



Acute Respiratory Distress Syndrome (ARDS)

Diagnosis and Management Tip Sheet for Providers

Berlin Definition of ARDS

Timing	Within 1 week of insult	
Imaging	Bilateral opacities	
Origin of Edema	Not due to heart failure	
Severity	Mild	PaO ₂ :FiO ₂ 200-300
*on ≥ 5 PEEP	Moderate	PaO ₂ :FiO ₂ 100-200
	Severe	PaO ₂ :FiO ₂ < 100

Goals of Mechanical Ventilation in ARDS

Maintain oxygenation	PaO ₂ goal 55-80 mmHg
Minimize volutrauma	Tidal Volume (V _T) goal 6 cc/kg *Ideal body weight (IBW)
Minimize barotrauma	Plateau pressure (P _{plat}) ≤ 30
Permissive hypercapnia	pH ≥ 7.2

Initial Ventilator Settings in ARDS

Mode: Assist Control-Volume Control (AC-VC)	
Tidal Volume (V_T)	6 cc/kg (IBW)
Respiratory Rate (RR)	Match pre-intubation RR
FiO₂	100%
PEEP	10 cm H ₂ O (5 if hypotensive)

Ideal Body Weight (IBW) Table for V_T 6cc/kg

Height (in)	5'0"	5'1"	5'2"	5'3"	5'4"	5'5"	5'6"	5'7"
Male	300	310	330	340	360	370	380	400
Female	270	290	300	310	330	340	360	370
Height (in)	5'8"	5'9"	5'10"	5'11"	6'0"	6'1"	6'2"	6'3"
Male	410	420	440	450	470	480	490	510
Female	380	400	410	420	440	450	470	480

Sedation and Analgesia

- Ensure sedation plan includes both analgesic + sedation
- Can wean to analgesia alone if not paralyzed
- Target RASS -2 to -3 initially; target 0-1 once improving
- Discuss medication shortages / alternatives with pharmacy

Medication	Class	Dosing	Notable SEs
Fentanyl	Analgesic	Bolus 25-50 mcg Gtt 50-200 mcg	Caution in renal/liver failure
Midazolam	Sedative	Start with 0.5-4mg Gtt 2-8 mg/hr	Caution in renal/liver failure; accumulates in adipose, ↑ delirium
Propofol	Sedative	5-80 mg/hr	↓BPs, ↓HRs, ↑TGs; PRIS

Ventilator Adjustments in ARDS

Step 1: Ensure you are meeting your oxygenation goals (PaO₂ 55-80, or SpO₂ 88-96%)

- | | |
|------------------------------|--|
| Ensure Vent Synchrony | <ul style="list-style-type: none"> • Assess sedation requirements • Goal RASS -2 to -3 initially |
| PEEP Titration | <ul style="list-style-type: none"> • Use ARDSNet table or driving pressure to set optimal PEEP • Monitor for hypotension as PEEP increases |

ARDSNet PEEP TABLES

Consider incremental FiO₂/PEEP combinations as shown below to achieve PaO₂ or SpO₂ goal

Low PEEP/FiO ₂ Table									
FiO ₂	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
PEEP	5	5-8	8-10	10	10-12	12-14	18	18-24	

High PEEP/FiO ₂ Table									
FiO ₂	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
PEEP	5-14	14-16	16-18	18-20	18-20	20-22	22	22-24	

Driving Pressure Titration for PEEP

Driving pressure = P_{plat} - PEEP
(goal is to find PEEP that minimizes Driving Pressure)

- Step 1:** measure P_{plat} with inspiratory pause
Step 2: Increase PEEP by 2-4
Step 3: After 20 sec remeasure P_{plat}
Step 4: If decrease in driving pressure, repeat 1-3. if increased or hypotension, return to prior PEEP

Step 2: Perform an inspiratory pause to check the plateau pressure P_{plat} (goal < 30)

Please see dedicated ventilator cards for specific guidance using different ventilator models, including how to check inspiratory hold maneuvers to assess P_{plat} (QR codes in RUQ of card)

Is P_{plat} at goal < 30 mm Hg?

YES

NO

Continue current settings, proceed to Step 3

- 1. Ensure Vent Synchrony**
 - Assess sedation requirements
 - Goal RASS -2 to -3 initially
- 2. Lower V_T below 6 cc/kg**
 - Decrease by 0.5-1 cc/kg (minimum 4 cc/kg IBW)
- 3. Repeat inspiratory pause**
 - If P_{plat} remains > 30, repeat steps 1-3
 - If P_{plat} > 30 despite V_T at 4 cc/kg, call for help

Step 3: Check Blood Gas 15 to 20 minutes after changes to assess adequacy of ventilation

If pH < 7.2	Increase RR, monitor for auto-PEEP Consider increasing V _T by 0.5 - 1 cc/kg, call for help
If pH 7.2 – 7.40	No changes, permissive hypercapnia OK to allow for low V _T
If pH > 7.40	Reduce set RR, assess for analgesia/sedation needs

Step 4: Reassess to ensure achieving ARDS ventilation goals

- PaO₂ 60-80 mm Hg, SpO₂ (90-94%), V_T (6 cc/kg), P_{plat} (<30), and pH (> 7.2)
- Titrate down FiO₂ for PaO₂ 60-80 mm Hg, SpO₂ (90-94%)

Ventilator Specific Pocket Cards



Refractory Hypoxemia

PRONE POSITIONING

Mortality Benefit for Moderate-Severe ARDS (PaO₂:FiO₂ < 150)

- Caution if... HD instability; facial/pelvic fractures; arrhythmias
- 1) Pre-proning huddle: establish roles*, don airborne PPE
 - 2) Prone for at least 16 hours
 - 3) Turn supine for 4-8 hours, then reassess candidacy for proning
 - 4) Repeat steps 2-3 if PaO₂:FiO₂ remains < 150 after 4 hours supine
- * Monitor lines, ET tube, vent connections, hemodynamics

ECMO (Extracorporeal Membrane Oxygenation)

- Call ECMO team if PaO₂ < 80 on FIO₂ 100% despite proning, hemodynamic instability X 12 hours
- Exclusions: BMI > 45, Age > 65, > 30 pack year smoking history

NEUROMUSCULAR BLOCKADE

- Ensure adequate sedation (RASS < -4) before starting paralytic
- Discuss medication shortages / alternatives with pharmacy
- Cisatracium – dosing 0.1-0.2 mg/kg bolus, 2-10 mcg/kg/min gtt
- Can use either bolus dosing or bolus followed by infusion
- Trend TOF (train of four) to assess adequacy of paralysis
- Note: Paralysis is NOT necessary for proning

INHALED VASODILATORS

- Inhaled Nitric Oxide
- Initial dosing 40 ppm. Titration up to 80ppm
 - Avoid epoprostenol (iFlolan) in COVID/PUI, clogs viral filter

RECRUITMENT MANEUVERS

- Set PEEP to 30 for 30 seconds ("30 for 30") or "40 for 40"
- Caution: Potential ↑ mortality, risk of ↓BPs and barotrauma

Additional Considerations for ARDS

- Plan for line placement on same side for safer proning
- Steroids not recommended for ARDS management unless concomitant refractory septic shock
- Conservative fluid strategy and/or diuresis for negative 24-hour fluid balance, even if requiring low dose vasopressors

Visit the Penn COVID-19 Learning Center Site



Check out the Mechanical Ventilation Tip Sheet

