Severe MAS & APHN:

The Advanced Management Protocol

Evidence-based pathways for **Meconium Aspiration Syndrome** and Acute Pulmonary Hypertension of the Newborn.

THE PATHOPHYSIOLOGICAL CASCADE

AIRWAY OBSTRUCTION & SURFACTANT INACTIVATION
(Mechanical blockage and chemical pneumonitis)

→

HYPOXIA & ACIDOSIS
(Failure of normal postnatal pulmonary transition)

→

FAILURE OF PVR DROP
(Pulmonary Vascular Resistance remains at fetal levels)

→

RIGHT-TO-LEFT SHUNTING
(Blood bypasses lungs via PFO/PDA; aPHN established)

→

SYSTEMIC HYPOPERFUSION
(Right Ventricular failure starves the Left Ventricle)

DELIVERY ROOM PROTOCOL UPDATES

OBSOLETE PRACTICES

~~**NO routine suctioning on**~~ the perineum.

~~**NO routine immediate**~~ laryngoscopy for non-vigorous infants.

CURRENT STANDARD

Intubate **ONLY** for suspected tracheal obstruction.

Prioritize early **CPAP** (**5 cm H_2O**) via face mask.

THE DIAGNOSTIC ANCHORS FOR aPHN

Pre/Post-Ductal Gradient:

>10% SpO_2 difference between right hand (pre-ductal) and feet (post-ductal) confirms right-to-left shunting.

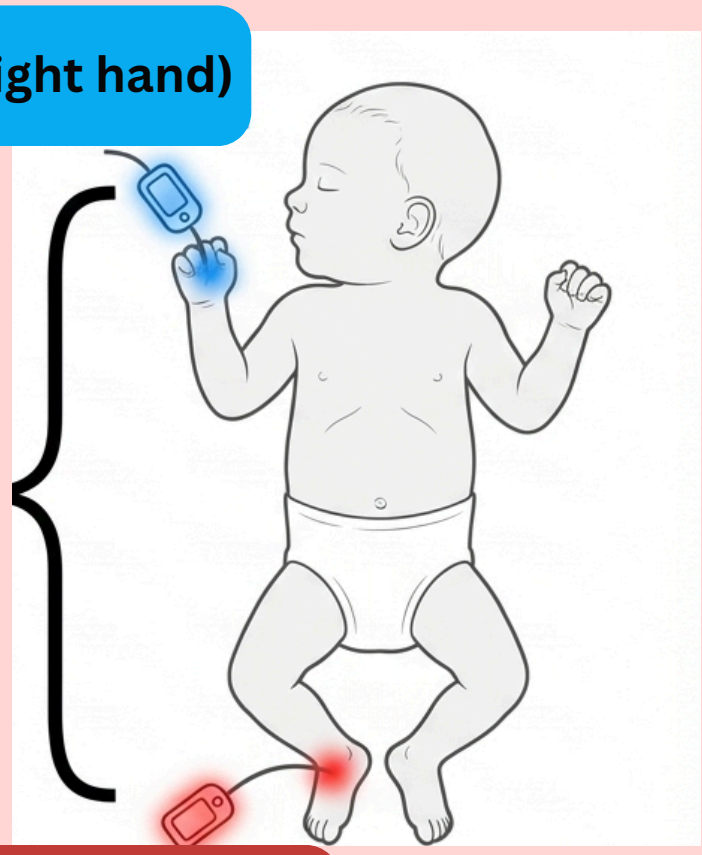
Clinical Presentation:

Hypoxia disproportionate to hypercapnia; Tricuspid regurgitant murmur; Systemic hypotension.

Mimics Cyanotic Heart Disease.

Always start Prostin if a duct-dependent cardiac lesion cannot be clinically excluded.

Pre-ductal (right hand)



>10% SpO2

Post-ductal

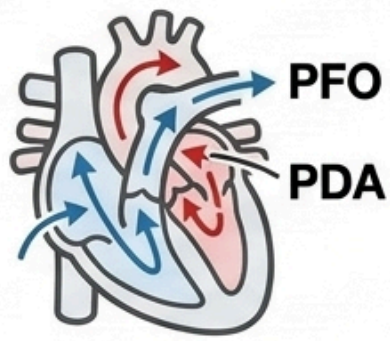
THE CRITICAL ROLE OF TnECHO

EXCLUDE

Rule out Cyanotic Congenital Heart Disease (CHD) and structural anomalies.

