

CARE OF THE CHILD WITH A TRACHEOSTOMY



Center for Infants and Children with Special Needs
Cincinnati Children's Hospital Medical Center
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This brochure is a guide to tracheostomy care, but should not replace recommendations of the patient's Managing Physician(s).

A tracheostomy is usually placed because of upper airway obstruction, need for better tracheobronchial toilet, or for prolonged positive pressure or ventilatory support. Specific conditions that can lead to the need for this procedure including:

Upper Airway Obstruction

Congenital:

- Macroglossia
- Vocal cord paralysis
- Cleft palate
- Pierre Robin
- Laryngomalacia
- Subglottic stenosis
- Laryngeal webs, cysts
- Vascular ring
- Tracheal hypoplasia

Trauma:

- Facial injury
- Oral injury
- Foreign body
- Burns/smoke
- Laryngeal edema
- Laryngeal fracture
- Corrosives

Infection:

- Epiglottitis
- Croup
- Diphtheria
- Retropharyngeal
- Abscess
- Rabies
- Neck cellulitis
- Tetanus

Tumor:

- Hemangioma
- Lymphangioma
- Sarcoma
- Cystic Hygroma
- Other

Lower Airway Obstruction

- Bronchomalacia
- Bronchial stenosis

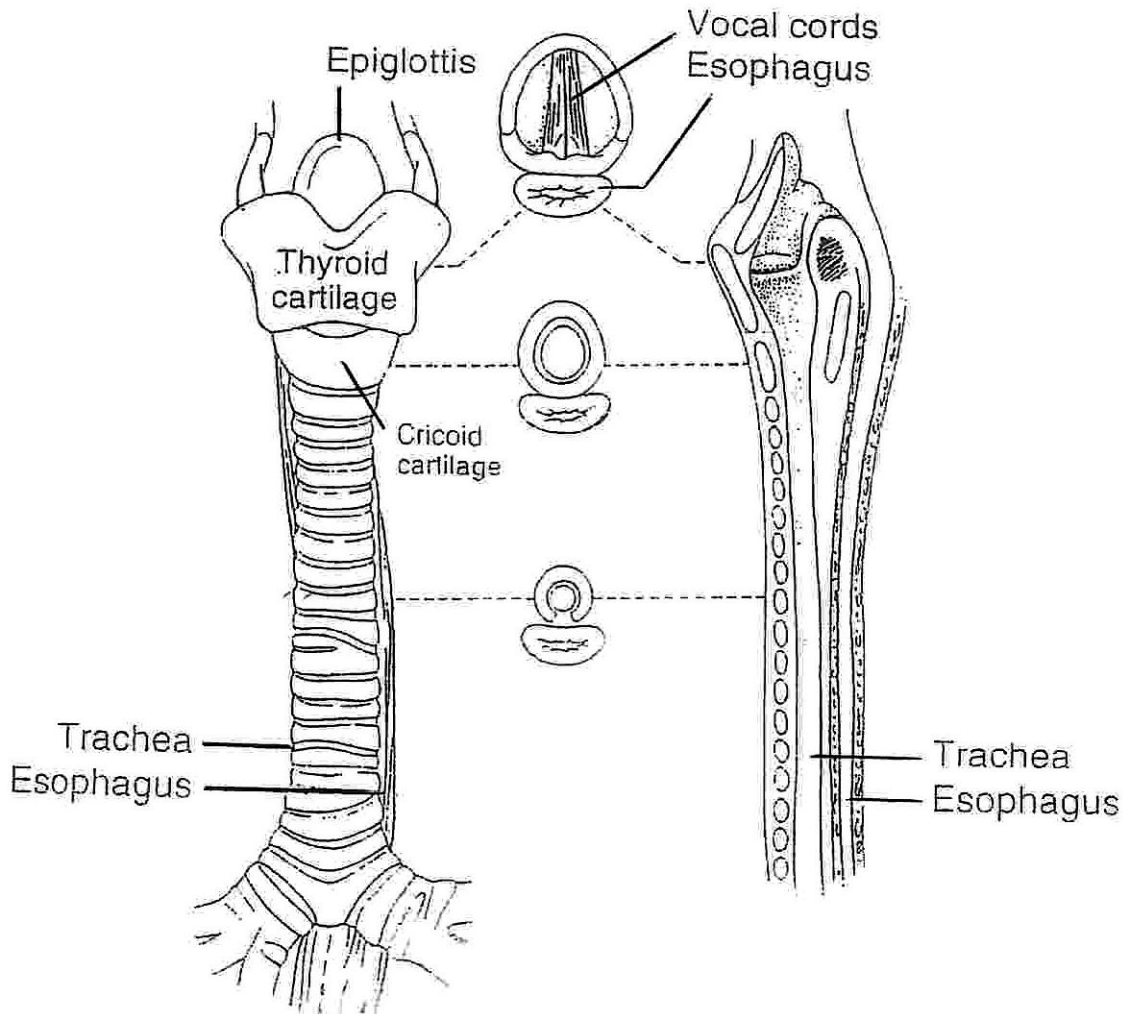
Lung Disease

- Chronic
- BPD, CF, etc.
- Trauma
- Infectious
- Trauma
- Aspiration
- Toxin
- GERD
- Meconium
- Asphyxia

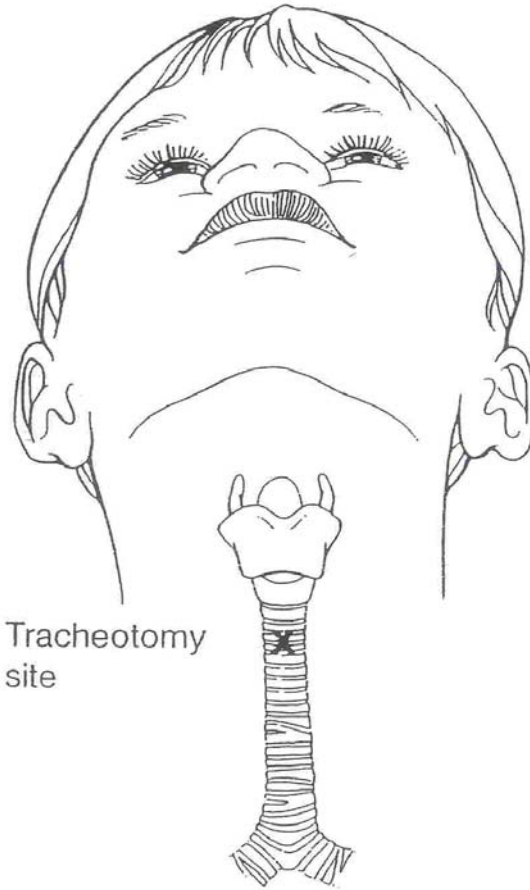
Neurologic Conditions

- Hypotonia
- Paresis, paralysis
- Tumor
- Trauma
- Infectious
- Post-infectious
- Myopathy
- Cerebral palsy
- Meningomyelocele
- Brain Malformation
- Traumatic brain injury

