Care of Children With Tracheostomy Tubes and Ventilators

Presented by: Kristina Callen, RRT
Title: Home Ventilation
Date: June 2019
Disclosures

• We do not have any conflict of interest, nor will we be discussing any off-label product use.
• This presentation has no commercial support or sponsorship, nor is it co-sponsored.
Background

• 19 years as an Registered Respiratory Therapist
  – Seattle Children’s Hospital ~ 16 years
  – Harborview Medical Center ~ 4 years
  – Phoenix Indian Medical Center ~ 4 years
Objectives

• Describe the anatomy of a trach tube
• Identify types and indication for different tracheostomy tubes, humidification, and ventilators
• State appropriate suction depth for patients with tracheostomy tubes
• Formulate strategies to troubleshoot common ventilator alarms
• Evaluate for respiratory distress in infant and children with tracheostomy tubes
• Summarize how to respond to tracheostomy related emergencies
# Types of Tracheostomy Tubes

<table>
<thead>
<tr>
<th>Shiley</th>
<th>Bivona</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stiff, PVC material</td>
<td>Silicone, Softer</td>
</tr>
<tr>
<td>Uncuffed &amp; Cuffed</td>
<td>Cuffless &amp; Cuffed; TTS: Tight to Shaft</td>
</tr>
<tr>
<td>Cuff: Air</td>
<td>Cuff: Water or Air</td>
</tr>
<tr>
<td>ALL are MRI safe</td>
<td>Conditional MRI</td>
</tr>
<tr>
<td>NO</td>
<td>Flextend</td>
</tr>
<tr>
<td>Single or double cannula</td>
<td>Single cannula</td>
</tr>
</tbody>
</table>
Anatomy of a Tracheostomy

Bivona Flextend TTS (Pediatric & Neonatal)

Shiley Uncuffed Pediatric & Neonatal

Adult Shiley, Cuffed
## Trach Tube Selection

<table>
<thead>
<tr>
<th>Bivona (Ped/Neo/Adult)</th>
<th>Shiley</th>
<th>Adult Shiley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flextend - Comfort TTS: Tight to shaft – cuff deflates down to the shaft</td>
<td>Bypass upper airway obstructions</td>
<td>Inner cannula – change the inner cannula instead of an emergency trach change when trach is blocked.</td>
</tr>
<tr>
<td>Most likely to be trached using this tube – Physician preference</td>
<td>MRI friendly</td>
<td></td>
</tr>
<tr>
<td>Ventilated patients</td>
<td>CHEAP</td>
<td>CHEAP</td>
</tr>
<tr>
<td>Patient with C-collar</td>
<td>Cuff makes these tube difficult to replace quickly</td>
<td></td>
</tr>
</tbody>
</table>
Humidification

- Heated Humidification
  - Ventilator
  - Mist Collar
- HME: Heat Moisture Exchanger AKA “Nose”
  - Appropriate for travel, bath and therapies
  - Slowly increase use over time and watch for thick secretions or ↑WOB
• Children are not small adults
• Suction just passed the end of the trach tube
Ventilators
<table>
<thead>
<tr>
<th></th>
<th>Trilogy</th>
<th>Astral</th>
<th>LTV *phased out</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indications</strong></td>
<td>1 L flow Trigger</td>
<td>0.5 L Flow Trigger (more sensitive), also can do dual limb</td>
<td>Phasing out of service you may see this on older kids/adults</td>
</tr>
<tr>
<td><strong>Pros</strong></td>
<td>Fundamentally simple Pressure control, 2 circuit styles 11 pounds, 6 hr battery No circuit test</td>
<td>Pressure and Volume control, 3 circuit styles, 7lbs, battery 6-8 hr</td>
<td>1 circuit style, external PEEP, Pressure &amp; Volume control</td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td>Higher flow trigger Poor volume ventilation Requires circuit test with every change</td>
<td>complicated interface Requires circuit test</td>
<td>14.5 lbs, Requires circuit test, 30 minute battery</td>
</tr>
</tbody>
</table>
**Monitoring**

