Clinical Description

Care of the hospitalized child experiencing the need for controlled or assisted breathing through an artificial airway.

Key Information

- Cuff must be deflated (if present) prior to using a speaking valve or capping a tracheostomy tube. Tubes used in children younger than 8 years of age may not have a cuff, as the tube is positioned in the narrowest portion of the cricoid cartilage and acts as the cuff.
- Laryngeal mask airways may be used for short-term use to facilitate breathing; however, they do not offer aspiration protection and should be changed to an endotracheal tube if there is a need for a prolonged artificial airway.
- To reduce the risk of pulmonary aspiration, a swallow evaluation should be performed prior to oral intake or feeding.
- Pediatric-sized and smaller tracheostomies may not have an inner cannula. If an inner cannula is not present, the tracheostomy tube should be changed on a regular schedule to prevent obstruction of the single lumen.
- Enteral feeding is preferred over parenteral due to physiologic benefits, such as gut integrity and function, stress ulcer prophylaxis and reduction of infection risk.
- In patients younger than 8 years of age, there is no evidence to support the use of cuffed or uncuffed tubes. Clinician discretion should be used.
- Evidence regarding pediatric ventilator-induced lung injury, lung protective measures and ventilator-associated pneumonia prevention originates from adult research.

Clinical Goals

By transition of care

A. The patient will demonstrate achievement of the following goals:

B. Patient, family or significant other will teach back or demonstrate education topics and points:
Correlate Health Status

Correlate health status to:

- history, comorbidity, congenital anomaly
- age, developmental level
- sex, gender identity
- baseline assessment data
- physiologic status
- response to medication and interventions
- psychosocial status, social determinants of health
- barriers to accessing care and services
- child and family/caregiver:
  - health literacy
  - cultural and spiritual preferences
- safety risks
- family interaction
- plan for transition of care

Communication Impairment (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- agitation
• anxiety
• artificial airway present inhibiting vocalization
• fear
• frustration expressed
• irritability
• maladaptive communication behavior (e.g., facial expressions, hand/head movements)
• powerlessness
• social withdrawal
• soundless crying

Problem Intervention(s)

Ensure Effective Communication

• Acknowledge and validate intensity and complexity of voicelessness. Maintain eye contact when speaking and awaiting response.
• Promote calming presence. Involve patient in decision-making and care to promote inclusion, self-efficacy, confidence and sense of control.
• Establish a nonverbal communication method. Use augmentative techniques to preserve self-identity and self-esteem, such as writing tools, letter board, computer, flash cards or picture boards.
• If longer-term airway, consider alternative communication methods that facilitate speech, such as speaking valve, tracheostomy or capping. Evaluate need to deflate cuff when using these devices to allow exhalation.
• Keep call system within reach; adapt to meet needs.
• Assess and monitor for signs of biopsychosocial concerns that may affect ability to communicate, such as delirium, anxiety and fear.

Associated Documentation

• Communication Enhancement Strategies

Device-Related Complication Risk (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation
Vital Signs

- heart rate increased
- respiratory rate increased
- SpO2 (peripheral oxygen saturation) decreased
- EtCO2 (end-tidal carbon dioxide) increased

Laboratory Values

- PaCO2 (arterial carbon dioxide) increased
- PaO2 (partial pressure of arterial oxygen) decreased

Diagnostic Results

- CXR (chest x-ray) confirmation of abnormal tube position
- EtCO2 (end-tidal carbon dioxide) waveform abnormal
- obstruction visualized with bronchoscopy
ultrasonography abnormal tube position

Problem Intervention(s)

