Respiratory failure

Deficit of pulmonary $O_2$ transfer - partial
Deficit of pulmonary $O_2$ transport - total

Mechanisms:
- Ventilation perfusion mismatching
- Altered diffusion
- Alveolar hypoventilation

Ventilation perfusion mismatch (V$_A$/Q)

$V/Q \downarrow$
- Shunt

$V/Q \uparrow$
- Increased dead space
Diffusion abnormalities

- Alveolar hypoventilation
  - Homogenic
    - Inhibited control of breathing
  - Non-homogenic
    - Wasted ventilation
      - Arterial hypoxia and Hypercapnia
Acute respiratory failure

**Etiology**

- Respiratory pacemaker suppression
  (poisoning, tumors, hemorrhages, trauma)
- Acute trauma to the thorax and pleura
- Paralysis of respiratory muscles and diaphragm
- Acute obstruction of airways
- Severe pneumonitis
- Acute pulmonary edema

The patient either “doesn’t want” to breathe or is not capable of breathing

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**Forms and etiology of ARF**

**Asphyxiation** (pump ARF)

- Foreign body aspiration
- Laryngeal edema
- Drowning
- Suffocation
- Paralysis of respiratory muscles

**ARDS** (parenchymal ARF)

- Sepsis
- Shock (shock lung)
- Pneumonia
- Toxic gases
- Traumas
Pathophysiology of acute respiratory distress syndrome (ARDS)

Types of respiratory failure

- Pulmonary or extrapulmonary
- Acute, chronic and exacerbated
- Hypoxemic and hypercapnic (ARF)
- Compensated and manifest (CRF)
- First, second, third stage (CRF)
Chronic respiratory failure
(following every chronic lung condition)

Decompensating factors for CRF

- Active pulmonary infection
  (most common)

- Suppression of the respiratory pacemaker
  (sedative drugs or inappropriate O2 therapy)

- Congestive heart failure, rhythm disturbances

- Increased metabolic rate
  (fever, hormonal imbalances)

- Increased thoracic stiffness
  (trauma, pleuritis)
Stages of chronic respiratory failure

- First stage
- Second stage
- Third stage
- Death

Stages of CRF

- First stage
  - $pO_2 = 60 - 70$ mm Hg;
  - No hypercapnia;
  - The clinical picture is dominated by broncho-pulmonary syndrome (cough, phlegm, dyspnea on exertion)
Stages of CRF

- **Second stage**
  - $pO_2 = 50-60$ mm Hg;
  - Normo-, hypo- and rarely hypercapnia
  - Cyanosis, inspiratory effort, finger clubbing
  - **Cardiac involvement**
    - congested jugular veins; irregular cardiac rhythm, enlarged liver, edema, fatigue
  - Polyglobulia and high hematocrit
  - High risk of pulmonary thromboembolic complications

Cyanosis and finger clubbing
Stages of CRF

○ Third stage
  - \( pO_2 < 50 \text{ mm Hg} \); Hypercapnia
  - **Respiratory encephalopathy** (headache, fainting, delusions, aggressive behavior, depression, disorientation, Flapping tremor);
  - Cyanosis

Management of chronic respiratory failure

○ Treatment of the underlying disease

○ Prevention of exacerbations

○ \( O_2 \) supplementation (when needed)

○ Respiratory and whole body rehabilitation
Thank you!