So Many Tubes, So Little Time!!

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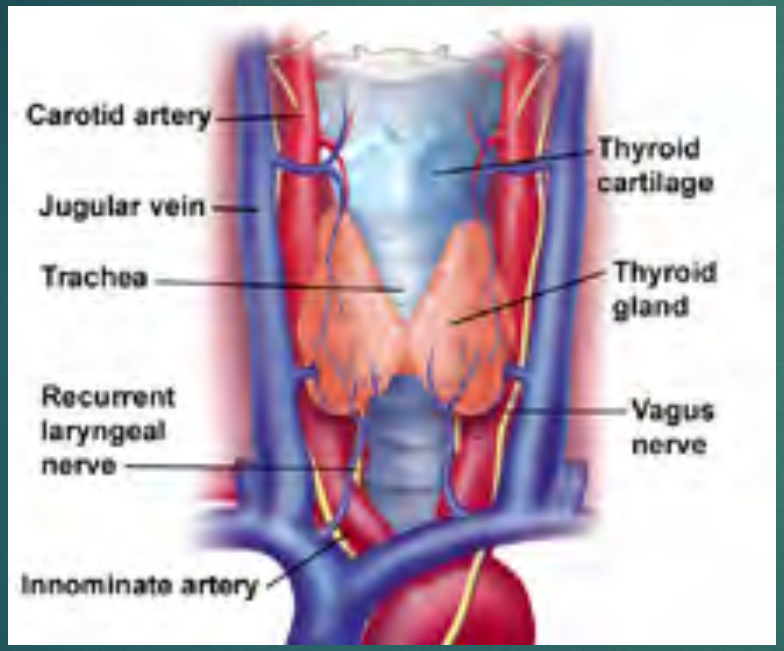
MEDTRONIC

Disclosures

- I work for Medtronic, the manufacture of the Shiley line of tracheostomy tubes.
- I will not be preferential to the Shiley brand of tracheostomy tubes.

Indications for Tracheostomy



- To provide a patent airway
- Administer positive pressure ventilation
- Provide access to the lower airway for clearance
- **<u>Not</u>** to prevent aspiration
  - (? Minimal ?)

TRACHEOSTOMIES - *A Brief History*

- The tracheotomy is one of the oldest surgical procedures. Amazingly, a tracheotomy was portrayed on Egyptian tablets dated back to 3600 BC.
- References were made to the procedure in a Hindu medicine text written in 2000 B.C.
- Asclepiades of Persia is credited as the first person to perform a tracheotomy in 100 BC.

TRACHEOSTOMIES - *A Brief History*

- **Antonio Musa Brasavola, an Italian physician, performed the first documented case of a successful tracheotomy 1546.**
  - **The patient, suffered from a laryngeal abscess and recovered from the procedure.**
- **In 1909, a tracheotomy technique was introduced in which the tracheal incision extends to the 4th or 5th tracheal ring.**
  - This operative technique was refined by Chevalier Jackson when faced with the challenge of the polio epidemic of the 1940's.
- **The technique is basically the same today.**

FACTOID

- Where did Chevalier Jackson practice?
- Name two places that I can find a display with his equipment, and items that he has removed from the airways of individuals.

What are

- Appointments at 6 Universities including
  - Allegheny General Hospital
  - Jefferson
  - Temple
  - Woman's Medical College (Drexel)
- Mutter Museum in Philadelphia
  - *Jackson Collection includes 2,374 inhaled or swallowed foreign bodies that Dr. Jackson removed from patients' throats, esophaguses, and lungs.*

Focus of Talk

- Types of tracheostomy tubes
- Risks and benefits of each type of tubes
- Why and Why not to use that tube
- How can I do that

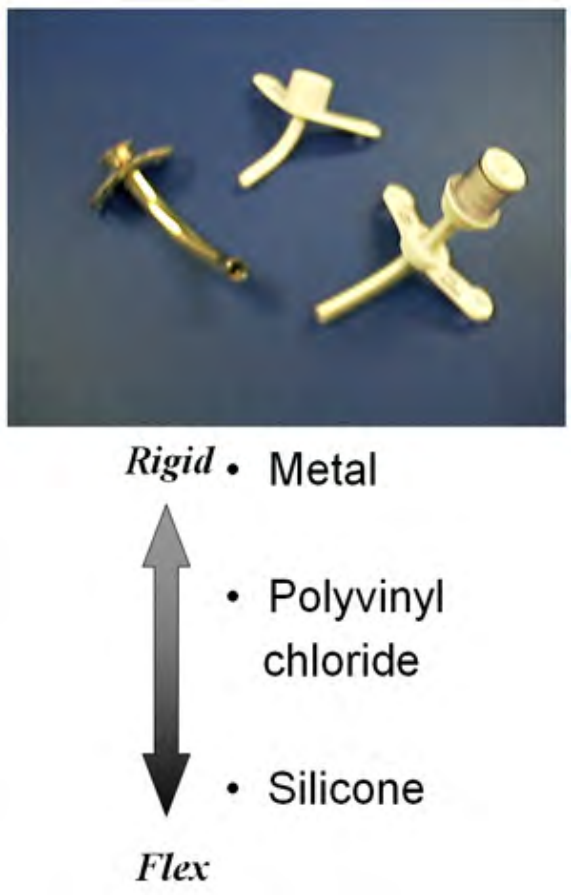
Trachophobia

- If you don't work with artificial airways you will be scared of artificial airways.
- Trachs are easy and are not scary

Basics of Tube Design to Discuss

- Tube Construction
- Dimensions
- Shape
- Cuff / Cuffless
- Single / Dual Lumen
- Fenestration

Tube Construction



- Metal
  - Silver
  - Stainless steel
- Plastic
  - Polyvinyl chloride
  - Silicone

