BC Children's Hospital Pediatric Critical Care
Nursing guidelines for management of ventilated pediatric patients

Objectives of Mechanical Ventilation in the pediatric patient include:

- **Improved pulmonary gas exchange**
- **Relief of respiratory distress (by relieving upper and lower airway obstruction, reducing oxygen consumption, and relieving respiratory fatigue)**
- **Management of pulmonary mechanisms (by normalizing and maintaining the distribution of lung volume and providing pulmonary toilet)**
- **Provide airway protection**
- **Provide general cardiopulmonary support**

Expected Outcomes	Activities and Interventions	Rationale

1. Adequate oxygenation, ventilation and supported work of breathing	• Assessment of the child receiving mechanical ventilation
	  • *General observations:* comfort of the child, synchrony between patient and ventilator, chest expansion, colour and perfusion, and level of consciousness
	  • *Auscultation*: note symmetry of breath sounds (recall that the thin chest wall of an infant transfer breath sounds to opposite side), evaluate quality of breath sounds, note adventitious sounds or absence of breath sounds
	  • *Work of Breathing*:
	  • *Volume and quality of secretions*- note quantity and characteristics.
	  • *Palpation*- note presence of crepitus, inspiratory crackles, or points of tenderness.
	• Provide additional ventilatory support as indicated by signs of hypoxia, hypercarbia, and hemodynamic instability (manual breaths and/or adjustment in mechanical ventilation)
	• Continuous pulse oximetry to monitor oxygenation (re-site q2-4 hours to avoid burns)
	• Consider utilizing ETCO2 monitoring for additional trending of ventilation therapy.
	• Monitor gastric insufflation and remove air from stomach as indicated. Positive pressure ventilation may lead to increased gas flow to stomach.
		Oxygen consumption is greatly increased with increased work of breathing.
		
		Ventilator Associated Pneumonia is a leading cause of nosocomial infection. Changes in the quality of secretions should prompt additional investigations – especially in the presence of a fever.
		
		Gastric decompression reduces the risk of aspiration.

2. Correct position and patency of artificial airway	• Verify placement of artificial airway utilizing at least 2 of the below methods:
	  • Chest radiograph
	  • Auscultation of breath sounds across the lung fields
	  • End tidal CO2 monitoring
	  • Verify distance marking on tube
		Patient safety.
		
		Airway verification and securement reduces risk of non-intentional extubation.
		
		CXR are important to

	• Ensure artificial airway is secure and stabilized in desired position	verify ETT or trach position and to evaluate pulmonary process. The decision is determined by the individual needs of the patient.
3. Adequate airway humidification; mobilization and removal of secretions	• Ensure adequate humidification of ventilation circuit, monitoring temperature of inspired gas (maintain at 35 – 37 degrees). • Suctioning of the endotracheal or tracheostomy tube should occur when there is evidence of increased airway secretions (coughing, increased PIP, auscultation of upper airway crackles) i. Always pre-oxygenate the patient ii. Suction catheter should be an appropriate size to allow ease of insertion (french size of catheter = 2 X the internal diameter of tube) iii. Aseptic technique to avoid contamination, consider use of inline suction catheters. iv. Insertion distance should be known and documented to avoid suctioning below the tip of the artificial airway. v. Routine instillation of N/S should not be necessary if the humidification is adequate (tenacious secretions may require 0.5 – 1 mL instillation of N/S, followed by several manual ventilation breaths to disperse instillation prior to suctioning)	Patient safety. Low temperatures may cause secretions to become thick and sticky. Body temperature may be altered by high and low temperatures of inspired gas. Suctioning clears airway secretions to maintain airway patency.
4. Maintenance of adequate pH and PaCO2	• Monitor pH and pCO2 through periodic sampling of arterial or capillary blood gases	Arterial and capillary blood sampling are both reliable methods of monitoring pH and pCO2
5. Hemodynamic stability	• Maintain optimal cardiovascular status of patient; hourly assessment of vital signs and perfusion • Ensure continuous ECG monitoring with alarms limits set to appropriate limits per age. • Monitor and optimize perfusion.	Increase in intrathoracic pressure that occurs with mechanical ventilation results in a reduction of venous return BP is a late sign of CV decompensation in child. Capillary refill ought to be≤ 2 seconds
6. Maintenance of fluid & electrolyte balances and	• Calculation and monitoring of all fluid intake. Fluid restriction may be implemented (usually 80% total fluids orders) to reduce fluid retention that is common with positive	Fluid retention may occur related to underlying disease or non-osmotic ADH

	• Monitor urine output. Goal should be ≥ 1mL/kg/hour of urine output. • Monitor fluid and electrolyte status through routine evaluation of lab results. • Daily weights are very important when can be safely performed. • Optimize nutrition through early initiation of feeding via NG or NJ tube.	release related to positive pressure ventilation. Enteral feeding is the preferred method of nutrition and may be initiated even in the absence of bowel sounds.
7. Child remains free of nosocomial infection	• Minimize ventilator sources of infection by emptying condensation in tubing. • Keep HOB elevated at 30 degrees unless contraindicated. • Mobilize patient as able. • Consider removal of additional potential sources of hospital acquired infection on a daily basis (CVL, foley catheter)	Ventilator associated pneumonia (VAP) is a cause of mortality in mechanically ventilated children. Elevating the head of bed reduces incidence of aspiration.
8. Maintenance of skin integrity	• Assess skin integrity every 2 – 4 hours (attention to bony prominences, areas of nose and mouth in contact with ETT). Assess for • Keep skin clean and dry. • Reposition child every 1 – 2 hours (including reposition of head) as tolerated. • Prone positioning every 4-6 hours for all ventilated patients • Maintenance of oral hygiene ▪ Brush teeth, gums and tongue at least twice a day ▪ Moisturize lips every 2-4 hours as required.	Repositioning alleviates pressure points and prevents skin breakdown. Oral care reduces inflammation and plaque (which has been shown to contribute to VAP)
9. Acceptable level of comfort	• Assess the patient's pain and sedation level q 1 – 4 hours using the MAPS and SBS scales (see attached pain and sedation guidelines) • Titrate pain and sedation medications as per protocol • Provide noninvasive comfort measures ▪ Parental presence ▪ Favorite blanket or toy ▪ Ear plugs to reduce noise levels ▪ Dim lights ▪ Distraction techniques	The presence of an artificial airway is uncomfortable