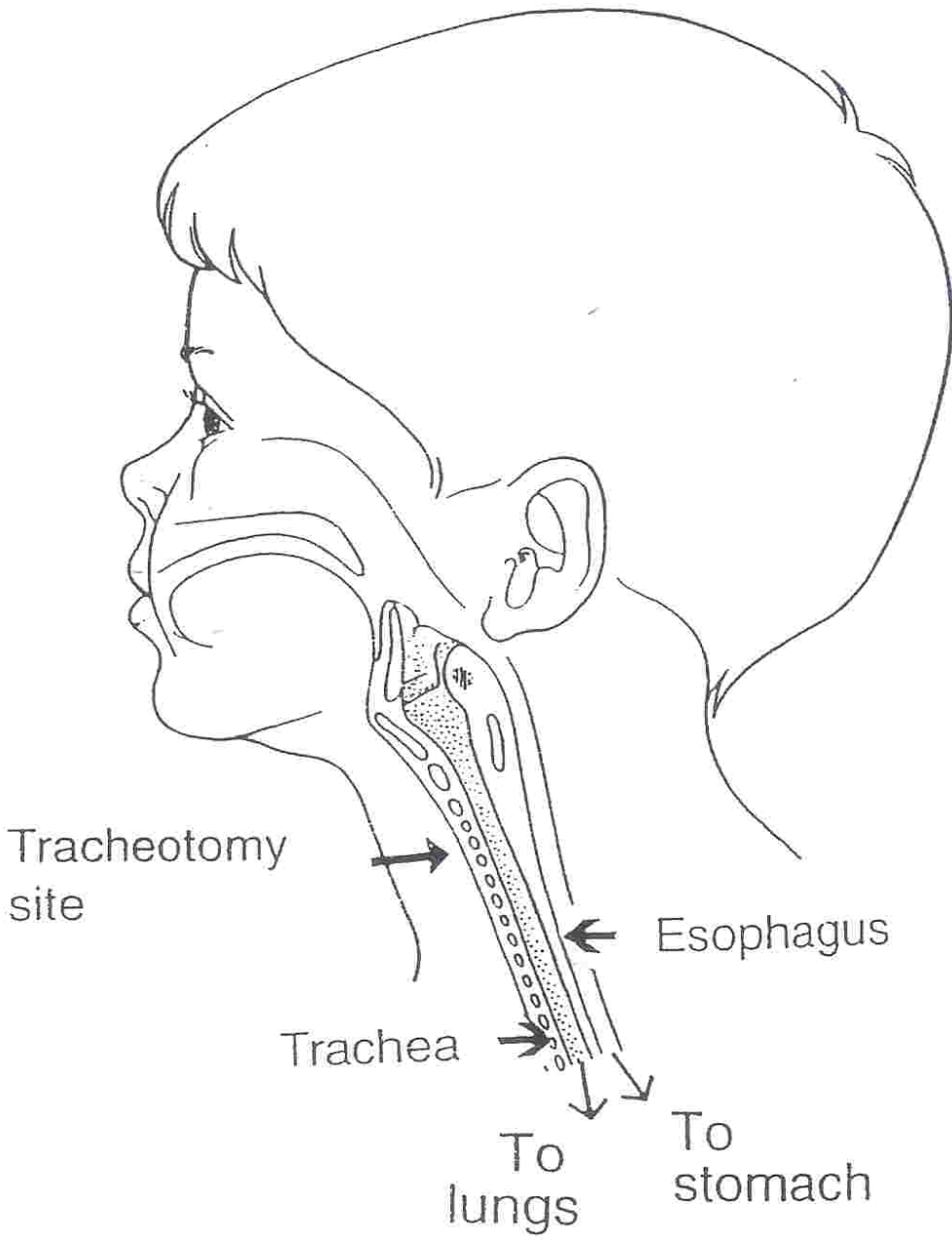
A tracheostomy may be temporary or life-long. Following are helpful diagrams of the trachea and surrounding tissues.



It is important to note the relationship of the trachea to the esophagus and the epiglottis that protects it from aspiration.



Tracheotomy
site



Preparation for Home care

The success or failure of managing these patients at home is dependent on how well home care is set up. Discharge Planning should start as early as possible.

Third party payers (private, Medicaid, and/or Waiver) must be contacted and approval obtained for any needed nursing, equipment, supplies, home and/or auto modifications. All caregivers (family, friends, &/or home nurses) must be taught and show competency in all of the patient's care. Many trach patients have significant problems other than their tracheostomy, such as: chronic lung disease; feeding problems and/or enteral feeds; developmental delays; seizures; behavior problems; and /or C-line, Mediport, or PICC lines. Teaching the caregivers basic CPR as well as the specific care for each problem should be followed with the caregiver demonstrating competency and, when possible, taking the child on passes or doing overnights to gain experience and confidence. The Discharge Planning Form (available on web site) can be used to help guide the Social Worker(s), nurses, and physicians in making sure that this process is done in a timely and quality manner. Discharge should be postponed if any of these issues are incomplete or unsatisfactory, and if there are concerns once the child is home they need to be dealt with promptly or there should be consideration of re-admission. Team care conferences with all of the caregivers are often helpful in this process.

Tracheostomy Tube selection

Tracheostomy tubes can vary in length, diameter, curvature, flexibility, and composition. They can be cuffed, fenestrated, and/or custom fitted. An incorrect tracheostomy tube can have significant consequences. The choices are based upon such issues as:

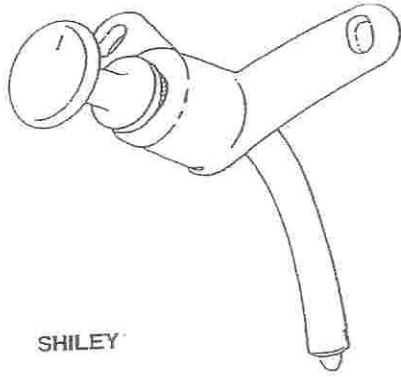
- Location of tracheal defects, i.e. malacia or stenosis - This can determine the length
- Need for mechanical support, i.e., CPAP, BiPAP, or ventilator - A leak can result in inadequate support.
- Upsizing or using a cuffed trach may be indicated.
- Risk of aspiration - Orally fed patients who aspirate from above and/or those with uncontrolled GE reflux may need a cuffed trach
- Variations in leak with position &/or sleep - Many patients have increased leak when in different positions &/or with sleep where their airway often relaxes and thus need a cuffed trach

In addition to the problems noted above, a poorly fitting tube can cause ulceration, scar tissue, esophageal obstruction, or occlusion of the tube tip by the tracheal wall.

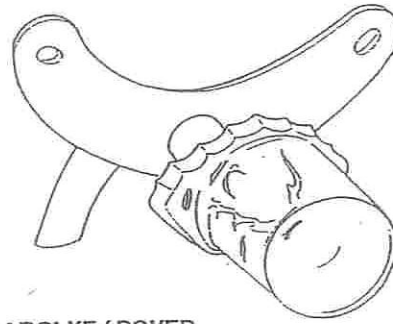
The decision on which tube to use can be determined by:

- Endoscopic exam by ENT (ML&B)
- X-ray
- Patient comfort
- Pulmonary function
- Sleep study

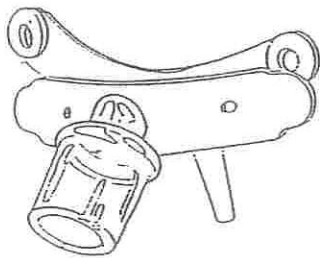
SYNTHETIC TRACHEOTOMY TUBES



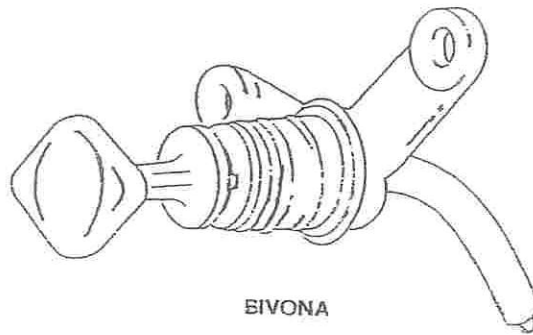
SHILEY



ARGLYE / DOVER



PORTEX



BIVONA

Stomal Care

Daily cleaning of the stoma with sterile water and cotton swabs at least twice daily is recommended. ½ strength hydrogen peroxide is still used by some physicians but recently there has been concern that this product increases granulation formation. An acute respiratory illness or local inflammation may necessitate more frequent care. Granulomas may occur and present with foul and/or blood-tinged drainage. Treatment with Silver nitrate and/or a steroid cream may be effective, but occasionally surgical removal is needed.

Trach Ties

Trach ties are made of several different products including cotton twill, foam backed, or stainless steel. They may connect by tying or Velcro. Patients often develop rashes and/or skin breakdown under them because of leaking secretions, perspiration, the short length of a child's neck, and/or skeletal deformities such as torticollis or scoliosis. Treatment of these conditions includes antibiotic or antifungal creams, powders, more frequent tie changes, changing the type of tie, using pads to "bridge" the damaged area, or covering the fragile area with products like Mepilex. Occasionally, it is necessary to reposition the patient to reduce pressure or air out the area. If all of these have failed to adequately improve the skin under the ties, the ENT Physician may need to briefly suture the trach in place and thus temporarily eliminate the need for any type of trach tie.