Metal Tube Characteristics

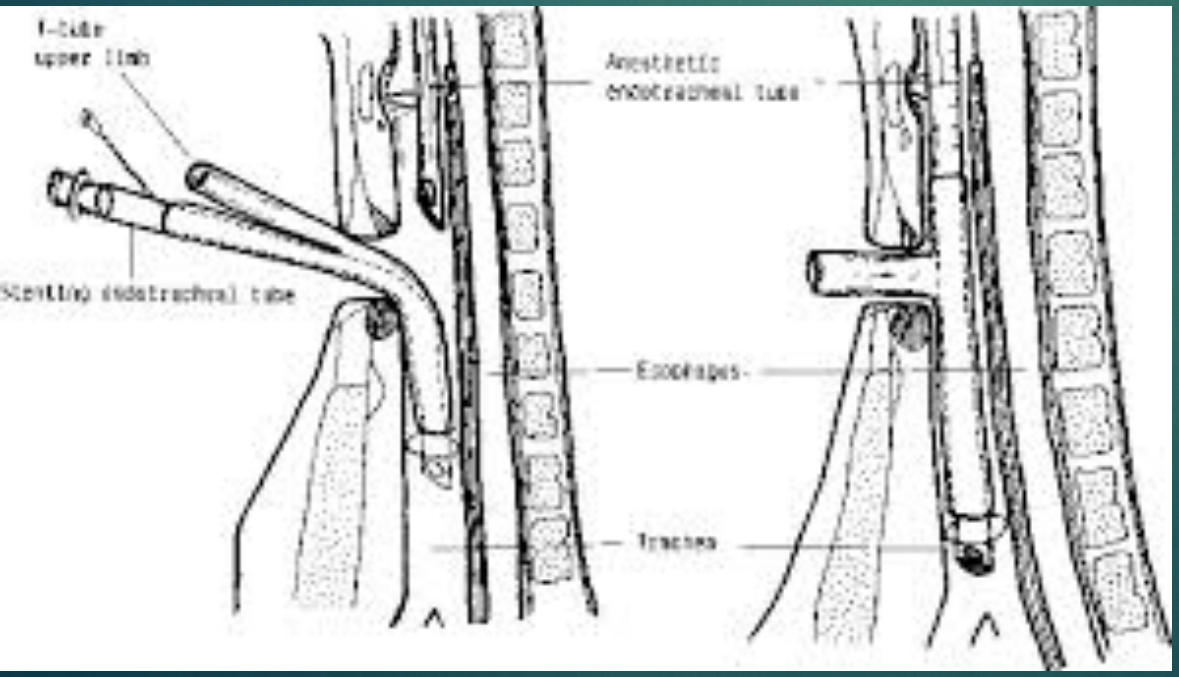
- Rigid construction
  - ? erosion issues ?
- Double lumen
- Permanent
- Often lower profile
- May have 15 mm adapter
- Used to have cuffs

OMG The Patient Needs to be Bagged and there is no 15 mm adapter on the metal trach

Grab an Endotracheal Tracheal Tube steal the adapter

I Really Need a Cuffed Airway Now and the guy has a Laryngectomy


Courtesy of Aaron Widowskey, DVM


T-tube
upper limb
Stenting endotracheal tube
Anesthetic
endotracheal tube
Esophagus
Trachea

Plastic Tube Characteristics

- Polyvinyl chloride
  - Thermolabile
    - Softens at body temperature
  - Available in innumerable configurations
  - Different hardness available

Plastic Tube Characteristics

- Silicone
  - Naturally soft and unaffected by temperature
  - Less options available

Tracheostomy Tube Dimensions

- Inner diameter
  - ID
- Outer diameter
  - OD
- Length
- Curvature

Tracheostomy Tube Dimensions

- Jackson Size
  - Metal tubes
  - Shiley tubes
- Refer to the length and taper of the outer diameter.
  - Gradual taper from the proximal to the distal end.

OD

- It's all about the OD
- What fits will be determined by the OD

Tracheostomy Tube Dimensions

- International Standards Organization
  - Use the inner diameter of the tube at its narrowest point as the tube size identifier.
    - In a dual lumen tube, if the inner cannula is necessary for connection to the ventilator, that identifier is used.

I.D. and O.D. Considerations

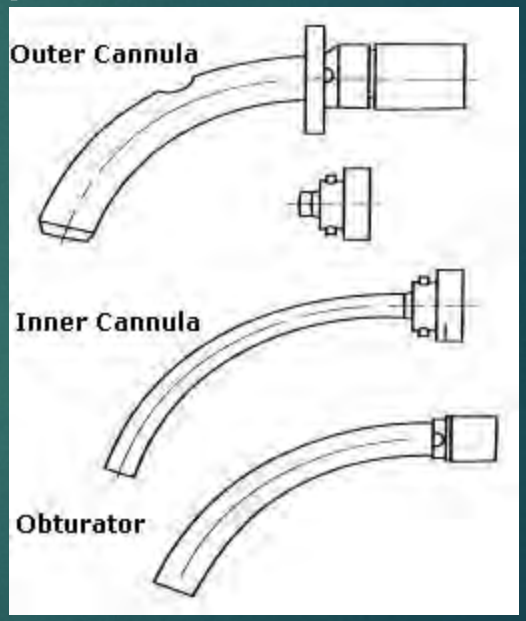
- ID too small
  - Increase airway resistance
  - Make suctioning more difficult
  - Increased pressure to seal the trache
- OD too large
  - Affect the ability to use the upper airway with cuff deflation
  - Difficult to pass through the stoma

I.D. and O.D. Considerations

- 10-mm OD is usually appropriate for adult women for an initial tube size.
- 11-mm OD is usually appropriate for adult men for an initial tube size .
- Tube length is different between manufacturers
  - Custom and extra proximal length tubes are available from the manufactures
  - Adjustable length tubes

Shape of the Tube

- Angled *or* Curved
- Curved
  - More common
  - Less physiologic
  - Fits a wider range of patients (?)
  - Easier to suction
    - Position (tube tip) considerations



Shape of the Tube

- Angled *or* Curved
- Angled
  - More physiologic shape
  - Fits considerations
  - More difficult to suction
    - Position (tube tip) considerations

Tracheostomy Tube Cuffs

- Cuffed

- Un-Cuffed

Tracheostomy Tube Cuffs

- Cuff Advantages
  - Allow for *(easier)* positive pressure ventilation
  - ? Some protection from aspiration ?
- Cuff Challenges
  - Tracheal wall damage *(mucosal damage)*
  - Occupies a larger percentage of the airway
  - Pressure monitoring is mandatory

If you Don't Use a Cuff Pressure Monitor

- You are incompetent

Tracheostomy Cuffs Types

High Volume ----- Foam ----- Tight to Shaft

Advantages & Challenges to different Styles

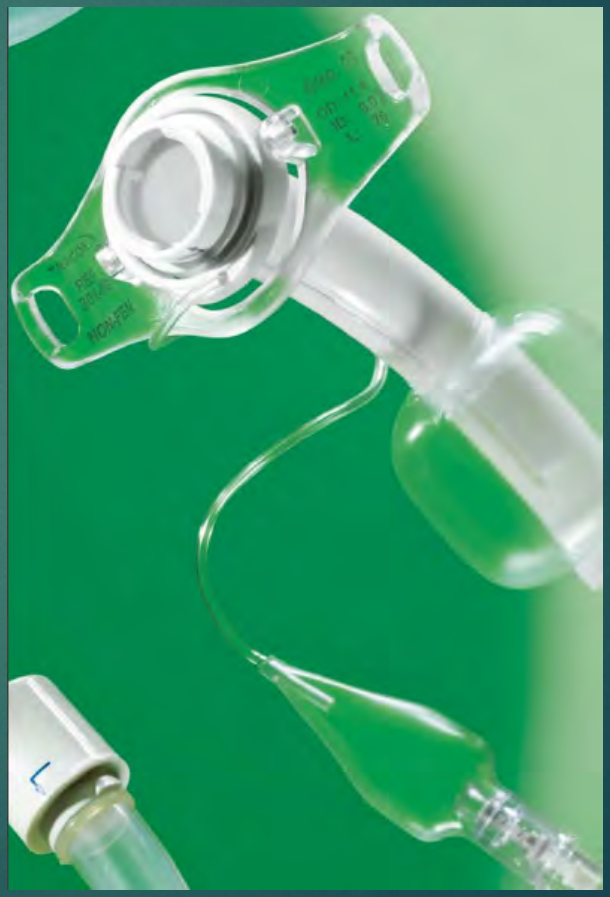
Tracheostomy Tube Cuffs

- Cuff-less Advantages
  - Lower profile
  - Occupies less of the airway
  - Simpler
  - Less potential impact on swallow
- Cuff-less Challenges
  - Tracheal wall damage is still possible *(tip damage)*
  - May lack a 15mm adaptor
  - Difficult positive pressure ventilation

