

**Disclosures**

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 • Financial Disclosure: Salary paid by the University of Kentucky College of Health Sciences  
 • Non-Financial Disclosure: None
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 • Financial Disclosure: Salary paid by the University of Kentucky College of Medicine  
 • Non-Financial Disclosure: None
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 • Financial Disclosure: Salary paid by the University of Kentucky Children's Hospital  
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**Challenge**

- Trach population is on the rise and patients are becoming more and more medically complex
- Inherent risks involved in treating this population
- Clinicians need proper training and mentoring but.....
- Typically not covered in detail by university programs
- Knowledge/Skills/Competencies are not specifically addressed by ASHA
- SLP's not consistently provided with employer support, adequate training or facility guidelines

**And yet.....**

*"Clinicians should only engage in those aspects of the professions that are within our scope of practice, competence, education, training, and experience" American Speech-Language-Hearing Association. (2016). Code of ethics [Ethics].*

**Outcome**

- Introductory understanding of:
  - reasons for tracheostomy
  - how the procedure is performed
  - how tracheotomy impacts respiration, communication and swallowing function
- Rationale for using evidence based evaluation and treatment strategies for trach patients

### Out of the Gate: Mark Fritz MD



### Learning Objectives

- Normal and abnormal phonatory and respiratory anatomy
- Indications for tracheotomy
- Anatomical changes after tracheotomy
- Complications of tracheotomy

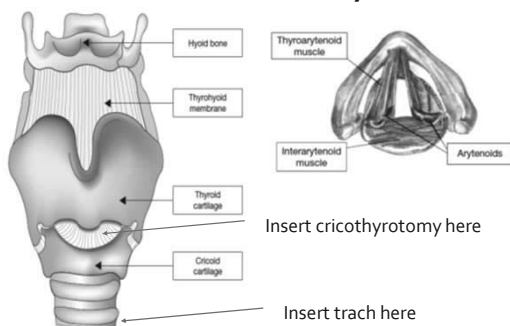
### What are we horsing around with?

- Tracheotomy or Tracheostomy, interchangeable. Shortened to "trach" sometimes
- Describes the creation of a hole between the trachea through the skin of the neck
- Effectively making a tracheocutaneous fistula that bypasses the glottis and the rest of the upper airway tract for some reason

### What is not a tracheotomy?

- **Cricothyrotomy** is a creation of an opening into the subglottis (right below vocal folds) through the cricothyroid ligament. Sometimes used in emergencies because of easy to palpate landmarks
- **Laryngectomy**, which is the removal of the larynx for cancer or nonfunctioning and creation of a fistula from trachea to the skin (no opening to the mouth)

### Normal anatomy



### Abnormal anatomy



### Abnormal anatomy



### Indications for a trach

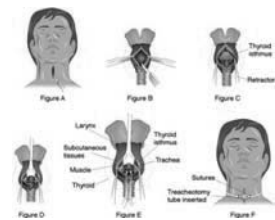
- Mechanical obstruction of the upper airways
- Protection of the patient at high risk of aspiration
- Respiratory failure
- Retention of bronchial secretions
- Elective, possibly during major head and neck surgeries to have a safer airway

### Reasons and Benefits

- Long-term >14-21 days of an endotracheal tube in place increase risk of laryngeal and tracheal trauma
  - Posterior glottic stenosis, subglottic/tracheal stenosis
- Easier to wean from ventilator
- Decrease the work of breathing (less dead space)
- Requires less sedation than endotracheal tube
- Pulmonary toilet

### Tracheotomy

- Status of the patient
- General anesthesia vs. awake (with local)
- Small ~2cm incision
- Divide strap muscles
- Move or ligate thyroid isthmus
- Make slit or window into trachea ~2 rings down from cricoid



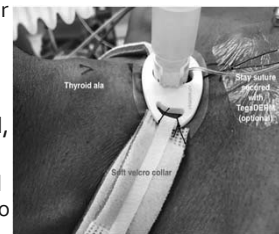
### Percutaneous Tracheotomy

- Increase in use
- Sometimes performed by non-surgeons
- Seldinger technique to dilate
- Bronchoscopy used to confirm placement
- Patient selection
  - No innominate, BMI > 40, goiter