MEASURE

Assess Pulmonary Artery Pressure utilizing Tricuspid Regurgitation (TR) jet velocity.



EVALUATE

Assess Right and Left Ventricular dysfunction and determine the direction of shunting across the PFO and PDA.

Foundation of Care: The Systemic Milieu

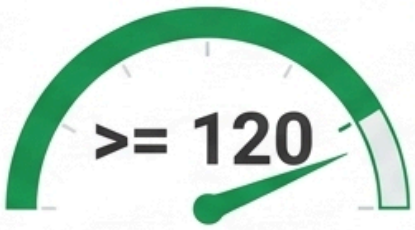
Optimize the baseline physiological state before escalating vasoactive drugs.

Ionized Calcium

iCa > 1.0 mmol/L (Essential for myocardial contractility).

Magnesium

Mg >= 1.0 mmol/L (Natural pulmonary vasodilator).



Hemoglobin

Hb >= 120 g/L (Optimize oxygen carrying capacity).

Environment

Minimal handling, rigid normothermia, and optimal sedation to minimize PVR spikes.

Respiratory Strategy: Gentle Ventilation

91 - 95%

SpO2 (Pre-ductal)

Do not attempt to close the pre/post-ductal gap if post-ductal SpO2 remains >70%. Avoid hyperoxia.

7.3 - 10.6 kPa

PaO2

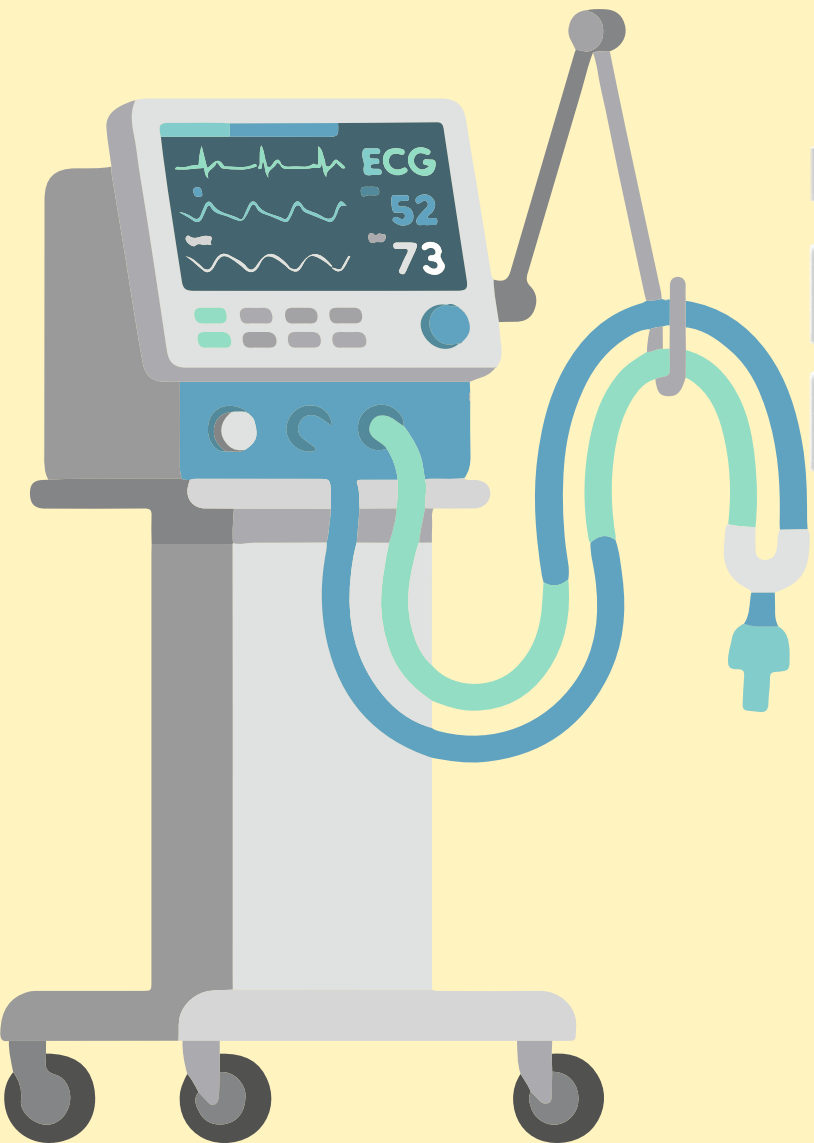
Tolerable hypoxaemia to prevent oxidative stress.