Tracheostomy Tube Changes

(see diagram below)

The average trach tube is changed every 1-2 weeks, but the range is from daily to every 2 months. Patients with chronic lung disease and/or increased secretions often need more frequent changes. On the other hand, more frequent changes often leads to increased stomal trauma. Tube durability and thus reusability varies, with silicone and metal tubes having the longest life.

Unscheduled, emergency trach changes are recommended for respiratory distress that does not respond promptly to suction, oxygen, and/or PPV (positive pressure ventilation). See Emergency Clinical Pathway. Other reasons to change a tube prematurely, includes cracks and cuffs not holding the desired inflation.

If you cannot put the same size tube back in, try the next size smaller.

If you cannot replace the tube at all and the patient has a patent (open) airway, use a resuscitator bag and a face mask to ventilate the patient until the tube can be replaced and/or paramedics arrive. You may have to cover the tracheostomy site to prevent air leakage. ***Then call 911.***

****** All caregivers should demonstrate competency in changing the trach and knowing when to consider it an emergency.***

Cleaning Tracheostomy Tubes

Current Protocol for cleaning and reuse of Tracheostomy Tubes (11-05)

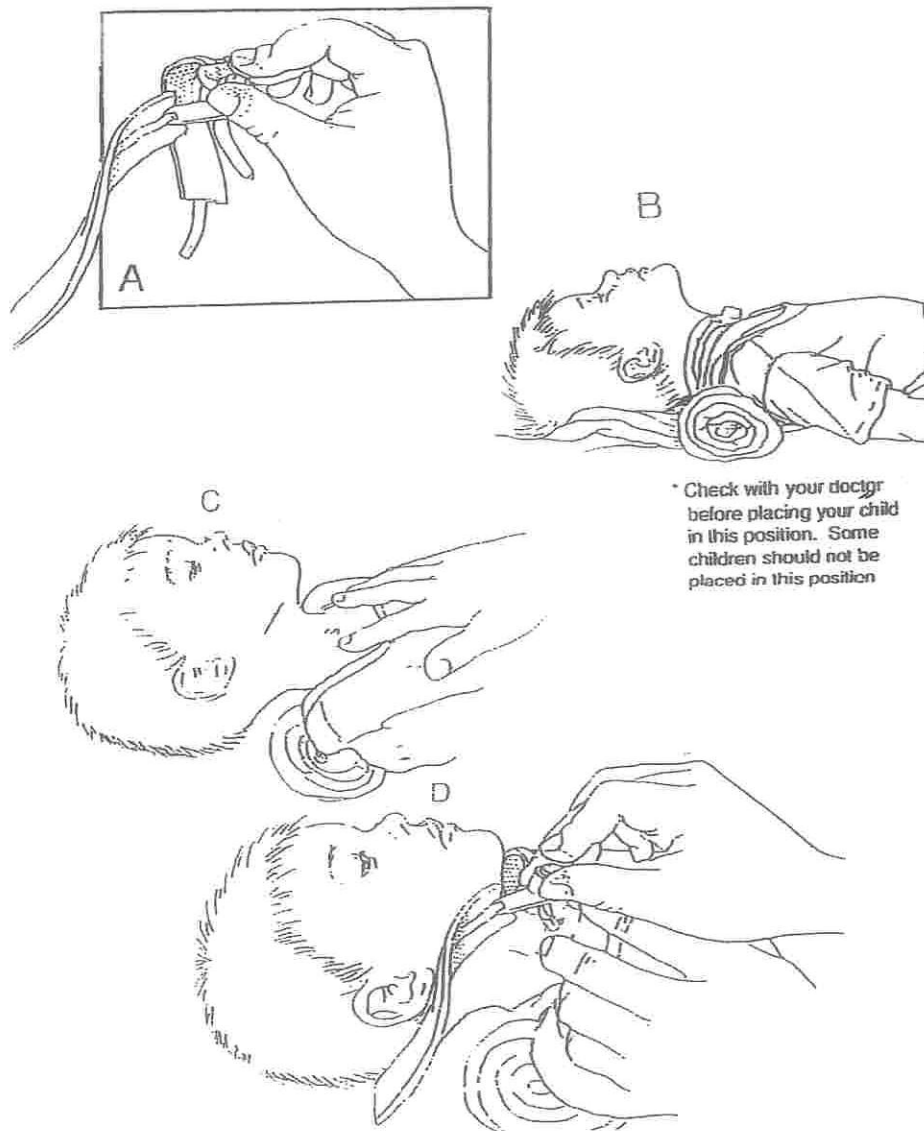
Trach Type	1/2 strength Hydrogen Peroxide	1/2 strength Vinegar	Sterile Saline	Water & mild soap	Distilled water
Pediatric & Neonatal	+	+	+	+	
Custom Shiley	+		+	+	+
Cuffed			+		+

* Never boil the tubes or soak them in full strength hydrogen peroxide

Suctioning

Maintaining a “patent airway” is the most important component of managing a child with a tracheostomy. Insuring a patent airway is the primary step in any resuscitative effort in addition to being part of routine care.

Catheter size: Contrary to older recommendations, patients do best using the largest catheter that easily fits down the tracheostomy tube and providing suction the entire time that the catheter is down the tube. Smaller suction catheters maybe less capable and take longer to remove thicker secretions.



Suctioning depth:

“Shallow suctioning” involves inserting the catheter just inside the trach hub and is used for children with a good cough and no distress.

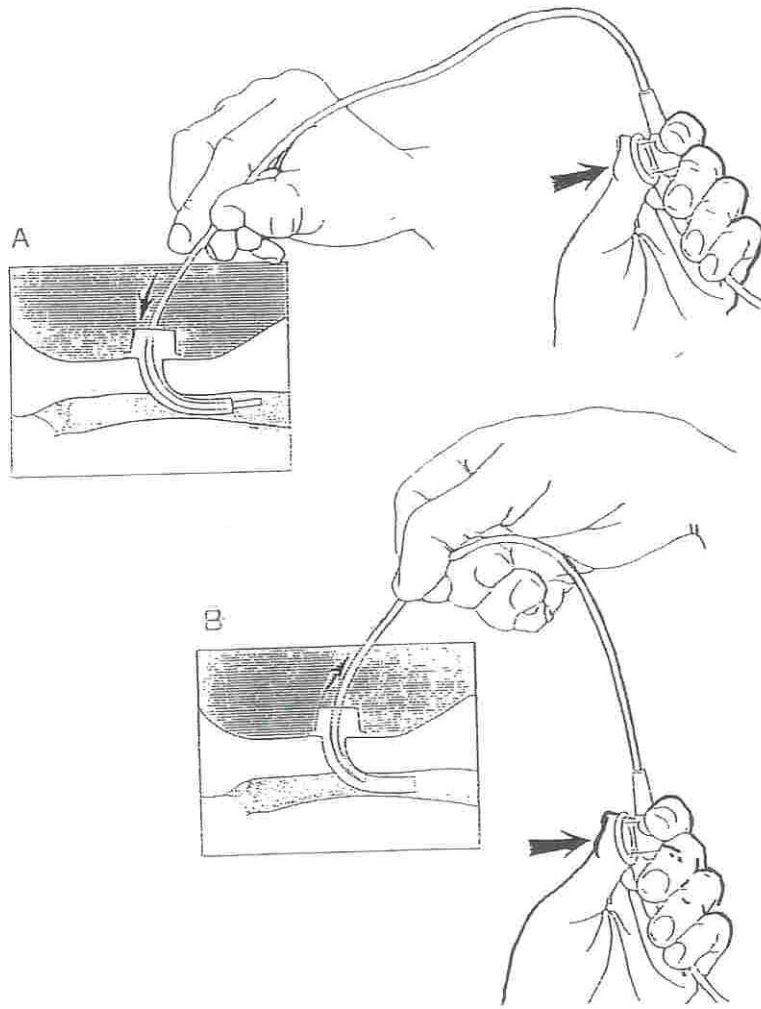
“Measured suctioning” is inserted such that the tip of the catheter extending just below the tip of the trach tube and is recommended for routine suctioning of patients with an inadequate cough or when a coughing or congestion persists after shallow suctioning.

“Deep suctioning” involves inserting the catheter until any resistance is met. It can cause tracheal damage and should be reserved for the child in respiratory distress who does not respond to measured suctioning.

