

# 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

- FiO<sub>2</sub> 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

- FiO<sub>2</sub> 1.0 (aiming for high sats)
- PaCO<sub>2</sub> 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 SpO<sub>2</sub> of 80-85%
- CO<sub>2</sub> 4.5-5.5kpa

### Neuroprotection

- Sats > 97% and PaCO<sub>2</sub> 4.5-5kpa
- Tapes not ties for tubes

## Suggested initial ventilator settings

<b>Respiratory pressures (P<sub>insp</sub> &amp; PEEP)</b>	PIP 15-30 (increased until adequate chest wall movement/tidal volumes) PEEP 5-8 (always have PEEP on)
<b>Maximum limits (P<sub>max</sub>)</b>	Peak pressures > 30 requires intervention (See trouble shooting)
<b>Inspiratory time</b>	<3kg 0.7 3-40kg 0.8 >40-60kg 1.0 >60kg 1.2
<b>I:E Ratio</b>	Typically 1:2
<b>Respiratory Rate</b>	<10kg 25-30 (no greater than this) >20kg 20-25 >50kg 12-20
<b>FiO<sub>2</sub></b>	Minimum amount to achieve target sats*
<b>Tidal volume</b>	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 EtCO<sub>2</sub> 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 FiO<sub>2</sub>
- 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 CO<sub>2</sub>

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 CO<sub>2</sub> 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 CO<sub>2</sub>, 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)