### Tracheostomy care

- Cuffed tube most often placed first (required for ventilator)
- Initial increase in secretions
- If ventilator not needed, the cuff goes down
- Removal of sutures and possibly trach change to cuffless 3-7 days after surgery



### Anatomical changes after trach

- Lack of nasal humidification of air to the trachea
- Diminished sense of smell/taste
- Increased risk of constipation (not able to valsalva fully)

### Anatomical changes after trach

- Still no voice if cuff is inflated
- Mucosal dryness/irritation from direct air exposure
- Secretions typically improve within days

### Early Complications

- Bleeding
  - Skin edges, thyroid gland
- Mucus plugging/crusting
  - Inner cannula maintenance key, along with suction
- Accidental decannulation
  - For this reason, we keep a replacement trach at bedside and there should always be a trach tray nearby in the acute setting (<24 hours at least)
  - Stay sutures are sometimes used, especially in pediatric populations

### Early Complications

- Subcutaneous emphysema
  - Rare as air escapes through non-closed wound
- Pneumothorax
- Tracheoesophageal fistula
  - From passing the trach through the party wall with esophagus

### Delayed Complications

- Bleeding
  - From skin edges, thyroid, aggressive suctioning/dry mucosa
- Tracheo-innominate fistula
  - Erosion of tracheal wall and perforation of the innominate artery
  - Commonly has sentinel bleed before massive bleed
  - CT angio, finger occlusion, trip to OR STAT

### Delayed Complications

- Decannulation
- Granulation tissue
- Tracheal stenosis
- Tracheocutaneous fistula (if decannulated)
  - Otherwise, 90+% of trach stomas close within 2 weeks of decannulation

### Decannulation

- Hopefully this is temporary!!
- Once off the ventilator, healthier, tolerating capping of the trach and is otherwise a normal airway, can start decannulating
- Rule out any other surgeries impending
- We will typically just scope their larynx/airway to make sure there is no anatomical obstruction
- Then we will remove the trach tube and place occlusive dressing until the fistula is closed completely

### Long-term trach care

- Communication amongst care team!!
- Should have follow-up and education given regarding trach care and maintenance
- Change of trach tube itself every 1-12 months (wide variability)
- Access to suction machine
- Access to humidifier
- Cleaning of inner cannula daily
- Optimization of airway, voice, swallowing to restore the functions of the glottis to

### Rounding the Bend: Mark Finrock RRT-NPS



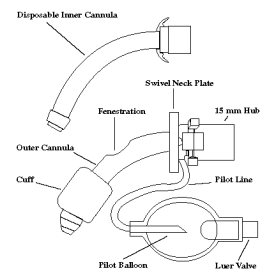
### Learning Objectives

- Types of tracheostomy tubes
- Tracheostomy tube design and function, e.g. cuffs, fenestrations, cannulas
- Physiological respiratory changes following tracheostomy
- Suctioning
- Humidification

### Types of Tubes

- Metal (Jackson, Pilling)
- Plastic (Shiley, Portex)
- Silicone (Bivona, Arcadia)
- Single cannula or double cannula
- Cuffed or uncuffed
- Fenestrated (for speaking) or non-fenestrated
- Disposable and permanent
- Long-term and short-term
- Specialty Tubes

