Current Trends in Multidisciplinary Care of Patients with Tracheostomy

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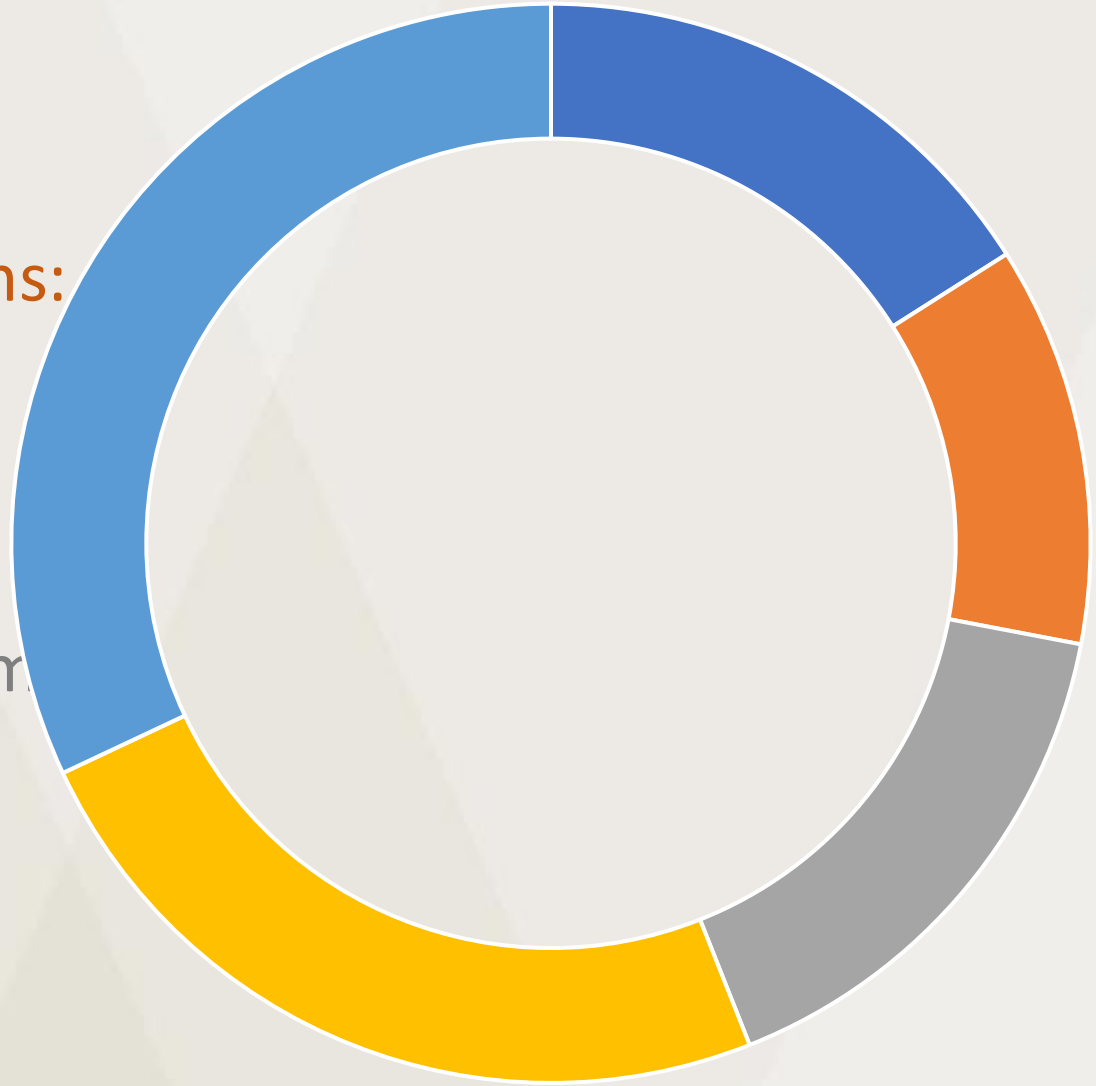
PRESENTATION OUTLINE

- Tracheostomy Foundations:
  Surgical Perspective
- Multidisciplinary Tracheostomy Teams:
  - What they are & How they work
- MDT# 1: Procedures, policies, emergencies, education.
- MDT Issue #2: What we learned from COVID
- MDT Issue #3: The importance of checking cuff pressures



LEARNING OBJECTIVES

- Describe how a multidisciplinary trach team can improve the quality of patient care.
- Describe multiple ways a multiple ways a multidisciplinary trach team can cut costs to a hospital.
- List steps for checking trach cuff pressure.

DISCLOSURES

Financial:

Meredith Oakey Ashford and Nina Collins are employees of Vanderbilt University Medical Center which pays her a salary.

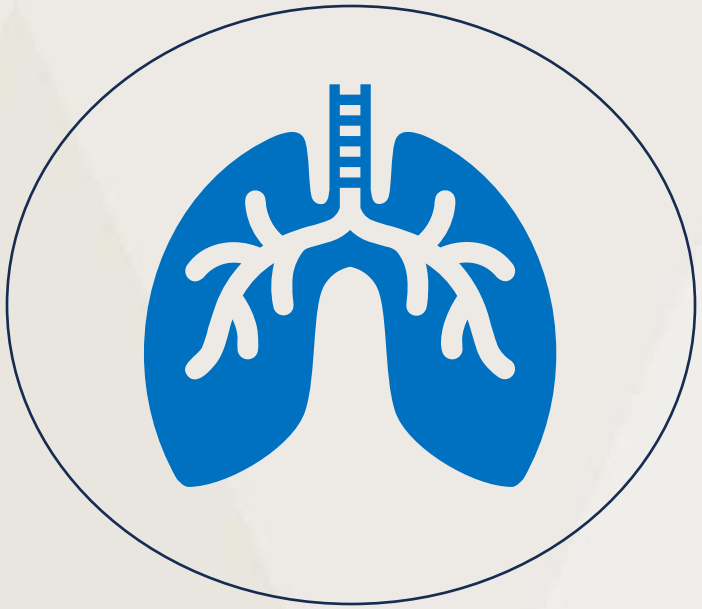
Non-Financial:

Meredith Oakey Ashford and Nina Collins are members of Vanderbilt Adult Hospital's multidisciplinary tracheostomy team.

Tracheostomy is one of the most frequent procedures performed in the Intensive Care Unit[1]

WHY? Common Indications for Tracheostomy[2]

- Respiratory failure with prolonged mechanical ventilation**
- Need for long term ventilation
- Inability to protect airway
  - Altered mental status
  - Weak “cough and clear”
- Upper airway obstructions
- Trauma[2]



Benefits of a Tracheostomy

- Minimizing sedation
- Improving comfort
- Improving communication
- Assisting with clearing of secretions
- Improved mobility
- More aggressive ventilator weaning
- Decreased ICU length of stay[3,4]

Who?