Single Cannula / Dual Cannula

- Single Lumen
- Dual Lumen

Different Manufactures



Different Manufactures

- Smith's Medical
  - Bivonia
  - Portex
- Trachoe
- Shiley
- Cook
- Pulmodyne

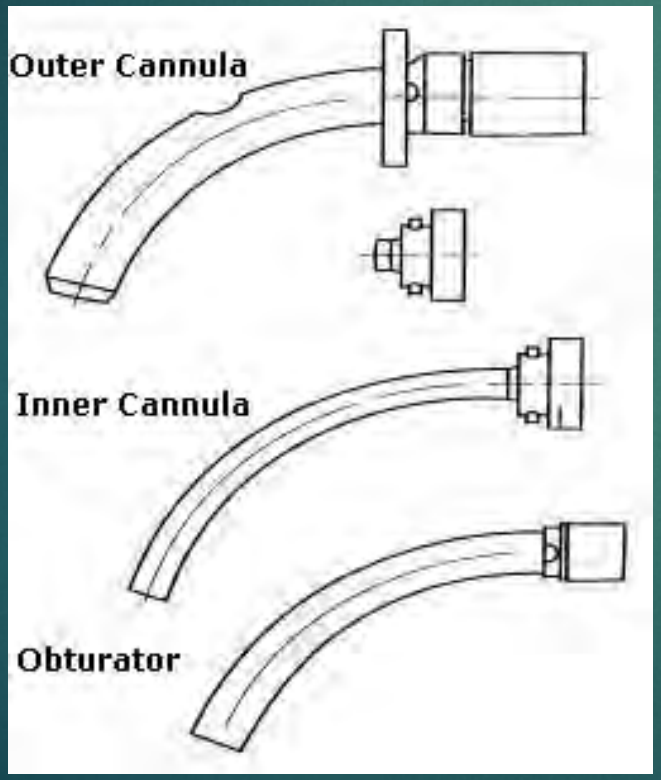
Single Cannula / Dual Cannula

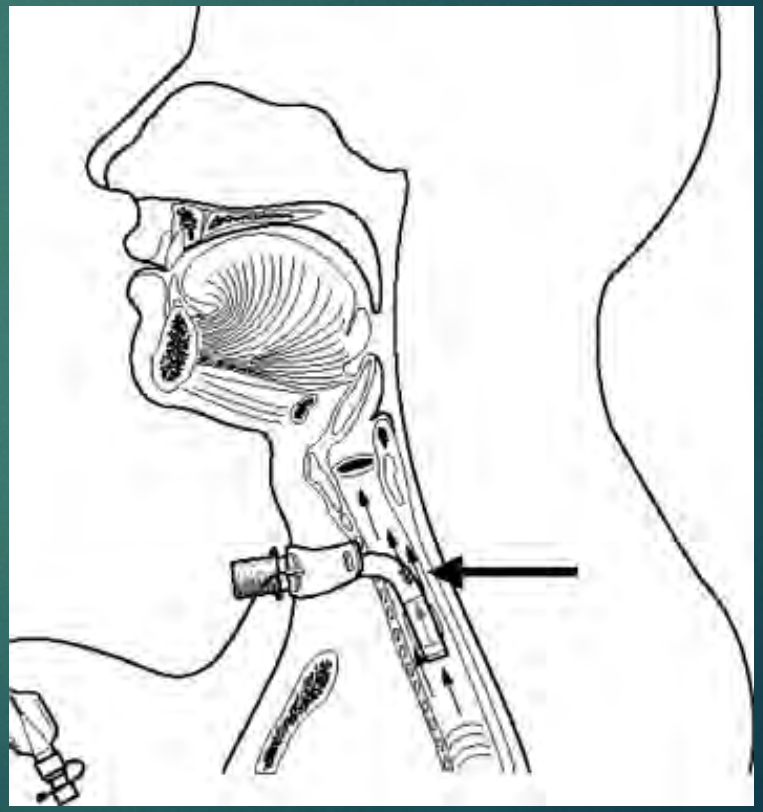
- Double Lumen Advantages
  - Rapid relief of Occlusion
  - Opportunity for cleaning
  - Opening and closing of fenestration
  - Often built in options
- Double Lumen Challenges
  - More complex *(locking mechanisms & parts)*
  - *Decreased ID*
  - *15mm connector on inner cannula*
  - *Inner cannula are NOT inter-changeable and universally designed.*

Single Cannula / Dual Cannula

- Single Lumen Advantages
  - Simpler
  - Increased ID & decreased WOB
  - 15mm adaptor always present *(if available)*
- Single Lumen Challenges
  - Obstruction
  - ? Kinking ?
- *Discuss inner Cannula options*

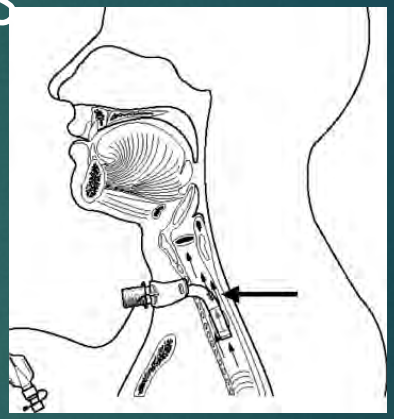
Fenestrated Tracheostomy Tubes





Fenestrated Tracheostomy Tubes

- Fenestration Advantages
  - Decreased WOB
- Fenestration Challenges
  - Poor fit
  - Granulation tissue
  - Suctioning
  - Complexity

