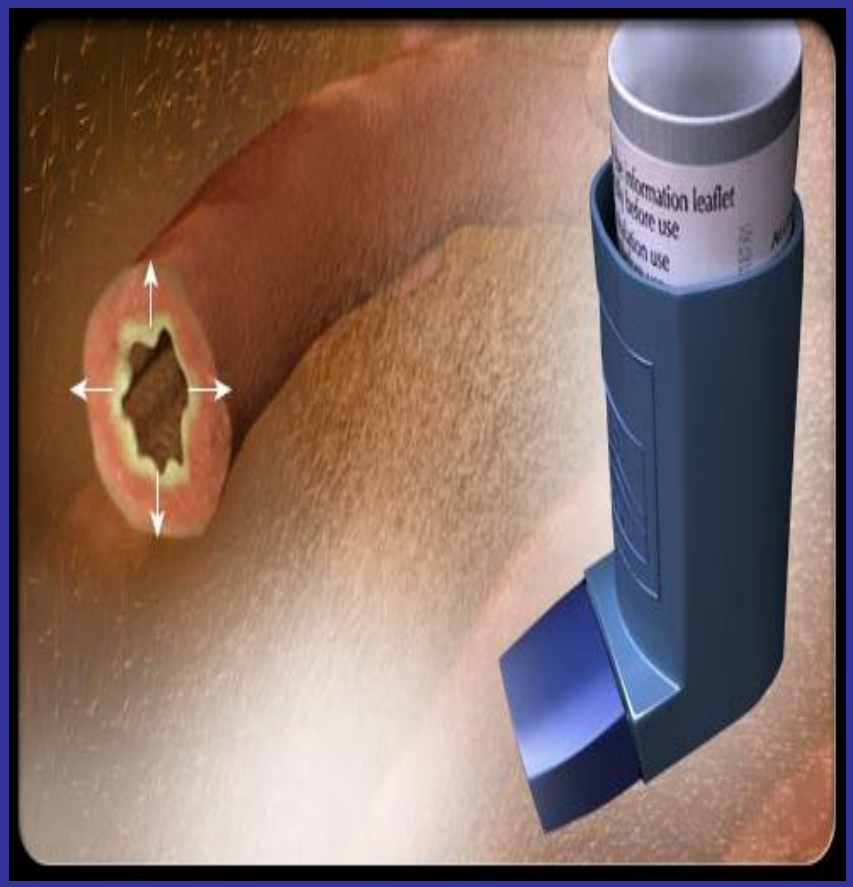

Quick Reliever

- Used in acute attacks
- Short acting beta$_{2}$- agonists
- Begins to work immediately and peaks at 5-10 minutes

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Inhalers and Spacers

Spacers can help patients who have difficulty with inhaler use and can reduce potential for adverse effects from medication.

ASTHMA
Nebulizers

- Machine produces a mist of medication
- Used for small children or for severe asthma
- No evidence that it is more effective than an inhaler used with spacers

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Inhaled Corticosteroids

- Main stay treatment of asthma
- Reduce airway inflammation

ASTHMA

Anti- Ig E

Anti-IL 5

- For treatment of moderate to severe allergic asthma
- For treatment of those who do not respond to high dose of corticosteroids

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Treatment of Severe Asthma

- Oxygen
- High doses of bronchodilator
- Systemic corticosteroids
- Intravenous fluids
- ICU management

ASTHMA

Initial Assessment

Treatment

- Oxygen

  High concentration of oxygen to achieve O2 Sat >92%

  Failure to achieve appropriate oxygenation and acidemia

  ↓

  assisted ventilation

ASTHMA

High doses of inhaled bronchodilator

- Short acting B2 agonist
  - via nebulizer OR
  - via metered dose inhaler through a spacer device
- An inhaled anticholinergics

  (Ipratropium bromide)

  It has synergistic effect with B2 agonist

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Systemic Corticosteroids

- intravenous hydrocortisone for those who are unable to swallow or in case of vomiting or disturb level of consciousness
  - It decreases mucus production
  - Improves oxygenation
  - Decreases bronchial hypersensitivity

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Intravenous Fluids

- To correct dehydration and acidosis
- Normal saline + sodium bicarbonate/lactate infusion
- Potassium supplement to treat hypokalemia induced by salbutamol