Optimize Device Care and Function

- Maintain semirecumbent position to minimize aspiration risk.
- Provide oral care regularly with antimicrobial solution and subglottic suction to reduce the risk of infection; perform prior to cuff deflation.
- Assess tube size, depth, location and securement frequently to minimize the risk of tube displacement; regularly confirm placement with radiography or ultrasonography.
- Facilitate regular mechanical ventilator and humidification equipment checks to ensure proper function; monitor and manage ventilator and alarm settings.
- Provide humidification and evaluate need for suctioning to minimize risk of airway obstruction; regularly replace closed in-line suction equipment.
- Perform ongoing tracheostomy and stoma care to prevent infection; minimize excessive moisture around device; replace or clean inner cannula or tracheostomy regularly to prevent obstruction from secretions.
- Monitor and manage cuff pressure routinely, if present; deflate cuff when not clinically indicated.
- Provide emergency equipment that includes appropriate-sized manual resuscitation bag, mask, suction equipment and cleaning supplies; replace device or assist breathing if displacement occurs.

Associated Documentation

- Airway Safety Measures
- Aspiration Precautions

Inability to Wean (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- confusion
- continued need for mechanical ventilation
- disconnected from reality
• fear
• inability to decrease ventilator settings
• increase in oxygenation or ventilation requirements
• level of consciousness decreased
• lung compliance decreased
• muscle weakness
• positive fluid balance
• respiratory effort absent
• unable to follow commands

Vital Signs

• heart rate increased
• respiratory rate increased
• blood pressure increased or decreased
• SpO2 (peripheral oxygen saturation) decreased
• EtCO2 (end-tidal carbon dioxide) increased

Laboratory Values

• ABG (arterial blood gas) abnormal

Problem Intervention(s)

Promote Extubation and Mechanical Ventilation Liberation

• Assess for pain and agitation regularly, utilizing a validated tool; minimize medication effects that may contribute to agitation, delirium or delay extubation.
• Encourage early rehabilitation using therapeutic intervention and functional mobility training to minimize deconditioning, weakness, functional dependence and delirium.
• Assess readiness to wake up, breathe, wean and extubate; consider protocol approach to reduce ventilator and intensive care days.
• Perform SBT (spontaneous breathing trial).
• Facilitate clustered care and uninterrupted sleep/rest pattern that supports home sleep routine; promote calm environment.
• Acknowledge fear and anxiety related to the patient’s and support system’s experience of prolonged mechanical ventilation; encourage complementary therapies, such as music and playtime.

Associated Documentation

• Environmental Support
• Medication Review/Management
• Sleep/Rest Enhancement

Nutrition Impairment (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

• inability to intake nutrition via oral route

Problem Intervention(s)

Optimize Nutrition Delivery

• Perform a nutritional assessment; include a nutrition-focused physical exam.
• Determine calorie, protein, vitamin, mineral and fluid requirements; use indirect calorimetry if nutrition support is required.
• Initiate early enteral nutrition support; consider another form of stress ulcer prophylaxis, if enteral feeding is contraindicated.
• Optimize protein intake, unless contraindicated.
• Consider postpyloric versus gastric tube feeding for patient at increased risk of aspiration.
• Advocate for, and adjust, infusion rate, formulation or volume based on feeding tolerance and clinical status (e.g., hemodynamic stability); minimize unnecessary interruptions.
• Anticipate the need for a promotility agent, if reduced gastric emptying or delayed bowel motility is suspected.
• Monitor nutrition delivery to ensure safe practices (e.g., confirmation of tube placement, tube patency, medication delivery, head of bed elevation, oral care).
Associated Documentation

- Nutrition Support Management

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Skin and Tissue Injury (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- bleeding
- laceration
- localized swelling
- redness
- skin blanching
- skin integrity disrupted
- stoma granulation
- stridor
- tracheal granuloma
- voice hoarse

Problem Intervention(s)