### Tracheostomy Tube



**Metal Tube**



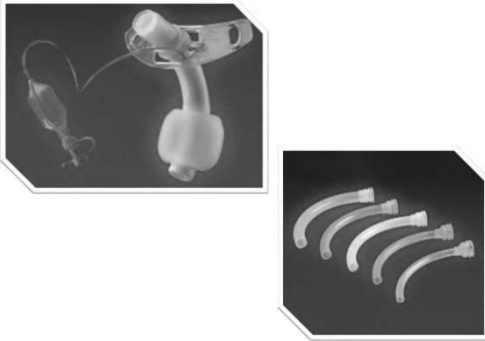
<http://www.tracheostomy.com>

**Plastic Tube**



<http://www.remarblog.com>

**Plastic Tube / Inner Cannula**



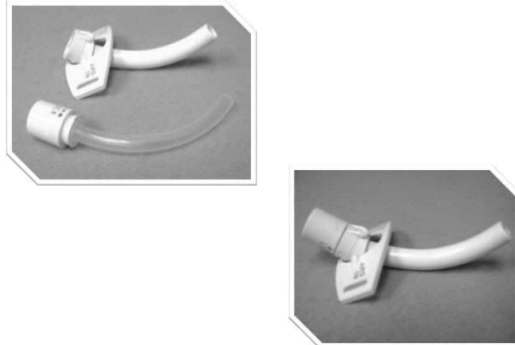
**Silicone Tube**



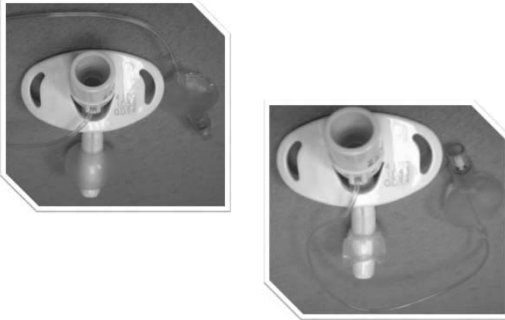
**TTS Cuff**



**Cuffless Tube**



### Cuff



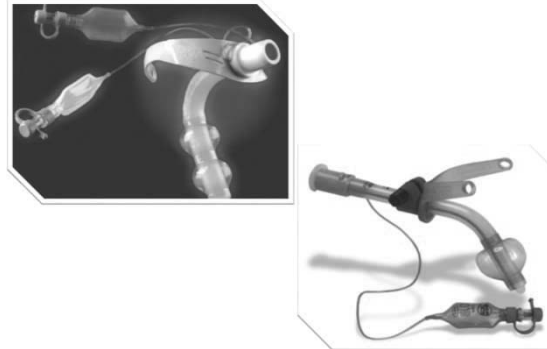
### Cuff Care

- Inflation
  - Volume
  - Pressure
  - Leak
- Deflation
- Tracheal Contact

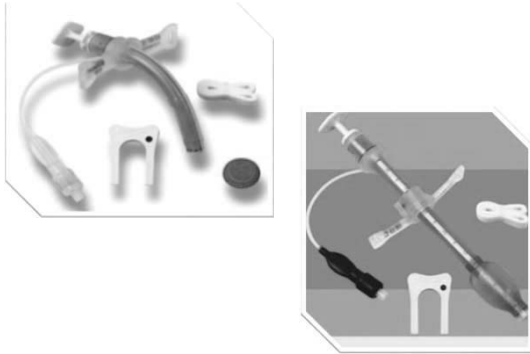
### Fenestrated Tube



### Specialty Tubes



### Hyperflex Tubes



### Changes Post Tracheotomy

- Loss of "Air Conditioning"
  - Heat
  - Humidity
  - Filter
- Loss of Effective Cough
  - Suctioning
- Dressings

H.M.E. (heat moisture exchanger)



Heated Humidifier



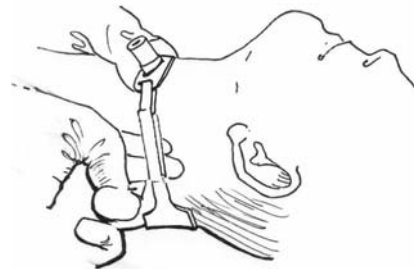
Saline "bullets"