ASTHMA

Treatment of Acute Attack of Asthma:

For severe cases consider:

- IV Mg SO_4

  Relaxes smooth muscles

- Heliox

  Improves laminar flow

- Ketamine

  Anesthetic agent induced bronchodilation

  It has anti-cholinergic effects

ASTHMA

Non-invasive Mechanical Ventilation Treatment

ASTHMA

Indication for ICU Admission

- Drowsiness
- Confusion
- Silent chest
- Worsening hypoxemia despite supplemental oxygen
- Acidemia and hypercapnia

ASTHMA

Mechanical Ventilation

Initial Goals:

- To correct hypoxemia
- To achieve adequate alveolar ventilation
- To minimize circulatory collapse
- To buy time for medical management to work

Indication:

- Coma
- Respiratory arrest
- Deterioration of arterial gas despite optimal therapy
- Exhaustion, confusion, drowsiness

COPD

Chronic Obstructive Pulmonary Disease

Learning Objectives

Chronic Obstructive Pulmonary Disease (COPD)

- Definition
- Risk Factors
- Emphysema
- Chronic Bronchitis
- Treatment and Prevention

Chronic Obstructive Pulmonary Disease (COPD)

- Limitation of expiratory flow
- Chronic progressive disease
- Associated with airway inflammation
- Generally irreversible airflow obstruction
- Related to smoking

Chronic Obstructive Pulmonary Disease (COPD)

COPD Exacerbation:

- 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 day to day variation and is acute in onset.

www.goldcopd,org

Chronic Obstructive Pulmonary Disease (COPD)

- Emphysema
- Chronic bronchitis
- Small airway disease

COPD

COPD Facts:

- COPD is the 4th leading cause of death in the United States
- COPD has higher mortality rate than asthma
- Leading cause of hospitalization in the US
- 2nd leading cause of disability

COPD

COPD Risk Factors

- Smoking: most common cause
- Environmental exposure
  - chemicals. Dust, fumes
  - second hand smoke
- Alpha-1 anti-trypsin (AAT) deficiency

Chronic Obstructive Pulmonary Disease (COPD)

COPD

Alpha 1 Anti-Trypsin (AAT)

- is a serine protease inhibitors
- Inhibit neutrophil elastase which break down elastin
- Synthesized and secreted by hepatocytes
- PiZZ phenotype is associated with low plasma concentration of AAT