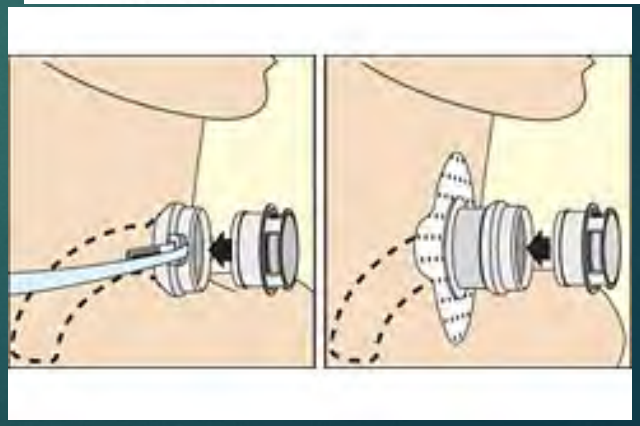


Specialty & Sized Trache Tubes

- Available from most manufacturers
  - Length
    - Thick necks
  - Configurations
  - Adjustable Length e.g. *Bivona*
    - Adjustable Neck Flange Hyperflex Tracheostomy Tubes

Atos Medical, *The Provox System*

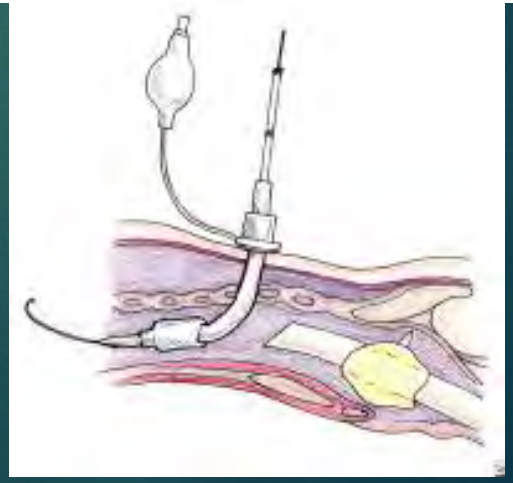
- Laryngectomy tube
  - Silicone
  - Single lumen
  - Un-cuffed
  - Low profile
- Integrated System
  - Filtered HME
  - Aternate securing methods
  - Fingerless occlusion



Humidity

Percutaneous Tracheostomy

- New technique & technology
  - Cricoid space
  - Small incision
  - Needle, Guide wire
  - Dilator
  - Tube
- Many advantages
- Some challenges

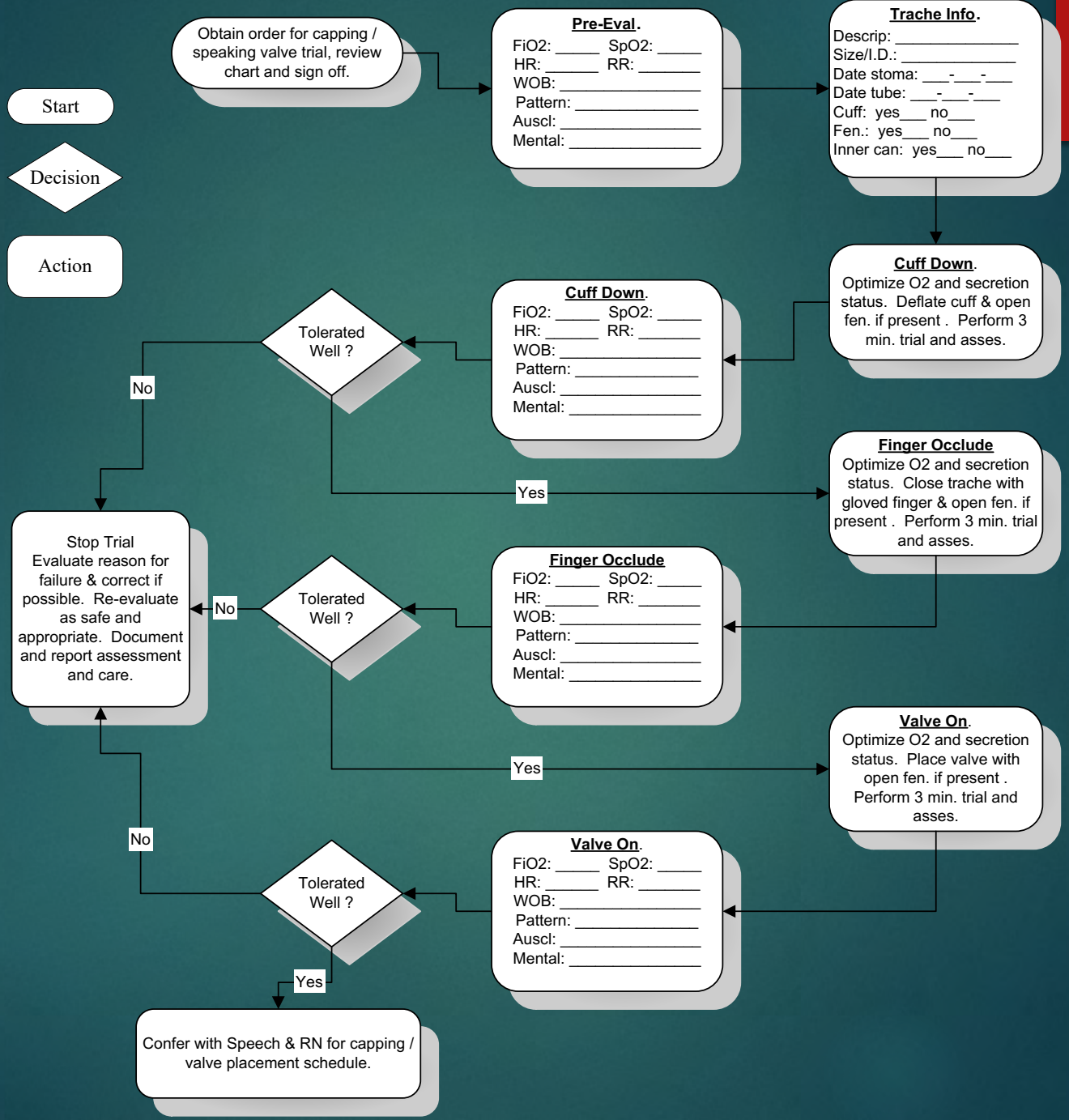


Liberation *(weaning)* from Tracheotomy

- Cautious Sequential Approach
  - Simple finger occlusion
  - One way speaking valve
  - Trache cap
- Rapid Sequence Approach
  - Cap and Assess
- The key is the assessment of the work of breathing.
- The larger the tube the less WOB but more difficult liberation.