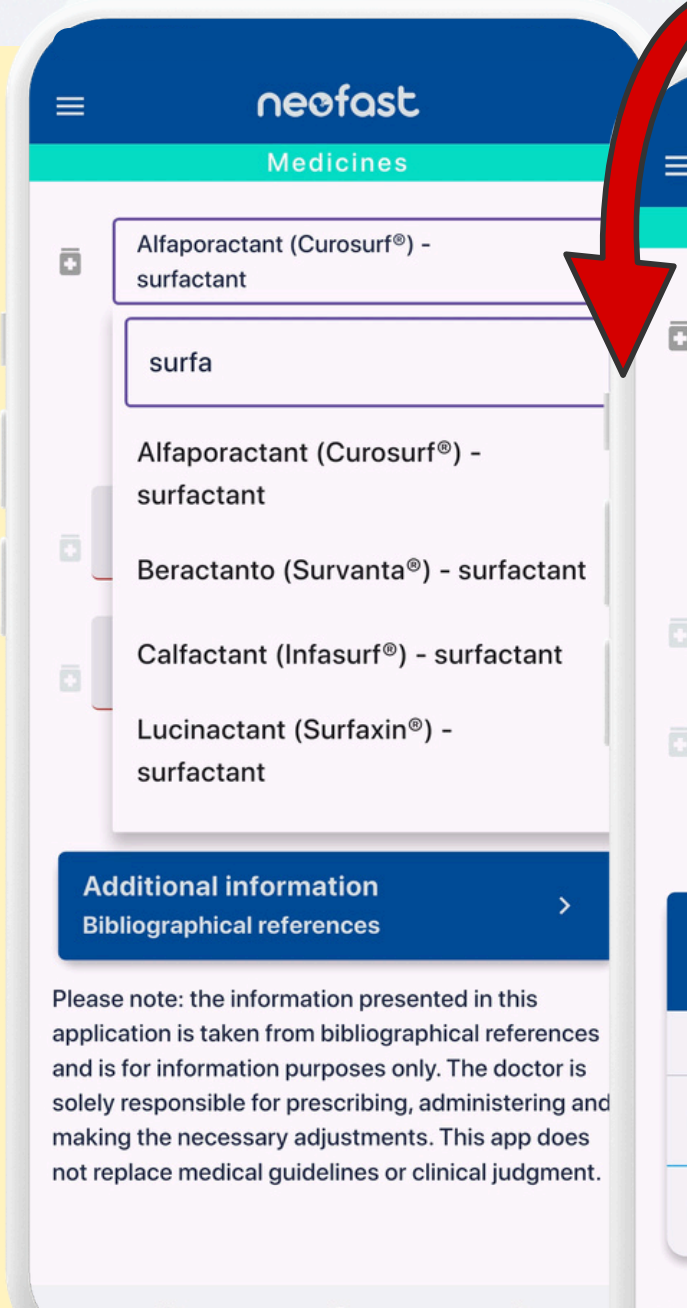
6 - 8 kPa

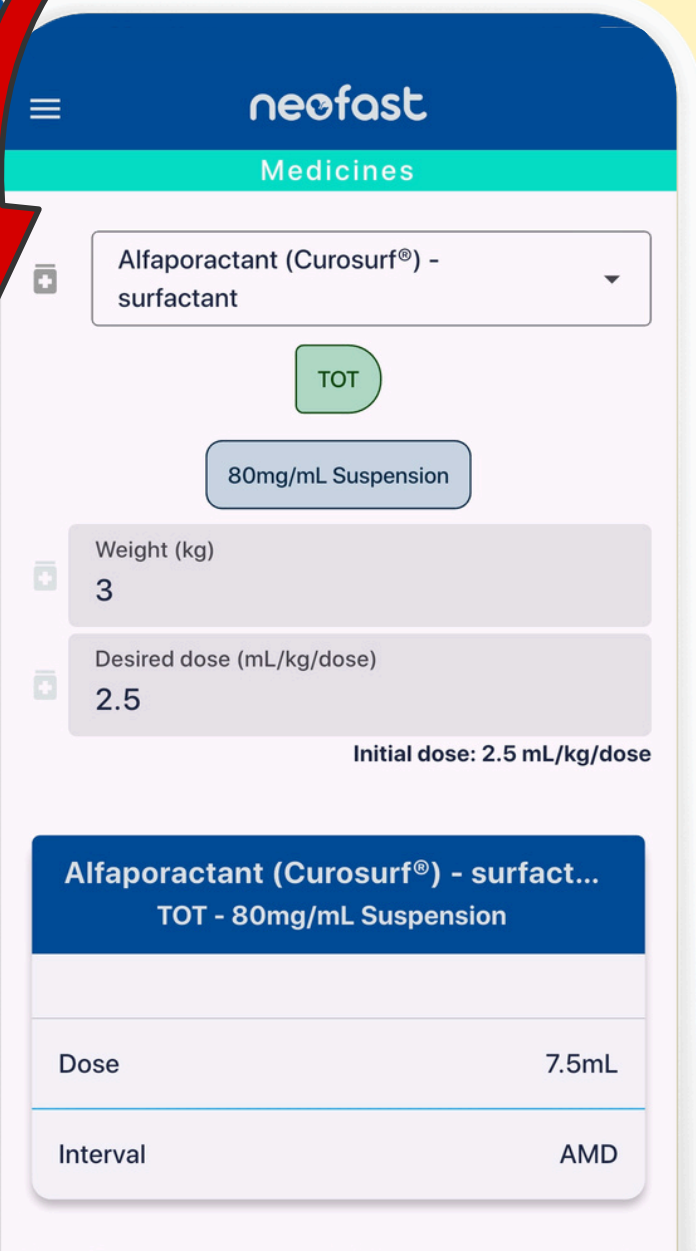
PaCO2

Avoid hypocapnia—hyperventilation lungs and impairs cerebral perfusion

