

PROTOCOL FOR: High Frequency Oscillatory Ventilator (HFOV)

- POLICY:**
1. Respiratory Therapist available will be on beeper at all times. If frequency of ventilator changes necessitates bedside availability of Respiratory Therapist, the lead therapist should be notified.
 2. Back-up oscillatory and conventional ventilator will be available in the event of oscillator malfunction.
 3. Supportive measures will be instituted to minimize discomfort or distress for the duration of oscillation.
 4. Every effort should be maintained to limit entry into the circuit (such as disconnection of circuit), which will affect desired level of lung infection.

DESIRED PATIENT

- OUTCOMES:**
1. Adequate gas exchange will be maintained.
 2. The infant will have a patent airway.
 3. The infant will have work of breathing minimized.

**CLINICAL
ASSESSMENT AND**

- CARE:**
1. Temperature (axillary) at least every 4 hours.
 2. Vital signs: HR and RR at least hourly. Cardiorespiratory monitor on at all times.
 - a. *BP monitoring every hour with arterial line. If no arterial line, monitor BP every hour for 48 hours on HFOV, then a minimum of every 4 hours. More frequent BP monitoring may be needed when increasing Paw on HFOV.*
 - b. *Report evidence of poor cardiac output, which may indicate decreased venous return to the heart.*
 3. Monitor SaO₂ continuously. Assess trends q1h. Observe events associated with increased or decreased O₂ saturations.
 - a. Report the following:
 - 1) Increased oxygen requirements of 15 to 20% to maintain SaO₂ in desired range.
 - 2) Decreased oxygen requirements of 15 to 20%. Additional changes in oscillatory support may be indicated.
 4. Transcutaneous monitoring continuously, if ordered.
 5. Strict I & O.
 6. Weigh as per infant's tolerance; in-bed scale may be preferable.
 7. Ventilator settings hourly for drifting of parameters.
 8. Chest wiggle factor and color (CWF) at least hourly.

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9. Respiratory pattern at least hourly - apnea is commonly seen during quiet sleep.
 - a. *Report increased frequency of spontaneous respirations which may indicate agitation, hypercarbia, pneumothorax or pain.*
10. Breath sounds, heart sounds and bowel sounds are auscultated after disconnecting the infant from the oscillator or placing the oscillator in the stand-by mode. The frequency of auscultation is individualized according to the infant's care needs. It may be helpful to auscultate the infant's chest during oscillations as changes in pitch and rhythm may be associated with ET Tube position change or need for suction.
11. Perfusion with "hands on" vital signs or "hands on" care.
12. Ongoing assessment for evidence of pneumothorax.
 - a. *Report signs suggestive of pneumothorax.*
13. Report signs/symptoms suggesting need for sedation of analgesia.
14. Ongoing assessment of nature and amount of secretions, need for suctioning, tolerance and effectiveness of suctioning.
15. Suction as needed, based on clinical assessment of the need for suctioning. Provide increased O₂ and intervention for alveolar re-recruitment as needed.
 - a. Report excessive secretions or concerns regarding endotracheal tube plugging or obstruction.
16. Tolerance of activity with each intervention.
17. Cover ears with cotton balls due to noise from the oscillator. These may be removed when directly talking to the infant.
18. Assess integrity of skin and mucous membranes at least every 4 hours. Oral care at least every 4 hours with water soaked gauze.
 - a. Secure ET tube to minimize in/out movement.
 - b. Use barriers, such as Hollihesive, between adhesive tape and skin.
19. Refrain from disconnecting ETT from ventilator in the first 24 hours.
 - a. Maintaining ETT/Ventilator connection will help to recruit alveoli.
20. Reposition at least every 12 hours or as per tolerance.
 - a. Identify position which optimizes lung mechanics.
21. Provide warm, humidified environment as per PROTOCOL: Thermoregulation of the Infant.

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22. Obtain blood gases and x-rays as ordered. Note results on flow sheet.

SYSTEM

- ASSESSMENT:**
1. Assess and record ventilator settings hourly (FiO₂, flow, Paw, Hz, ΔP, % inspiratory time). Maintain settings as ordered.
 2. Assess level of ET tube at the lip and security of tape hourly and document every 8 to 12 hours.
 3. Assess that humidity is on and functional.
 4. Assess circuit for:
 - a. Secure connections.
 - b. Excessive condensation in circuit which may impede oscillations.
 - c. Closure of stopcock for draining circuit.
 - d. Excessive tension on the ET tube.

**CARE DURING
NITRIC OXIDE
(NO)**

- ADMINISTRATION:**
1. Document the following on an hourly basis:
 - a. FiO₂ set
 - b. FiO₂ delivered (analyzed distal to NO administration)
 - c. NO (ppm)
 - d. NO₂ (ppm) (Levels should be less than 3 ppm)
 2. Calculate and document the oxygenation index (OI) with each blood gas. May be calculated by RN, AP or MD.
 - a.
$$OI = \frac{MAP \times FiO_2 \times 100}{PaO_2}$$
 3. Ongoing assessment for cyanosis and changes in cardiopulmonary status.
 4. Assess for and report positive response to NO: improved saturation, blood gases, TcPO₂, color, perfusion.
 5. Assess for and report lack of response to NO: unchanged saturation, blood gases, TcPO₂, color, perfusion.
 6. Ongoing assessment for bleeding tendencies.
 7. Obtain methemoglobin levels with blood gases as ordered. Levels should be less than 5%.

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8. Prepare for transport to ECMO center when there is a treatment failure.
9. Resuscitation equipment with either the self-inflating bag or the flow-inflating bag should be set up to the INOVENT so that infant is bagged within NO and treatment is not interrupted. 15L/minute flow is needed to deliver 20ppm nitric oxide.
 - a. The flow-inflating bag, the flow control valve (e.g., PEEP valve) will need to be adjusted for adequate bag fill at this high flow rate.
 - b. NO gas delivery varies depending on the liter flow and the type of flow meter used. At flow rates < 8 L/minute, NO is not being delivered.

- SAFETY:**
1. Laryngoscope, prepared ET tube, CO₂ detector, flow-inflating bag, mask, manometer set-up to O₂ at bedside at all times.
 2. Pneumothorax aspiration set-up at bedside at all times.
 3. Keep previous conventional ventilator settings on Kardex and on respiratory therapy HFOV Flowsheet in the event that manual bagging or a return to conventional ventilation is needed.
 4. Position circuit to provide support so as to prevent accidental extubation.
 5. Repositioning infant should be a two-person procedure.
 6. If infant is in Giraffe bed, disable the ability to change the height of the bed.
 7. Ensure that ventilator is "locked" into position.

APPROVAL: Nursing Standards Committee

EFFECTIVE DATE: 1/95

REVISION DATES: 5/97, 1/99, 8/00, 10/00, 10/01, 11/02, 10/03, 1/06, 5/08