Duration of suctioning: This should be tailored to the severity of the congestion and the patient’s tolerance. As a guideline, shallow and measured suctioning should be < 5 sec and deep suctioning should be < 15 sec.

Equipment: Suction equipment is available as electric (stationary or portable) and manual. Patients should at least have a portable and a manual available at all times. The electric suction machines deliver stronger and more consistent pressure and are usually easier to use. However, in the event of a power failure, lack of a conveniently located outlet, or the machine malfunctions, ***a Battery or Manual suction device is necessary and may be life saving.***





*****Note:** Waiting to apply suction until the catheter is down delays removal of secretions, takes more time, and thus compromises breathing. Also, twirling the catheter isn't necessary unless there is resistance to pulling it out.

Saline installation: Normal saline can be instilled to stimulate cough, loosen or thin secretions, and/or lubricate the catheter. It should not be used routinely, but can be helpful when: the child is congested with thick secretions and routine suctioning is inadequate; to provide a source of moisture when the child has been off humidification (blow by or from a ventilator, CPAP, or BiPAP unit), and/or has a history of developing thick secretions.

Infant → 2yo	½ ml
2yo → 6yo	up to 2-3ml
>6yo	up to 3-5ml

When a child is out of the home and only using the “artificial nose”, it may be helpful to instill ½ to 2ml every 1-3hrs. This is especially beneficial when outside or in a building with dry heat.

Frequency of suctioning: All patients require suctioning to remove secretions and check for patency of the tube. The minimum recommendation is morning and bedtime, but suctioning in between should be based on clinical need. A patient requiring persistent frequent suctioning should be considered for other treatment i.e. saline installation, bronchodilator, change in pressure support settings, and/or trach change, as well as a call to the managing physician.

Suction Pressure: The amount of pressure delivered to the tip of the suction catheter is variable based on the viscosity (thickness) of the secretions, length and diameter of the tubing, and the size of the collection bottle. Portable suction machines typically now work at the same pressures as wall suction. It is the ability to safely suction mucous in a few seconds that is important. There is concern about too much pressure when the catheter is in direct contact with the mucosa (trach lining) as this can cause damage. Guidelines for suctioning are:

<u>Portable and Wall</u>	
Infants	60-100 mm
Children	100-110 mm
Adults	110-150 mm

Bag Ventilation (PPV): Not all patients require PPV after suctioning. Those with poor respiratory effort, resultant hypoxia and/or bradycardia may benefit by brief PPV with oxygen.

Clean vs. Sterile technique:

Sterile technique is defined as the use of sterile catheter and gloves each time the patient is suctioned. This is routinely used in the hospital setting.

Clean technique is defined as the reuse of catheters after washing them in various accepted solutions and the use of disposable nonsterile gloves. This is the preferred method in the home and extended care facilities primarily because Private Insurers, Medicaid, and Waiver usually limit the number of catheters that can be used per month. ***Remember not to use the same catheter to suction the mouth and the tracheostomy as you may contaminate the airway with potentially harmful bacteria.***

Cleaning catheters: While sterilizing the outside of the catheters is the primary goal, irrigating the catheters with at least water is necessary to keep them functioning properly. If not disposed of, catheters should be flushed with clean tap water after each use and placed in a protected and clean area. Wiping off the outside with alcohol is optional.

Methods of more thorough cleaning (at least every 8 hours) include:

- Hot soapy water, then soaking in vinegar & water solution
- Commercial disinfectants
- Wiping the exterior with alcohol

Frequency: of cleaning catheters in the home setting varies based upon the need to reuse them. Most policies including Medicaid limit the number of catheters allowed per month and thus reuse of a catheter is necessary for up to 24 hrs.

CPT (Chest physiotherapy): Some patients clear their secretions more effectively after CPT which can be administered in several ways.

- Manual- 'patting' the chest to vibrate the lungs and help mobilize secretions
- Mechanical

- Electric Chest Percussionator (vibrator)
- Vest- An inflatable vest that rapidly inflates /deflates
- IPV- (Intrapulmonary Percussive Ventilation) An oscillating device that delivers high flow jets of air to the airways.

Cough Assist: Augments a weakened cough by mechanically replicating the cough maneuver. This is frequently used in patients with paralysis or muscular dystrophy. Younger patients and those with developmental delay may not tolerate this equipment.

Humidification

The upper airway (nose, oropharynx, and trachea) functions to filter, humidify, and warm inspired air. These areas add moisture to the air on inspiration and remove it on expiration. These benefits are lost when the patient has a tracheostomy and the resultant humidity deficit can cause loss of ciliary action, damage to mucous glands, disorganization of airway epithelium and basement membranes, cellular desquamation, and thickening of mucous secretions. This can result in decreased pulmonary function, and increased risk of infection. In order to approximate (mimic) normal conditions, the inspired air needs to be artificially humidified by:

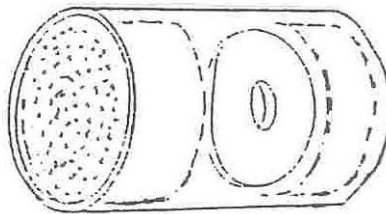
Jet nebulizer: With this device, a high pressure gas flow is directed thru a jet orifice, which creates a spray of small water droplets. These are usually unheated and used for spontaneously breathing (not on a ventilator) patients.



Passive humidifier “artificial nose” : These devices collect heat and moisture from the patient’s exhaled air and then delivers some of it back during inhalation. These devices are less effective than the other methods of humidification and they cannot be used with speaking valves. Their advantage is that they require no pneumatic or electric device (mechanical) and are not subject to spilling into the tubing like the other devices when patients are being moved about.

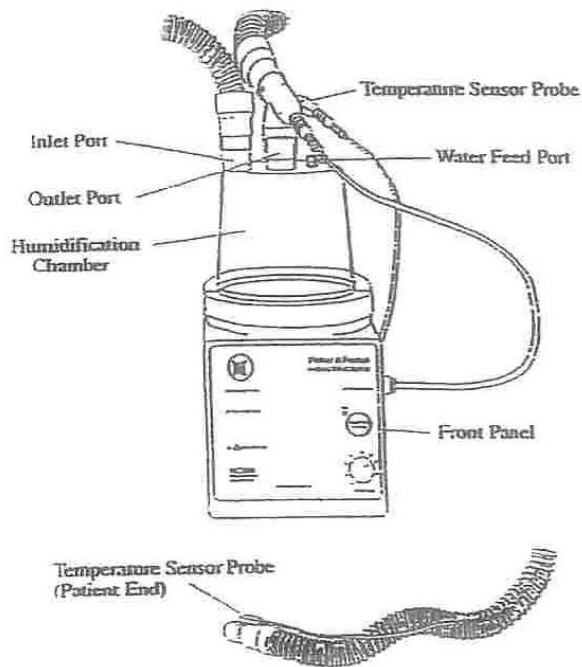
Thus, this is the primary mode of humidification in patients that are not stationary, and especially those that are ambulatory and/or in school. An additional benefit is the prevention of small foreign bodies from entering the airway.

Patients with significant problems with their secretions may need supplementary humidification by instilling saline every 1-3hrs and/or running a humidifier in the room.



This is one of several different types of Artificial Noses. They need to be changed if they get too wet from secretions.

Pass-over or Bubble-through humidifier: Air and/or oxygen are directed thru a heated bath designed to have a large water surface to air ratio. This is usually used with mechanical ventilation or CPAP and where the delivery tubes have heated wires and can deliver up to 100% humidity without causing condensation in the tubing.



HUMIDIFIER For ventilator or CPAP

Monitoring

Medical monitors

These are similar to those in the hospital and are used to provide a rapid warning of clinical deterioration in the patient. In most cases, they are meant to assist but not replace the direct observation of the caregiver. Even when the caregiver is present, a monitor may alert them to unrecognized changes in cardiopulmonary function (see below) which will likely be more responsive to therapy if dealt with sooner.

While we direct all caregivers not to leave the child unattended, we are aware that there are times when distractions occur that cause the patient to be less well observed: *the phone or doorbell rings; supplies are needed from the other room; a sibling has an emergency; the caregiver needs to use the restroom or inadvertently falls asleep; etc.* While not all studies support monitor use, most of us can recall bad outcomes related to caregivers not responding quick enough only to find out later that there was no monitor in use, the alarm was turned off, or improperly set.

