

## **Nursing policy for care of a child requiring**

### **High Frequency Oscillation Ventilation (HFOV)**

All nursing staff should read this policy to familiarise themselves with the relevant areas prior to taking over care of a child requiring High Frequency Oscillation Ventilation (HFOV) in PICU.

#### **Standard**

- Only qualified nurses who have satisfactorily completed the paediatric intensive care orientation programme, competency booklet and are fully competent with the oscillator, may independently care for child/infant on HFOV.
- All nurses must use this policy in conjunction with the care of a ventilated child policy as this forms the foundation of all care of invasive ventilation.
- This policy must be also used in conjunction with the ventilation care bundle.
- Any concerns or marked changes in the patient's condition should be reported immediately to medical staff and the nurse in charge.

#### **High Frequency Oscillation Ventilation**

- High frequency oscillation is an established treatment for both neonatal and paediatric acute lung injury, which allows effective oxygenation and ventilation whilst minimizing ventilator induced lung injury
- This form of ventilation delivers small tidal volumes to the infant/child at fast frequencies (rates around 600 breaths per minute).
- Both inspiration and expiration are active, maintaining recruitment achieved through the application of a constant mean airway pressure, therefore reducing the likelihood of gas trapping and preventing CO<sub>2</sub> accumulation.
- The use of small tidal volumes causes less stretch and sheer injury and alveolar over distension.

- The actual mechanism of gaseous exchange is not entirely understood, but by having a constant high mean airway pressure (MAP), recruitment of previously unventilated alveoli becomes possible.

### **Indications for HFOV**

Patient who may require this type of support on PICU

- ARDS
- Pneumonia
- Bronchiolitis
- Smoke inhalation
- Septic patients, requiring high volume of fluid resuscitation and capillary leak syndrome.
- Unable to achieve adequate oxygenation on conventional ventilation

### **Equipment**

- The two machines used on the unit are the **Sensor Medics 3100A** and **3100B**. They operate by having a constant flow of fresh gas introduced to the system distal to a diaphragm which is vibrated by a motor.
- The frequency and amplitude of the vibration of the diaphragm determine the frequency and amplitude of oscillation
- The **3100B** is sufficiently powered to ventilate patients above 35 kgs
- Inline suction is also required as disconnection from the HFOV will cause de-recruitment of the alveoli. Use the same calculation for inline suction catheters as normal suction catheters: These are kept in the CSSD room in sizes 6,8,10 frg.

### **Assessment of the patient requiring HFOV.**

Parameters that are routinely adjusted with HFOV include:

- Fraction of inspired oxygen

- Mean airway pressure
- Amplitude (delta P) – the difference between high frequency positive and negative pressures
- Frequency – measured in Hertz
- Percent inspiratory time
- Chest wiggle
- ET tapes, are they secure?

These parameters should be documented every hour on the observation chart. Any changes to the settings should be noted in red pen.

Hourly observations should also include HR, BP, Pulse Oximetry, sedation score, equal and continuous vibrations of the chest wall. Changes in pitch and rhythm of delivered breaths should also be recorded.

### **Signs and symptoms of Pneumothorax**

- Decreased chest vibrations (Lack of Wiggle)
- Increased oxygen requirements
- Increased CO<sub>2</sub>
- Asymmetrical chest movements
- Late signs are, bradycardia, hypotension, severe hypercarbia or acidosis

Obtain Arterial blood gas 30 minutes after initiation of therapy and after ventilation changes. Chest x-ray at least 30 minutes after initiation of therapy to evaluate lung inflation.

### **Notify medical/nursing teams if the following occur:**

- Vital signs outside the doctors ordered parameters.
- Absence of chest vibrations
- Rising CO<sub>2</sub> on blood gases
- Falling Oxygen saturations
- Increase in oxygen requirements
- Agitation

- Signs/symptoms of Pneumothorax

### **Caring for a patient requiring HFVO**

- Co-ordinate cares so patient is not interrupted unnecessarily
- Reposition every 4-6 hrs or/as condition dictates. This should be done by two nurses to avoid disconnection of ventilator and kinking /dislodgement of the ET tube.
- Suction via the closed inline suction as required. **Disconnection for physiotherapy only on consultant's request.**
- To be nursed on repose mattress to relieve pressure areas.
- Prone positioning may be requested by consultant to maximise oxygenation and ventilation.
- Keep circuit humidified but free from water condensation as this impairs oscillation
- Administer analgesics, sedation and paralysis as required according to unit protocol
- Verify ventilator alarm limits at beginning of shift and after any alterations.
- Assessment of the ET tapes each shift and re-taped with adequate amount of sedation and paralysis and the medical team aware that tapes are being changed.
- Tubing should be kept as straight as possible and patient head above the oscillator tubing to avoid water running down into the ET tube.
- Nurse the patient at 30 degrees bed tilt.

### **Parents and carers.**

- Explain how HFOV is different to other forms of ventilation on PICU in a language that the parents understand, also explain why their child has been commenced on this therapy.
- The need for sedation, analgesia and paralysing agents.
- Why they cannot hold their child when on this therapy, but can talk to/and touch their child to provide comfort
- Allow/encourage parents to verbalise their anxiety, fears and concerns.

## **References**

Hasinski M, Manual of paediatric intensive care, Mosby 1999

Woodward, M. Princess Margarets Children's hospital, Intensive care clinical manual

Rat John Higgison: high frequency oscillatory ventilation. /the internet journal of intensive care medicine 2003, volume 6 number 2.

Davies, J. Hassell, LA. Children's intensive care, a nurse's survival guild, 2007. Churchill Livingstone.

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