  i.e. associated with development of emphysema

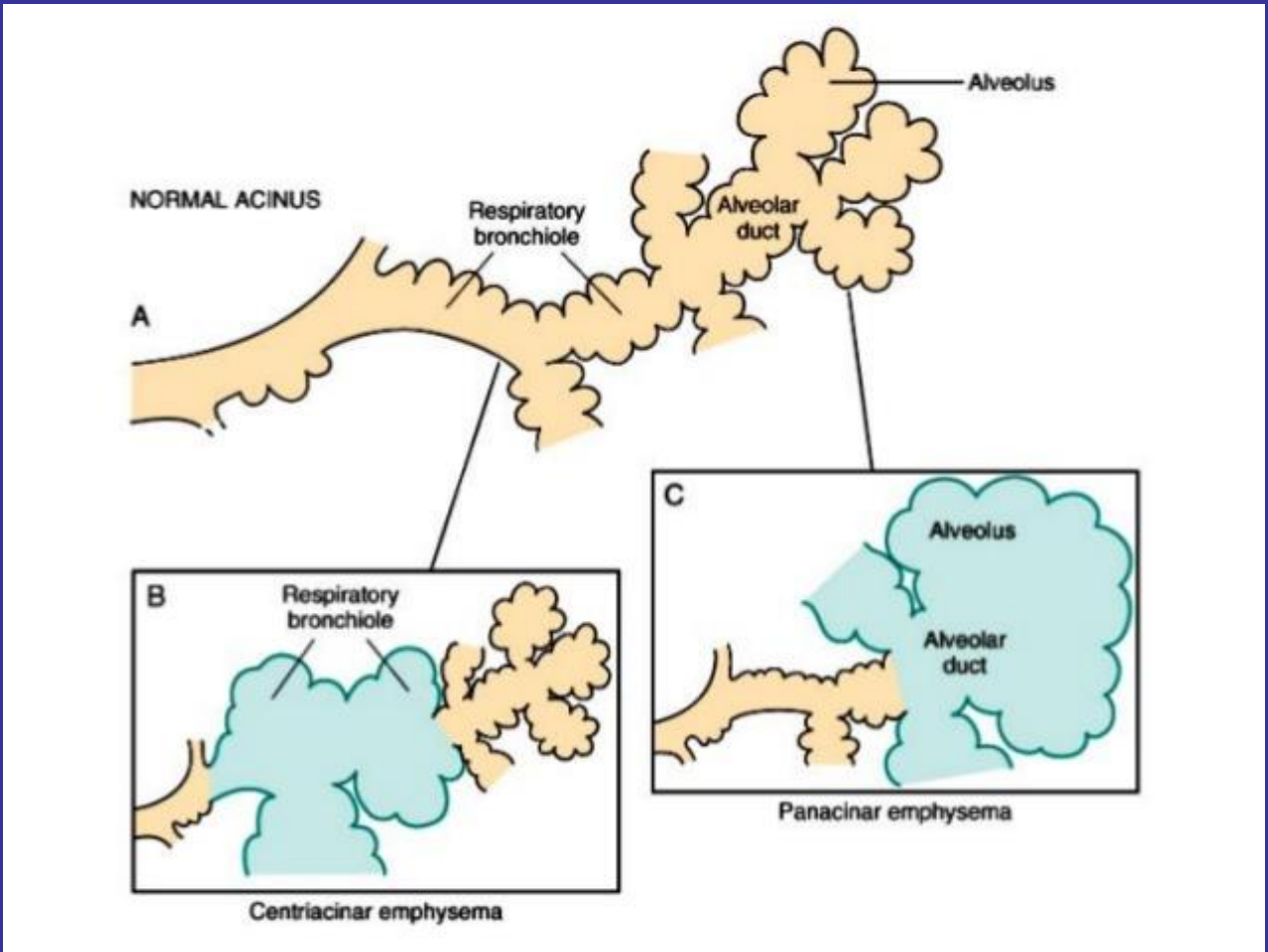
Emphysema

Emphysema

Definition: Abnormal permanent enlargement of the airspaces distal to the terminal bronchiole, accompanied by destruction of their walls and without obvious fibrosis.

