



NCCU CLINICAL GUIDELINES
SECTION: 2

RESPIRATORY PROBLEMS AND MANAGEMENT

Section 2: Respiratory problems and management
Conventional ventilation
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CONVENTIONAL VENTILATION

IPPV/IMV

- Controlled ventilation according to a predetermined pattern (pressure and flow) and frequency
- Time-controlled/pressure limited ventilation.
- Mandatory ventilation, ignores patient's spontaneous RR.
- Tidal volume is determined by the pressure pattern (pressures set).

ADVANTAGES OF IPPV/IMV

- Can control ventilation when the patient is muscle relaxed.
- Can use with HFV and VIVE.
- Inspiratory pressure is limited to PIP (prevent barotrauma).
- Can use with and without pressure plateau.

SYNCHRONISED INTERMITTENT MANDATORY VENTILATION (SIMV)

- Combines spontaneous breathing with synchronised ventilation.
- Support is provided for the rate set by the operator, not for the breaths the infant takes in between the ventilator strokes.
- No pressure support for the patient's breath.
- Useful for weaning bigger infants from the ventilator.
- If the patient is apnoeic, the ventilator cuts in at the set rate.
- Can be combined with VG and VIVE.

SYNCHRONISED INTERMITTENT POSITIVE PRESSURE VENTILATION (SIPPV)

- Ventilation strokes are synchronised with spontaneous breathing: a stroke begins when a spontaneous inspiration is detected and ends after the IT (giving pressure support).
- The patient determines the respiratory rate.
- If the patient becomes apnoeic the ventilator cuts in at the rate determined by the IT & ET, the same as IPPV.
- Patient has time to breathe out.
- Can be combined with VG and VIVE.
- Use a low back up rate to promote triggering. Wean on pressure, not rate, and then switch to SIMV (larger infants only). Small infants should remain on a mode that supports all breaths taken until they are extubated.
- It is possible to maintain MV with lower V_T than during low rate SIMV on SIPPV, potentially limiting volutrauma.

PEAK INSPIRATORY PRESSURE (PIP)

Changes in PIP alter the following:

- MAP – resulting in changes in arterial oxygen levels
- PaCO₂: Increase in PIP, increases tidal volume and minute ventilation thus decrease PaCO₂

- Use of a high PIP may increase the risk of barotraumas and volutrauma with resultant air leaks and bronchopulmonary dysplasia or chronic lung disease (CLD).
- The level of PIP needed is determined by lung compliance and airway resistance and can be assessed by blood gas analysis, chest rise and breath sounds.
- Larger infants do not necessarily need a higher PIP as their lungs may be more compliant than the preterm lung.
- Required PIP is determined by the tidal volume required (aim for 4-6 mL/kg) Initial clinical settings, breath sounds and visible (but not excessive) chest excursions are good indicators for tidal volume.

POSITIVE END-EXPIRATORY PRESSURE (PEEP)

- Application of PEEP prevents alveolar collapse, maintains lung volume at end-expiration and improves V/Q matching.
- Increases in PEEP raise mean airway pressure and thus improve oxygenation. Levels of 3-6 cmH₂O improve oxygenation in infants with HMD without compromising lung mechanics, CO₂ elimination or haemodynamic stability.
- Older infants with chronic lung disease may tolerate higher levels of PEEP with improvement in oxygenation.
- Higher levels of PEEP may be beneficial for short periods in the presence of severe atelectasis.

RATE

- Changes in frequency alter minute ventilation and thus PaCO₂.
- An individualised approach should be taken, considering that the goal of infant minute ventilation is to provide adequate minute ventilation using minimal mechanical force.
- At very fast rates the short expiratory time used may result in incomplete expiration
- Gas trapped in the lung may increase the functional residual capacity and place the infant on the flat part of the pressure-volume curve, thus decreasing lung compliance.
- Rate changes alone (with no change in I:E ratio) usually do not alter the airway pressure (MAP) nor substantially affect PaO₂.

FiO₂

As FiO₂ and MAP both determine oxygenation, they can be balanced as follows:

- Initially FiO₂ is first increased until about 0.6-0.7, then increases in MAP are warranted.
- During weaning, FiO₂ is first decreased to about 0.5-0.6 before MAP is reduced because maintenance of an appropriate MAP may allow a substantial reduction in FiO₂.
- It is essential that the tidal volume be monitored during this weaning phase to minimise volutrauma and barotrauma to the lung.

FLOW

Flows of 5 to 8 L/min are sufficient in most neonates. Lower flows allow more gradual inflation of the lung and may result in less shear stress injury.