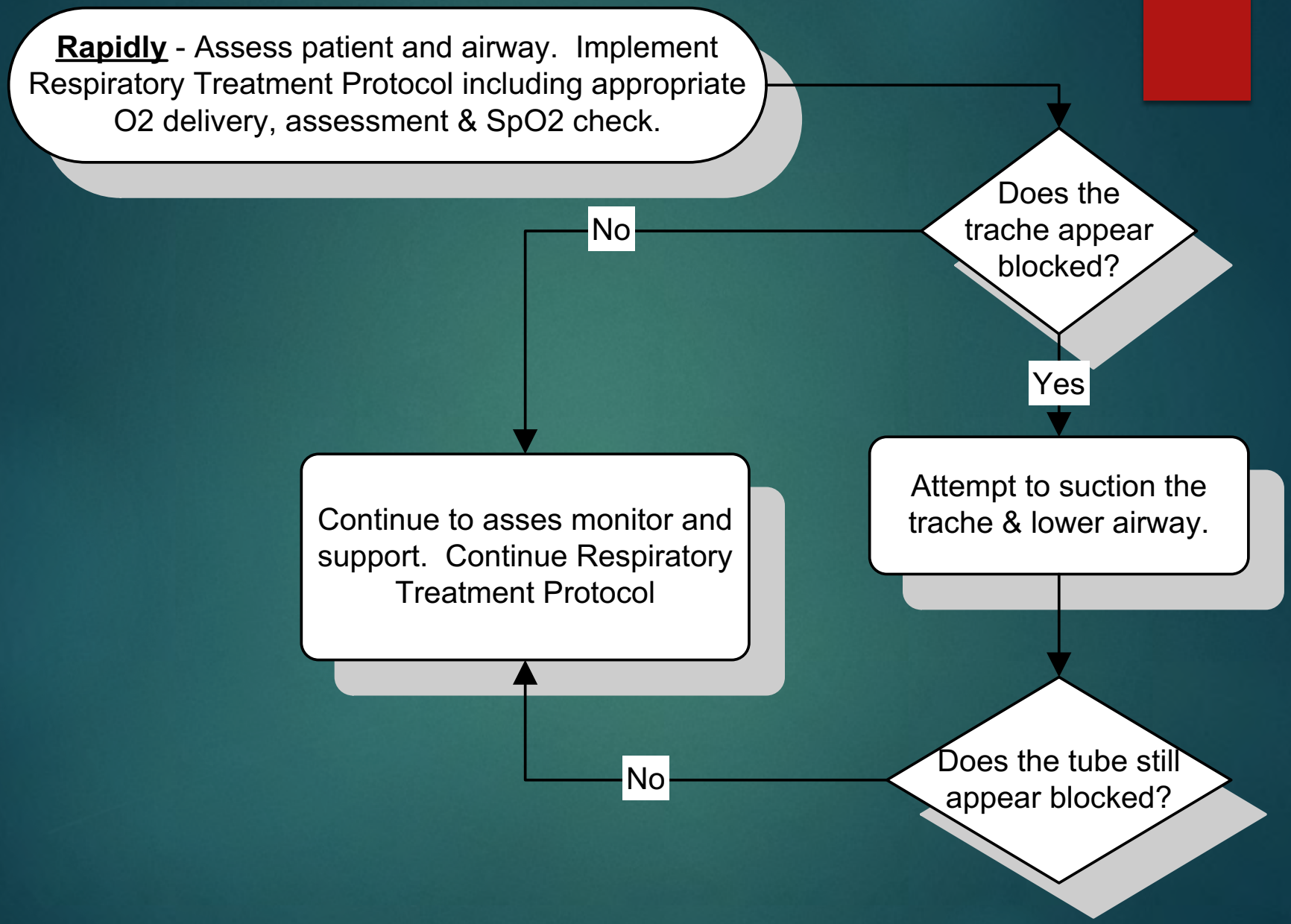
One-Way Trache Speaking Valves

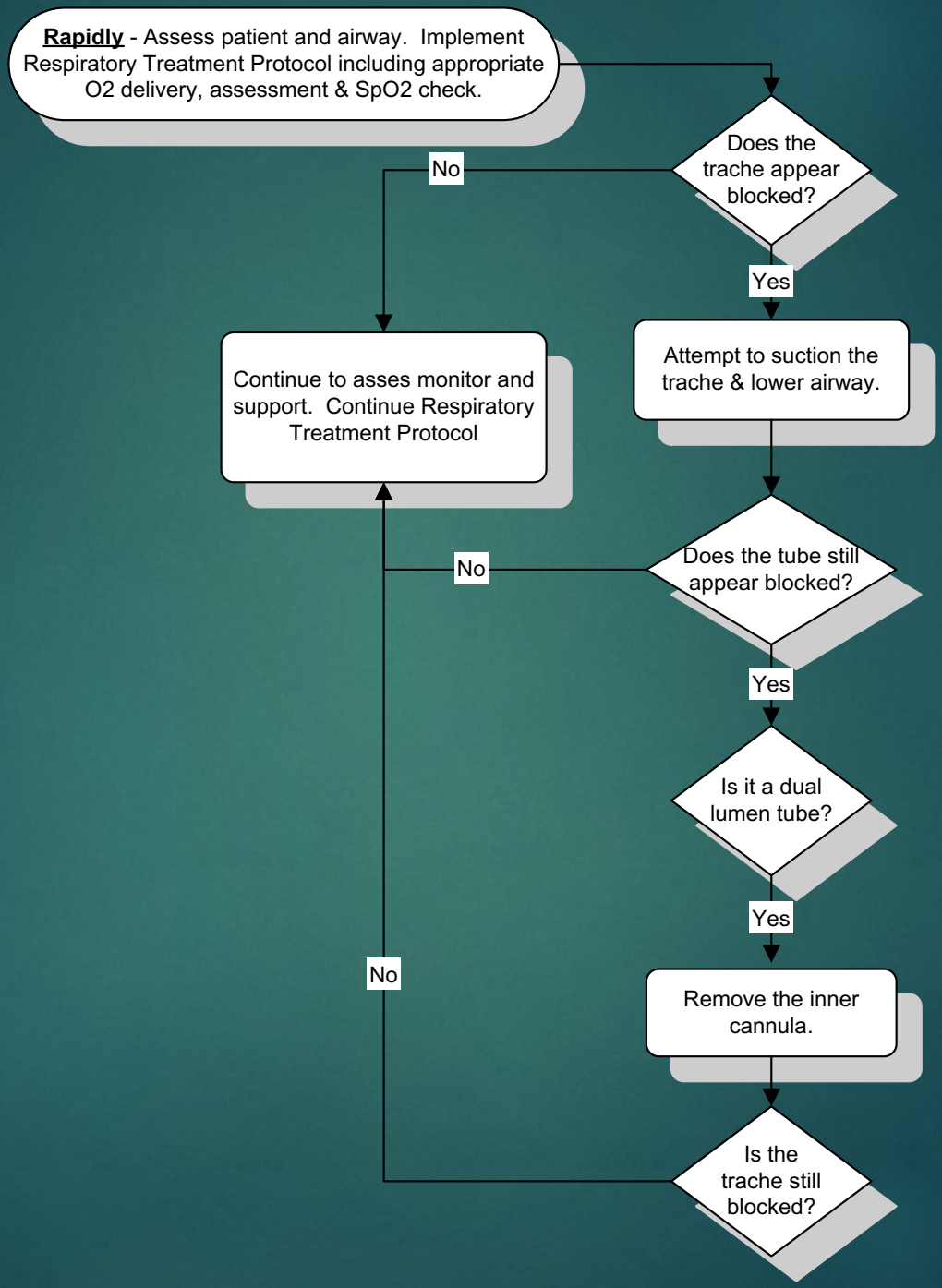
- Restore the closed airway.
- Improve speech production without finger occlusion.
- Expedite decannulation.
- Facilitate the return of the patient's normal ability to swallow, maintain their own secretions and protect their own airway.