- Intubated for 7 or more days
- 1 or more failed extubation attempts
- INR <2.0
- FIO2 <60%, PEEP 10 or less
  - COVID-19: >21 days from + test, FIO2 <80%, PEEP 12 or less
- Conventional ventilation modes
- Use caution with prior radiation
- Use caution with exchanges for BMI >60

When? Early Tracheostomy

- Many studies show that early tracheostomy (ventilator day #7) is associated with:
  - Fewer ventilator days
  - Fewer ICU days[5]

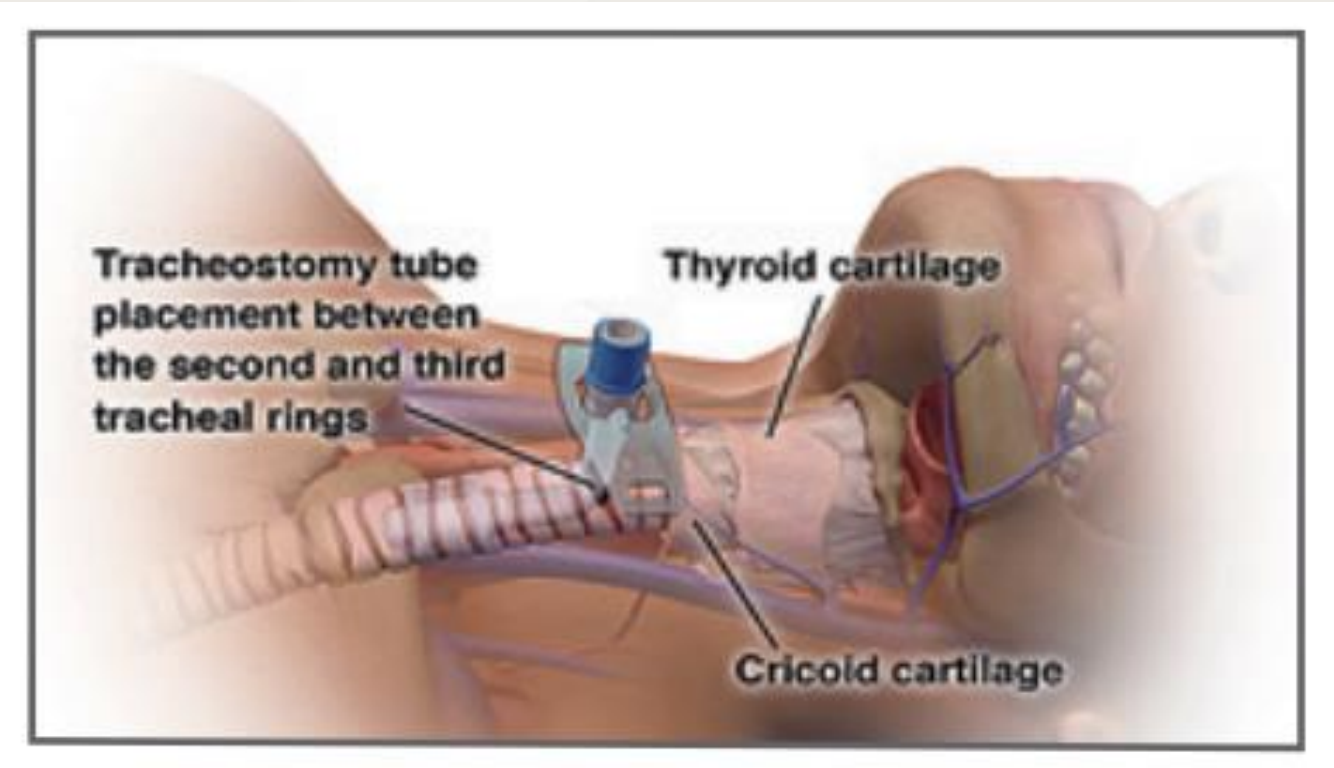
When to pump the brakes

- Limited life expectancy
- Need for goals of care conversations
- Hemodynamically unstable
- Out-of-range vent settings
- BMI >60
- Prior history of radiation or surgery to neck
- Anterior cervical fusion within 7 days

- Coagulopathy
  - INR >2
  - Platelet count less than 50 (x10(3)/mcl)
    - 20-50- need platelets transfusing during actual procedure
    - Hold for platelet counts less than 20
- Therapeutic blood thinners that have not been held appropriately

How? Percutaneous Dilational Approach (PDT)

- First described in 1955
- Further refined in 1985 (Ciaglia approach)
- Paved the way for bedside percutaneous tracheostomies
- Improved cost efficacy
- Minimized transport of critically ill patients to the operating room (OR)
- Improved patient safety[6]



How? Percutaneous Tracheostomy

- Introduction of a series of increasingly large dilators into the trachea until a stoma is created
- Can be performed at the bedside in the ICU
- Vast majority of tracheostomy procedures performed by Trauma/Burn/Emergency General Surgery and Cardiothoracic Surgery
- 3.5% complication rate in immediate post-surgical period[15]

How? Open Tracheostomy

- Traditional open stoma approach
- Performed in the operating room
- Surgical approach typically used by ENT
- **Pros:** appropriate for high risk patients
  - Prior tracheal surgeries
  - Head and neck cancers – prior surgeries or radiation
  - Obesity
- **Cons**: more costly, transporting to OR

How? Cricothyroidotomy

- Placement of a breathing tube (usually an ETT) into an incision through the cricothyroid membrane
- Indication: “can’t intubate or can’t oxygenate”
  - Establishment of an emergency airway
    - Trauma/facial fractures, airway edema or trauma, high volume vomitus or bleeding, trismus, obstruction (i.e. tumors), foreign bodies
  - can be performed pre-hospital (i.e. air ambulance)
  - Later formalized into a tracheostomy
- Complications: (13%) bleeding, not successful, damage to larynx or trachea[16]

Exchanges – "Downsizing"

- **Need to perform under supervision until develop/demonstrate competence**
- May be performed by RT at some facilities
- Changing to smaller lumen trach
- Cuffed or non-cuffed
- Cuffed exchanges are more technically difficult
- Need to have second licensed person in room (MD, NP, RN)
- Can use obturator or red rubber as guide
- **Beware: bleeding**

Cuffed Exchanges

- After POD #5
- continued mechanical ventilation
- Need to tolerate PS/trach collar for at least 10 min (if possible)
- INR? Platelet Count? Medications?
- Impending procedures?
  - Can use #7.0 or 7.5 cuffed
- Impending bronchoscopies?
  - #8 or #9 preferred, but can ventilate with 7.5- #7.0 cuffed

Non-Cuffed Exchanges

- Off vent for >48 hrs (or longer in some cases)
  - COVID-19 = ~5 days
- Tolerating cuff deflation for >24 hrs
- Only use #7.0 or #7.5 non-cuffed in acute setting
  - #5 or #6 trachs have very narrow lumen, frequent plugging

Exchange Procedure

- Make sure red airway bag is outside door
- Hyper-oxygenate to 100% FIo2
- Tell bedside nurse you're about to do it
- Check that you have a ambu with mask
- Check that suction is working, have Yaunkeur
- Suction patient if needed
- Open trach package (clean procedure), remove inner cannula, lubricate outside of trach and outside of inner cannula
- Place obturator in trach
- Stand on dominant hand side and not in direct line of fire
- Place at 90 degree angle and swing down as insert into lumen
- Should feel a pop-pop when in lumen
- Pull out obturator
    - Hold faceplate stable
    - Insert inner cannula
    - Check ETCO2 to check placement
    - See if can pass suction catheter
    - Turn down FIo2
    - Have RN update size on airway sign at HOB

Am I in the Airway?

- ETCO2 detection
- Able to pass suction catheter
- Equal chest rise
- Bilateral breath sounds
- Return of TV on vent (match of TVi and TVe)

What could go wrong?

- Bleeding
- False passage
- Mal-positioned
- Patient decompensation
- Loss of airway

When is some bleeding too much bleeding?

