ICR-ARDS-034
Pulmonary critical care
Updated 21 Jun 2026

CRITICAL CARE ORDER SET

Acute Respiratory Distress Syndrome

Management of ARDS in adults. The mortality benefit comes from a small number of proven interventions — lung-protective ventilation, prone positioning, conservative fluids, and ECMO for the most refractory. Confirm the diagnosis (Global 2023 / Berlin), stratify severity, and follow the A→C ladder. Adapt every threshold to your protocol and the patient.

01 Inclusion criteria & severity

INITIATE IF ALL Start the ARDS order set when **all four** are present.

- [ ] **Acute onset** — within **1 week** of a known insult or new / worsening respiratory symptoms
- [ ] **Bilateral opacities** on CXR / CT, or bilateral B-lines / consolidation on lung ultrasound — not fully explained by effusion, collapse, or nodules / masses
- [ ] Respiratory failure / edema **not fully explained by cardiac failure or fluid overload**; hypoxemia not primarily from atelectasis
- [ ] Impaired oxygenation — $PaO_2/FiO_2 \leq 300$ with $PEEP \geq 5$ (Berlin), or a qualifying SpO_2/FiO_2 below

PREDISPOSING FACTORS

Pneumonia, non-pulmonary sepsis, trauma, transfusion, aspiration, or shock. ARDS may still be diagnosed alongside cardiac disease / fluid overload if a recognized ARDS risk factor is present.

SEVERITY — GLOBAL 2023 DEFINITION (USE SPO_2:FIO_2 ONLY IF $SPO_2 \leq 97\%$)

Severity	$PaO_2:FiO_2$ (mm Hg)	$SpO_2:FiO_2$
Mild	201–300	235–315
Moderate	101–200	148–235
Severe	≤ 100	≤ 148

SPECIAL DIAGNOSTIC CATEGORIES (GLOBAL DEFINITION)

Intubated
Classic Berlin case — severity by P/F or S/F as above.

Non-intubated (new)
P/F ≤ 300 or S/F ≤ 315 on **HFNO ≥ 30 L/min** or NIV/CPAP with PEEP ≥ 5.

Resource-limited (Kigali)
S/F < 235 (SpO_2 ≤ 97%); no PEEP / flow requirement to diagnose.

02 Predicted body weight & minute ventilation

PREDICTED BODY WEIGHT (PBW)

Men = 50 + 0.9 × [height (cm) – 154]

Women = 45.5 + 0.9 × [height (cm) – 154]

REQUIRED MINUTE VENTILATION

MV = PBW × (100–200) mL

...depending on metabolic demand. Set RR = MV ÷ target VT.

A Lung-protective ventilation

TARGETS

Tidal volume — **4–6 mL/kg PBW**

Plateau pressure — **< 30 cm H_2O** (aim < 28; higher acceptable with stiff chest wall / abdominal distension)

Driving pressure (Pplat – PEEP) — **≤ 14 cm H_2O**

pH **7.25–7.45** · PaO_2 **55–80** / SpO_2 **88–95%** · FiO_2 **≤ 60%**

Option 1 · Volume-controlled

- [ ] PRVC / autoflow / AC+ / APVcmv or AC; set VT `6 mL/kg PBW`
- [ ] Reduce VT by `1 mL/kg` increments toward Pplat goal (min 4 mL/kg)

Option 2 · Pressure-controlled

- [ ] Set inspiratory pressure ≤ `30 cm $H_2O$`
- [ ] Adjust pressure to deliver VT `4–6 mL/kg PBW`

- [ ] Set pressure-limit alarm; RR = MV ÷ VT (start 16–24); adjust RR to pH, watch auto-PEEP

- [ ] RR = MV ÷ VT; avoid air-trapping (flow waveform / auto-PEEP); I:E 1:2–1:3

PEEP / FiO_2 TITRATION — LOW-PEEP TABLE

FiO_2%														
PEEP	5	5	8	8	10	10	10	12	14	14	14	16	18	18–24

PEEP / FiO_2 TITRATION — HIGH-PEEP TABLE

FiO_2%													
PEEP	5	8	10	12	14	14	16	16	18	20	22	22	22–24

MONITORING

- [ ] Plateau pressure via inspiratory hold `0.5–1 s`; recompute driving pressure with each change

- [ ] ABG `30–60 min` after major changes, then `q4–6h` or as indicated; allow permissive hypercapnia if hemodynamically tolerated

NO LONGER ROUTINE **Recruitment maneuvers** are no longer recommended for routine use.

B Transpulmonary & esophageal pressure

CONSIDER IN Esophageal-pressure (transpulmonary) monitoring is indicated in **moderate–severe ARDS** or when intrathoracic / intra-abdominal pressure is high (e.g., morbid obesity). It has not been shown to improve mortality.