Start
Decision
Action
Obtain order for capping / speaking valve trial, review chart and sign off.
Pre-Eval.
FiO2: _____ SpO2: _____
HR: _____ RR: _____
WOB: _____
Pattern: _____
Auscl: _____
Mental: _____
Trache Info.
Descrip: _____
Size/I.D.: _____
Date stoma: ___-___-___
Date tube: ___-___-___
Cuff: yes___ no___
Fen.: yes___ no___
Inner can: yes___ no___
Cuff Down.
Optimize O2 and secretion status. Deflate cuff & open fen. if present . Perform 3 min. trial and asses.
Cuff Down.
FiO2: _____ SpO2: _____
HR: _____ RR: _____
WOB: _____
Pattern: _____
Auscl: _____
Mental: _____
Tolerated Well ?
No
Yes
Finger Occlude
Optimize O2 and secretion status. Close trache with gloved finger & open fen. if present . Perform 3 min. trial and asses.
Finger Occlude
FiO2: _____ SpO2: _____
HR: _____ RR: _____
WOB: _____
Pattern: _____
Auscl: _____
Mental: _____
Tolerated Well ?
No
Yes
Stop Trial
Evaluate reason for failure & correct if possible. Re-evaluate as safe and appropriate. Document and report assessment and care.
Valve On.
Optimize O2 and secretion status. Place valve with open fen. if present . Perform 3 min. trial and asses.
Valve On.
FiO2: _____ SpO2: _____
HR: _____ RR: _____
WOB: _____
Pattern: _____
Auscl: _____
Mental: _____
Tolerated Well ?
No
Yes
Confer with Speech & RN for capping / valve placement schedule.

Dealing with Tracheotomy Emergencies

- Sequential non-surgical approach.
- Acute response team
  - Use resources available
- Careful assessment
- Most often, an alternative airway is available.
- Immediately contact the physician.


Rapidly - Assess patient and airway. Implement Respiratory Treatment Protocol including appropriate O2 delivery, assessment & SpO2 check.
Does the trache appear blocked?
No
Yes
Attempt to suction the trache & lower airway.
Continue to asses monitor and support. Continue Respiratory Treatment Protocol
Does the tube still appear blocked?
No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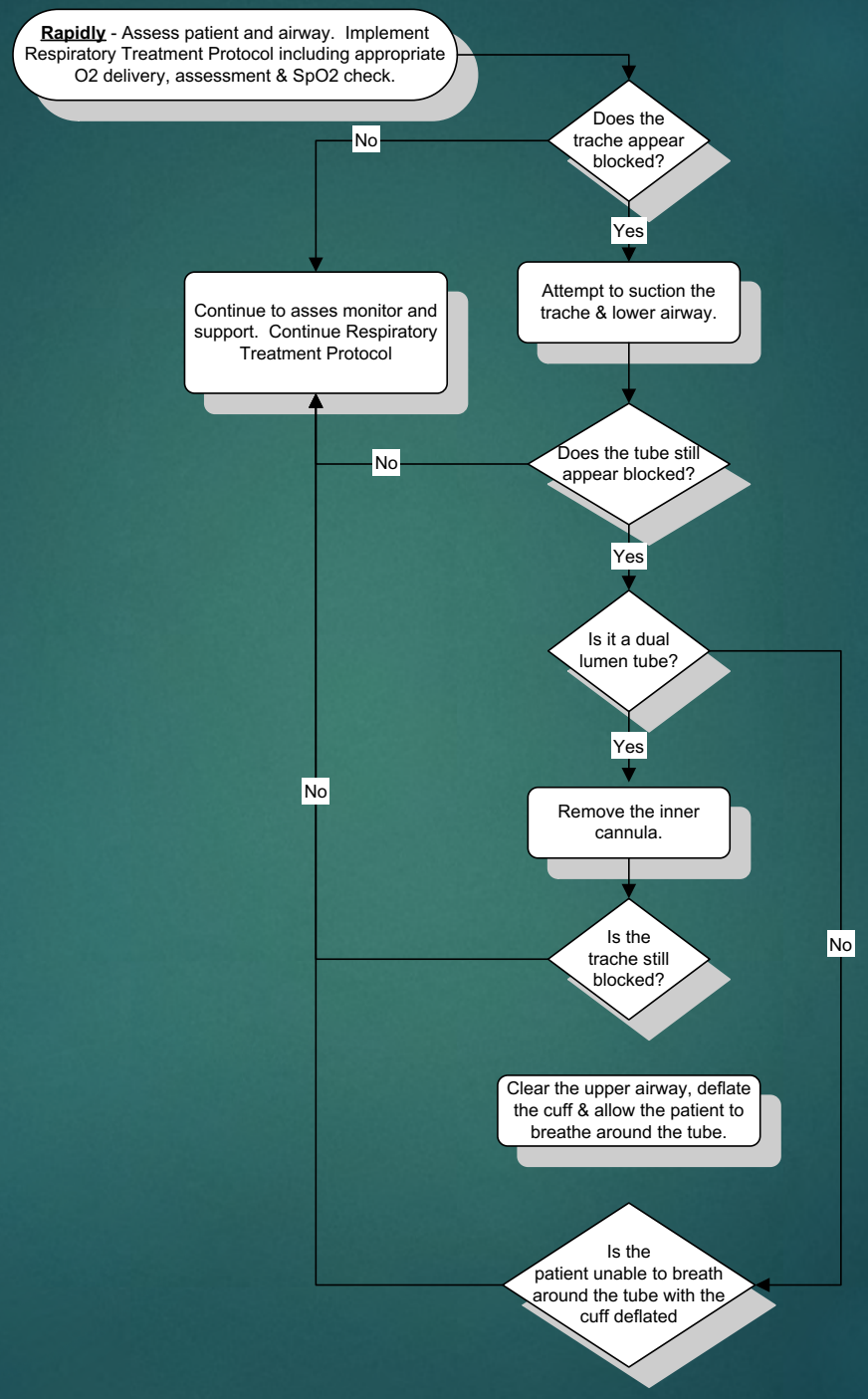
Continue to asses monitor and support. Continue Respiratory Treatment Protocol
Attempt to suction the trache & lower airway.
Does the tube still appear blocked?
No
Yes
Is it a dual lumen tube?
Yes
No
Remove the inner cannula.
Is the trache still blocked?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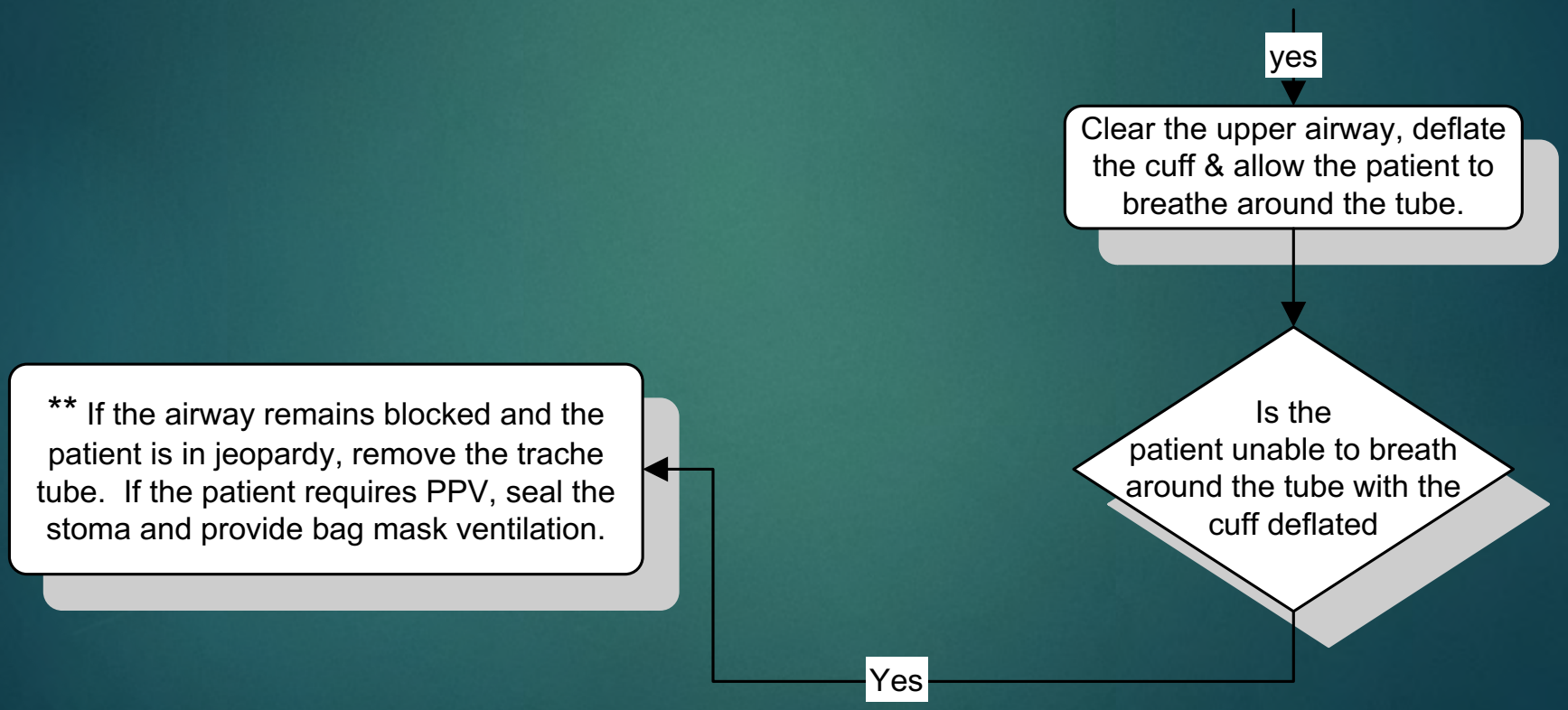
Attempt to suction the trache & lower airway.
Does the tube still appear blocked?
No
Yes
Is it a dual lumen tube?
Yes
No
Remove the inner cannula.
Is the trache still blocked?
No
Clear the upper airway, deflate the cuff & allow the patient to breathe around the tube.
Is the patient unable to breath around the tube with the cuff deflated

