

Tracheostomy and Ventilator Education Program

Module 6: Equipment

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Objectives:

- Introduction to respiratory equipment:
 - Humidity therapy
 - Oxygen therapy
 - Speaking valves
 - Cough assist
 - Strollers/medical power chairs



Humidity therapy

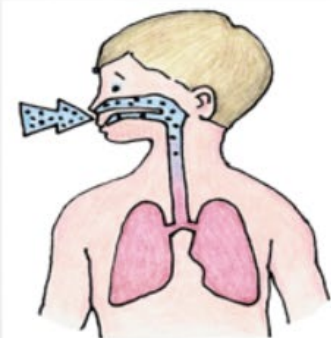
- Humidity is the moisture in the air we breathe in
- We measure it as relative humidity (the percentage of how much water vapor is in the air compared to how much water the air could carry)
- Optimal humidity range is 30% to 50% for the Calgary area



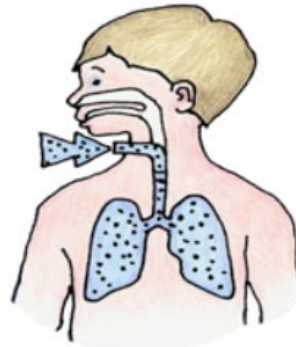
Humidity therapy

- When we breathe through our mouths and noses, we moisten, warm, and filter the air that we are breathing in
- A trach tube bypasses this process – so we have to replace this humidity loss

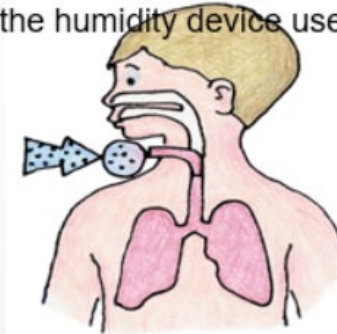
With a normal airway, the air we breathe in is warmed, filtered, and humidified mostly by our nose



With a trach tube in place, the air we breathe in is cool, unfiltered, and dry because our nose and mouth are bypassed



When a humidity device is in place with a trach tube, the air we breathe in is humidified and may be warmed and filtered as well depending on the humidity device used



When there is not enough humidity

A lack of humidity may result in:

- Thicker secretions
- A dry cough that does not clear mucus well
- These can lead to:
 - Secretions that do not clear and mucus plugs
 - An increased risk of infection in the lungs
 - Increased work of breathing

Not enough hydration can also lead to thicker secretions – make sure your child is getting enough fluid intake!

Humidity devices



We can provide humidification several ways:

- Trach collar with a humidity bottle set-up
- Heat and moisture exchangers (HMEs)
- Heated humidified ventilator circuit
- Heated humidity (Airvo)
- In the hospital, your child's equipment will be provided
- At home, your health care team will help you with the equipment your child needs

Trach collar with a humidity bottle set-up

- An adjustable trach collar connected to plastic tubing, which is attached to a cold humidity bottle (cold neb)
- Non-heated and not portable
- This can be set up in hospital to the wall and at home via a compressor gas source



Trach collar with a humidity bottle set-up

- Provides cold humidity which you can see as mist
- Water (called rain-out) may collect in the tubing
 - If rain-out is present, empty it into a trash container
 - Never empty this water back into the humidity bottle
- If there is no mist, there may be a leak or not enough water in the humidity bottle
- The compressors for home use are very loud
- Never leave leftover water in the bottles at home, empty them and rinse/air dry when not in use

Heat and moisture exchangers (HMEs)

- Small disposable single use humidity devices called artificial noses that directly connect to the trach
- Non-heated and portable
- Some can be used with O_2 connectors and in-line with portable ventilator circuits



HMEs

- HMEs provide humidity by trapping the heat and moisture that your child breathes out and recycling it to warm/humidify the air while they have it on
- They will filter dust and debris but they do not filter air irritants (e.g. perfumes, smoke) and they are affected by weather – too cold and they can dry out or freeze + too hot and they oversaturate and get too wet
- Your health care team will determine if your child can use an HME and which type is most suitable
- An HME trial by your hospital RRT will make sure your child can breathe safely through an HME

