**Acute Respiratory Distress Syndrome (ARDS):**

An acute and life-threatening inflammatory pulmonary reaction to systemic insult or injury. Causes:

- Pneumonia (bacterial or viral)
- Non-pulmonary sepsis
- Aspiration of gastric contents
- Major trauma (esp. if ≥3 long bone fractures)
- Pulmonary contusion
- Pancreatitis
- Inhalational injury
- Severe burns
- (Non-cardiogenic) shock
- Drug overdose
- Transfusion related (TRALI)
- Pulmonary vasculitis
- near-Drowning

**Definition:** (requires all 4)
- **Timing:** - within one week of known insult
- **Imaging:** - bilateral opacities not explained by another process
- **Origin of Edema:** - respiratory failure not explained entirely by volume overload or CHF
- **Impaired Oxygenation:** PaO2/FiO2 (P/F) ratio < 300

**Severity** of ARDS is determined by P/F ratio
- **Mild** (200-300)
- **Moderate** (100-200)
- **Severe** (<100)

**Pathophysiology:** ARDS lungs develop reduced compliance; making ventilation difficult. Mechanical ventilator can cause further damage; **Ventilator Induced Lung Injury** (VILI) can be caused by:
- Barotrauma → too much pressure
- Volutrauma → too much volume
- Atelectrauma → repetitive cycles of alveoli recruiting/de-recruiting

**Consider conditions that can mimic ARDS**
- Acute Eosinophilic pneumonia (AEP) - idiopathic, drugs
- Acute Interstitial pneumonia (AIP) – idiopathic, CVD, drugs
- Organizing Pneumonia (BOOP) – CVD, drugs, radiation, infxn
- Diffuse Alveolar Hemorrhage (DAH) – vasculitis, ABMA, CVD

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**Seven ‘P’s for ARDS Treatment:**

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**PEEP / Lung Protective Ventilation (LPV)**

*Mxn:* High PEEP low tidal volume ventilator strategy avoids VILI by limiting volumes & pressure, and keeping alveoli open w/ PEEP. Reduces mortality.

**Approach:**
- Set RR to maintain MV; adjusting rate up to 35 to maintain goal pH > 7.3
- Initial Tidal Volume (TV) = 6 cc/kg PBW; Measure Plateau Pressure (Pplat) every 4 hours and adjust TV for goal Pplat < 30 cmH2O, decreasing TV down to 4 cc/kg PBW if Pplat elevated; if pH is <7.2, may need to increase TV and Pplat may need to be higher than 30 cmH2O.
- Adjust PEEP and FiO2 for goal SpO2 > 90% or PaO2 > 55 mmHg; use either a LOW or HIGH PEEP “ladder” to protocolize PEEP/FiO2 titration

**Paralysis (e.g. Neuromuscular Blockade)**

*Mxn:* Improves ventilator compliance; decreases oxygen consumption; most effective if initiated early

**Approach:**
- Sedate deeply (e.g. RASS -4)
- Use infusion of cisatracurium or vecuronium to achieve and maintain neuromuscular blockade (NMB)
- Repeat clinical assessments including train of four stimulation to avoid excess NMB. Wean dose as tolerated

**Pneumonia evacuation (e.g. Thoracentesis)**

*Mxn:* Improves oxygenation by reducing collapsed lung due to effusions.

**Approach:**
- Look for large pleural effusions using POCUS; if present consider drainage using thoracentesis

**Prone Positioning**

*Mxn:* By moving from a supine to prone position, we can reduce dependent edema, increases lung volumes (from reduced atelectasis), and improve secretion clearance

**Approach:** follow a checklist
- Apply soft pads, secure all tubes/lines, place pillows on chest and wrap with sheets (e.g. burrito technique)
- Using a team (ideally 6 or more people) rotate the patient as a unit; supinate once per day for 4-6 hrs

**Inhaled Prostacyclin/Nitric Oxide**

*Mxn:* Dilates blood vessels in areas of the lungs that are well ventilated, improves V/Q matching

**Approach:**
- Start inhaled EPO at high dose and wean as tolerated. If patients respond, they generally have >20% increase in PaO2 within 10 min.

**Peripheral Oxygenation (ECMO)**

*Indication:* Consider when inhaled vasodilators (prostaclycins or NO) and for patients with refractory severe ARDS.

*Mxn:* directly oxygenate blood, remove carbon dioxide, and provide mechanical circulatory support (VA ECMO only). It should be used for selected patients who have the highest probability of benefit; consider using a scoring system to assess the potential risk/benefit:
- RESPscore (VV ECMO) or SAVEscore (VA ECMO)

**Approach:**
- ECMO should be performed by experienced providers; consider transfer if local experience or resources are insufficient