Only then ……


yes
Clear the upper airway, deflate the cuff & allow the patient to breathe around the tube.
Is the patient unable to breath around the tube with the cuff deflated
Yes
** If the airway remains blocked and the patient is in jeopardy, remove the trache tube. If the patient requires PPV, seal the stoma and provide bag mask ventilation.

But .....

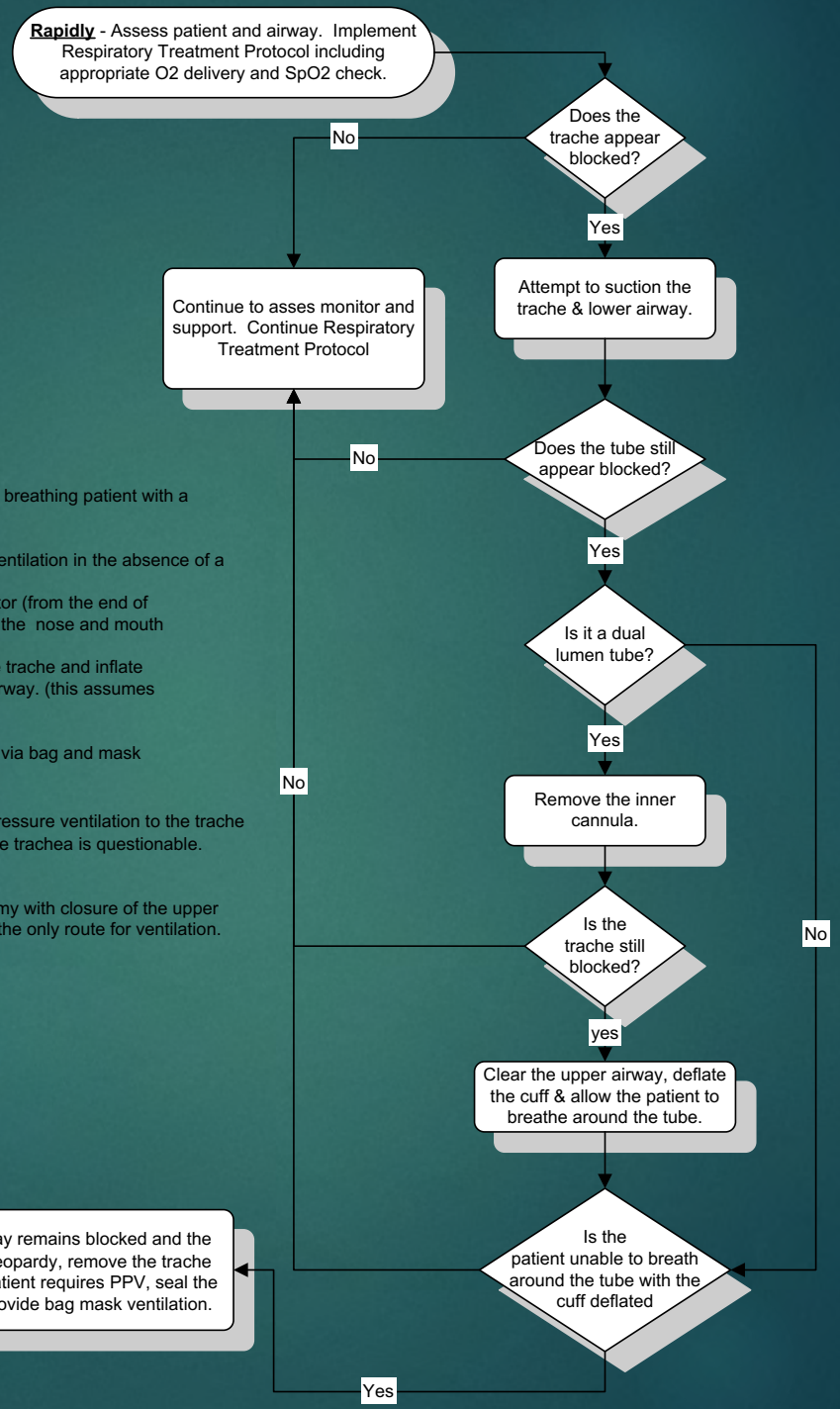
This algorithm assumes a spontaneously breathing patient with a tracheotomy tube.