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIP: Peak Inspiratory Pressure</td>
<td>Highest pressure measured in the airway</td>
</tr>
<tr>
<td>PEEP: Positive End Expiratory Pressure</td>
<td>pressure applied by the ventilator at the end of each breath to maintain pressure in the airway – used for malacia in the trachea and bronchus</td>
</tr>
<tr>
<td>Vte: Tidal Volume (exhaled)</td>
<td>The Volume of each breath in mL</td>
</tr>
<tr>
<td>RR: Respiratory Rate</td>
<td>Breaths per minute</td>
</tr>
<tr>
<td>Minute Ventilation:</td>
<td>RR x Vte = the volume of gas exhaled during a minute in L/min</td>
</tr>
<tr>
<td>Leak:</td>
<td>leak at the exhalation port (not at the airway or cuff)</td>
</tr>
</tbody>
</table>
The most common alarms:
- High or Low RR
- High or Low Min. Ventilation
- Circuit disconnect
- High or Low pressure
Troubleshooting

- Coughing:
  - High Pressure, High Min. Vent, High RR
- Disconnection
  - Low pressure, High or Low Min. Vent, Circuit disconnect
- Low MVE
  - A leak somewhere; circuit
  - Check patient
  - Check trach cuff pressure
- High RR
  - check patient
  - Water in circuit (disconnect patient at airway and drain into garbage or towel)
• Run hand down the length of the circuit. Only 1 place where a leak should be felt (exhalation port)
Troubleshooting Circuits/Astral

Not for home use, no leaks should be physically detectable

Connecting a single limb circuit for invasive use

⚠️ CAUTION
Always set up the ResMed Leak Valve in the breathing circuit with the arrows and the symbol pointing in the direction of air flow from the Astral device to the patient.

Leak at exhalation port just like Trilogy

(Resmed.com, 2019)
External PEEP valve, water accumulates - shake onto a towel

Pressure lines; connect to ventilator.

Keep lines up, water can get into pressure lines

(Anon, 2019)
Troubleshooting

• Assess your patient for respiratory distress
  – Suction
    • Verify trach tube is in
  – Oxygen
  – Saline drops
  – Remove from vent and bag
    • Use patient’s respiratory rate not ventilator set rate
Emergency Airway Management

**Trach Tube In**
- Suction/bag
  - Can pass suction catheter to predetermined length and good chest rise
    - Respiratory distress continues?
      - Temp (O2) (Oxygen)
        - Saline drops and suction
          - Use broncho-dilators or Cough Assist if ordered
            - Bag and suction
              - Respiratory distress continues?
                - Change trach tube
  - Cannot pass suction catheter to predetermined length or poor/no chest rise
    - Change trach tube

**Evaluate Situation**
- Check under the dressing to verify the trach is in the stoma.

**Trach Tube Out**
- Put in the same size trach
  - Trach inserted
    - Support with blow-by oxygen to stoma or bag mask ventilate to face or stoma
      - Reposition for better stoma access. Helpful to spread stoma open with fingers.
    - Try inserting trach again. If trach cannot be inserted, try smaller emergency trach.
  - Trach cannot be inserted
    - Unable to reinsert trach
Emergency Airway Management

Trach tube in
- Suction/bag
- Can pass suction catheter to predetermined length and good chest rise
  - Respiratory distress continues?
    - ↑ O₂ (Oxygen)
    - Saline drops and suction
    - Use broncho-dilators or Cough Assist if ordered
    - Bag and suction
  - Respiratory distress continues?
    - Change trach tube
- Cannot pass suction catheter to predetermined length or poor/no chest rise
  - Change trach tube

Evaluate Situation
- Check under the dressing to verify the trach is in the stoma.

Trach tube out
- Put in the same size trach
- Trach tube inserted
  - Support with blow-by oxygen to stoma or bag mask ventilate to face or stoma
  - Reposition for better stoma access. Helpful to spread stoma open with fingers.
- Trach cannot be inserted
  - Try inserting trach again. If trach cannot be inserted, try smaller emergency trach.

Evaluate trach placement
1. Chest rise?
2. Secretions/ coughing
3. Can you pass suction catheter?
4. Is skin color or oxygen level good?