If any caregiver has to leave the room, they should recheck the monitor to insure that it is on and properly set. Many children are too young or developmentally delayed to communicate that they are in distress and thus a monitor may be their only method to notify the family or nurse of a problem. This equipment check should be done at least at the onset of each caregiver's time or shift with the patient and the settings should be verified with the plan of care (POC) and not changed without a physician order.

The type(s) of monitor should be based on the clinical need.

- Oximeter- measures oxygen saturation and heart rate. Alarms if there is bradycardia, tachycardia, or hypoxia based upon the limits set.
- High & low pressure alarms on ventilators / BiPAP / CPAP can indicate that the equipment (circuit) has a leak or has become disconnected or that there is a sudden obstruction or worsening lung function.

These monitors are usually available with options such as memory and/or printouts. These options may help the physician in evaluating events that are reported and/or compliance by the caregivers.

Turning down the volume or muting the alarm, changing the high and low limits, or turning off the entire monitor are dangerous actions taken by some caregivers because the alarm is “annoying”. Leaving the room and not being able to hear the alarms and thus respond promptly can have devastating results and even death.

Portable baby monitors: such as those made by Fisher Price (see image) and Graco have a portable unit that can be worn by the caregiver and can provide additional surveillance when the caregiver has to leave the room or worries that they might fall asleep. They would allow the caregiver the ability to hear the oximeter or ventilator alarm sound. While these are inexpensive and very convenient, they are not meant to replace direct observation.



COMPLICATIONS OF TRACHEOSTOMIES

Complications can be divided into several categories based upon the time elapsed after the initial surgery and the associated conditions or diseases.

Intraoperative: These include problems related to the surgical procedure, anesthesia, and overall health and associated conditions of the patient... hemorrhage, tracheoesophageal fistula, pneumothorax, pneumomediastinum, cricoid cartilage injury, cardiopulmonary, tube obstruction or displacement, posterior tracheal wall disruption, and death.

Immediate postoperative: Hemorrhage, wound infection, subcutaneous emphysema and/or pneumothorax, pulmonary edema, dysphagia, pneumonia, sepsis, atelectasis, and death.

Late postoperative: Suprasternal collapse, suprasternal and/or distal tracheal granuloma(s), tracheoesophageal fistula, tracheocutaneous fistula, laryngotracheal stenosis, tracheal wall erosion, hemorrhage/sentinel bleed, inability to decannulate, mucous plug, bronchospasm, and death.

Specific issues related to the more common complications are listed below:

Mucus Plugging: Occurs when secretions coalesce and partially or totally obstruct (plug) the airway. It is more common in patients with lung disease (acute or chronic) inadequate humidification, inadequate suctioning, and those with smaller airways. **Symptoms** include a whistling sound, rapid &/or labored breathing, poor or absent air movement, and difficulty passing a suction catheter.

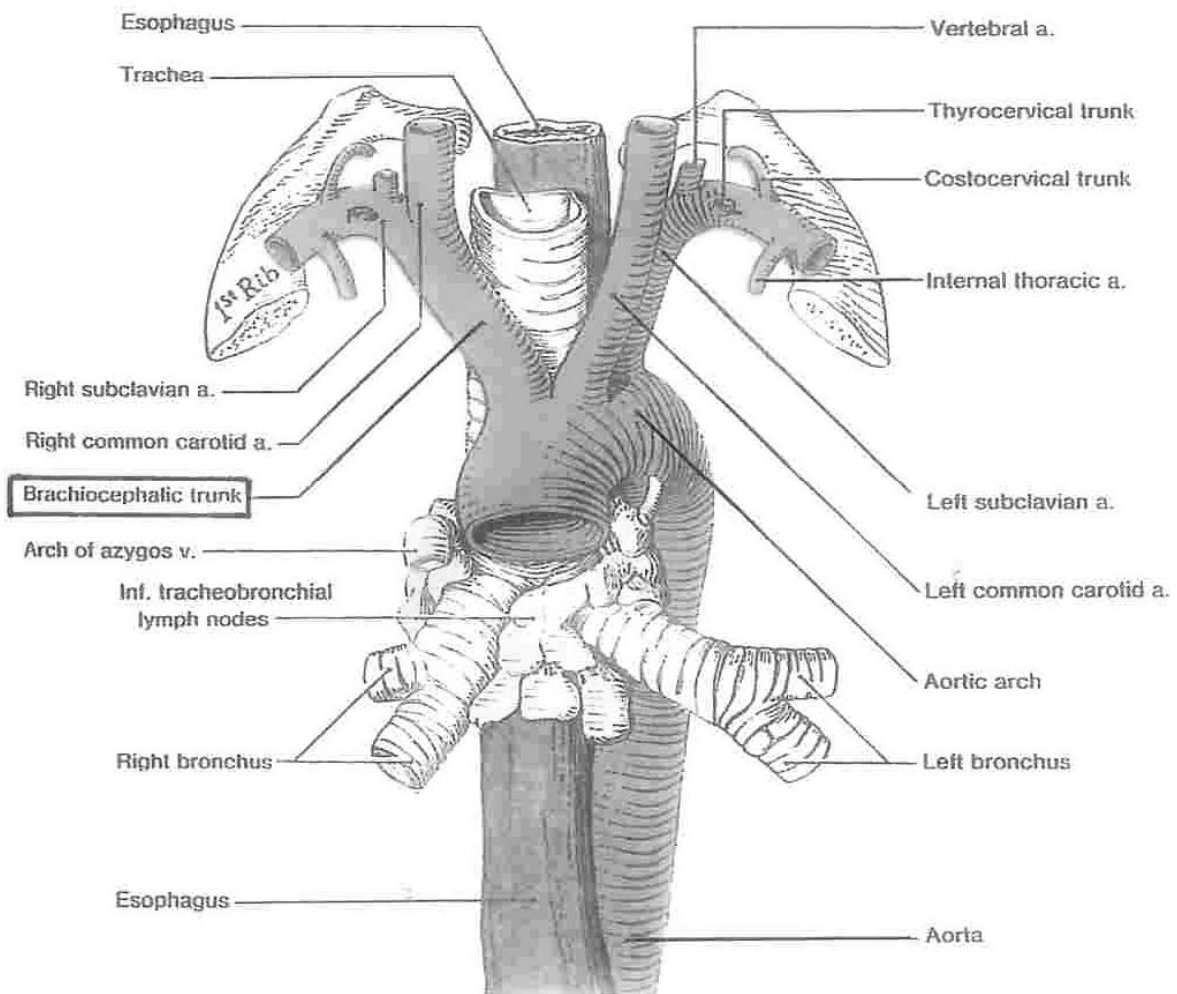
Treatment includes suctioning often deep and with saline instillation; changing the tracheostomy tube; providing oxygen as needed; and *calling 911 if no response*. Often, the patient responds but remains congested after the above treatments and may benefit from a bronchodilator, i.e. albuterol or Xopenex (see pages 22, 23).

** Note that the presenting symptoms of a mucous plug are often indistinguishable from many other causes of respiratory distress in these patients, but the treatment recommendations are the same (see clinical pathway). Once remedied, efforts should be made to reduce the likelihood of recurrence by increasing humidification; treating any underlying infection &/or bronchospasm; and possibly changing the tracheostomy tube more often.

Bleeding/Hemorrhage: Bright red blood coming from the tracheostomy tube can be serious. It can be the result of irritation, granulation, ulceration, and/or infection. The amount and duration of the bleeding is also critical. While careful, measured

suctioning and adequate humidification are important to prevent these situations, some episodes of bleeding occur from stasis (secretions lying around) which results from inadequate suctioning. Reviewing the recent suctioning patterns of the patient can help you choose a mode of action. A very serious complication can be erosion of the Brachiocephalic (innominate) artery. This is more likely to occur in trachs that have been in a long time or in patients with certain neck or spin deformities, i.e. severe scoliosis (see following page).