Spaces in parenchyma > 1mm = Abnormal

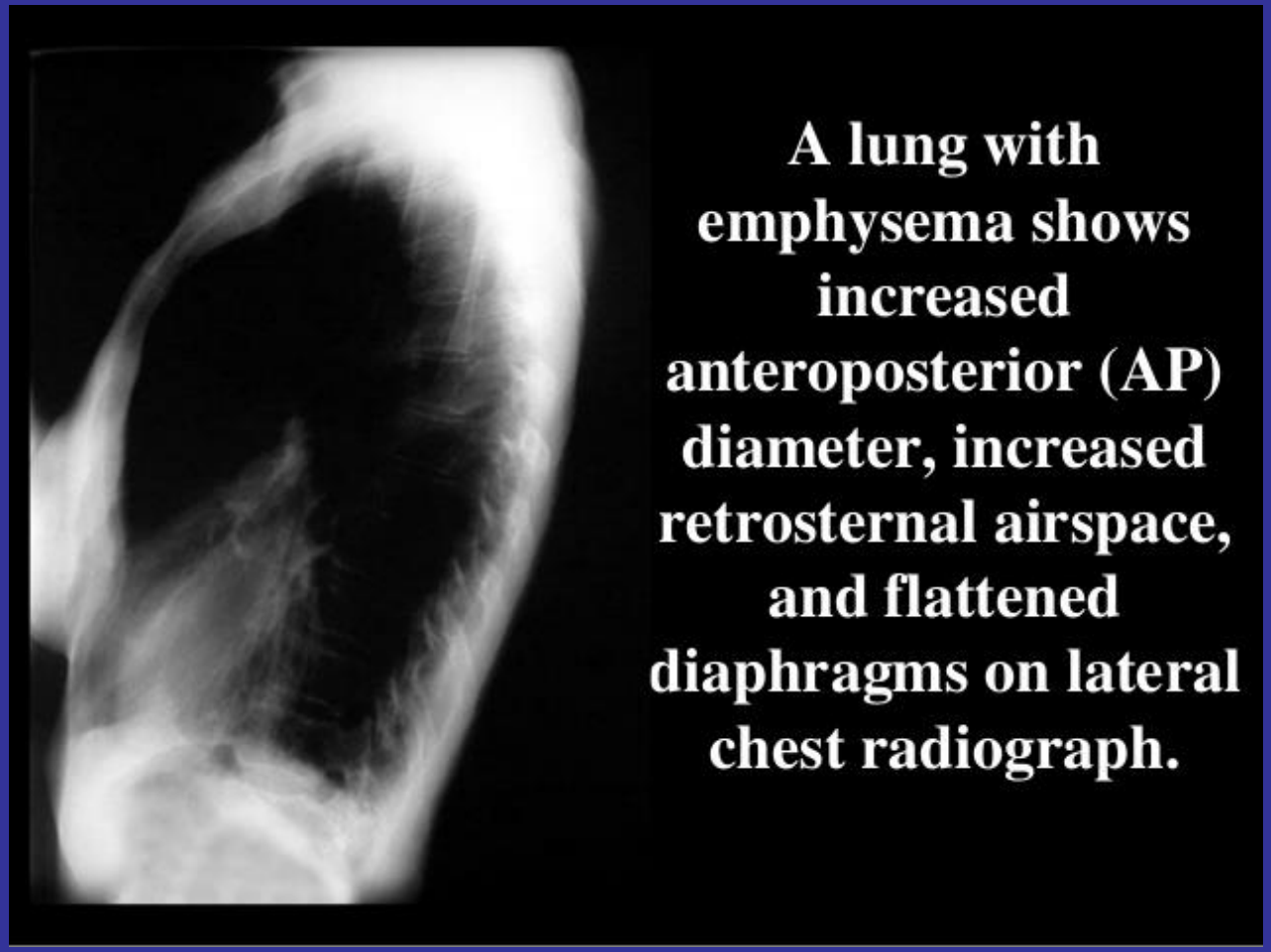
Emphysema


Alveolus
NORMAL ACINUS
Respiratory bronchiole
Alveolar duct
A
B
Respiratory bronchiole
C
Alveolus
Alveolar duct
Panacinar emphysema
Centriacinar emphysema