If the patient requires positive pressure ventilation in the absence of a cuffed trache with a 15mm adaptor:

1. place tapered endotracheal tube adaptor (from the end of an endo tube) into the trache and seal the nose and mouth
   -OR.
2. place an entotracheal tube through the trache and inflate the cuff past the tube in the patients airway. (this assumes a fairly large trache tube.
   - OR
3. seal the trache and provide ventilation via bag and mask ventilation.

** DO NOT attempt to provide positive pressure ventilation to the trache tube if correct placement of the tube in the trachea is questionable.

* If the patient has had a total laryngectomy with closure of the upper airway, the permanent tracheal stoma is the only route for ventilation.



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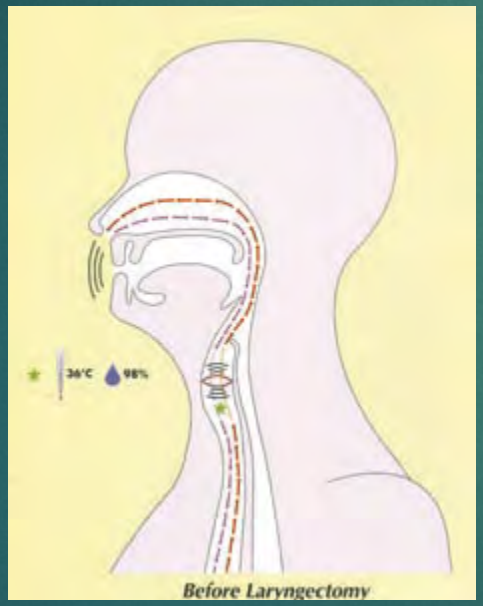
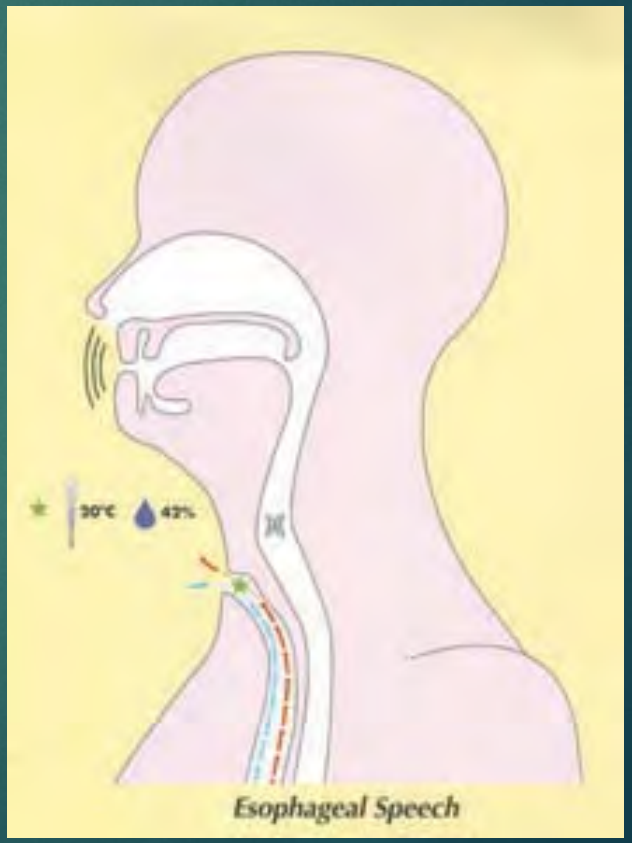
Start

Decision

Action

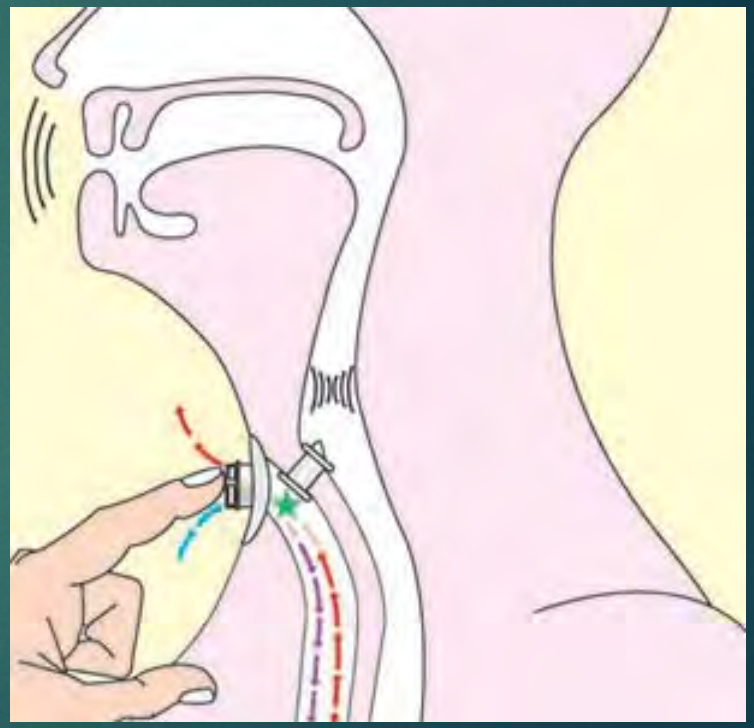
The Provox Voice Prosthesis





The Provox Voice Prosthesis,

New Options for Laryngectomy Patients



Other similar devices are also available.

Just an Introduction -

Always something new to learn