Velcro Ties



Twill Ties

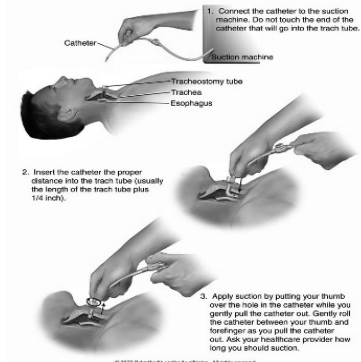




## Pulmonary Toilet

- Viscosity and expectoration of lung secretions is best managed by:
  - systemic hydration
  - humidity
  - chest physiotherapy
  - suctioning, coughs and assisted coughs
  - mucolytic agents

## How to Suction a Tracheostomy Tube



## Complications Associated with Suctioning

- Hypoxemia, dysrhythmia, hypotension, cardiac arrest
- Atelectasis or lung collapse
- Mucosal damage
- Bronchospasm
- Tracheobronchial bacterial growth

## Emergency Equipment

- To be kept at the patient's bedside at all times and to be with the patient when transported off the unit:
  - Suction equipment
  - 10mL syringe for cuff inflation/deflation
  - Obturator for tube now *in situ*
  - Replacement trach tube in specially marked bag (one size smaller than *in situ*)
  - Scissors (newly trach'ed patient)
  - Ambu bag (manual resuscitation bag)
  - Oxygen equipment (optional)

## Resuscitation Bag



## In the Home Stretch: Tammy Wigginton MS CCC/SLP BCS-S



## Learning Objectives

- Identify 2 common myths about swallowing function in trach
- Identify strategies for facilitating functional communication in tracheostomized patients

## Evidence Based Practice

- A problem-solving approach to clinical practice
- Based on conscientious use of
  - Best research evidence available
  - Your own clinical experience and expertise
  - Patient values

## Knowledge/Confidence/Efficacy

**Manley, Frank and Melvin (1999)**

- 42% of respondents scored less than a 75% on a true/false test
- Over half of respondents did not feel prepared to evaluate & treat pts. with trach's
- 1/2 of the respondents never attended a conference focusing on pts. with trach's

**Baker-Rush (2016)**

- Knowledge scores were low as identified by responses
- SLPs reported confidence and high self-efficacy which did not correlate with test scores
- Some SLPs may not recognize lack of knowledge/competency
- Continued issues regarding education and opportunity for mentoring

## Can SLP's Suction Pt.'s with Trach's?

- ASHA Scope of practice does not specifically address suctioning.
- Check with SLP Board in your state
- Clinicians must be competent by virtue of training, education and experience to perform any activities
- Advisable for facility to develop a written policy addressing SLP level of involvement, training and a mechanism for verifying competency
- Carefully consider liability
- Suctioning should be done in the context of assessment and treatment of communication and/or swallowing disorders

## The Cuff

- Cuff inflation prevents aspiration: false
- The cuff is below the vocal folds. Secretions and other materials that reach the cuff, have already been aspirated.
- Cuffs do not form a complete seal against the walls of the trachea. Pooled material may seep around the cuff into the lower airway
- The cuff must be deflated to evaluate voice: true
- The cuff is below the vocal folds and must be deflated to allow airflow to the true vocal folds.
- A speaking valve cannot be attached to the trach tube if the cuff is inflated.
- The cuff must be deflated to evaluate swallowing function: maybe

## Other....

- The presence of a trach tube tethers the larynx: Maybe
- Significantly increased laryngeal elevation with cuff deflated Ding & Logemann (2005)
- Less hyoid elevation after decannulation Terk, et al., (2007)
- The lack of a closed system compromises pressure generation which can negatively impact swallowing: Maybe
- High Variability
- Enough studies which show benefit to justify evaluation of tube occlusion Muz et al. (1998) Eibling and Gross (1996), Stachler et al., (1996), Gross et. al., (2003), Sulter, et al., (2003)

## Trach's and Dysphagia

- There is a high incidence of swallowing difficulty status post intubation, mechanical ventilation and tracheostomy: True
- Trach's cause aspiration: False
  - no reliable data to show the presence of a tracheotomy tube is directly associated with swallowing difficulties and aspiration.
  - Swallowing difficulty and aspiration are more likely to be related to the patients medical status than the presence of a tracheostomy tube *Leder & Ross (2000), Donzelli et al., (2005), Shama et al., (2007)*