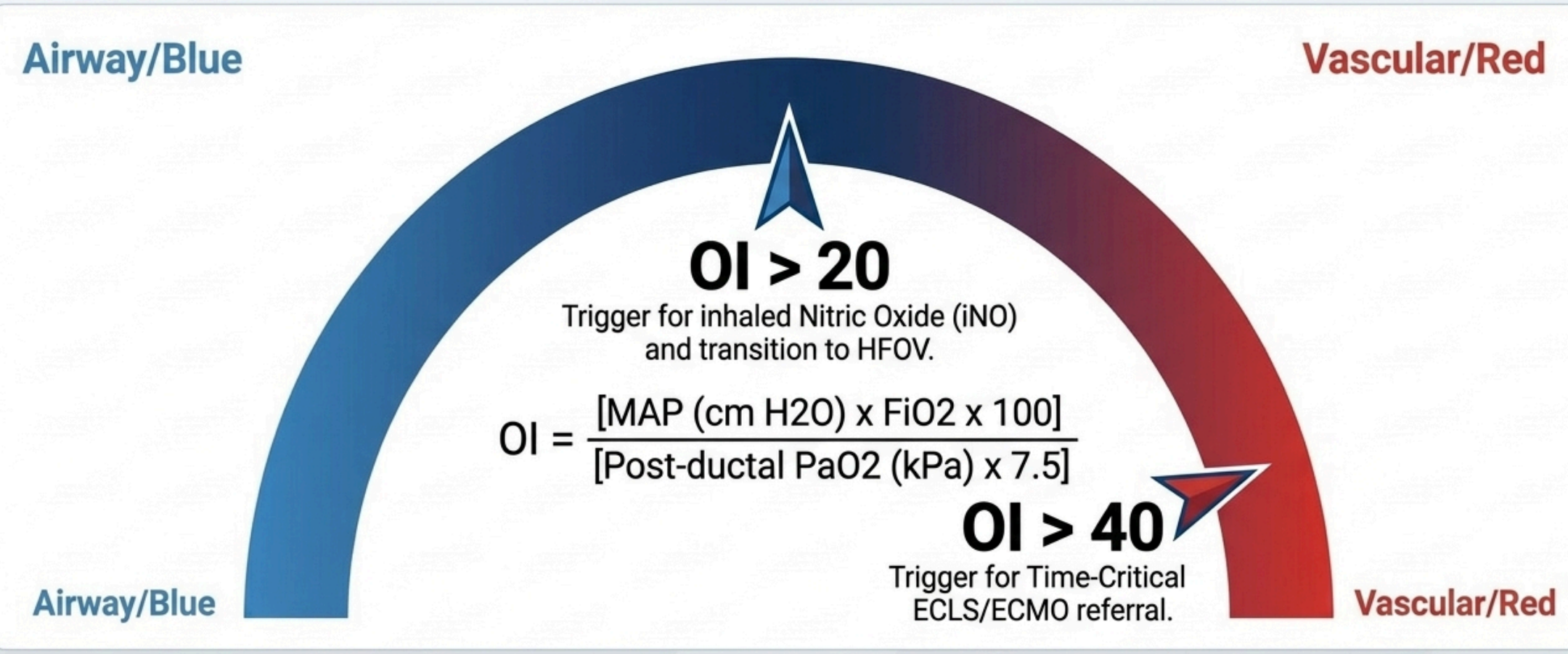
Note: Consider surfactant therapy for underlying parenchymal disease (MAS, Pneumonia).