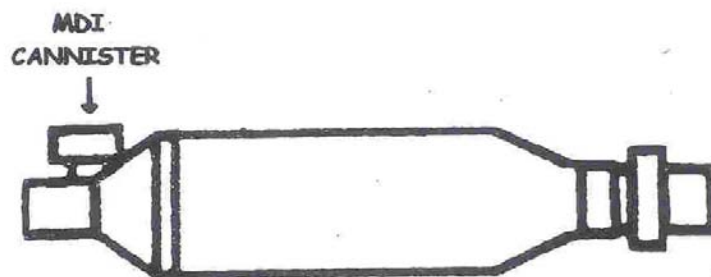
***** Large amounts or persistent bleeding should be reported promptly to the physician or seen in the ER.***



This shows the relationship of the Brachiocephalic (Innominate) Artery to the Trachea and how it is possible to have compression &/or erosion from a tracheostomy tube if the stoma is too close to this blood vessel.

Bronchospasm: Airway spasm, increased secretions, and decreased air movement are common with tracheostomy patients. This can occur as a result of underlying lung disease; airway stenosis or malacia; mucous plugs; atopy; exposure to irritants such as tobacco; dryness; or the poor ability to handle secretions 2° to the tracheostomy itself and/or neuromuscular disease. This bronchospasm can be treated by administering a bronchodilator such as albuterol (Ventolin) or levalbuterol (Xopenex) by nebulizer, MDI (metered dose inhaler) via a “spacer”, and/or by treating or eliminating the cause.

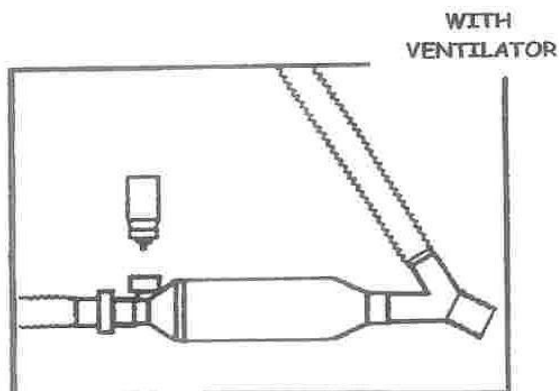
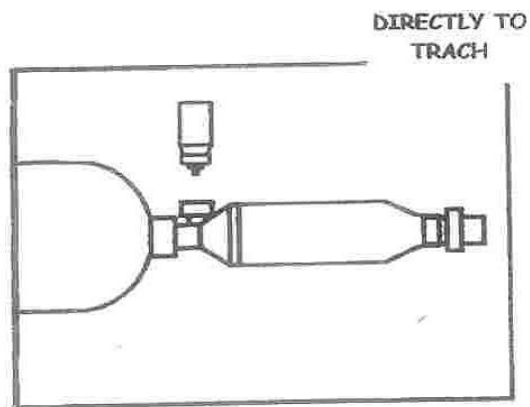
**AEROCHAMBER
for
TRACH & VENTILATOR
PATIENTS**



For those patients who aren't on respiratory support (CPAP, BiPAP, or Ventilator), it is often helpful to give several breaths after each MDI dose using the resuscitation bag on the distal end of the AeroChamber as shown in upper diagram.

The spacer can be positioned “in-line” for those on ventilator support.

SETUP FOR DELIVERY OF MEDICATION
BY METERED DOSE INHALER (MDI)



Aspiration: This is the passage of solids, liquids, saliva or gastric secretions into the trachea (airway). It can occur during swallowing (dysphagia) or as a result of gastroesophageal reflux (GERD). While many patients have problems with dysphagia prior to the tracheostomy tube, the tube itself can cause or worsen the problem.

Symptoms include:

- Choking or coughing
- Increased tracheal secretions after eating
- Tracheal secretions resembling the food or liquid just swallowed.
- Recurrent pneumonia
- Recurrent bronchospasm
- Recurrent desaturations &/or apnea

Management of aspiration is based on acute episodes and prevention.

Acute aspiration: Unless the events immediately follow emesis (vomiting) its symptoms are similar to those caused by other respiratory problems and it is not always clear that aspiration was the cause. Thus the treatment is very similar to that of other respiratory emergencies: Suction with the largest catheter that easily fits down the trach. Saline instillation may be of help especially if solids or thicker liquids are aspirated. Changing the tracheostomy tube if unable to suction and/or severe distress persists. Oxygen, PPV, and bronchodilators as needed. Antibiotics are indicated if signs of pneumonia exist. ***Call the managing physician or 911 if the patient does not rapidly improve.***

Prevention: Thickening liquids and selecting solids that are soft, easy to chew, and tend to not crumble.

- Frequent small meals
- Positioning upright mainly with feeds and, in some patients, all of the time.
- Using a cuffed trach tube and inflating it during feedings.
- Enteral (tube) feeds if PO fed or jejunal feeds (NJ, GJ, or J) if already receiving enteral feeds.

<u>Medications</u>	<u>Benefits</u>
Glycopyrrolate (Robinul) Scopolamine Ipratropium (Atrovent)	↓ secretions
H2 Blockers (Zantac) Proton pump inh. PPI (Prilosec)	Alkalinize GI secretions
Reglan	Shorten gastric emptying time

Surgery: drool procedure, fundoplication, jejunostomy, gastrostomy, vocal cord closure (laryngotracheal separation)

****** Because aspiration or other complications can occur at any time or place, all emergency supplies and equipment should be close by the patient at all times!***

Accidental Decannulation: This refers to the tracheostomy tube unexpectedly coming out of the airway. It can occur because the ties were too loose or came undone; the tube was too short; &/or the patient or caregiver pulls it out. The significance and urgency of this event depends upon the patency (how well it stays open on its own) of the airway above and the need for ventilator or CPAP support. Some patients can breathe adequately for awhile if they are suddenly decannulated, while others need the tube replaced ASAP. Every caregiver should know the likely status of the patient if they were to become decannulated and should always have the proper supplies and equipment with them:

- If the tube can be slipped back in and does not appear dirty or contaminated, then it is not necessary to put a new one in.
- If you cannot put the same size tube back in, try the next size smaller.
- If you cannot replace the tube at all and the patient has a patent (open) airway, use a resuscitator bag and a face mask to ventilate the patient until the tube can be replaced &/or paramedics arrive. You may have to cover the tracheostomy site to prevent air leakage. ***Call 911.***

Mechanical Support complications: Equipment such as Ventilators, BiPAP, or CPAP can fail or malfunction. A common occurrence is a dead battery or the power cord can fail or be forgotten and this results in complete failure of the equipment. In this case the tubing must be removed quickly from the trach as it essentially preventing air movement and can be catastrophic if left attached to the trach. If the child cannot breathe without the mechanical support, manual ventilation with a resuscitator bag attached to the tracheostomy tube should be initiated immediately.

Tracheostomy complications may have catastrophic outcomes. These can be minimized by:

- Knowing the patient's full medical history including the extent of their disability and tracheostomy problems that they have had in the past.
- Maintaining a book with an updated and detailed Plan of Care along with progress notes from all caregivers.
- Knowing the clinical pathway to follow if a complication occurs and having a printed copy posted near the patient.
- The pathways should be posted where they can be easily seen and copies attached to the Emergency/travel Bag.
- ***Never leaving the patient unattended or off their monitor(s).***
- Always having emergency supplies, equipment, and phone numbers (see page 31) close by, especially if you are the only caregiver present.
- Having to go upstairs or out to the car to get the oxygen, spare trach or suction machine may cause the patient to suffer serious injury and even death in the event of an unexpected complication.
- Making sure the wheelchair can tilt back and has adequate storage for all of the equipment and supplies.
- Posting the Clinical Pathways (pages 34, 35) near the patient's bed with copies for the Emergency Bag & School.
- Setting up "mock emergencies" with the help of your nurses or physician can help families be better prepared.
- Having a refresher course (repeat training) of CPR and other emergency care is often helpful as caregivers often become "rusty" if they haven't experienced a crisis in a year or more.
- ***Making sure that the patient has regular follow-up visits with ENT, as well as other physicians, so that significant problems are discovered before they become severe.***

Manual Ventilation

Manual ventilation (PPV) is an infrequently used procedure that can be life-saving, yet can also be harmful if not done correctly. There are 2 basic types of resuscitator bags available, self inflating and anesthesia (Mapleson) bags. Their features and differences are important to know:

Self inflating bags (Ambu) are usually the type used in the home. They do not require an air or oxygen source and thus can be used anywhere. They limit the peak pressure delivered (~35cm) and come in sizes based upon the patients age or size. Caregivers occasionally leave the bag attached to the trach, while they do other care, thinking that the patient is receiving adequate air flow. While some bags allow air flow if attached to an oxygen source when not being squeezed, the bag is rarely labeled as such. Those that do allow air flow require flows higher than usually available at home, and even if the oxygen flow was available (~10L/m), the oxygen delivery to the patient is not adequate to allow the patient to adequately breathe. Thus, these bags should be detached from the tracheostomy when not manually ventilating the patient.