## Specific Effects

- Disordered abductor and adductor laryngeal reflexes
- Desensitization of the oropharynx and larynx as a result of airflow diversion through the tracheotomy tube
- Impaired cough reflex to resulting in accumulation of secretions in the supraglottis
- Reduced subglottal air pressure
- Diffuse atrophy of the laryngeal muscles

## Skill Sets

- Neurological
- Respiratory
- Trauma
- Head and Neck Cancer
- Swallowing
- Voice
- AAC
- Counseling
- Signs of respiratory fatigue, distress and failure
- Familiarity with emergency procedures
- Instrumental assessment technique
  - FEES
  - VFSS
- Counseling

## Speech Pathology Responsibilities

- Cognitive status
- Physical
- Communication status
- Swallowing
- And other duties.....
  - Education
  - Discharge planning
  - Monitoring vitals

## Pre-assessment

- Medical History
- Purpose of consult
- Who trach'ed the patient and why
- Is the tube temporary or permanent
- Trach info
  - Size/Type
  - Cuff info
- Is the patient medically stable
- Feeding/Nutritional status
- Potential safety issues

## Explain and Consent

- Explanation
- Patient/caregiver goals of care
- Explain potential risks and burdens
  - Coughing
  - Shortness of breath
  - Odd sensations
- Anticipated benefits
  - Assessment of speech/voice
  - Assessment of swallowing function
  - \*Moving toward decannulation
- Obtain consent

## Cognitive/Physical Assessment

### Cognitive

- Level of alertness
- Ability to follow commands
- General orientation
- Judgement Insight into current circumstances
- Memory
- Behavioral/Emotional status

### Physical

- Breathing
- Mobility
- Tolerance for activity
- Hearing and visual acuity
- Gross and fine motor skills
- The tube: properly seated
- The neck: bleeding, secretions, odor, air leakage around the tube

## Oral Communication Skills

- Previous and current method of communication
- Receptive/expressive language
- Oral motor examination
- Articulation

## Communication and the Cuff

- If the tube has a cuff, it needs to be deflated prior to assessment of voice. Is RT available?
- Do you have permission from the physician to deflate the cuff and do you feel comfortable doing so?
- Make sure oral /tracheal secretions are suctioned prior to cuff deflation
- Make a note of vitals
- Proceed with manual occlusion
- No cuff or cuff already deflated: proceed with manual occlusion

## Impaired Phonation

- Manually occlude the tube:
  - Restricted airflow
  - Back pressure
    - Edema
    - Obstruction: supraglottic, glottic or immediate subglottis
    - Tube is too large and is obstructing airflow
- Evaluate for other methods of communication: artificial larynx, writing, communication Board
- Just because the person cannot voice does not mean you cannot evaluate swallowing function

## Re-evaluate

- If there are still issues, speak with members of the care team regarding:
  - Laryngeal examination via endoscopy
  - Can the tube be downsized?
  - Is a cuff necessary: partial ventilator assist or upcoming surgeries?

## Functional Respiration/Phonation

- Manually occlude the trach tube
  - Check and continue to monitor vitals and physical responses
- If patient able to functionally breathe through nose and/or mouth and exhibits no/minimal signs of anxiety have the patient gently phonate
- Evaluate perceptual vocal quality (GRBAS/Cape V) and overall functionality
- If vocal quality is functional
  - Train the patient to manually occlude the trach tube
  - Consider speaking valve use if no contraindications

### Manual Occlusion Goals

- **Long Term Goal:**
  - Mr. X will functionally coordinate trach occlusion with respiration and phonation to functionally communicate at the conversational speech level in the context of activities of daily living.
- **Short Term Goals:**
  - Mr. X will functionally occlude his trach tube 8/10 trials for with moderate visual cues in the context of structured voicing activities
  - Mr. X will coordinate trach occlusion with respiration and phonation with minimal cues to 80% accuracy in the context of structured voicing activities