Inspiratory P_L	Expiratory P_L	True driving (DP_{tp})
< 20 cm H_2O	~0–2 cm H_2O	< 14 cm H_2O

05 Sedation & analgesia

GOALS Target **light sedation (RASS −1 to 0)** when feasible. Deeper sedation (**RASS −4 to −5**) is acceptable in early moderate–severe ARDS to enable lung-protective ventilation and proning.

ANALGESIA — FIRST LINE

- [ ] **Fentanyl** — bolus `25–100 mcg IV q15–30 min PRN` (or 0.5–1 mcg/kg); infusion `25–200 mcg/h`, titrate to pain & ventilator synchrony
- [ ] Alt — **hydromorphone** `0.2–0.6 mg IV q1–2h PRN`, infusion `0.5–4 mg/h`

SEDATION

- [ ] **Propofol** (hemodynamically stable) — start `5–10 mcg/kg/min`, titrate q5–10 min; usual `10–50` (cap ~60–70). Daily triglycerides; watch hypotension / PRIS
- [ ] **Dexmedetomidine** (lighter sedation / weaning) — optional load `0.5–1 mcg/kg` over 10–20 min (omit if unstable); infusion `0.2–1.4 mcg/kg/h`; watch bradycardia / hypotension
- [ ] **Midazolam** (if hypotension limits propofol / short-term deep sedation) — bolus `1–2 mg IV q5–10 min PRN`, infusion `1–5 mg/h` (up to 10), shortest duration possible

ADJUNCTS

- [ ] Daily sedation interruption / lightening if **not proned or paralyzed** and hemodynamically stable; consider enteral opioid ± atypical antipsychotic (e.g., quetiapine) per delirium protocol when extubation anticipated

06 Neuromuscular blockade (moderate–severe)

NOT ROUTINE Routine continuous NMBA infusion is **no longer recommended**. Use time-limited (e.g., `24–48 h`) — intermittent boluses, or infusion only if needed — to reduce work of breathing and dyssynchrony. **Ensure deep sedation / amnesia (RASS −4 to −5) first.**

INDICATIONS

- [ ] Severe dyssynchrony despite optimized sedation / analgesia · `P/F ≤ 150` on PEEP ≥ 10 or during proning with high WOB · need to strictly control VT / Pplat

Cisatracurium · preferred in organ dysfunction

- [ ] Optional bolus `0.1–0.2 mg/kg`; infusion `0.1–0.2 mg/kg/h`

Rocuronium · shorter-term

- [ ] Bolus `0.6–1.0 mg/kg`; infusion `7–12 mcg/kg/min`

MONITORING

- [ ] Train-of-four **q4h** (target 1–2/4) and after each dose change; **BIS** target `40–60` to confirm adequate depth of sedation under paralysis; eye lubrication; DVT & pressure-injury prophylaxis; reposition as feasible; **daily attempt to reduce / stop** if oxygenation & synchrony allow

07 Corticosteroids

- [ ] Consider if $PaO_2/FiO_2 < 200$ and no contraindication — **dexamethasone 20 mg IV daily × 5 days, then 10 mg IV daily × 5 days**

C Prone positioning

INDICATIONS — WHO TO PRONE

- [ ] Severe ARDS (`P/F < 150` on $FiO_2 \geq 0.6$ and PEEP ≥ 10) despite optimized ventilation; **early** (within 48 h ideal); focal infiltrate pattern

CONTRAINDICATIONS

- [ ] Raised ICP; massive hemoptysis
- [ ] Facial / neck trauma or surgery < 2 weeks; unstable spine, pelvic / femur fractures
- [ ] Extensive anterior-surface burns; morbid obesity
- [ ] Tracheal / sternotomy surgery < 2 weeks
- [ ] Pregnancy; treated DVT < 2 days; cardiac pacemaker < 2 days
- [ ] High risk of needing CPR / defibrillation; staff judgment

Technique & duration

- [ ] **3–5 staff**, vigilant ETT / central-line control. Prep: preoxygenate, empty stomach, suction ETT & mouth, move ECG leads to back, re-zero hemodynamic transducers
- [ ] Pad / reposition pressure points — face, shoulders, anterior pelvis; protect eyes
- [ ] **≥ 16 h prone** daily, 8 h supine; prolonged sessions help avoid de-recruitment; maintain lung-protective settings & reassess oxygenation / pressors during and after each turn

STOP WHEN **P/F > 150** sustained 4 h after returning supine (PEEP < 10, FiO_2 < 0.6), or significant hemodynamic instability / complications.

WATCH Complications — airway secretions / obstruction, ETT displacement or kinking, line kinking, raised intra-abdominal pressure, gastric residuals, facial pressure ulcers / edema, lip trauma, brachial-plexus injury.