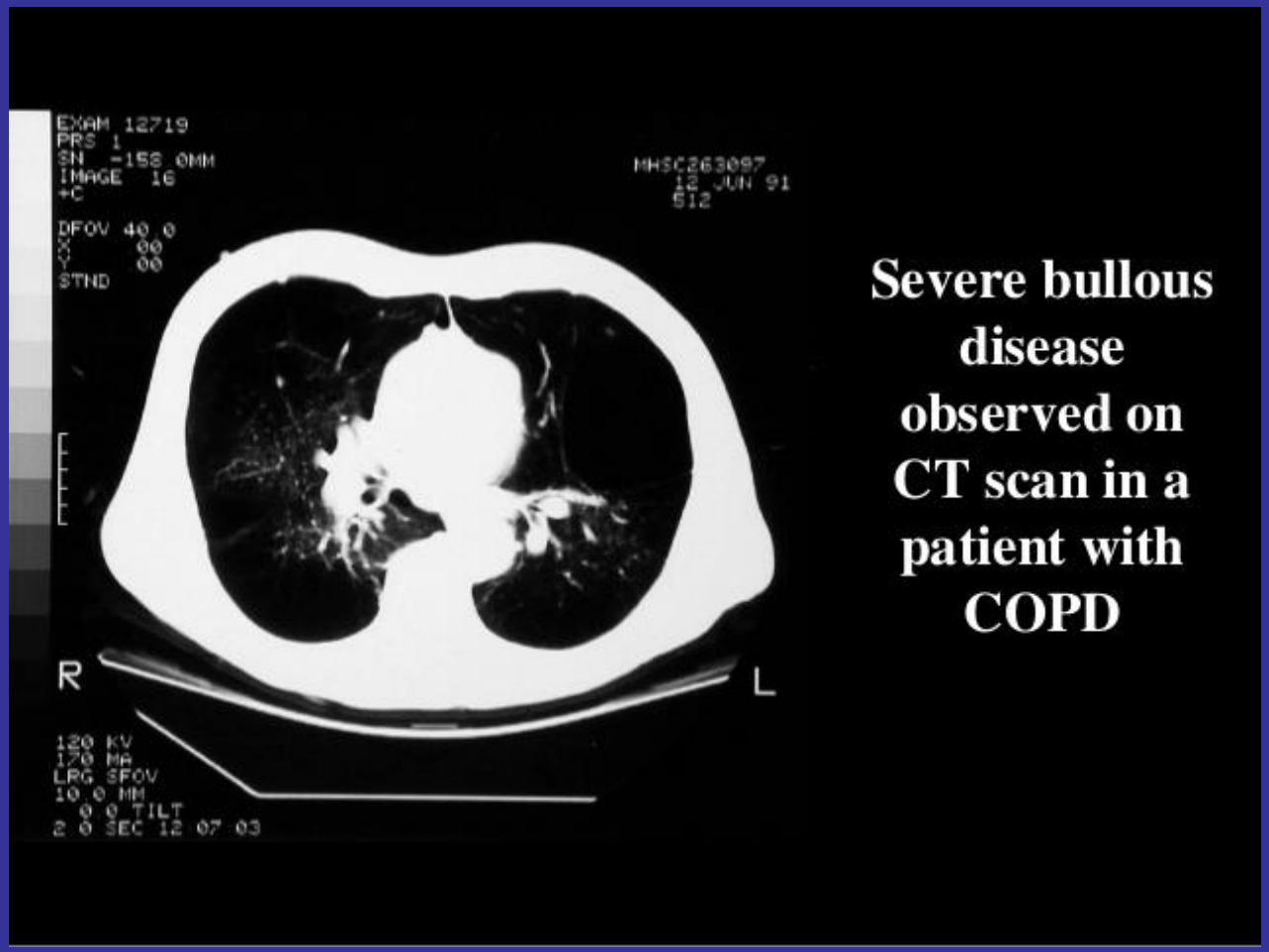
Emphysema

Posteroanterior (PA) and lateral chest radiograph in a patient with severe chronic obstructive pulmonary disease (COPD). Hyperinflation, depressed diaphragms, increased retrosternal space, and hypovascularity of lung parenchyma is demonstrated.

Emphysema


A lung with emphysema shows increased anteroposterior (AP) diameter, increased retrosternal airspace, and flattened diaphragms on lateral chest radiograph.

Emphysema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Severe bullous disease observed on CT scan in a patient with COPD