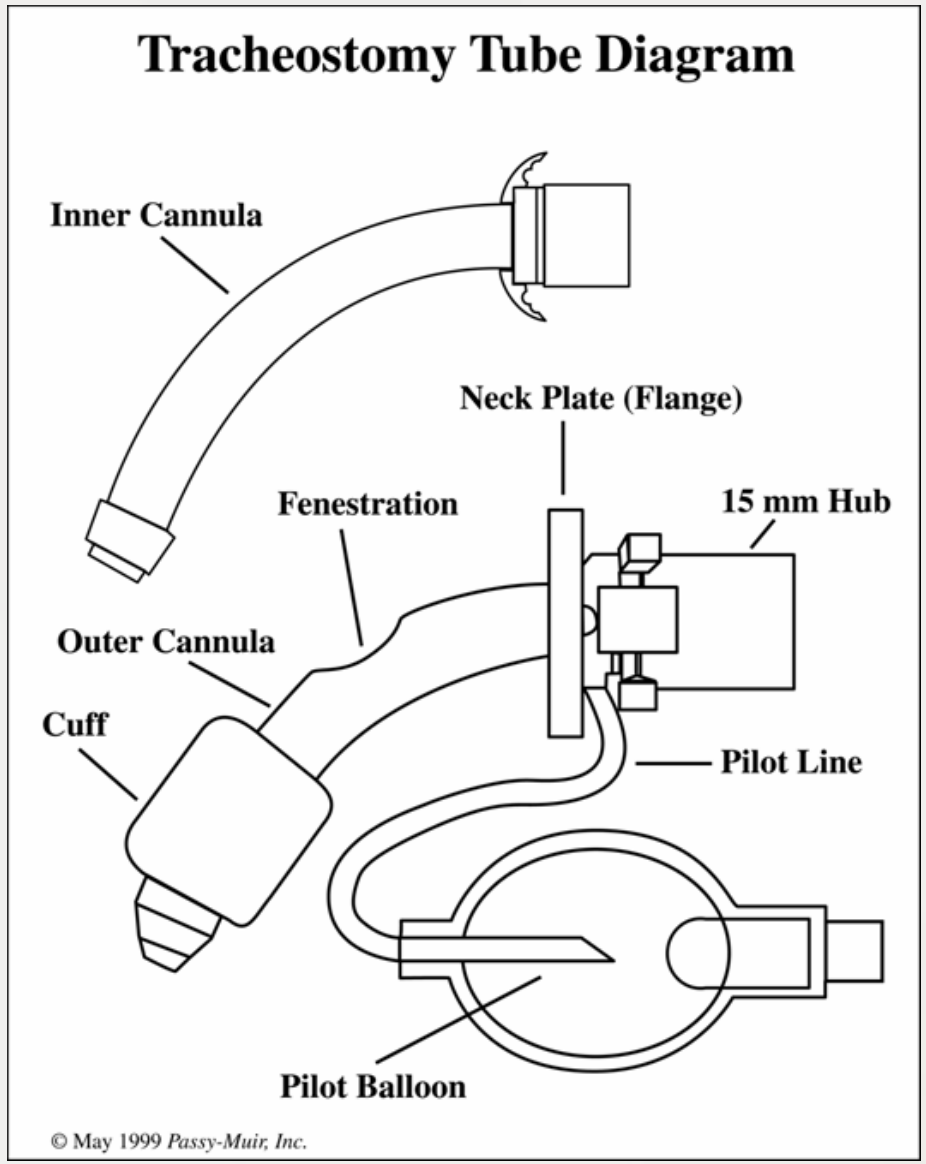
- Drop in SAO2
- Changes in vital signs/hemodynamics
- Drop in HGB/HCT
- Suctioning significant clots/plugs
- Bleeding that is new onset
- Bleeding that is getting worse, not better
- Increase in PIP

Early Complications

- **Bleeding**
- Injury to blood vessels
- Infection
- Injury to the tracheal wall
- Loss of airway
- Pneumothorax
- Impaired communication and swallowing

Late(r) Complications

- Accidental dislodgement
- Tube obstruction
- Tracheal stenosis
- Tracheomalacia
- Granulation tissue
- Fistulas
  - Tracheocutaneous
  - Tracheoesophageal
  - Tracheoinnominate
- Tracheomegaly



