

Initiation of ventilation during stabilisation

Benefits of ventilation

- Airway protection
- Respiratory support
- Cardiovascular support
- Aids neuroprotection
- Facilitates transfers, scans and procedures

Key points

- **Keep the child sedated & muscle relaxed**
 - No benefit in spontaneous breathing whilst waiting for the retrieval team
- **Pressure control is recommended**
 - Tidal volume estimation can be inaccurate in smaller infants/children

General goals

Ensure adequate oxygenation and ventilation, with consideration of the following special circumstances*

Special circumstances*

Respiratory failure

- FiO₂ to achieve sats of > 92%. Avoid hypoxia and hyperoxia
- Accept hypercapnia (providing pH > 7.2)

Asthma

- Sats > 92%
- Prolonged expiratory time; slow RR
- PEEP of 5
- Accept hypercapnia (providing pH >7.2)

Pulmonary hypertensive crisis

- FiO₂ 1.0 (aiming for high sats)
- PaCO₂ 4-5kpa with alkalotic pH
- Consider inhaled nitric oxide if available

Cyanotic congenital heart disease

Seek SORT advice, generally:

- Use oxygen
- May need to accept SpO₂ of 80-85%
- CO₂ 4.5-5.5kpa

Neuroprotection

- Sats > 97% and PaCO₂ 4.5-5kpa
- Tapes not ties for tubes

Suggested initial ventilator settings

Respiratory pressures (Pinsp & PEEP)	PIP 15-30 (increased until adequate chest wall movement/tidal volumes) PEEP 5-8 (always have PEEP on)
Maximum limits (Pmax)	Peak pressures > 30 requires intervention (See trouble shooting)
Inspiratory time	<3kg 0.7 3-40kg 0.8 >40-60kg 1.0 >60kg 1.2
I:E Ratio	Typically 1:2
Respiratory Rate	<10kg 25-30 (no greater than this) >20kg 20-25 >50kg 12-20
FiO₂	Minimum amount to achieve target sats*
Tidal volume	5-8mls/kg. Aiming for normal chest rise

Troubleshooting Ventilation

Deterioration (Call for help)

- Ensure adequate sedation + paralysis & think **DOPES**
- **Displacement**:- check tube position (often too long)
 - ensure EtCO₂ trace present
- **Obstruction**:- suction down tube & secretion clearance
 - consider collapse/atelectasis
- **Pneumothorax**:-assess clinically or with POCUS/CXR
- **Equipment**:-take off the ventilator and bag manually
 - easy to bag suggests equipment problem
 - check correct size equipment
- **Stomach**:- consider raised intra-abdominal pressure (NG tube should always be inserted & aspirated)

Ventilator asynchrony

- Sedation
- Muscle relax
- Check flow triggers suitable for size
- Minimise dead space

Low saturations

Hand ventilate, check tube length, secretion clearance, then try back on ventilator, and:

- Increase FiO₂
- Increase mean airway pressure by increasing:
 - * PEEP
 - * Inspiratory time
 - * PIP or tidal volume
- Improve V/Q mismatch (recruitment techniques)
- Sedate & muscle relax
- Exclude reversible respiratory pathology (pneumothorax)

High or rising end-tidal CO₂

Hand ventilate, check tube length, secretion clearance, then try back on ventilator, and:

- Increase minute volume by increasing:
 - * RR (balance against time for gas clearance)
 - * PIP or tidal volumes
- Sedate & muscle relax
- Review your acceptable CO₂ targets; keep pH >7.2
- Check correct size equipment (e.g. HME size)

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Troubleshooting Ventilation: A practical approach

Difficulty establishing ventilation

(E.g: Low saturations, high or rising end-tidal CO₂, ventilator asynchrony)

Sedate and muscle relax

- ✓ Disconnect from ventilator
- ✓ Eliminate dead space
- ✓ Hand ventilate, use an Ayres T-piece

* If unable to re-establish:
-Ensure all aspects of troubleshooting have been covered
-Hand ventilate if needed
-Discuss with SORT

- ✓ Check tube length
- ✓ Ensure ventilating both sides of chest

Attempt to re-establish ventilation

- ✓ Suction down the ET tube
- ✓ Use secretion clearance techniques

- ✓ Decompress the stomach with an NGT

- ✓ Exclude pneumothorax (CXR or Lung Ultrasound)