Anesthesia (Mapleson) bags are the main bags we use in the hospital. They require an air &/or oxygen source capable of delivering at least 8-10L/m; allow the caregiver to regulate the pressure with ranges from 0 to >50cm. They continually deliver air flow and, as long as the pressure is monitored, they can be attached to the tracheostomy when not ventilating (bagging or squeezing the bag) the patient.

Manual ventilation is used *occasionally* when suctioning a patient or during resuscitation:

With suctioning: patients should not be routinely ventilated with suctioning, but some patients with thick secretions are given saline and then several breaths before suctioning. This should be done only with a physician order. There may also be occasional apnea during or after suctioning and the patient may need several breaths.

During resuscitation: it is usually preferred to manually ventilate (even patients on a ventilator) during resuscitation. Once the patient has stabilized they can be placed back on their ventilator. A patient whose tracheostomy tube cannot be replaced during an elective change or accidental decannulation, can usually be mask ventilated unless they have upper airway obstruction.

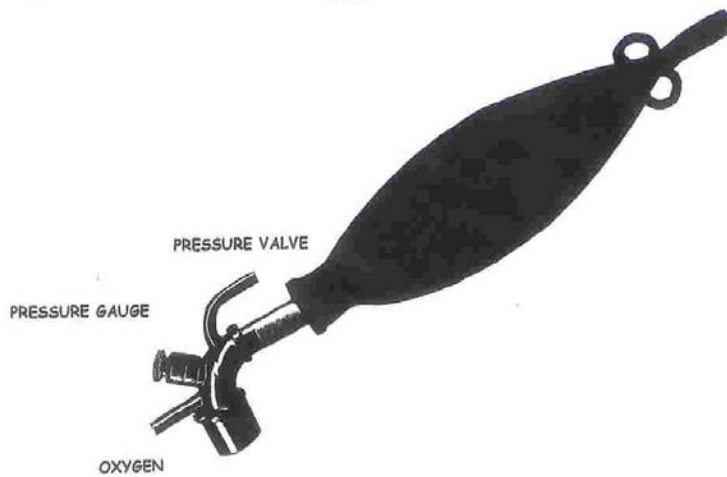
With an MDI: Patients with poor respiratory effort who aren't on a ventilator, CPAP, or BiPAP may benefit from 1-2 puffs of PPV with each dose using an AeroChamber and Ambu bag.

All caregivers should know how to use a resuscitation bag and should have previous experience with a patient. A slow, firm squeeze of the bag that results in visible chest movement and good air exchange on auscultation is recommended. Never use mask ventilation to the face if the tracheostomy tube is still in place.

Self-inflating bag



MAPLESON or ANESTHESIA BAG



Oxygen

Oxygen may be required by patients with a tracheostomy. It may be needed daily in those with chronic lung disease and only occasionally in other patients when they have a respiratory illness or a tracheostomy complication. Many physicians recommend always having at least a small portable oxygen tank available because all tracheostomy patients are at risk for a sudden and potentially life-saving need for it. Oxygen can be provided from various sources such as a tank or concentrator. It can be stored as a gas or liquid. Delivery can be continuous or intermittent based on patient ability and convenience. The actual oxygen concentration depends on the flow rate and where it is delivered. It is preferred that all oxygen delivered be humidified but this is not always possible when out and about. Smaller children and infants often require the humidification and oxygen to be heated to prevent the patient from developing hypothermia.

Source

Tank

Gas- most common, can deliver up to 15 liters/ minute, and usually covered by insurance.

Liquid- enables more oxygen to be stored in the tank but is extremely cold and more expensive. Thus it is rarely used at home.

Concentrator- Electric units that convert Room Air to 87-95% oxygen (the % decreases as the flow increases) and do not require storage and thus replacement of oxygen tanks. Limited to 5-6 liters oxygen per minute, uses a fair amount of electricity that is not covered by insurance, and is not portable.

Delivery

Continuous- Uninterrupted flow and the most common type used in children and the most reliable.

Intermittent- Designed to be more efficient and last longer by trying to deliver oxygen only with inspiration, thus it requires a smaller tank.

Unfortunately, many patients (especially children) cannot exert enough air flow (negative pressure) to trigger the delivery.

Concentration/ Flow rate- Home oxygen is delivered at a set concentration of 85-100% oxygen because it requires a separate air source to create variable percentages of oxygen as in the hospital (i.e. 40%). The flow meter used determines the range of oxygen delivery from as low as 1/10 L/min to as high as 15L/min. The actual concentration of oxygen received by the patient depends upon the oxygen source, flow meter rate, where the oxygen tubing is placed in relation to the trach and what other sources of air flow are delivered to the patient. Administering fractionated (low) flow rates such as 1/4 or 1/2 L/min are extremely inaccurate if the flow meter is not marked in fractions of a liter and can even result in the patient receiving no oxygen at all. On the other hand, a patient in distress who needs a high amount of oxygen, as in an emergency (such as a mucous plug or an accidental decannulation), needs a flow meter that delivers 10-15 L/min.

Humidification- (see pages 15-16) The most effective way is with a humidifier unit but this requires the patient to be fairly stationary and thus is not feasible when moving around (car, school, yard, etc.). A humidvent or intermittent instillation of saline to the trach is an alternative.

Definitions

BAL - “Bronchoscopy and Laryngoscopy” usually performed by the Pulmonary physician to evaluate and treat the upper and lower airways including the larynx.

BiPAP – “Bi-level Positive Airway Pressure” delivered mechanically. Differs from CPAP in that the pressure delivered during inspiration (breathing in) and expiration (breathing out) can be adjusted separately and a rate can be set to insure a minimum number of breaths.

Bronchi – The tube-like structure leading from the distal tip of the trachea into the lungs.

Bronchomalacia – Floppiness / intermittent collapse of a portion of the lung’s bronchi.

CPAP – “Continuous Positive Airway Pressure” provided mechanically. Delivers a continuous flow of air with a preset and constant pressure during inspiration and expiration.

EGD – “Esophagogastroduodenoscopy” is a fiberoptic exam performed to evaluate and treat the esophagus, stomach, and duodenum (upper gastrointestinal tract).

Epiglottis – Lid-like structure covering/protecting the entrance to the larynx.

FEES – “Fiberoptic Endoscopic Exam of Swallowing” performed by passing a fiberoptic scope thru the nose to visualize the act of swallowing food &/or liquid.

Gastrostomy - Surgically placed opening into the stomach for patients who cannot adequately or safely take food/drink orally.

GERD – “Gastroesophageal Reflux Disease” - A condition where gastric contents frequently reflux up into the esophagus with or without emesis.

Glottis – the vocal part of the larynx including the vocal cords.

Granulation - The formation in wounds (stoma) of small, rounded, fleshy masses that may ooze, bleed, and occasionally obstruct a surgical opening (stoma).

Hypopharynx – the area just above the vocal cords and includes the epiglottis.

Laryngomalacia - Floppiness/ intermittent collapse of the posterior pharynx, just above the vocal cords.

Larynx – Upper part of the trachea that includes the vocal cords.

ML & B – “Microlaryngoscopy and Bronchoscopy” usually performed by the ENT physician to evaluate and occasionally treat the hypopharynx and trachea.

Nissen Fundoplication - Surgical procedure that tightens the juncture where the esophagus empties into the stomach as a treatment for GERD.

Stoma – Fleshy rim and opening into the trachea or GI tract (stomach).

Subglottic stenosis – Narrowing of the upper trachea, the area beneath the glottis.

Trachea – A tube-like structure between the vocal cords and the bronchi.

Tracheostomy – Surgically placed opening into the trachea for patients who are unable to adequately breathe their nose or mouth or clear their secretions.