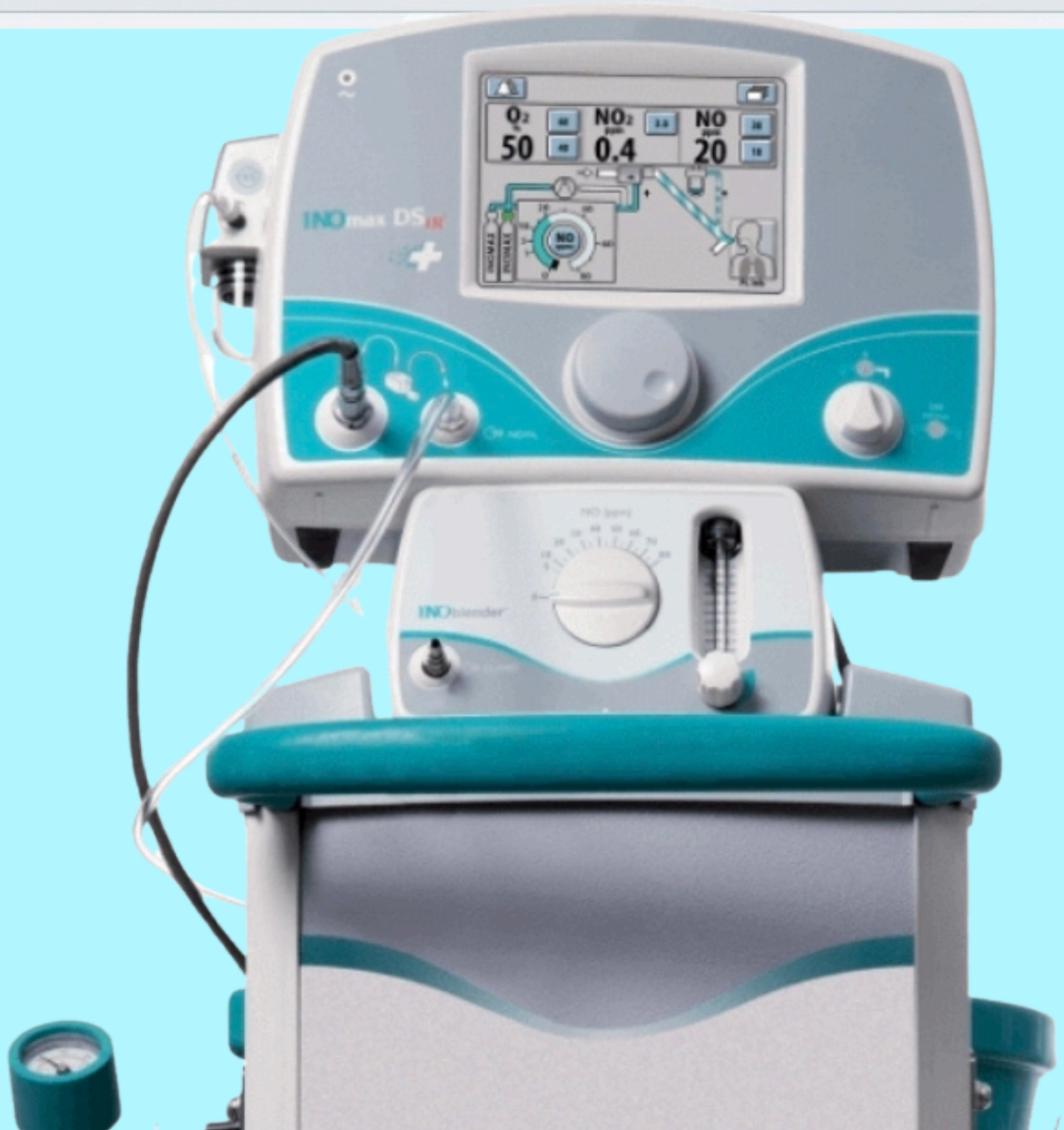




Tracking the Oxygenation Index (OI)



Alternative: If arterial lines are unavailable, utilize the Oxygen Saturation Index (OSI = MAP x FiO2 x SpO2 / 100).