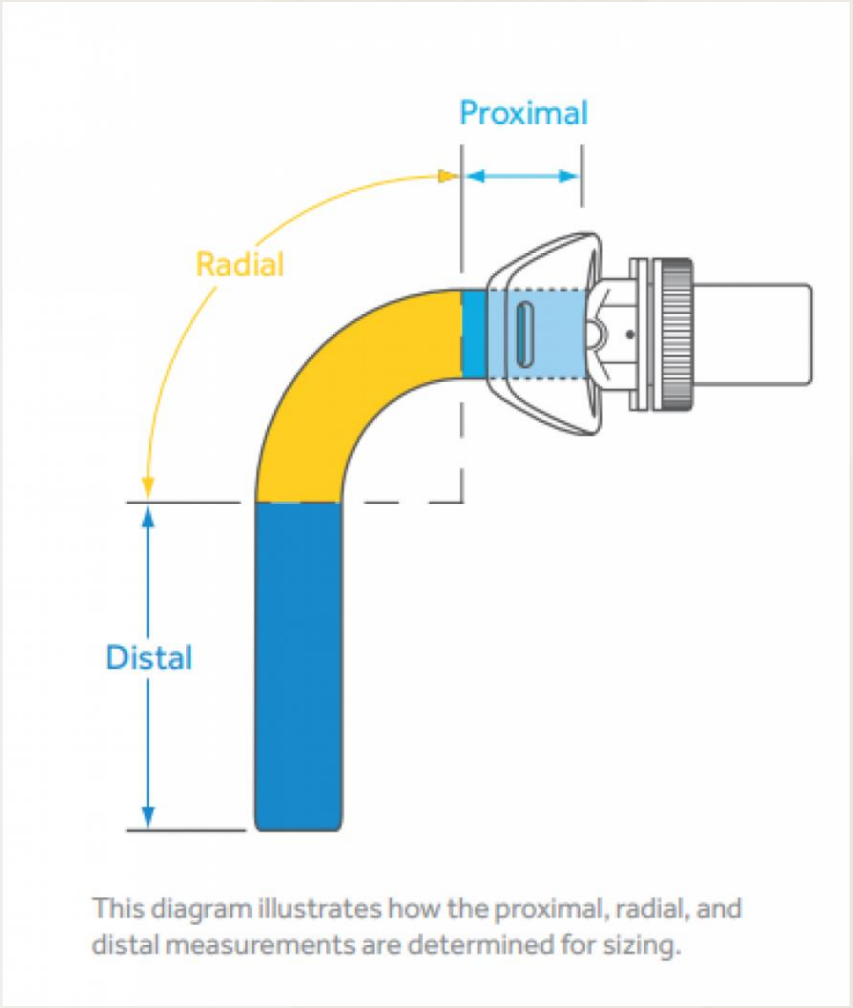
What? Tracheostomy Tube Components

Cuffed vs. Non-Cuffed

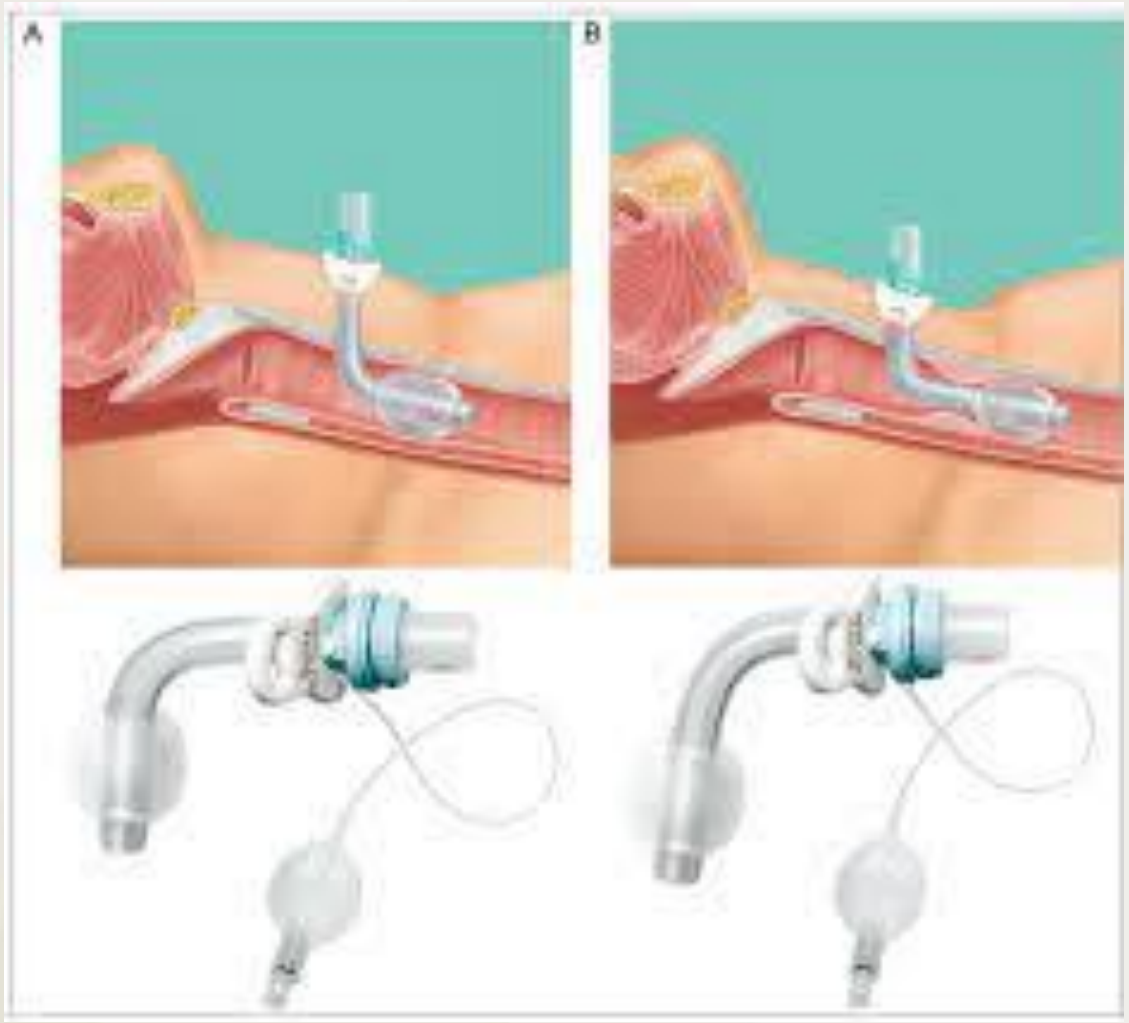
Fenestrated vs. Non-Fenestrated

XLT-Distal vs. XLT-Proximal

XLT-Distal vs. XLT-Proximal



This diagram illustrates how the proximal, radial, and distal measurements are determined for sizing.



Above the Cuff Suctioning & Above the Cuff Phonation

- Cuffed trach tube with an additional tube that connects to an air source. Air travels through this tube and flows out of an opening above level of cuff

- Primarily for **vent dependent** patients with **adequate oral motor** function who **cannot** tolerate cuff deflation

Multidisciplinary Tracheostomy Teams

(MDT)