Trach inserted
- Unable to reinset trach
Emergency Airway Management

Trach tube in
- Suction/bag
  - Can pass suction catheter to predetermined length and good chest rise
    - Respiratory distress continues?
      - ↑ O₂ (Oxygen)
      - Saline drops and suction
      - Use broncho-dilators or Cough Assist if ordered
    - Bag and suction
    - Change trach tube
  - Cannot pass suction catheter to predetermined length or poor/no chest rise
    - Change trach tube

Evaluate Situation
- Check under the dressing to verify the trach is in the stoma.

Trach tube out
- Put in the same size trach
- Trach inserted
  - Support with blow-by oxygen to stoma or bag mask ventilate to face or stoma
  - Reposition for better stoma access. Helpful to spread stoma open with fingers.
  - Try inserting trach again. If trach cannot be inserted, try smaller emergency trach.
- Trach cannot be inserted
  - Try inserting trach again. If trach cannot be inserted, try smaller emergency trach.
- Trach inserted
  - Evaluate trach placement
    1. Chest rise?
    2. Secretions/coughing
    3. Can you pass suction catheter?
    4. Is skin color or oxygen level good?
- Unable to reinsert trach
Case Studies
Case Study #1

Infant has an 3.0 uncuffed trach tube due to an upper airway obstruction

- Lower than normal SpO2 ~mid 90’s on RA
- Higher than normal HR
- Very restless, hasn’t had good sleep in the past few days
- Able to pass suction catheter
- Past few days the patients has been using the HME longer in preparation for going home.
Discussion
Emergency Airway Management

Trach tube in
- Suction/bag
  - Can pass suction catheter to predetermined length and good chest rise
    - Respiratory distress continues?
      - T O2 (Oxygen)
        - Saline drops and suction
          - Use broncho-dilators or Cough Assist if ordered
            - Bag and suction
              - Respiratory distress continues?
                - Change trach tube
      - Change trach tube
    - Evaluate trach placement
      1. Chest rise?
      2. Secretions/ coughing
      3. Can you pass suction catheter?
      4. Is skin color or oxygen level good?

Evaluate Situation
Check under the dressing to verify the trach is in the stoma.
- Cannot pass suction catheter to predetermined length or poor/no chest rise
  - Change trach tube

Trach tube out
- Put in the same size trach
  - Trach inserted
    - Support with blow-by oxygen to stoma or bag mask ventilate to face or stoma
    - Reposition for better stoma access. Helpful to spread stoma open with fingers.
    - Try inserting trach again. If trach cannot be inserted, try smaller emergency trach.
  - Trach cannot be inserted
    - Trach inserted
    - Unable to reinsert trach
Case study #2

– Normal day (Vitals Normal)
– Trach care just completed
– Sudden decompensation
  • Pt appears blue/purple (SpO2 not reading)
  • Ventilator alarming (LMV, circuit disconnect, low RR)
How can you help with education?
How to help...

- Review Tracheostomy Handbook
  - Know what parents will or have learned
- Communicate with family
  - Encourage caregivers to practice skills
  - *Just-in-time education of troubleshooting*: at the bedside education, walk through of
  - Save bath and trach care caregivers
  - Evaluate how confident parents feel about their training
Encourage families to retake CPR at a community center
Setup a simulation using the Emergency airway management algorithm – Review this pathway often
Other ideas?
Resources at Seattle Children’s Hospital

- Bedside RT
- RT supervisors 7-3306
- RN educators
- All training handouts are available on CHILD
  - Also available from the outside at Seattlechildrens.org
Summary

- Always assess your patient first
- The trach tube & ventilator selection will be dependent upon the patient’s specific needs
- Each trach tube will have a specific suction depth
- Ventilators they do have similarities when it comes to alarms
- Review Emergency Airway Management often
- Be diligent about placing patient on oximeter
Questions?

Contact RT Educators 987-2258
RTDischarge@seattlechildrens.org
References

• Anon, (2019). [online] Available at: https://www.vyaire.com/mwg-internal/de5fs23hu73ds/progress?id=ShIhCVT5URoSZa4e_7t73CNsCPK_b7GoJ6QsMMSs6ok, [Accessed 31 May 2019].