Escalation to HFOV

Optimal Lung Volume Strategy

- **Initiation:** Set MAP **2-4 cm H_2O** above the conventional MAP.
- **Frequency:** Set strictly to **10 Hz**.
- **Target:** Titrate MAP in **1-2 cm** increments to achieve **8 ribs** of expansion on CXR.

Troubleshooting Low PaO2

- **Increase MAP** (Assess for sub-optimal recruitment vs. over-inflation).
- **Check ETT** patency and ensure **in-line suction** is utilized to maintain **PEEP**.

Targeted Pulmonary Vasodilation: iNO Protocol

Initiate iNO at 20 ppm

Assess at 60 minutes

Full Response

SpO2 increases **>20%**

PaO2 increases **>3 kPa**

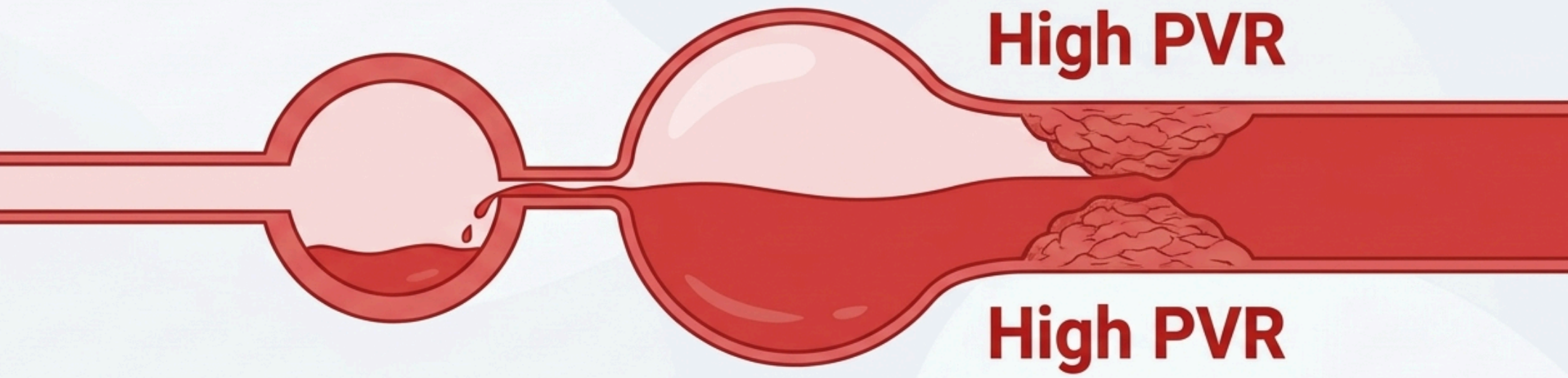
FiO2 decreases **>0.2**

Action: Wean slowly per standard guidelines.

Partial / No Response

Action: Optimize lung recruitment (HFOV), re-evaluate hemodynamics, consider alternative vasodilators (Magnesium, Milrinone).