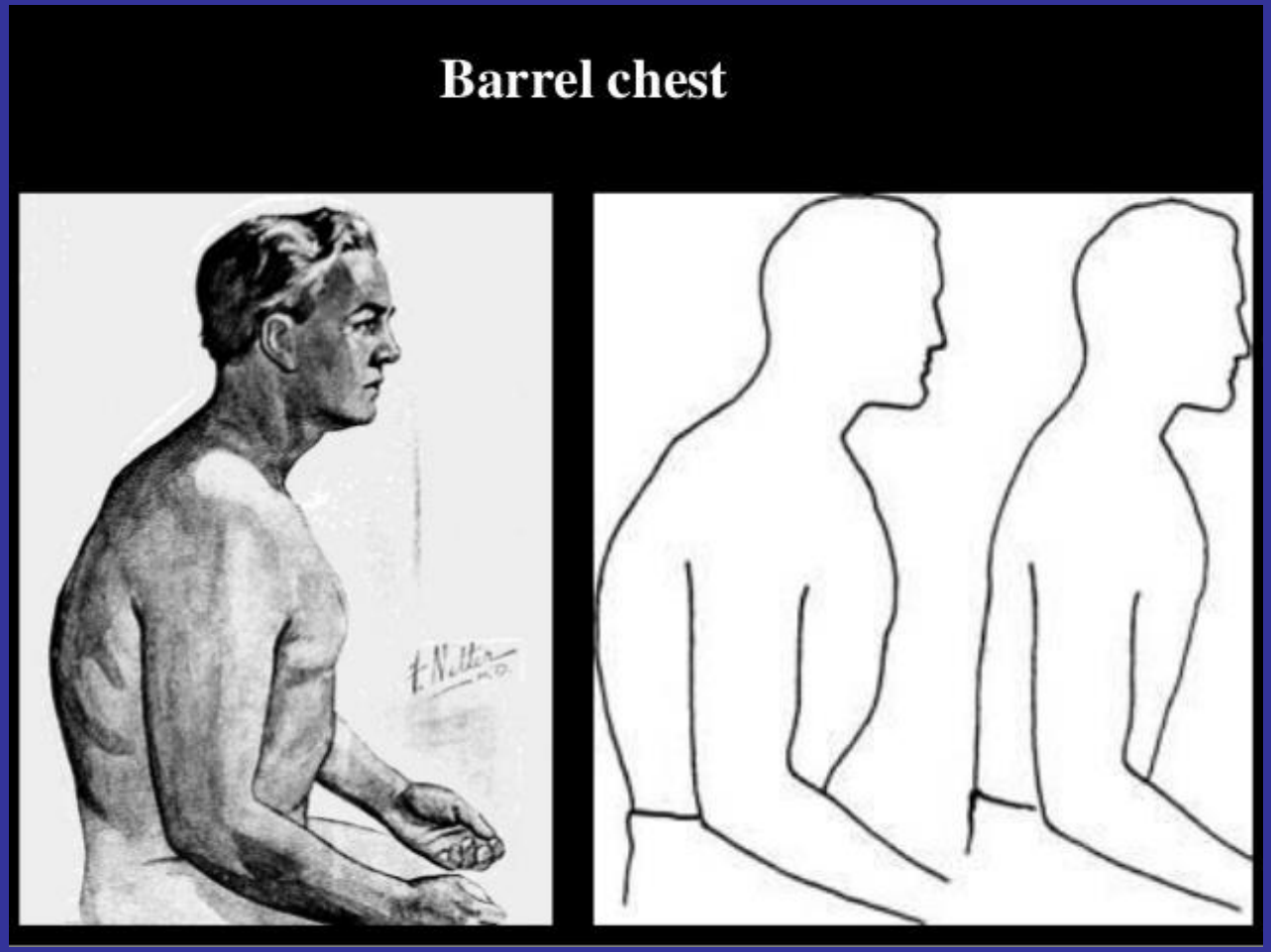
Emphysema

COPD

Clinical Picture

- Dyspnea-progressive
- Cough with or without expectoration
- Wheezing
- Loss of weight
- Hypercapnia>changes in central nervous system
- Barrel chest