09 Fluid management

EARLY PHASE — SHOCK PRESENT

- [ ] Balanced crystalloid `250–500 mL IV` over 15–30 min PRN hypotension, guided by dynamic measures; prefer **norepinephrine over excess fluid** once volume-replete

CONSERVATIVE PHASE — SHOCK RESOLVED

- [ ] Net balance goal even to `–0.5 to –1.0 L/day` as tolerated; hold / minimize maintenance fluids
- [ ] **Furosemide** — bolus `20–40 mg IV` q6–8h to UOP / negative balance, or infusion `5–20 mg/h` if frequent boluses needed

10 Vasopressors & hemodynamic support

- [ ] Goal `MAP ≥ 65 mmHg` (individualize); avoid excess fluid once euvolemic
- [ ] **Norepinephrine** — start `0.01–0.05 mcg/kg/min`, titrate to MAP; typical `0.05–0.5 mcg/kg/min`
- [ ] **Vasopressin** fixed `0.03 units/min` if NE > 0.1–0.2 mcg/kg/min; **dobutamine** `2–20 mcg/kg/min` for low cardiac index with high filling pressures

11 Infection management (if pneumonia / sepsis source)

DIAGNOSTICS

- [ ] Blood cultures ×2; endotracheal aspirate / BAL as indicated; viral PCR, urinary antigens, infection panel per institution

EMPIRIC ANTIBIOTICS — tailor to local antibiogram & source

Severe CAP

- [ ] Ceftriaxone `1–2 g IV q24h` + azithromycin `500 mg IV q24h`

HAP / VAP risk

- [ ] Piperacillin-tazobactam `4.5 g IV q6h` ± vancomycin `15–20 mg/kg q8–12h` (renal, per pharmacy)

- [ ] **De-escalate** daily — narrow / stop at `48–72 h` by cultures; typical course `5–7 days` for responding pneumonia

12 Anticoagulation & prophylaxis

VTE PROPHYLAXIS

- [ ] **Enoxaparin 40 mg SC q24h** — obesity (BMI ≥ 40) `40 mg q12h` or 0.5 mg/kg q12h; CrCl < 30 → `30 mg q24h`
- [ ] **OR UFH 5,000 units SC q8–12h** (adjust per BMI / bleeding risk)

GI, PRESSURE INJURY & EYE PROPHYLAXIS

- [ ] Pantoprazole `40 mg IV/PO q24h` or famotidine `20 mg IV/PO q12h` (renal adjust)
- [ ] Reposition **q2h** if not proned and stable; eye lubrication drops / ointment **q4–6h** if sedated / paralyzed

13 Nutrition & glycemic control

- [ ] **Enteral nutrition within 24–48 h** if not contraindicated — start `10–20 mL/h`, advance toward `20–25 kcal/kg/day` per dietitian
- [ ] Glucose target `140–180 mg/dL` — insulin infusion or basal/bolus per protocol; POC glucose **q4h**

14 Other supportive measures

- [ ] Head of bed `30–45°` if tolerated
- [ ] Daily readiness to wean FiO_2, PEEP, sedation, vasopressors
- [ ] Chlorhexidine oral care per protocol
- [ ] PT / OT consult once stable (early passive ROM)

15 Rescue / refractory hypoxemia

CONSIDER For persistent **P/F ≤ 80–100** despite optimized lung-protective ventilation, high PEEP, proning, and NMB.

INHALED PULMONARY VASODILATORS — oxygenation bridge, no mortality benefit

- [ ] **Inhaled epoprostenol 20–50 ng/kg/min** nebulized, titrate to SpO_2
- [ ] **OR inhaled nitric oxide 5–20 ppm** per protocol; wean if no clear benefit in 1–2 h
- [ ] Tracheal gas insufflation (TGI) may improve oxygenation

NOT ADVISED **APRV** has not proven superior; **HFOV** is no longer recommended in adults with ARDS.

ECMO — EOLIA eligibility

- [ ] **Early referral** to an ECMO center for any of: **P/F < 50** for > 3 h · **P/F < 80** for > 6 h · **pH < 7.15** with $PaCO_2$ rise despite RR 35 & Pplat ≥ 32
- [ ] Candidate profile — no end-stage disease (expected survival > 6 mo), intact neurologic status, adequate vascular access, ventilatory support < 7 days (relative)

16 Weaning & liberation

- [ ] **Daily weaning screen** — FiO_2 ≤ 0.4–0.5, PEEP ≤ 8–10, hemodynamically stable, adequate mental status, manageable secretions
- [ ] **SBT** — PS **5–8**, PEEP 5, FiO_2 to keep SpO_2 88–95% for **30–120 min**
- [ ] **Extubation** — passed SBT, adequate cough / airway protection, acceptable gas exchange & WOB; plan post-extubation support (HFNC / NIV) in high-risk patients