HMEs

- HMEs will get moist while in use
- HMEs must not be used with any other humidity device
- If HMEs get too wet or blocked with secretions, they can become difficult to breathe through
 - Always check the HME regularly
 - Always remove the HME if it's really wet or full of secretions and replace with a new one
- HMEs must not be used for longer than 24 hours of total use
- HMEs must **NOT** be cleaned or re-used – they are disposable **ONLY**

There are many brands/types of HMEs – the ones here are funded by Pediatric Home Care

HME Types

Thermovent T:

- Paper wick system
- Larger children
- Has a separate O_2 connector if needed



Thermovent 600

- (small children) or 1200 (large children to adults):
- Paper wick system
 - In-line for portable ventilator circuits only



Aquasure:

- Sponge wick system
- Infants
- If O_2 is needed, a separate connector and trach collar set up must be used



Hydrotrach T:

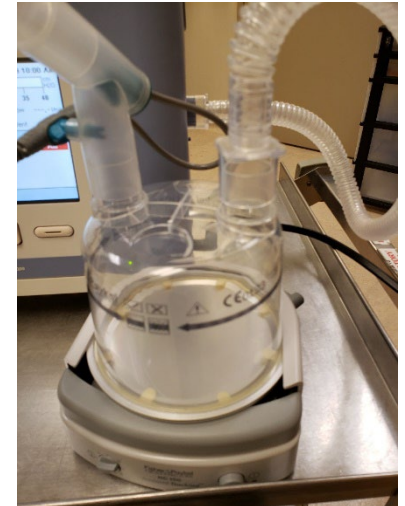
- Sponge wick system
- Infants to adults
- If an infant can't use a Thermovent T and needs O_2 - they can use this HME



- All HMEs can become water sealed to the trach tube – ALWAYS slightly turn the HME before trying to remove it to break the water seal

Heated humidified ventilator circuit

- If your child is on a ventilator, they will have non-portable heated humidity set up
- You will be shown how to set up this circuit and how to maintain/clean this set up for home
- Rain-out may collect in this set up just like the humidity bottle set up
 - If rain-out is present, empty it into a trash container and do not empty this water back into the humidifier pot



Heated humidity (Airvo)

- If your child is on an Airvo, they may have this non-portable heated set up for home
- You will be shown how to set up and maintain/clean this system for home (it has a 99 minute self cleaning cycle that must be done daily)
- The Airvo can be used to provide warm, heated, filtered humidity with set temperatures and flow and additional O_2 if needed



Airvo trach collar connector




Airvo direct trach connector

Oxygen therapy



O₂

- The air we breathe in (room air) has 21% oxygen (O₂)
 - O₂ is colorless, tasteless, odorless, is not flammable but will make a fire bigger 
- Medical O₂ is a prescribed medication that can be used more than the 21% O₂ in room air is needed
- We monitor O₂ needs by blood tests and pulse oximeter measurements
- In the hospital, your child's equipment will be provided
- At home, your health care team will help you with the equipment your child needs

O₂ therapy

O₂ can be delivered:

- In the hospital:
 - O₂ can be delivered by a set flow rate, measured in litres per minute (LPM)
 - Or as a fraction / percentage of oxygen (FiO₂)
- In the community:
 - O₂ can be delivered by a set flow rate in LPM only



The middle of the float indicator reads 4LPM – that is what is being delivered



The digital readout on a ventilator reads 100%

O₂ therapy

- In hospital, we provide O₂ from the wall outlet or from a tank



O₂ therapy

- At home, you will have O₂ from a concentrator or from a tank
- Your respiratory vendor will show you how to set up, use, and change out your tanks safely – and will set up your concentrator in the home for you and show you how to use and maintain it as well
- They will also set up a schedule to bring you new tanks as needed



O₂ therapy

We can provide O₂ in several ways:

- Trach collar with a humidity bottle set-up
- HME with an adaptor
- Through a ventilator or an Airvo
- Through a bagger
- In the hospital, your child's equipment will be provided
- At home, your health care team will help you with the equipment your child needs