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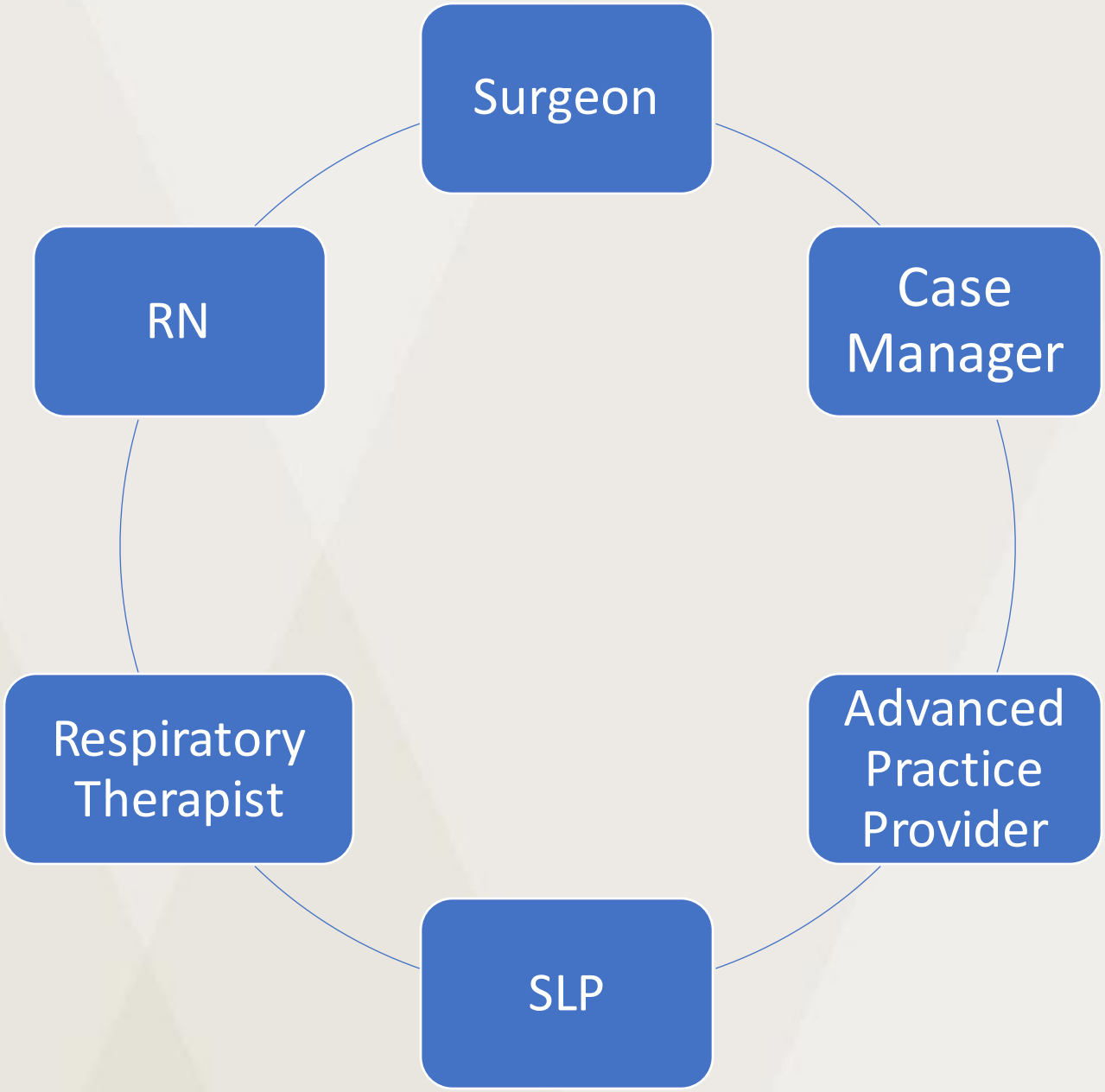
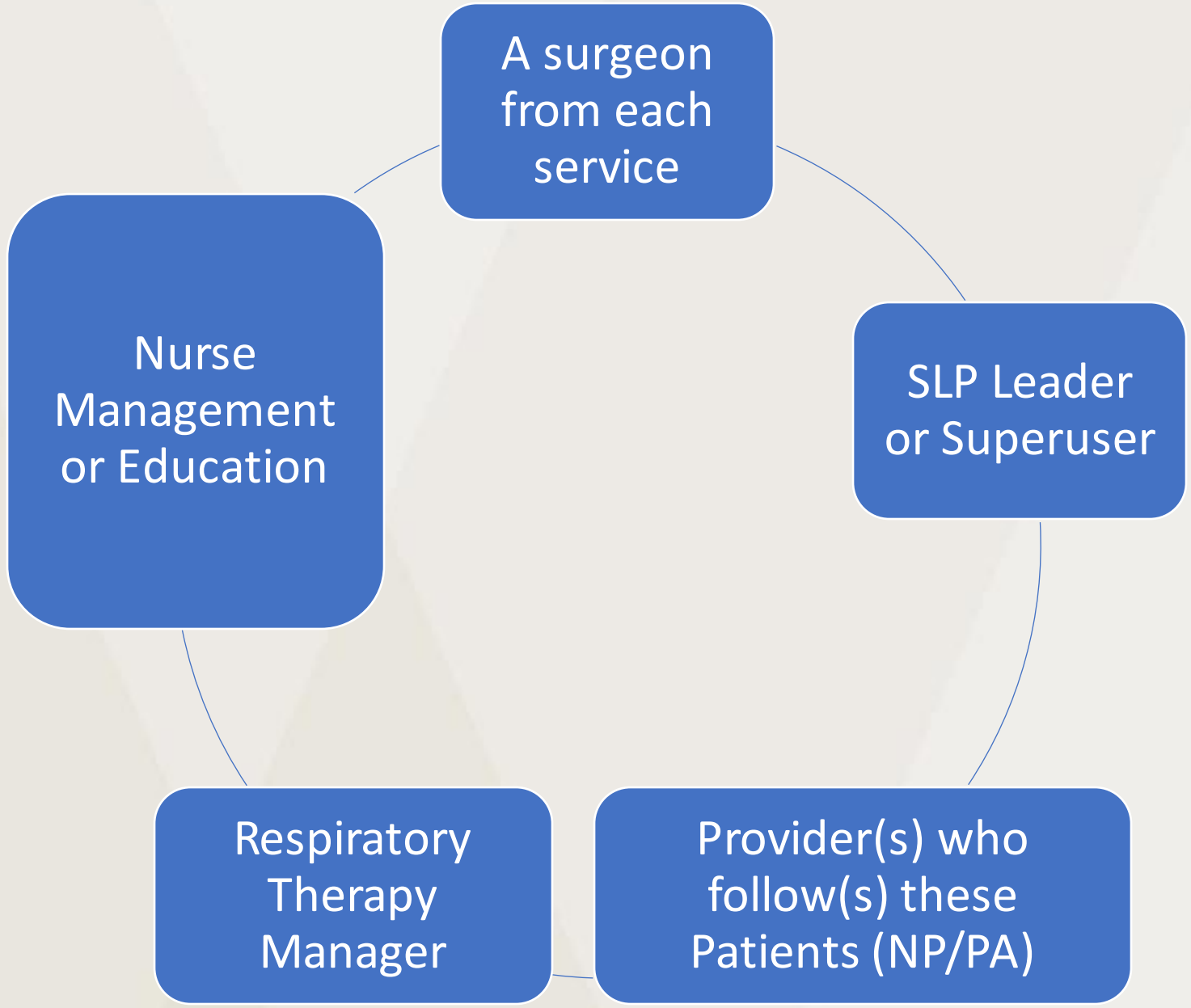
Interprofessional Practice:

Clinical Care Collaboration



Multidisciplinary Team:

Program Development



Goals of Multidisciplinary Teams

Clinical Care Goals

- Improved quality of patient care
- Consistent use evidence-based practice across the team[9]

Program Development Goals

- Strategic management process that develops thinking and learning among team members[7]
- Advancement of research to establish better methods of patient care[8]

- **Quality Care defined:**

  - -provides **patient safety**,
  - -takes into account **patient experiences** and
  - -empowers patients through **offering choices** and better information.[10]


Loss of follow up when trach not placed by ENT
Inconsistent Pt &Family Education
Follow up done by non-surg service-not ideal
How did we get here?
Poor consensus on post-op care
Per Literature: Higher risk when out of ICU
Increased risk of complications

Safety

- Reduced potential for infection
- Decreased complications and adverse events

Patient Comfort

- Improved QOL
- Use of small trach tube sizes
- Standardized Cuff deflation

Coordination with SLP

- Increased use of speaking Valve
- Faster communication and swallowing evaluations
- Restoration of normal respiratory physiology/cough function

Cost savings

- Reduced time to procedure
- Cost savings due to decrease LOS [11]

Trach/PEG Nurse Practitioner

Patient Care Roles

- “Face” of the Trach/PEG team
- Initial consultation and evaluation
- Coordination of the procedure
- Daily management/rounds
- Documentation
- Procedures: downsizing, trach exchanges, decannulations
- Outpatient clinic

Program Development Roles

- Research
- Staff education – nursing staff, house staff, students
- Development of evidence-based protocols/order sets

Speech Language Pathologist

Possible Patient Care Roles: *Your house, your rules.*

- For primary service, receives standard swallowing and speaking valve evaluations orders as part of the tracheostomy pathway when tracheostomy is planned.
- Monitors chart for placement of tracheostomy tube, mental status readiness for assessment, respiratory readiness for speaking valve assessment. Completes assessments when patient is ready.
- Acts as consultant: Offers suggestions to team about other communication options including trach change (downsize vs. cuffless vs. above the cuff phonation)
- Discusses candidacy for communication options while vent dependent via trach.