Maintain Skin and Tissue Health

- Monitor depth of suction catheter advancement to minimize the risk of internal tracheobronchial tissue injury.
- Reposition and resecure endotracheal tube regularly; ensure proper tube location.
- Monitor tightness of securement device, as well as skin and mucosal areas, regularly; consider skin barrier protection.
- Minimize pressure points and prevent traction on device, using careful positioning, flexible extenders and props.
- Assess and monitor for the presence of bleeding that may indicate injury to tracheobronchial tissue. Notify provider for persistent bleeding.
- Anticipate the need for further treatment or procedure, if bleeding persists.
- Anticipate adjunct therapy, such as cool mist, racemic epinephrine, corticosteroid or heliox, for symptoms related to airway swelling or stridor after removal of tube.
Associated Documentation

- Device Skin Pressure Protection

Ventilator-Induced Lung Injury (Mechanical Ventilation, Invasive)

Signs/Symptoms/Presentation

- lung compliance decreasing
- oxygenation requirements increasing (e.g., FiO2 or positive end expiratory pressure needs)
- ventilatory requirements increasing (e.g., minute volume, respiratory rate)

Vital Signs

- heart rate increased
- respiratory rate increased
- blood pressure increased or decreased
- SpO2 (peripheral oxygen saturation) decreased
- EtCO2 (end-tidal carbon dioxide) increased

Laboratory Values

- oxygen index decreased
- PaCO2 (arterial carbon dioxide) increased
- PaO2 (partial pressure of arterial oxygen) decreased

Diagnostic Results

- bronchoscopy abnormal
- CXR (chest x-ray) abnormal
Problem Intervention(s)

Facilitate Lung-Protection Measures

- Provide oxygen therapy judiciously to maintain oxygenation goals; adjust to avoid hyperoxia.
- Monitor and limit ventilator tidal volumes to minimize volutrauma; initiate a low tidal-volume strategy (e.g., less than 8 mL/kg for ideal body weight).
- Monitor and limit ventilator pressure to reduce risk of barotrauma; maintain less than 30 cm H2O (e.g., plateau, inspiratory pressure delta).
- Apply PEEP (positive end expiratory pressure) to minimize atelectasis; adjust for changes in lung compliance and oxygenation.
- Monitor fluid balance closely to minimize the risk of fluid overload.
- Monitor ventilator waveforms and promote patient-ventilator synchrony; adjust ventilator settings and sedation.

Prevent Ventilator-Associated Pneumonia

- Assess readiness to extubate; perform sedation interruption and spontaneous breathing trial.
- Maintain semirecumbent position to minimize aspiration risk.
- Provide ongoing oral care to reduce pathogens in oral cavity; anticipate antiseptic oral decontamination.
- Minimize ventilator circuit breaks; consider use of closed suction device.
- Minimize microaspiration risk; consider the use of ultrathin polyurethane tapered endotracheal tubes with subglottic secretion drainage, as well as cuff pressure monitoring.
- Assess need for stress ulcer and venous thromboembolism prophylaxis due to increased risk during mechanical ventilation.

Associated Documentation

- Lung Protection Measures

Associated Documentation

- Head of Bed (HOB) Positioning
- Oral Care
- VAP Prevention Bundle
General Education

- admission, transition of care
- orientation to care setting, routine
- advance care planning
- diagnostic tests/procedures
- opioid medication management
- oral health
- medication management
- pain assessment process
- safe medication disposal
- tobacco use, smoke exposure
- treatment plan

Safety Education

- call light use
- equipment/home supplies
- fall prevention
- harm prevention
- infection prevention
- MDRO (multidrug-resistant organism) care
- personal health information
- resources for support

Education: Mechanical Ventilation, Invasive: Overview

- description
- indications
Education: Mechanical Ventilation, Invasive: Self-Management

- CPR education
- VAP prevention
- VTE prevention

Education: Mechanical Ventilation, Invasive: When to Seek Medical Attention

- unresolved/worsening symptoms

References


American Association for Respiratory Care (AARC). Endotracheal suctioning of mechanically ventilated patients with artificial airways. Respiratory Care. 2010;55(6), 758-764. [Quality Measures, Clinical Practice Guidelines]


CARE PLANNING

CPG IP Mech Vent Peds

Setting: Inpatient
Population: Pediatric


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