Trach collar with a humidity bottle set up

- The same trach collar set up for humidity can be used to deliver O_2 as well
- In hospital, the cold neb is connected to O_2 which can be set to what is prescribed
- At home, the same set up would be connected to O_2 by concentrator or tank which would be set to what is prescribed

O_2 setting

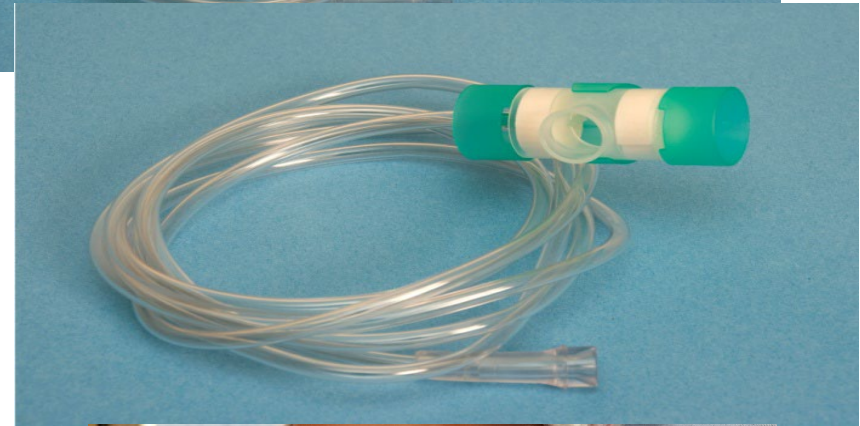
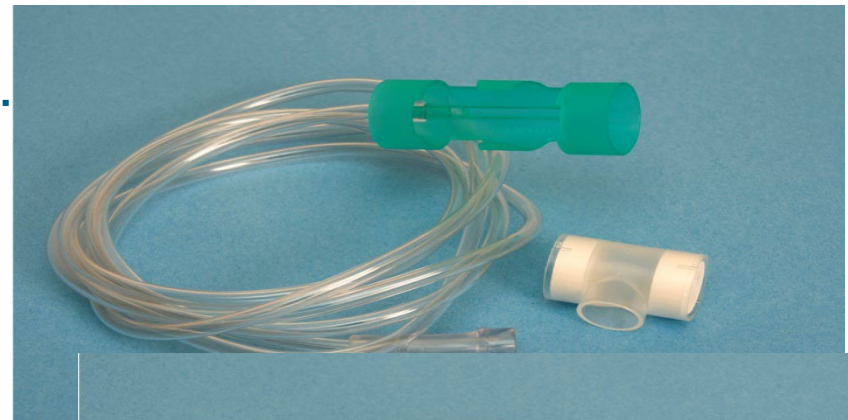


O_2 setting



HME O₂ adaptors

- The Thermovent T HMEs have a separate adaptor that connects to allow O₂ to be connected by tubing to either a concentrator or a tank with a set flow
- The Hydrotrach HMEs can be used in small infants who are too small for the Thermovent but need O₂



HME O_2 venturi adaptor

- The Aquasure HMEs do not have a special separate adaptor
- We can add a venturi adaptor that connects to a trach cradle to allow a specific O_2 to be connected by tubing to either a concentrator or a tank with a set flowrate
- Each adaptor delivers a specific FiO_2 with a specific flowrate