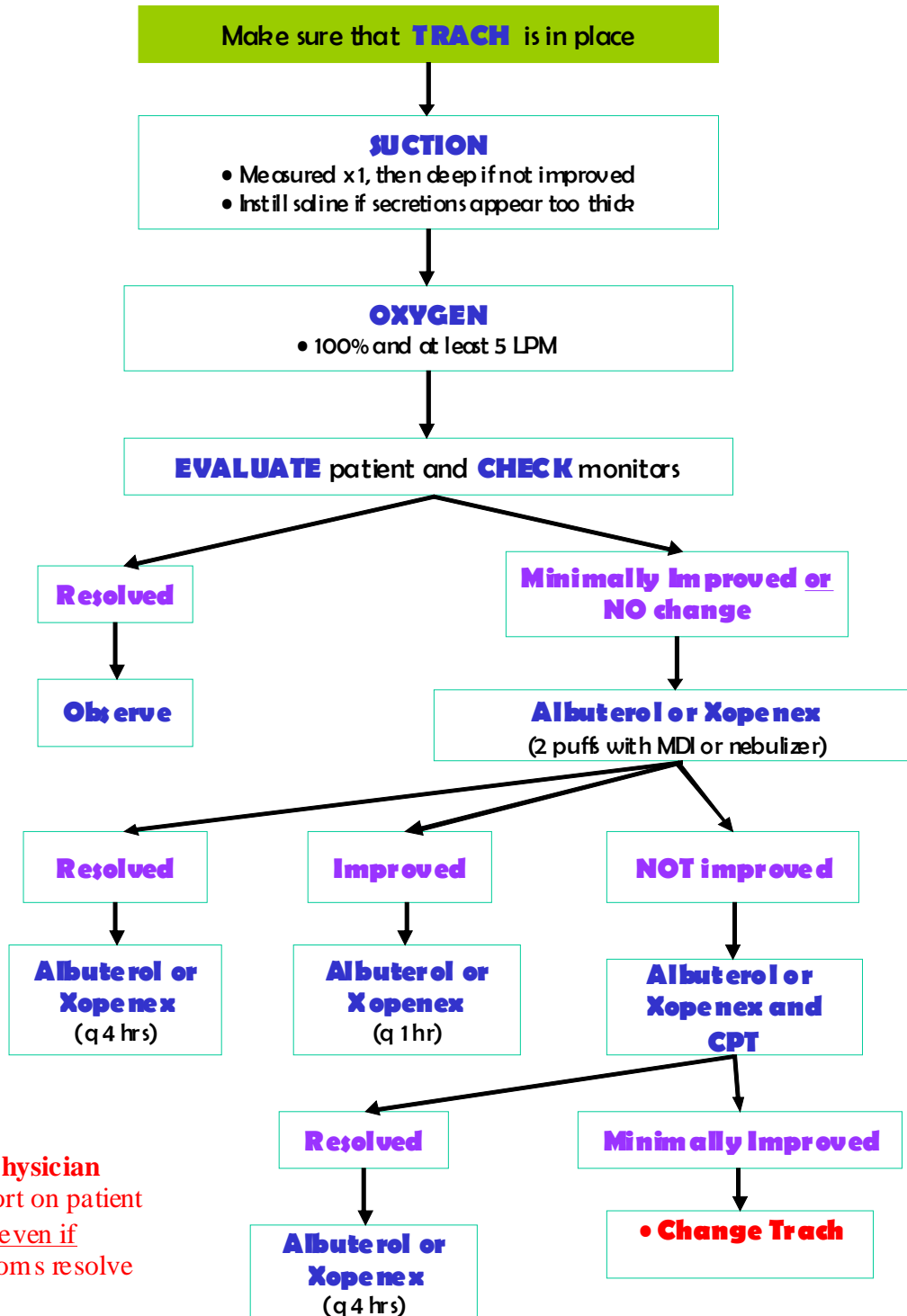
Tracheomalacia – Floppiness / intermittent collapse of a portion of the trachea.

Ventilator / Respirator / Mechanical Ventilation – similar terms for equipment that provides or assists breaths for the patient. A device that provides artificial respiration.

Management of Acute Respiratory Emergencies in Patients with Tracheostomies

mild to moderate

(Increased congestion, slight labored respirations, not cyanotic and is alert)

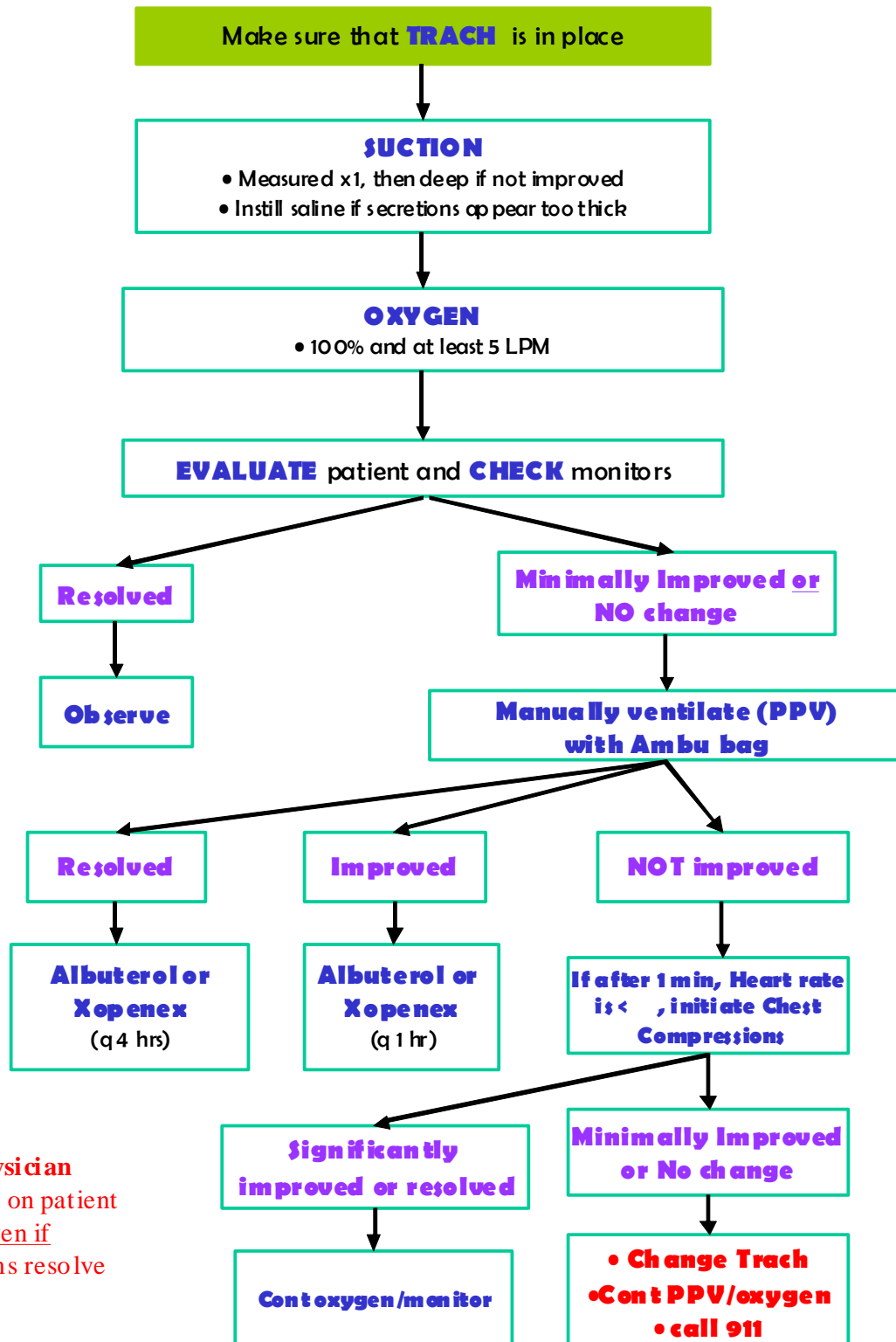


Call physician
to report on patient
status even if
symptoms resolve

Management of Acute Respiratory Emergencies in Patients with Tracheostomies

moderate to severe

(very labored respirations or not breathing, cyanotic, limp, bradycardic)



Call physician to report on patient status even if symptoms resolve