Speech Language Pathologist

Program Development Roles:

- Nursing education regarding swallowing and communication.
- Advises multidisciplinary team for trends that cross surgical services

Mutlidisciplinary Team Issue # 1: Collaboration on Protocols and Procedures

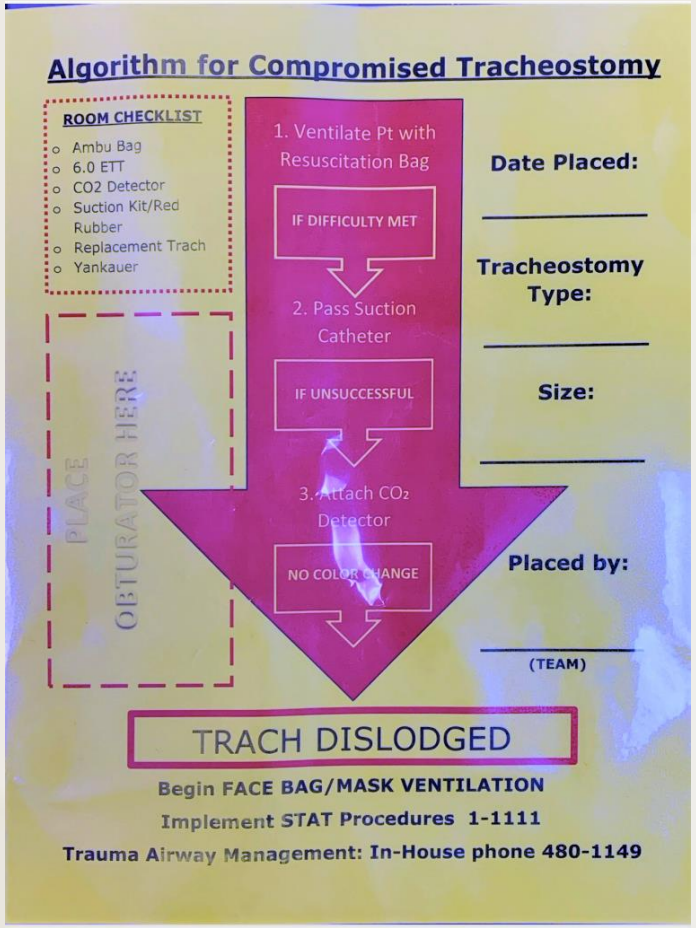
Nursing orders and Education

SLP orders

Emergency airway procedures and supplies

Safety Equipment

- **Surgical Airway Safety Kit**
  - Ambu bag
  - Mask
  - End-tidal CO2 detector
  - Suction kit x 2
  - Airway sign
  - small-bore ETT tubes
- **Working Suction** – at all times with Yaunker
  - Portable suctioning when traveling?
- **Replacement trach tube of same style and size**
- **Pulse oximetry**
- **TRAVELS WITH PATIENT**
- **Extra inner cannulas?**



Safety: Replacement Tubes

- A duplicate sterile trach tube should be on hand at all times
- Taped to the HOB to the wall above the bed.
- same brand and size
- Sent with patient when leaves room for tests /procedures

Safety: Mask

- Mask must stay with Ambu bag
- Travels with patient
- Where can I use this mask?
  - Face for vent weaning trachs
  - Stoma for laryngectomy patients
- Neonatal or infant oxygen mask for patients with Ossoff tube or permanent tracheostoma to be used with the Ambu bag.

Tracheostomies and Vents

- Always use the “arm” to hold vent circuit in neutral position
  - can deviate Trach with weight of the vent circuit
  - Can “tilt” the trach tube within the trachea
  - Can partially or completely dislodge trach tube
- Never tie vent circuit to bedrails- Can dislodge trach!

Multidisciplinary Team Issue #2: How COVID-19 Changed Patient Care

COVID-19

- Recommendations are a moving target
- Timing: currently when cleared from isolation precautions
- Shorter time to tracheostomy associated with decreased duration of mech vent 12
- Goal vent settings:
  - Conventional modes of ventilation
  - Stable on FIO2 of 80% or less, PEEP 12 or less
- Appropriately held anticoagulation
- High risk of adverse events – typically bleeding

COVID-19: Farlow et al.- 4/2021[12]

n=64 (of 146 pts with ETT), 64% male, median age 54, BMI median of 33, SOFA median 9

13% of intubated COVID patients

n=60 at bedside, 20% on VV ECMO

59% DPT, 41% open trach

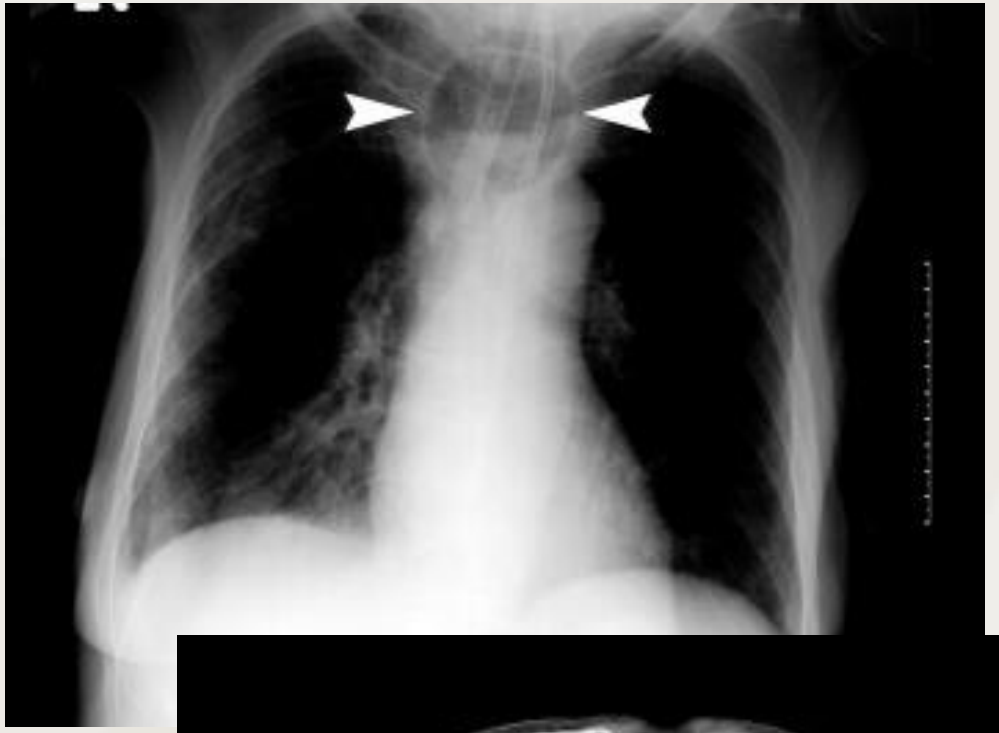
Median time to trach was **22 days**

Earlier trach associated with decreased duration of mech vent (P<0.01)

- 19% of cohort died during study of non-trach related causes
- 45% experienced adverse events
  - Bleeding (33%)
  - Plugging (11%)
  - Accidental decannulation (5%)
  - Desaturation during procedure (3%)
  - False passage (2%)
  - Vocal cord dysfunction (3%)

COVID 19 & Tracheomegaly

- Acquired
- Dilated trachea ≥ 25mm (F) and 27mm (M)[4]
- Frequently in COVID-19
- Likely 2/2 prolonged high PEEP, high PIP leading to high cuff manometry
- Cuff pressures > 25 cm H20
- Peritubal cuff leak despite over-inflation
- c/f TVi/TVe mismatch, Δ MV, hypercarbia, resp acidosis, aspiration
- May require XLT distal trach



Multidisciplinary Team Issue #3: The Problem of Cuff Over Inflation

Provenance and Peer review: Unsolicited contribution; Peer reviewed; Accepted for publication August 2011.