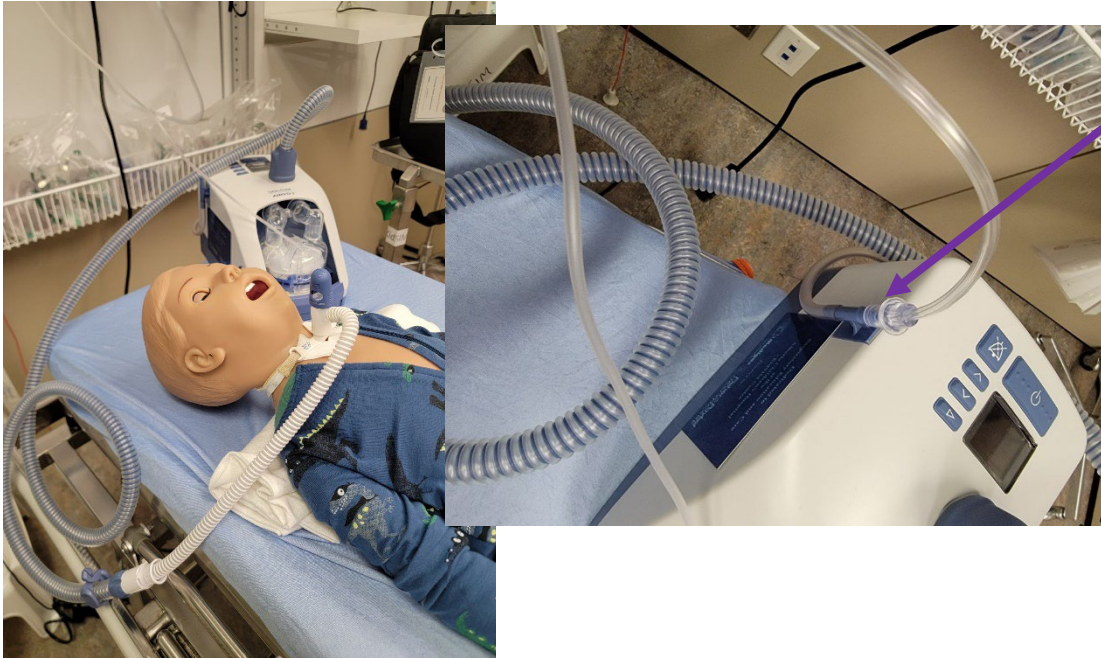
O₂ with a ventilator

- If your child is on a ventilator, you will have an O₂ adaptor to connect to O₂ tubing that clicks into place at the back of the ventilator



O₂ with an Airvo

- If your child is on an Airvo, there is a connector for O₂ tubing on the side of the Airvo



The home MyAirvo2's do not continuously display O₂ – if you want to check, press the side arrow twice and then and hold the Mute button for 5 seconds = the FiO₂ will display for 30 seconds and then disappear




O₂ with a bagger

- If your child is on a ventilator, you will have a bagging unit to give your child breaths if needed
- This bagger can be used without O₂ but has an adaptor to connect to O₂ tubing if needed
- You will be shown how to use this device if your child is ventilated



O₂ safety

- Your health care team and your respiratory vendor will help you learn about oxygen therapy safety guidelines
- Oxygen supports combustion so:
 - Never use oxygen near an open flame
 - There should be no smoking allowed in the home with oxygen equipment 
 - Try to prevent static electricity as it may generate a spark
 - Never use petroleum products on a child receiving oxygen therapy (e.g. Vaseline or other ointments)
 - Keep a fire extinguisher close by

Trach tubes and communication

- Children who have a trach tube in place may be able to express themselves by:
 - Non-verbal communication skills such as facial expressions, body language, and gestures
 - Moving air through the upper airway and vocal cords to speak or make noise
 - With a communication support like sign language or a tablet
 - With a speaking valve in place
- Many children are not able to speak or make sounds with a tracheostomy tube in place – some can, but get tired and short of breath from the effort
- If they can speak, their voices may sound different – quiet, breathy, low pitched or high pitched

Speaking valves

Children who have a tracheostomy tube in place may not be able to make sounds or speak because of:

- Their medical condition and why the tracheostomy tube was placed
- Their upper airway anatomy and airflow (Module 2: Respiratory Anatomy)
- The size of their tracheostomy tube
- The tracheostomy tube affects how air flows through the upper airway:
 - Most air flows through the tracheostomy tube meaning less air that flows through the vocal cords
 - Depending on the child's ventilation support, there may be no air movement through the vocal cords at all

Speech Language Pathologists (SLPs)