COPD

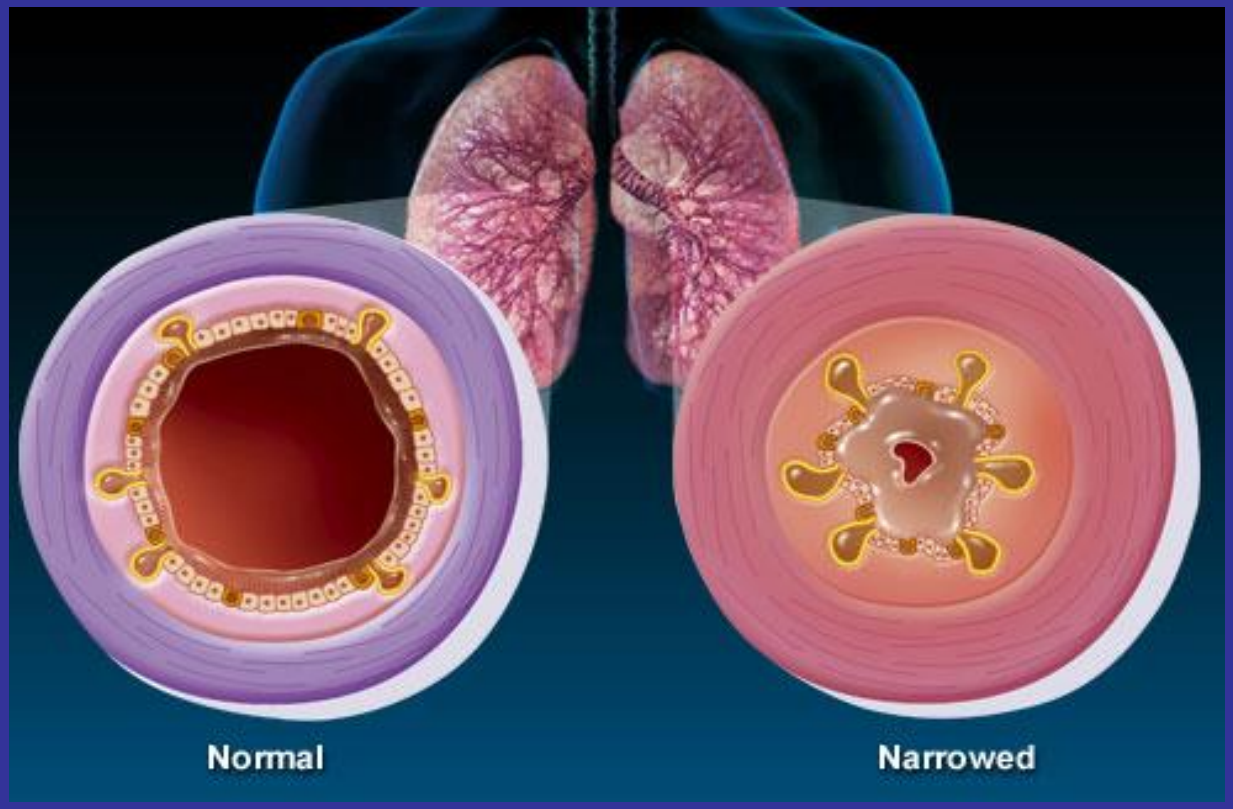


Chronic Bronchitis

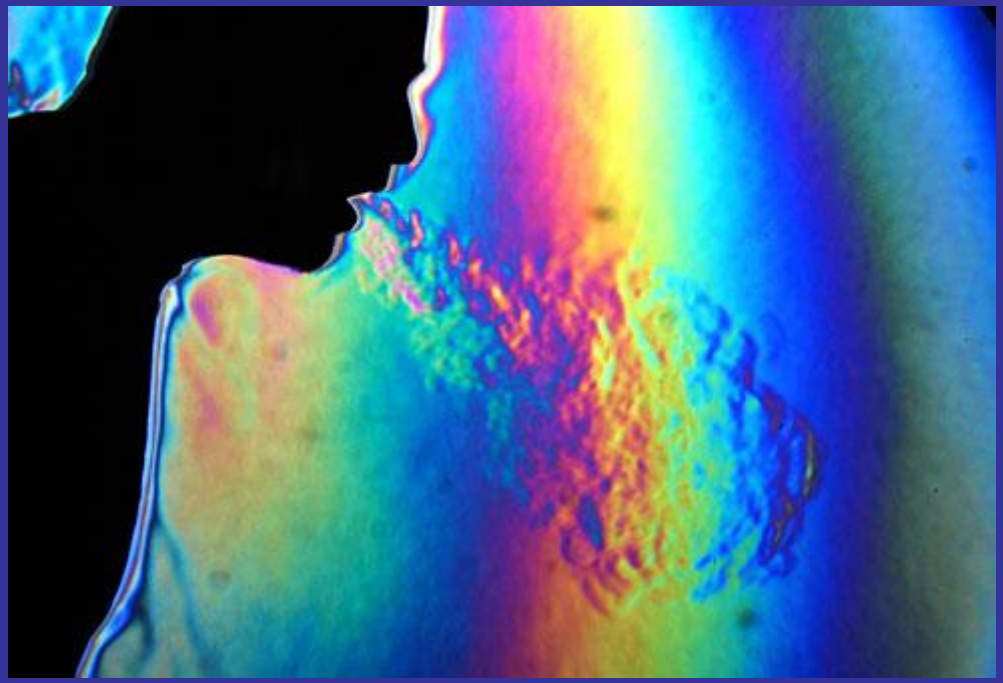
Definition

- Cough for 3 months in a year for 2 consecutive year

Chronic Bronchitis



Chronic Bronchitis



COPD
Oxygen Therapy

COPD

Home Oxygen Therapy

COPD

Oxygen therapy

For COPD with severe hypoxemia

- It improves survival
- It improves quality of life
- Indicated in patient with $PaO_2 < 60$ mmHg

COPD

Treatment of Acute Attack of COPD

- Oxygen therapy

  Low flow of oxygen to keep the $SO_2 \approx 90\%$
  to avoid oxygen induced hypercapnia
- Inhaled bronchodilators
- Inhaled corticosteroids
- Inhaled anti-cholinergic
- Theophylline therapy
- Antibiotics

