

NURSING CLINICAL STANDARD

MECHANICAL VENTILATION, ALTERNATIVE MODES- ICU

PURPOSE: To outline the management of the patient undergoing alternative modes of mechanical ventilation

SUPPORTIVE DATA: Alternative modes of ventilation are generally indicated for patients with respiratory failure for whom conventional ventilator modes have failed to achieve adequate oxygenation and ventilation. The goals for these modes are to recruit alveoli without compromising hemodynamics, and to reduce barotrauma to the lungs.

Airway pressure release ventilation (APRV) is an inverse inspiratory:expiratory (I:E) ratio ventilation in which a high constant pressure is provided with intermittent releases of pressure. It allows for pressure supported spontaneous breathing, which improves ventilation of additional areas of the lungs. It also decreases the risk of cardiac compromise due to increased venous return during patient's inspiratory effort.

High frequency ventilation (HFV) modes deliver gas at rates greater than 60 breaths per minute (BPM) at subtidal volumes (less than 50 mL). The most frequent mode used for adults at this facility is high frequency percussive ventilation (HFPV). High frequency oscillating ventilation (HFOV), High frequency jet ventilation (HFJV), and HFPV are also used for pediatric patients.

HFPV is also used for mobilization of secretions, e.g., inhalation injuries, cystic fibrosis. It is important to know the purpose of HFPV, i.e., respiratory failure versus secretion removal, because assessment and interventions will vary.

- ASSESSMENT:**
1. Assess the following upon initiation, with any ventilator changes, a minimum of every 4 hours and upon discontinuation:
 - Breath sounds
 - Symmetrical chest expansion
 - Secretions: quantity, color, quality
 - HFPV used for secretion mobilization: should see continuous bubbling of oral secretions resulting from continuous pulmonary toilet via the cuff leak
 - Cough
 - Use of accessory muscles
 - Sedation/comfort level
 - HFPV: Peak inspiratory pressure (PIP)
 - For signs of decreased cardiac output and pneumothorax
 - For subcutaneous emphysema
 - Depth of endotracheal tube at teeth or lips
 2. Monitor the following a minimum of every hour:
 - ECG rhythm
 - Vital Signs
 - Oxygen saturation
 - End-tidal CO₂ (EtCO₂) - if appropriate to area
 - Transcutaneous CO₂ (TcCO₂) - if appropriate to area
 3. Assess ventilator settings within one hour of assuming care of the patient and a minimum of every 4 hours (pediatrics a minimum of every 2 hours):
 - FiO₂
 - Mode
 4. Assess the following ventilator mode settings/parameters within one hour of assuming care of patient and a minimum of every 4 hours (pediatrics a minimum of every 2 hours):
 - HFPV

- PEEP
 - CPAP
 - Small rate/high rate (e.g. 15/500)
 - Blender FiO₂
 - Peak inspiratory pressure (PIP)
 - I:E ratio
 - Proper humidification
- HFOV
 - Frequency
 - Amplitude
 - Mean airway pressure
 - HFJV
 - Rate
 - Mean airway pressure
 - APRV
 - Pressure high (P high)
 - Pressure low (P low)
 - Time high (T high)
 - Time low (T low)
 - Pressure support
5. Assess full line of data as ordered and prn (e.g. with ventilator changes, deterioration of vital signs; patients with pulmonary artery catheter only).
 6. Evaluate arterial blood gas (ABG)/venous blood gas (VBG) results when drawn.

CUFF PRESSURE:

7. Ensure cuff pressure has not changed after moving patient (especially for HFPV). Report changes to Respiratory Care Practitioner.

SUCTION:

8. Suction as needed per assessment.
 - HFPV for secretion removal
9. Do not interrupt ventilation for treatments, auscultation or suctioning
10. Use closed suction system.

SAFETY:

11. Keep bag-valve-mask (BVM), with PEEP valve if patient on PEEP, at bedside at all times. (NICU - bag, mask, and manometer)
12. Stabilize endotracheal tube while moving patient
13. Remove patient from ventilator, ventilate with BVM and 100% oxygen in an emergency (For HRPV: ensure cuff has been inflated).

REPORTABLE CONDITIONS:

14. Report inadequate humidification/ventilator malfunctions to Respiratory Care Practitioner STAT.
15. Notify the provider for:
 - Abnormal assessment findings
 - Deteriorating arterial blood gases

PATIENT/FAMILY TEACHING:

16. Instruct on the following:
 - Purpose of ventilator
 - Patient's inability to talk
 - Need for sedation/paralysis
 - Necessity for restraints
17. Encourage family to talk to/touch patient even though patient may be unable to respond.

ADDITIONAL
STANDARDS:

18. Refer to the following as indicated:

- Artificial Airway
- Immobility
- Neuromuscular Blocking Agents – ICU
- Restraints
- Sedation/ Analgesia (Intravenous) – ICU

DOCUMENTATION:

19. Document in accordance with “documentation standards”.
20. Document in iView in Systems Assessment Navigator Band

Initial date approved: 11/94	Reviewed and approved by: Professional Practice Committee Nurse Executive Council Attending Staff Association Executive Committee	Revision Date: 01/96, 02/96, 03/96, 11/00, 03/05, 11/14, 09/18
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References:

AACN Procedure Manual for High Acuity, Progressive and Critical Care. 7th Edition Chapter 128. Pages 227-248.

Courey, A. J., & Hyzy, R. (2017). High frequency ventilation in adults. Retrieved from Uptodate.com