- An Speech Language Pathologist (SLP) is a member of your healthcare team who will help your child with communication
- They help assess your child's communication strengths, oral motor skills, and swallowing abilities and if they can use a speaking valve
- Your SLP will help your child expand their non-verbal communication abilities and find the best ways for supporting your child's communication strategies

Speaking valve trials

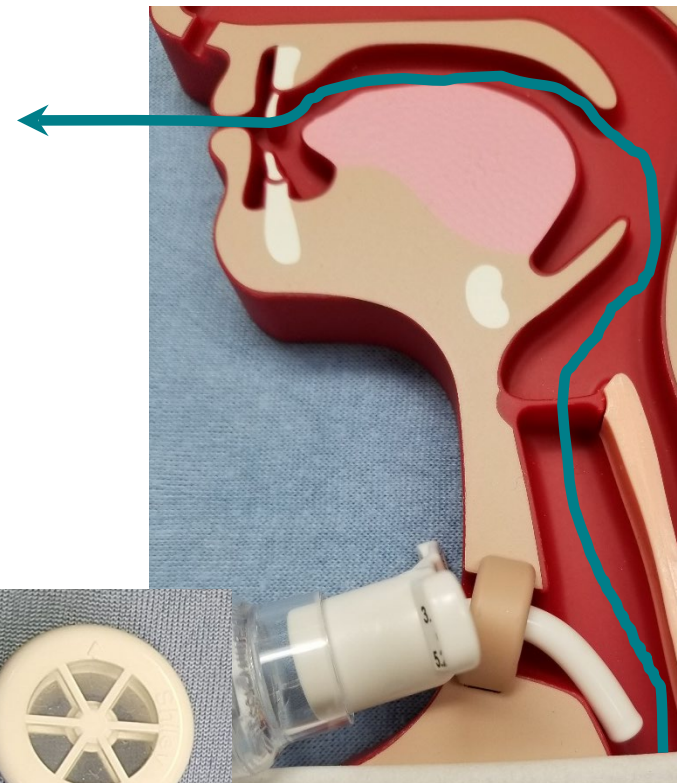
Your child's health care team will assess your child's ability to try a speaking valve based on:

- Their medical stability, respiratory status, trach tube size and cuff or not, air leak around the tube, suctioning needs
- Your SLP and RRT will coordinate in hospital or after discharge in clinic to perform a trial to see if your child can tolerate wearing a speaking valve
- The trial consists of:
 - Pairing the best type of speaking valve for your child
 - Watch your child and how they are tolerating the valve in place with their breathing (it may feel strange for your child to breath through their mouth again after being used to the tracheostomy tube)
 - Watch how long your child can wear the valve and if they can make sounds or speak

Speaking valves

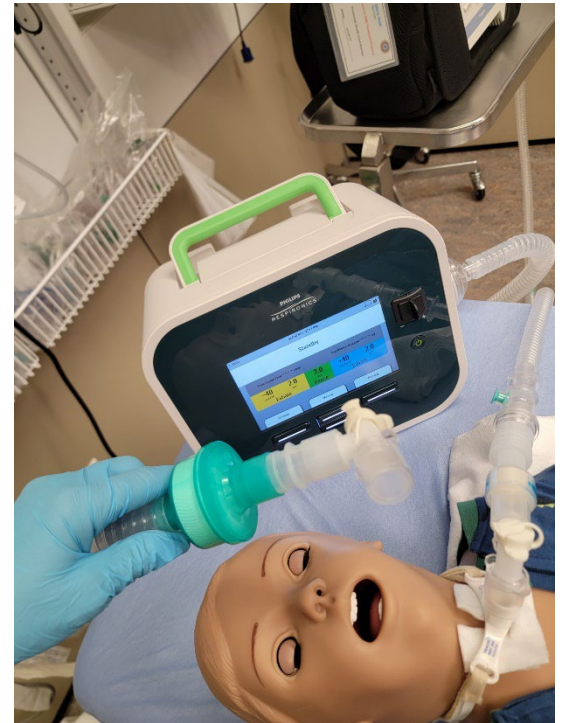
- The valve opens when your child breathes in letting air flow into the lungs
- The valve closes as they breathe out which makes the air to go up through the vocal cords and out through the mouth
- This air movement allows your child to make sounds and words

