RESPIRATORY REFERENCE

High Frequency Ventilation

HFOV (High-Frequency Oscillatory Ventilation)

HFOV (High-Frequency Oscillatory Ventilation) is an advanced ventilation mode that delivers very small tidal volumes at a constant mean airway pressure (MAP) using rapid oscillations generated by a piston. Unlike conventional mechanical ventilation, both inspiration and expiration are active, helping improve oxygenation while minimizing ventilator-induced lung injury. It operates at 8–15 Hz (480–900 breaths/min) and is commonly described as "CPAP with wiggles.

HFV Types

- HFPPV-High Frequency Positive Pressure Ventilation.
- HFJV- High Frequency Jet Ventilation.
- HFOV- High Frequency Oscillatory Ventilation
- HFFI- High Frequency Flow Interruption.

Advantages of HFOV

- Small VT ⟶ ↓ Volutrauma & alveolar overdistention.
- High MAP ⟶ ↑ Alveolar recruitment & oxygenation.
- Small pressure swings ⟶ ↓ Atelectrauma (less alveolar collapse/reopening).
- Low peak pressure ⟶ ↓ Barotrauma.

HFOV Settings

MAP (for oxygenatio)	MAP = 10 cmH_2O, then adjust to maintain 8–9 posterior ribs on CXR. Rescue – High Volume Strategy: MAP = CMV +2–4 cmH_2O (Homogeneous lung disease: RDS, PPHN). Rescue – Low Volume Strategy: MAP ≤ CMV (PIE, air leak syndrome).
Fio2 (for oxygenation)	100% → then titrate.
Amplitude (ventilation)	Start at 30 and adjust by the wiggle • Neonates: Nipples to umbilicus • Adults: Nipples to mid thigh
Frequency (Ventilation)	1 Hz = 60 breaths/min. Higher weight → Lower frequency → Larger VT. <1 kg: 15 Hz 1–10 kg: 10 Hz >10 kg: 6 Hz
Ti	33%
Bias Flow	Continuous gas flow that **delivers O_2 and removes CO_2** from the HFOV circuit.

Weaning

- Wean FiO_2 first to <0.4, then reduce MAP (unless lung overinflation is present).
- If CXR >9 ribs → Reduce MAP first.
- Decrease MAP by 1–2 cmH_2O every 1–2 hr as tolerated.
- If oxygenation worsens → Increase MAP by 3–4 cmH_2O, then wean more slowly.
- Air leak syndrome: Prioritize MAP reduction over FiO_2.
- Wean Amplitude (ΔP) by 5–15% based on $PaCO_2$.

Indications

- Severe ARDS
- CMV failure
- Refractory hypoxemia
- Air leak syndrome (PIE, pneumothorax)
- PPHN / Neonatal RDS
- Persistent hypercapnia despite CMV

Management

↗	↘
↑ MAP / ↑ FiO_2	↓ Frequency
↑ Oxygenation	**↑ CO_2 elimination**

↑ MAP	↑ PaO_2
↑ FiO_2	↑ PaO_2
↑ Amplitude (ΔP)	↓ $PaCO_2$
↓ Frequency	↓ $PaCO_2$

A- Draeger
B- SensorMedics:
— Green: > 35 Kg
— Blu: < 35 Kg

A

B

Assessment

- Chest wiggle: Absent → Obstruction | One-sided → Mainstem intubation or pneumothorax.
- Auscultation: Check equal piston sounds.
- CXR: 1 hr after initiation, then every 12–24 hr (ETT, 8–9 ribs, air leak).
- Suction: Only if indicated (↓ chest wiggle, ↑$PaCO_2$, secretions, worsening oxygenation); use in-line suction.