The RV/LV Interdependence Challenge



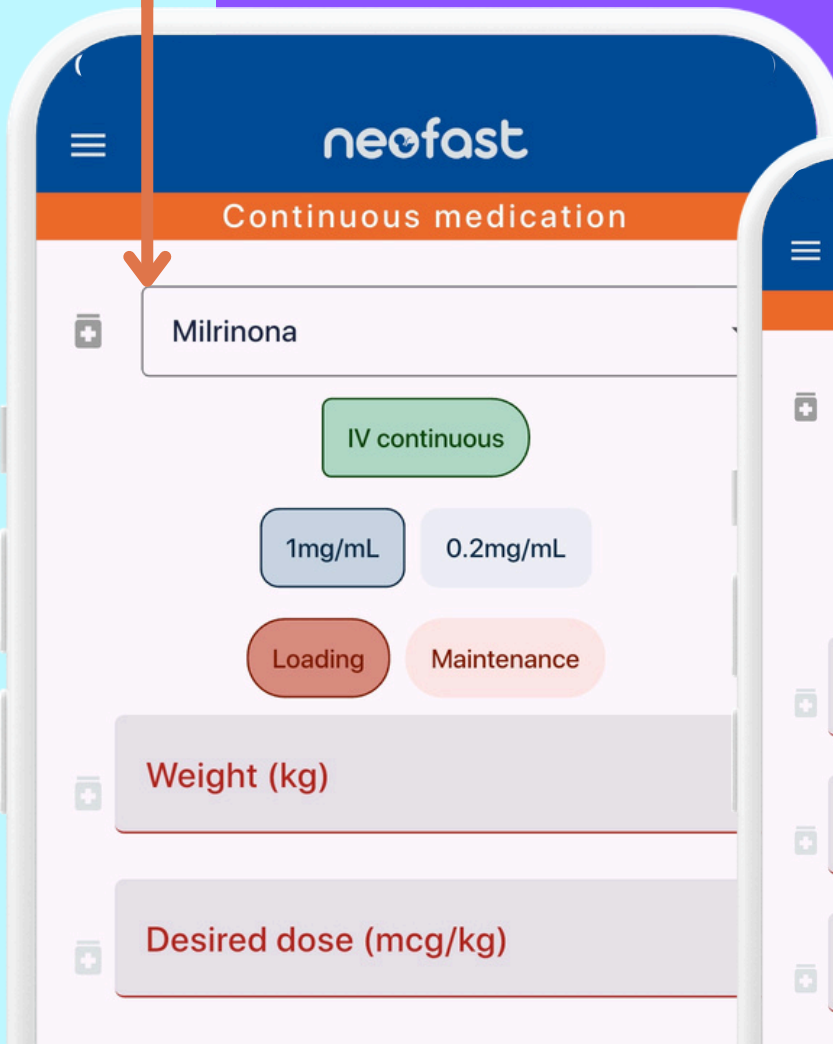
aPHN is a **systemic hemodynamic crisis**. Elevated **Pulmonary Vascular Resistance (PVR)** creates a severe **afterload** on the **Right Ventricle**.

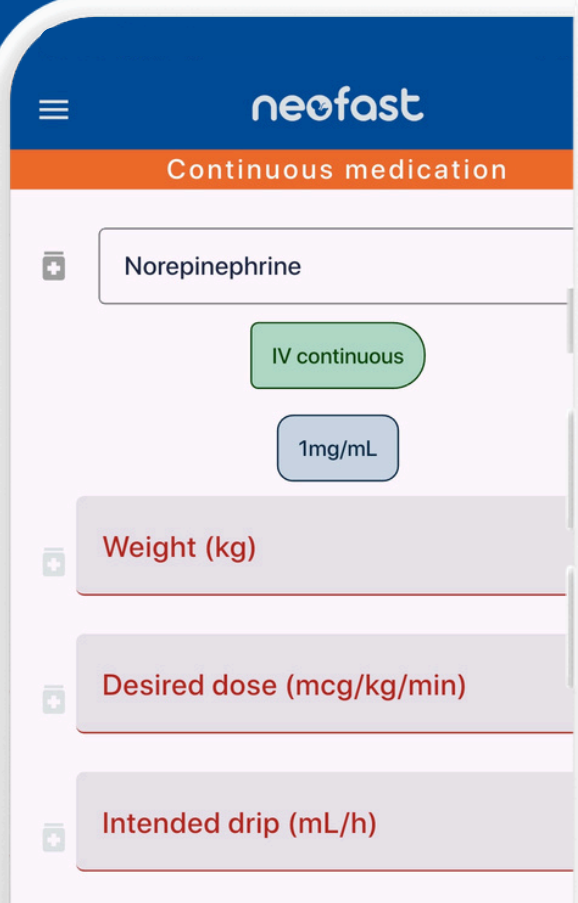
The **failing Right Ventricle** is unable to pump blood through the lungs, resulting in severe **Left Ventricular preload starvation** and profound **systemic hypotension**.