COPD

Indication for ICU Admission

- Severe dyspnea that respond inadequately to initial emergency therapy
- Change in mental status (confusion, coma)
- Persistent or worsening hypoxemia $PO_2 < 50mmHg$ and / OR worsening respiratory acidosis $pH < 7.25$
- Need for mechanical ventilation e.g: apnea or respiratory arrest
- Hemodynamic instability-need for vasopressor

COPD

Indication for Non-Invasive Mechanical Ventilation (NIV)

At least of the following:

- Respiratory acidosis

  $PCO_2 \geq 45mmHg$ and $pH < 7.35$

- Severe dyspnea with clinical degree suggestive of respiratory muscle fatigue
- Persistent hypoxemia despite supplemental oxygen therapy

COPD

Non-Invasive Mechanical Ventilation

- **Both within the ICU and the ward environment have been showing in RCTs and systematic reviews:**
- **To reduce intubation rate and mortality in COPD patients with decompensated respiratory acidosis.**

COPD

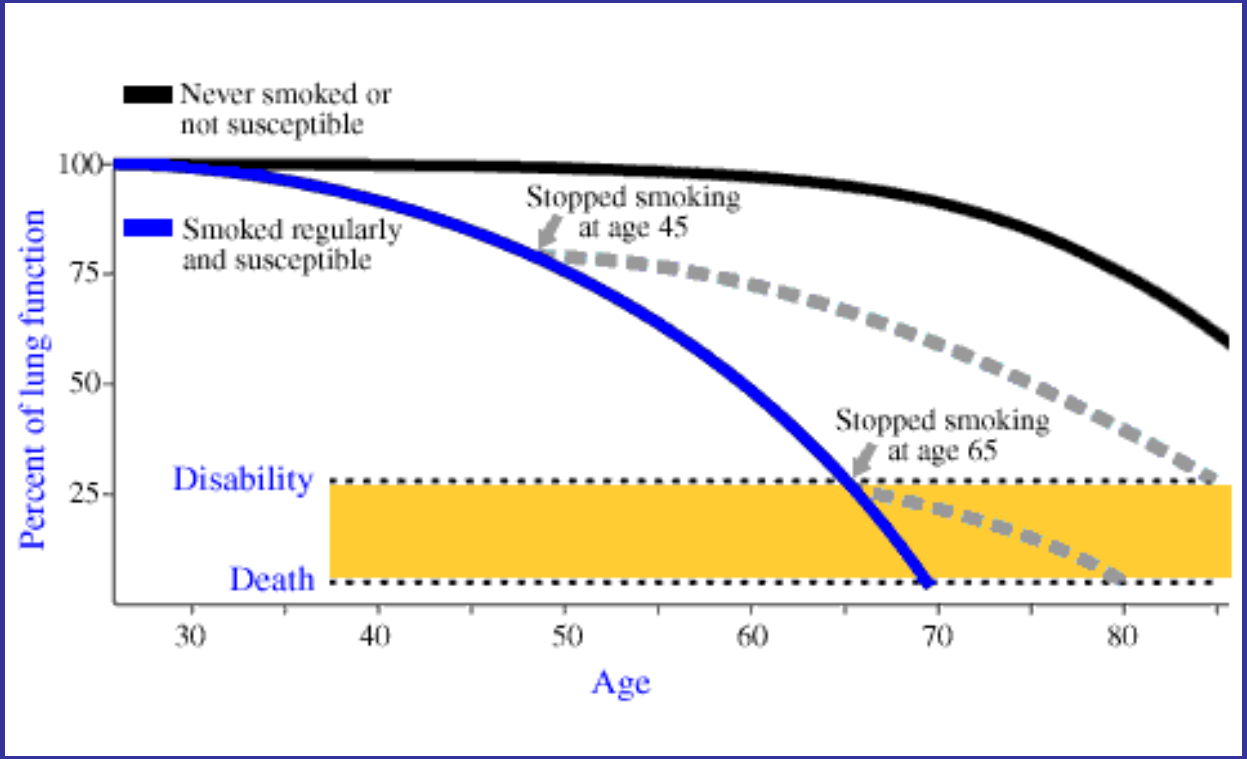
Non-invasive Mechanical Ventilation Treatment

COPD

Rehabilitation program

- Decreased symptoms
- Decreased anxiety an depression improved quality of life
- Decreased hospitalization
- Increase exercise capacity

COPD



Changes in FEV_1 with Aging (Smoker vs Non-Smoker)

END