Endotracheal tube cuff pressure monitoring:

a review of the evidence

by Pervez Sultan, Brendan Carvalho, Bernd Oliver Rose and Roman Cregg

- Blood flow compromised at pressures exceeding 30cmH20 and obstructed at pressures exceeding 50cmH20 in normotensive patients
- Cuff overinflation for greater than **15 minutes** appears to be an important determinant of tracheal capillary hypoperfusion in animal models

Complication	Reference
Recurrent laryngeal nerve palsy	(Otani et al 1998, McHardy & Chung 1999)
Mucosal ischemia and loss of ciliary function	(Klainer et al 1975)
Mucosal ulceration	(Combes et al 2001)
Mucosal bleeding	(Berlauk 1986)
Tracheal ulceration/granuloma	(McHardy & Chung 1999)
Tracheal stenosis	(Shelly et al 1969, Nordin 1977, Weber & Grillo 1978, Stauffer et al 1981)
Tracheal rupture	(Harris & Joseph 2000, Hofmann et al 2002, Fan et al 2004)
Non-malignant tracheo-esophageal fistula	(Stauffer et al 1981, Pelc et al 2001, Reed & Mathisen 2003)
Vocal cord paralysis	(Holley & Gildea 1971)
Post-extubation stridor	(Efferen & Elsakr 1998)
Tracheomalacia	(Valentino et al 1999)
Tracheo-carotid artery erosion	(LoCicero 1984)
Laryngeal stenosis	(Evrard et al 1990, Liu et al 1995)
Death	(Fan et al 2004)

Table 1 Complications associated with increased ET tube cuff pressures

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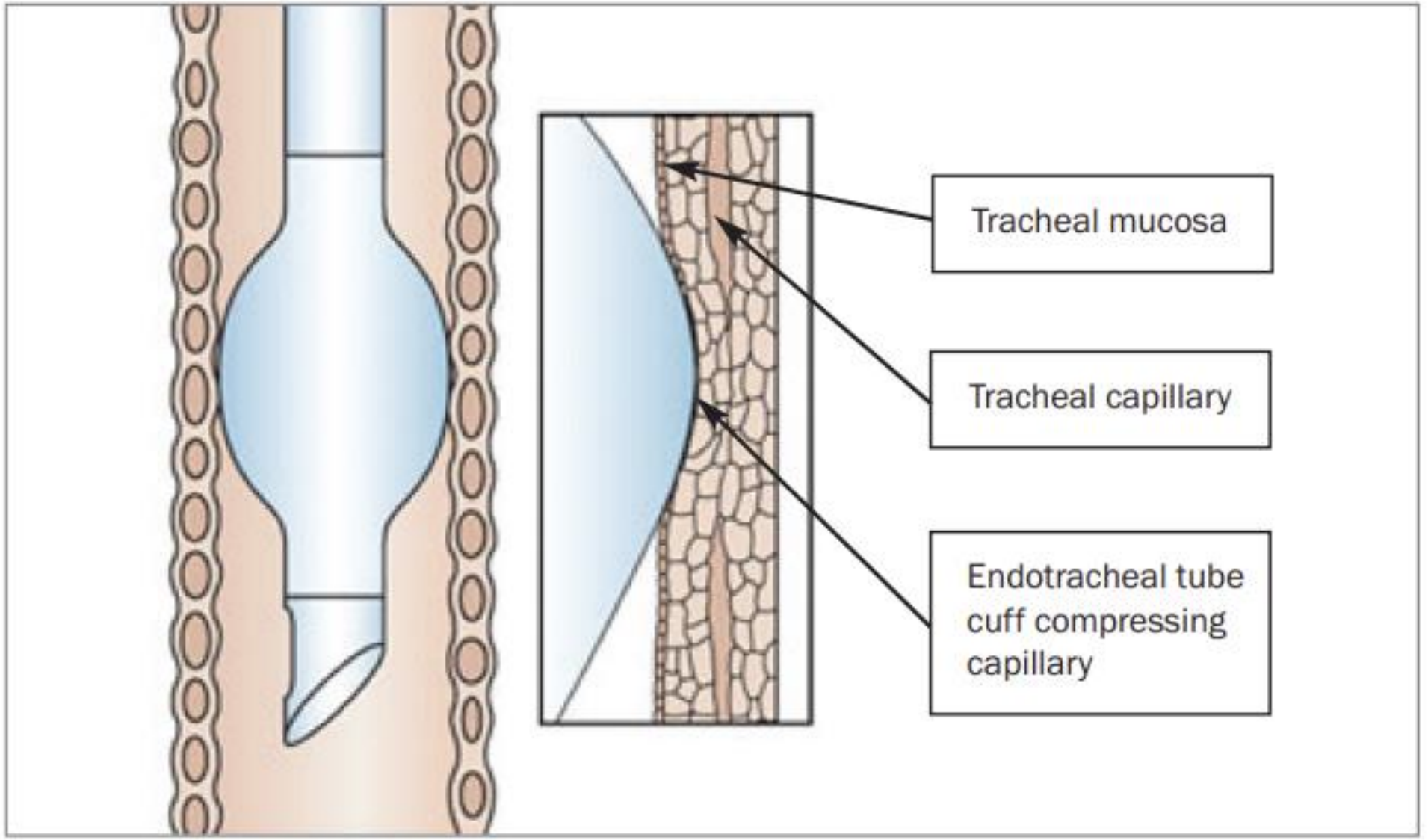


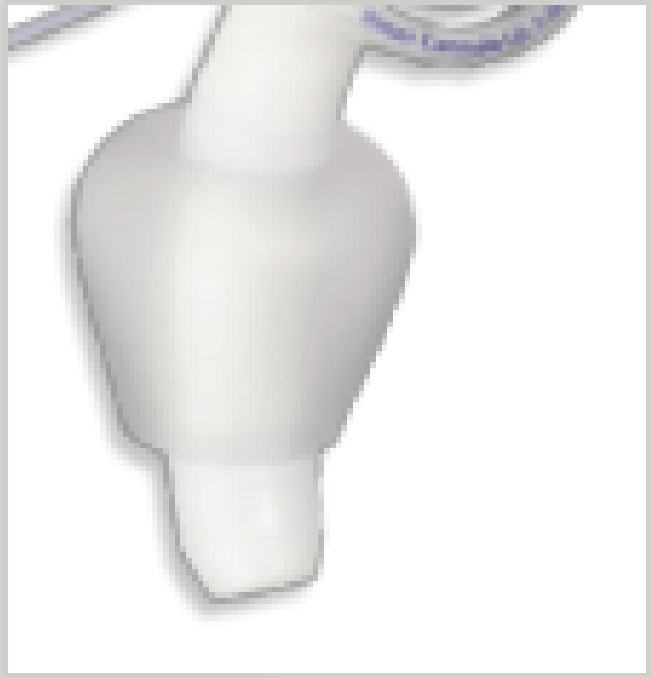
Figure 2 Diagram representing potential mechanism for tracheal mucosal perfusion injury secondary to endotracheal tube cuff overinflation

(Sultan 2011)

