

NATIONAL INSTITUTES OF HEALTH
WARREN GRANT MAGNUSON CLINICAL CENTER
NURSING & PATIENT CARE SERVICES

Standards of Practice: Care of Patients Requiring Mechanical Ventilation

Essential Information

- The equipment necessary to maintain airway patency and ventilation will be readily available at each bedside in the event of accidental extubation or mechanical ventilator failure. A bag-valve device will be available with appropriate sized- mask at each patient's bedside.
- Intubation equipment is available in all critical care units at the bedside and in the ACLS crash carts. In addition, 10D stores a "difficult intubation cart" that has equipment for accessing the airway in unusual or difficult situations
- All ventilator alarms can only be silenced for a set time and then are automatically re-activated. High pressure alarms in the system are caused by coughing, decreased lung compliance or obstruction of tubing or airways. Disconnection of the patient from the ventilator initiates the low pressure alarm.
- Following intubation, stomach decompression may be needed. The need for stomach decompression may be needed for pediatric patients as a distended abdomen may interfere with ventilation
- For pediatric patients, an ambu bag should generate an approximate tidal volume of 10-15 mL/kg
- Tube Fixation System (TFS) devices are not to be used with pediatric patients

Intubation

I. ASSESSMENT

- A. For the patient in respiratory distress, the nurse will assess for signs and symptoms of impending intubation, i.e., hypoxemia, hypercarbia, increased work of breathing and increased respiratory rate.
- B. Immediately following intubation, a nurse:
 1. Monitors for complications of intubation such as hypotension, dysrhythmias, oxygen desaturation, anxiety, or pain
 2. Auscultates both lung fields and epigastrium to confirm tracheal intubation.
 3. Confirms tube placement by utilizing end-tidal CO₂ device.
 4. Assists with obtaining a chest X-ray to ascertain exact tube position (the tip should be at least three centimeters above the carina).
- C. Observe patient for the following conditions:
 1. Signs of bruises, lacerations, or abrasions in the patient's nose or mouth
 2. Bleeding from the mouth
 3. Tooth loss or damage

4. Aspiration of gastric contents with endotracheal tube (ETT) suctioning
5. Assess need for restraints to prevent accidental removal of ET tube

II. INTERVENTIONS

- A. Following intubation, the nurse secures the ETT with cloth tape or a TFS.
- B. Measure the distance in centimeters from the patient's teeth or gums to the tip of the tube.
- C. Provide patient and family teaching to include the rationale for intubation, the patient limitations with the ETT in place, the procedure for suctioning, and communication methods, necessity for restraints and their use.

III. DOCUMENTATION

- A. On the critical care flow sheet:
 1. Date, time, and intubation route
 2. Size of endotracheal or tracheostomy tube
 3. Centimeter marking at the teeth or gums
 4. Sedation given during the intubation procedure
 5. Ventilator settings
 6. Arterial blood gases (ABG's), pulse oximetry, end-tidal CO₂ (if used)
 7. Vital signs
 8. Implement used to secure ETT, e.g., cloth tape or TFS
- B. In the Progress Notes:
 1. Events leading up to the intubation
 2. Patient's response to the procedure including:
 - a. Lung sounds pre- and post-tube insertion
 - b. Complications or injuries
 - c. Level of consciousness
 - d. Response to sedation or other medications given during procedure
 - e. Presence, amount, color, and consistency of secretions
 - f. Intact cuff with no leak
 - g. Patient and family teaching
 - h. Per the critical care restraint documentation sheet.

Mechanical Ventilation, Weaning and Extubation

I. ASSESSMENT

- A. Verify the ventilator settings with the medical orders
- B. Assess the adequacy of ventilatory support
- C. An arterial blood gas is assessed in conjunction with a medical order and in consultation with the assigned respiratory therapist when changes are made in ventilator settings or changes occur in the patient's hemodynamic, respiratory, or neurological status
- D. Continuous pulse oximetry is monitored on all ventilated patients.
- E. Assess the following measured ventilatory parameters:
 - 1. Peak Inspiratory Pressures (should be less than 30 cm. of H₂O)
 - 2. Minute Ventilation (V_E)
 - 3. Ratio of inspired to expired tidal volume
- F. Determine need for suctioning based on clinical judgment and assess presence, color, consistency and amount of secretions.
- G. Monitor vital signs and assess breath sounds
- H. Monitor adequacy of anxiety and pain control.
 - 1. Assess patient's level of pain and/or discomfort related to the endotracheal or tracheostomy tube
 - 2. Assess characteristics and location of pain
 - 3. All patients receiving neuromuscular blocker must receive adequate analgesia and sedation.
- I. Assess oral cavity using Beck's score. Beck's score determines the frequency and duration of oral care.
- J. During weaning assess patients tolerance to the process including:
 - 1. Anxiety level
 - 2. Respiratory rate, depth and effort
 - 3. Lung sounds
 - 4. Vital signs
 - 5. Cardiac rhythm
 - 6. Pulse oximetry
 - 7. Results from arterial blood gases and end tidal CO₂ monitoring
 - 8. Level of consciousness
 - 9. Tidal volumes of spontaneous breaths
- K. Immediately post-extubation, the following will be done
 - 1. Observe for aspiration, laryngospasm, bronchospasm, stridor over trachea, or breathing difficulties.
 - 2. If the patient experiences a change in the level of consciousness, becomes hemodynamically unstable, or develops dyspnea, hypoxemia, or diaphoresis, immediately notify a physician.
 - 3. Observe respiratory effort, depth, rate, and breath sounds

4. Monitor pulse oximetry readings and trends.
5. Monitor end-tidal CO₂ readings/trends, if applicable

II. INTERVENTIONS

A. Pulmonary care

1. Turn the patient at least every 2 hours.
2. Monitor response and tolerance to turning.
3. Discuss with critical care team efficacy of adding, continuous lateral rotation, vibration, and percussion, customizing specialty bed settings to the patient.
4. Initiate chest physiotherapy if ordered, and monitor response.

