

# ACUTE RESPIRATORY DISTRESS SYNDROME

by Nick Mark MD



onepagericu.com  
@nickmark

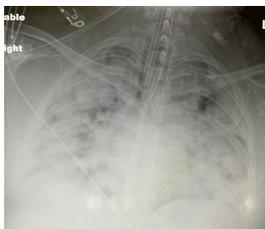
Link to the most current version →



## ETIOLOGY:

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

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



CXR showing severe ARDS due to COVID-19

## THE EIGHT P'S FOR ARDS TREATMENT:

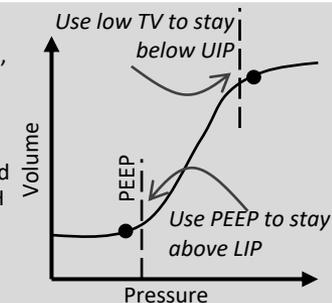
Mild	Moderate	Severe
Protective ventilation & Peeing		
Paralysis & Proning & Prednisone		
Prostacyclin & ECMO		

## 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 cmH<sub>2</sub>O, 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 cmH<sub>2</sub>O.
- Adjust PEEP and FiO<sub>2</sub> for goal SpO<sub>2</sub> > 90% or PaO<sub>2</sub> > 55 mmHg; use either a LOW or HIGH PEEP “**ladder**” to protocolize PEEP/FiO<sub>2</sub> titration



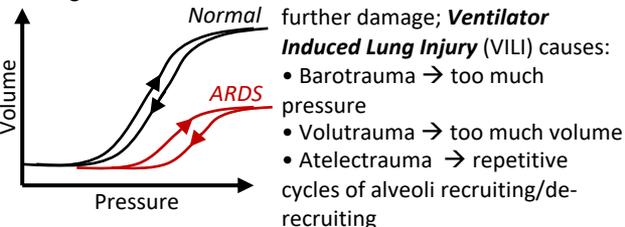
## DEFINITION: (requires all 4)

- **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** PaO<sub>2</sub>/FiO<sub>2</sub> (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)** causes:



## 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

## 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

## 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/iNO

*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 PaO<sub>2</sub> within 10 min.

## PLEURAL EVACUATION (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.

## PERIPHERAL OXYGENATION (ECMO)

*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/resources are insufficient

## PREDNISONE (e.g. **CORTICOSTEROIDS**)

*Mxn:* the anti-inflammatory & immunomodulatory effects of glucocorticoids may mitigate the early exudative phase of ARDS. *Approach:*

Start early in ARDS (e.g. within 14 days)

- Methylprednisone 1 mg/kg for 21 days then taper **or**
- Dexamethasone 20 mg daily for 10 days then 10mg daily for 5 days.

There is evidence for lower doses in COVID19 (e.g. 6 mg Dexamethasone IV or PO daily)