Courtesy of Dr. Alex Gelbard

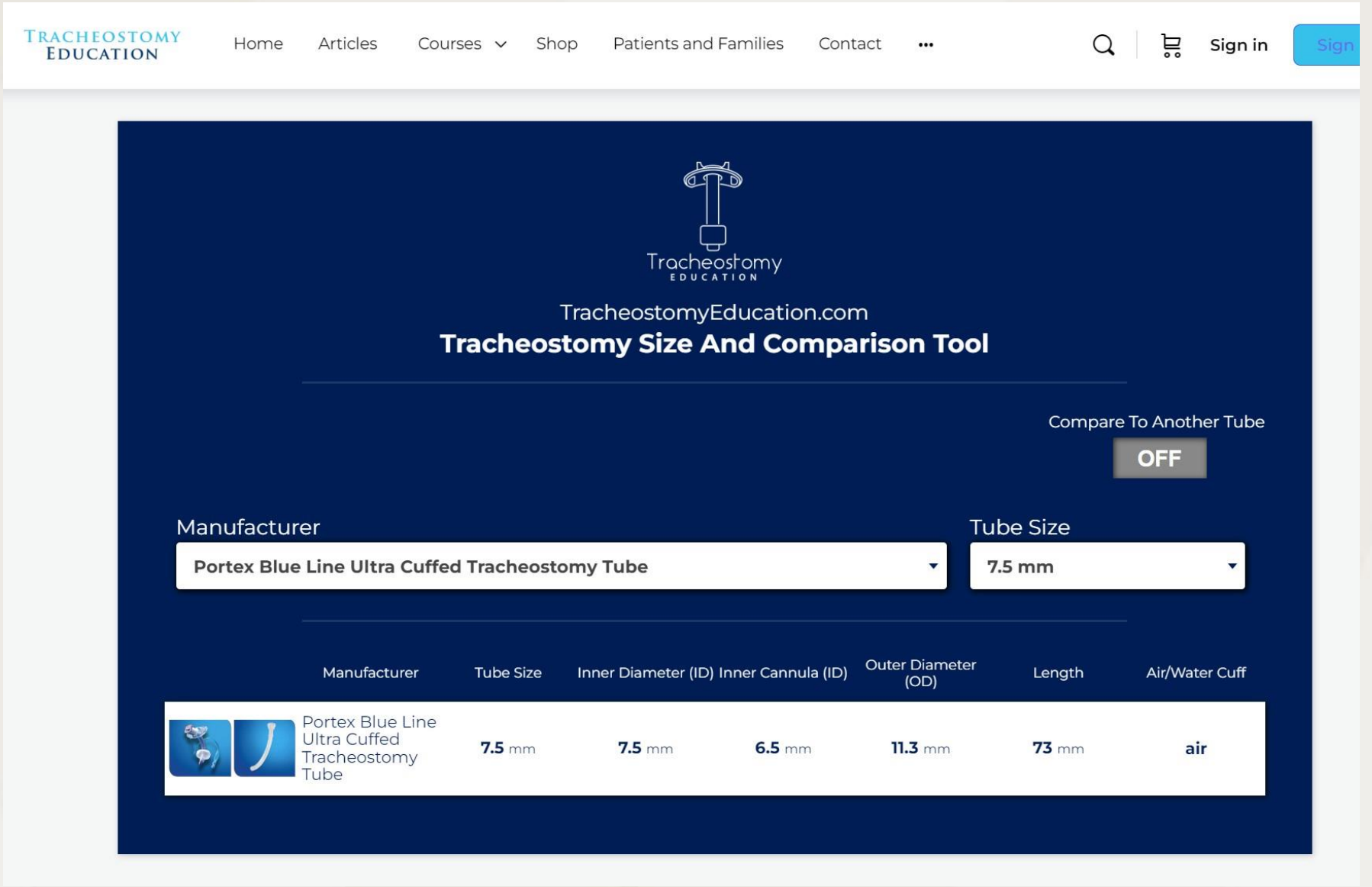
Cuff Inflation

Trach Cuff Shapes

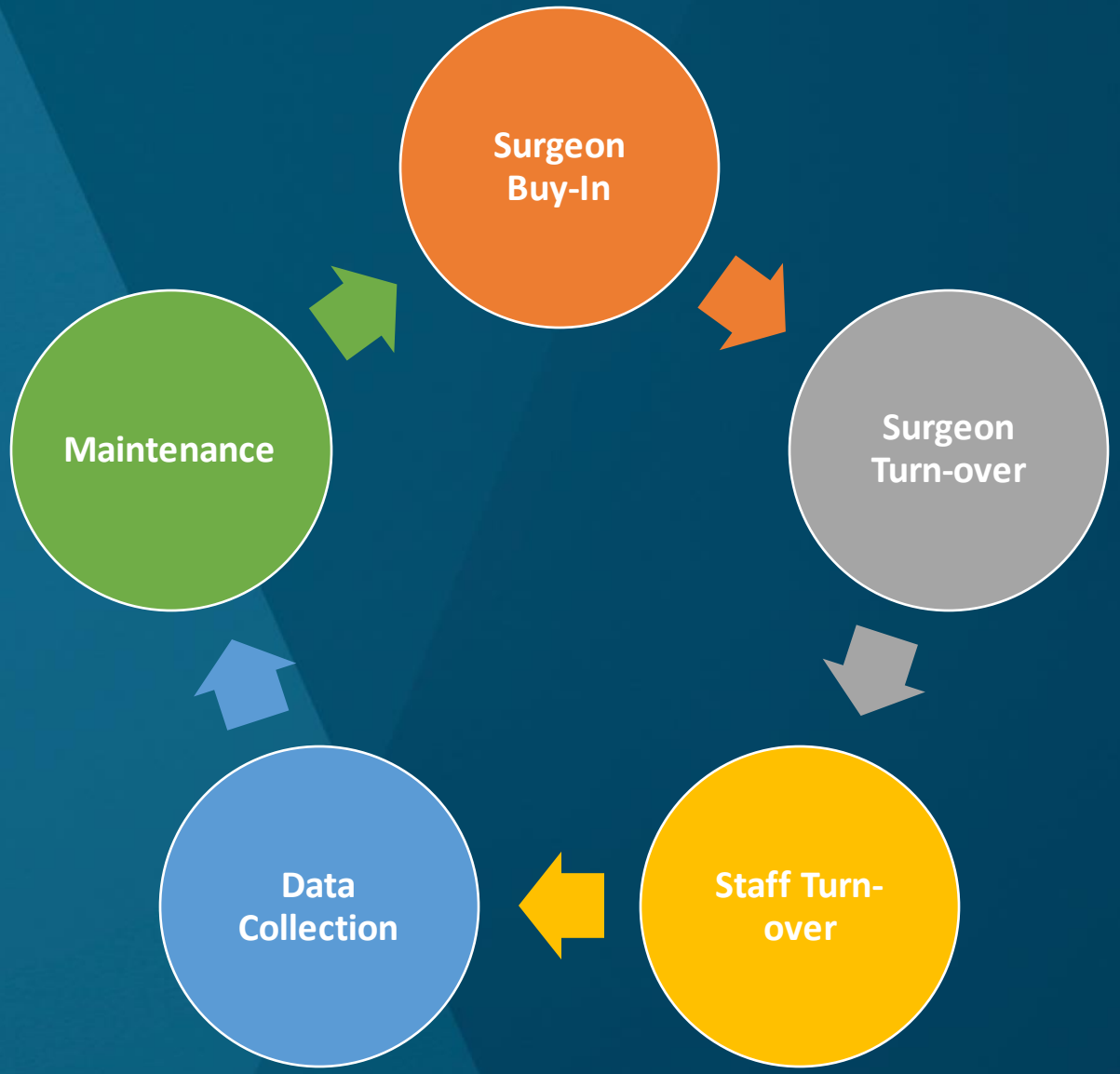


- IF:
  *Unintentional cuff leak
  * cuff pressures > 30 cmH2O
  *Loss of volumes on ventilator
  *Aspiration

- THEN:
  *May need XLT (P vs D)
  * P vs D depending on BMI



How does it compare?



The work is never done.

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THANK YOU

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