B. Anxiety and pain control

1. Devise communication system for patient to communicate pain or anxiety when awake
2. Medicate as ordered and evaluate effectiveness of anti-anxiety and analgesic therapy. Discuss with physician alternatives to present therapies if patient continues to have unrelieved pain and/or anxiety.

C. If patient becomes anxious and dissynchronous with the ventilator:

1. Rapidly assess the patient for any physiological cause of dissynchrony, i.e., hypoxemia, need for suctioning, sedation, pain, dyspnea, pneumothorax, auto-PEEP, increased ventilatory drive, or ventilator malfunction.
2. Immediately discuss with critical care team different ventilator modes, changing sensitivity or flow to increase patient comfort, or titrating medication to comfort.
3. If unable to determine a reason for the dissynchrony and patient is not being adequately ventilated, manually bag patient with 100% oxygen.
4. If unable to ventilate and patient is maximally sedated and adequate analgesia is provided, consider neuromuscular blocker.

D. Maintain patency of ventilator tubing, draining all secretions and fluid into traps away from patient.

E. Retape the tube and reposition every 24 hours, or remove the TFS device at least every 12 hours. For pediatric patients on whom cloth tape only is used to secure the ETT, verify ETT placement after tape changes and consider a chest x-ray to confirm placement.

F. For pediatric patients, maintain head in neutral position. Utilize a log roll technique when turning and manually stabilize the ETT during transfer and position changes.

G. If possible, brush patient's teeth with soft toothbrush and/or provide oral care according to Beck's score

H. The physician, respiratory therapist or nurse may perform an extubation. The patient's nurse should be in the room during the procedure.

I. The patient is usually placed on supplemental oxygen immediately following extubation.

J. Patient/Family Teaching

1. Provide patient/family teaching related to mechanical ventilation including the rationale for ventilatory support, medications given for sedation and pain control, purpose of restraints, nutritional support, and routine nursing care.

2. Provide patient/family teaching related to the weaning process including the method of weaning, providing emotional support, and signs and symptoms that the patient is not tolerating weaning.
3. Prior to extubation provide patient and family teaching to include preparation for extubation, signs and symptoms that the patient has not tolerated extubation, and the procedure for reintubation.

III. DOCUMENTATION

A. The following elements are documented as often as the clinical situation dictates, but at least every shift:

1. On the critical care flow sheet
 - a. Ventilator settings
 - b. Medication administered including sedation given
 - c. Peak inspiratory pressures
 - d. Exhaled/delivered tidal volumes.
 - e. Results of ABG's
 - f. Endotracheal suctioning
 - g. Use of lateral rotation , vibration and percussion.
 - h. Chest postural drainage and aerosolyzed respiratory medications.
 - i. Vital signs
 - j. amount of oxygen needed after extubation
2. In the Progress Notes
 - a. Response to sedation given and medication for anxiety
 - b. Level of consciousness
 - c. Breath sounds
 - d. Presence and characteristics of sputum
 - e. Response to ventilatory therapy
 - f. Patient and family teaching
 - g. If changes in vent settings were required reason and effect on patient
 - h. Reason for terminating or holding weaning and plans for further weaning
 - i. Patient's tolerance to extubation procedure.

IV. References:

- A. MAS Policy: Restraint Application.
- B. Pilbeam, S. P. *Mechanical Ventilation*, 3rd ed. Mosby Year Book, St Louis, (2001).
- C. Mc-Hale, L. & Carlson, K.J. *AACN Procedure Manual for Critical Care*, 4th ed., Philadelphia, W.B.Saunders, pp. 1-189, (2001).

- D. Burns, S.M., “Mechanical ventilation and weaning”. In: Kinney MR, Dunbar SB, Brooks-Brunn J, Molter, N, Vitello-Cicciu J.M., eds, *AACN Clinical Reference for Critical Care Nursing*. 4th ed. ST Louis, Mosby-Year Book, pp. 607-633 (1998).
- E. Krieger, B.P. “Top ten list in mechanical ventilation”, *Chest*. Nov;122(5):pp. 1797-800. (2002).
- F. Society of Critical Care Medicine and American Society of Health-System Pharmacists: Clinical practice guidelines for sustained neuromuscular blockade in the adult critically ill patient. *Critical Care Medicine*, 30 pp.142-156 (2002).
- G. Society of Critical Care Medicine and American Society of Health-System Pharmacists: Clinical practice guidelines for sustained neuromuscular blockade in the adult critically ill patient. *Critical Care Medicine*, 30 pp.119-141 (2002).

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