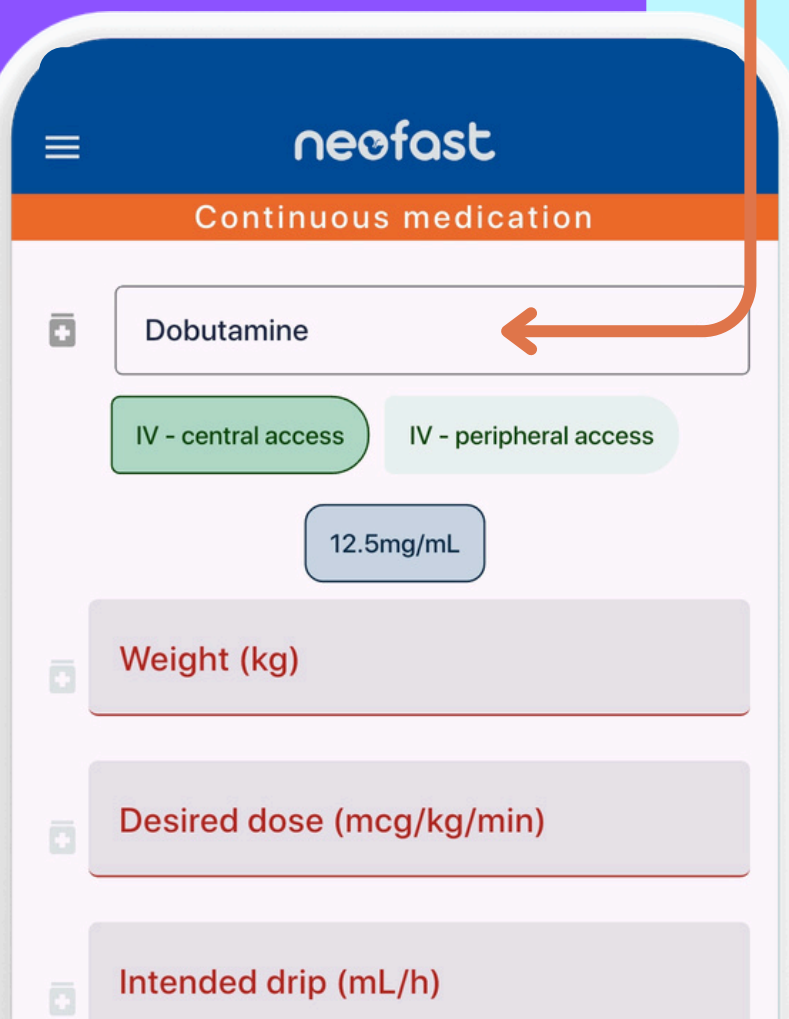
Echo-Guided Inotrope Selection Matrix

Blood Pressure	Echocardiogram Findings: RV Dysfunction	Echocardiogram Findings: Biventricular Dysfunction
Normal BP	**Milrinone (0.25 mcg/kg/min)** If PDA is closing/restrictive, add Prostin to offload the RV.	**Milrinone (0.25 mcg/kg/min)**
Low BP	**Noradrenaline (0.05-0.4 mcg/kg/min) +/- Vasopressin.** Wide Pulse Pressure profile.	**Dobutamine (5-10 mcg/kg/min) + Adrenaline (0.05-0.2 mcg/kg/min)** Narrow Pulse Pressure profile.

Refractory Modifier: Add Hydrocortisone (2.5 mg/kg 6-hrly) if unresponsive to first-line inotropes.







Refractory aPHN: ECLS (ECMO) Criteria

Recognize failure early. Do not delay consultation with an ECLS center when conventional therapies plateau.

Baseline Criteria

- Gestation >= 34 weeks OR Weight >= 2 kg.
- Reversible underlying lung disease.

Absolute Triggers

- Oxygenation Index (OI) > 40 on conventional ventilation.
- Oxygenation Index (OI) > 40 on HFOV.
- Persistent hypotension despite escalating inotropic support.

The aPHN Algorithm

Milieu Track

Target SpO2 **91-95%,** Normalize Temp, **Ca > 1.0,** **Mg >= 1.0.**

Respiratory Track

Gentle Ventilation (PaCO2 6-8)

↓

OI **> 20**

↓

Start iNO **20 ppm** & escalate to HFOV.

Hemodynamic Track

Echo Assessment →

- Normal BP → Milrinone
- Low BP → Dobutamine + Noradrenaline/ Adrenaline

→ Hydrocortisone for refractory shock.

Escalation Point: OI > 40 OR Refractory Shock -> ECLS/ECMO Transfer


neofast
Venous hydration
Continuous medication
Medicines
Intubation
Other calculati