There are several types of speaking valves available – they are a 1-way valve that fits on the trach tube connector to allow air flow



Cough Assist

- Some children with trachs need help with their ability to cough effectively
- This can be helped with physiotherapy and sometimes with a device called Cough Assist
- This device uses set inspiratory and expiratory pressures that will cycle on/off at set times – this mimics a good strong cough and can help move secretions that can be suctioned more easily
- It will be set to deliver pressure at a set rate/time and works automatically when on



Cough Assist

- This device may be funded for certain conditions
- If your child needs this therapy, you will be taught how to perform this safely



Strollers and medical power chairs

- Your child with a trach will require equipment to be with them at all times:
 - Trach ER kit
 - Suction supplies
 - Ventilator, supplies, bagger if your child is ventilated
 - Oxygen tanks and supplies if your child need O₂
- All of this weighs a lot and can be hard to carry, so you will need a way to transport all of this necessary equipment
- You will need to be able to have all this equipment, transport your child and stroller/chair to wherever you need to go, transfer your child to your stroller/chair and repeat as needed

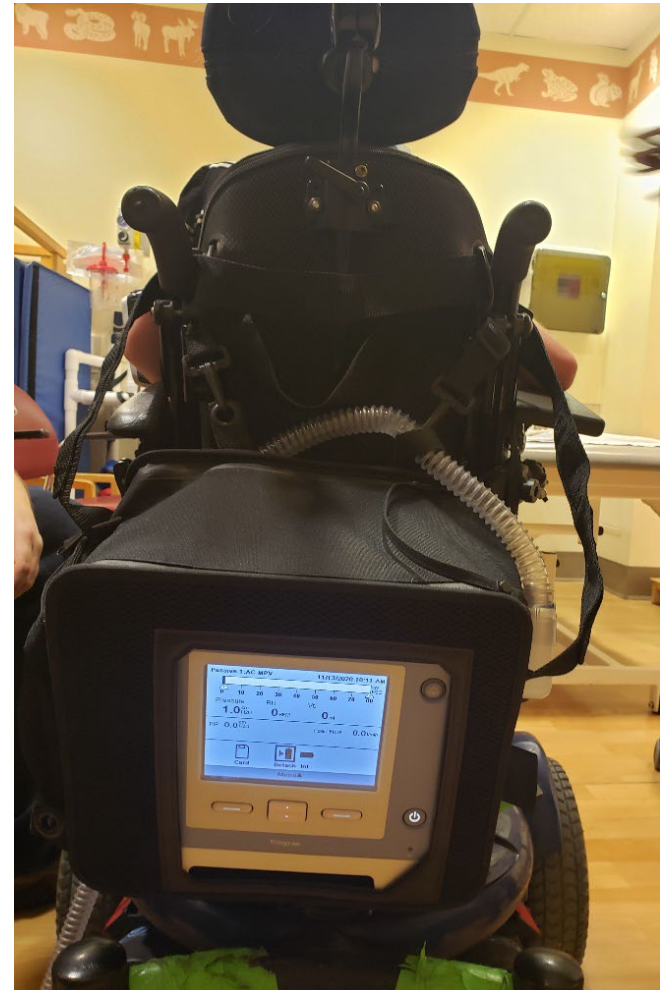
Strollers

- Your healthcare team will help you determine if your child requires a medical stroller and if you need extra equipment to secure a portable ventilator like brackets, trays, straps
- If needed, you will be shown how to set this up and use it



Power chairs

- If your child is older, they may require a power wheelchair
- These can have extra equipment to secure ventilators, have carry bags, and mouth or hand controls for power and steering
- Your healthcare team will help determine if your child needs this type of chair and will help you learn how to use this if needed



Summary:

- This module has provided a basic introduction to the some of the respiratory equipment needed to care for your child with a trach
- If you have concerns or questions, please talk to your healthcare team