### Speaking Valve Placement

- Obtain an order for a speaking valve
- Work with the RT if an RT is part of the team
- Educate patient/family regarding potential risks/burdens and anticipated benefits
- Make sure the cuff is deflated
- Record baseline vitals
- Place the valve

### Speaking Valves Benefits

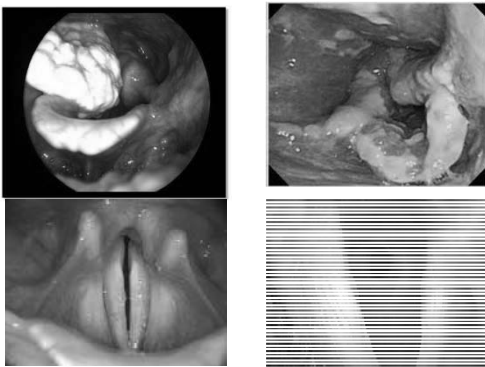
- Re-establish a more typical respiratory pattern for breathing, speaking, mobilization of secretions
- Respiration
  - Weaning
  - Moving toward capping and decannulation
  - Improved cough
- Communication
  - Restoration of verbal communication
  - Does not require manual occlusion of the trach tube
  - Improved psychosocial function and emotional status
  - Swallowing

Hiss et al., (2002)

### Speaking Valve Contraindications

- Tracheal or laryngeal obstruction
- Bilateral vocal fold paralysis or laryngeal stenosis
- Inability to tolerate cuff deflation
- Fome/Foam cuff
- Unstable medical or pulmonary status
- Copious secretions
- End stage pulmonary disease
- Severe anxiety or behavioral issues

### Upper airway obstruction



### Speaking Valves



### Unsuccessful Valve Trial

- Constant uncontrolled coughing
- Dyspnea
- Diaphoresis
- Anxiety
- O<sub>2</sub> Sats of <90% or a decrease of >5% from baseline
- Respiratory rate increase of more than 10 breaths per minute from baseline
- Change in blood pressure
- Change in heart rate 10% from baseline

*Bell (1996)*

### Unsuccessful Valve Trial

- Patient issues
  - Too fragile/unstable
  - Cognitive or behavioral issues
  - Secretion management
- Trach issues
  - Speak with members of the care team regarding
    - Laryngeal examination via endoscopy
    - Can the tube be downsized
    - Is a cuff necessary: partial ventilator assist or upcoming surgeries?
- Consider other methods of communication

### Successful Valve Trial

- Continue to monitor vitals and behavioral/emotional response
- Assess vocal quality
- Voice therapy
- Increase valve wear time as tolerated
- Patient/family/staff education

### Patient/Family/Staff Education

- Verify goals of care
- Guidelines for speaking valve use
- Signs of distress and emergency planning
- How and when to place and/or remove the speaking valve
- How to clean/store the speaking valve

### Speaking Valve Goals

- **Long Term Goals:**
  - Mrs. X will independently place, remove and clean speaking valve.
  - Mrs. X will functionally coordinate trach occlusion with respiration and phonation to functionally communicate at the conversational speech level in the context of activities of daily living.
- **Short Term Goals:**
  - Mrs. X will independently place and remove her speaking valve 8/10 trials with only verbal cues
  - Mrs. X will independently clean her speaking valve 3/3 trials.
  - Mrs. X will wear tolerate wearing her speaking valve for 1 hour without anxiety or changes in O<sub>2</sub> sats and respiratory rate or BP for 3 consecutive trials.

### Capping

- Involves placement of a cap over the trach tube opening to close off airflow through the tube
- The patient must now breath through their nose/mouth
- Pts. physical and emotional responses are evaluated over time
- Typically it is advisable for patients to be able to tolerate capping a minimum of 24 hours prior to consideration for decannulation
- SLP: May provide input into readiness for capping and cap tolerance as well as patient education



## Swallowing Evaluation

- Safety
- Efficiency
- Readiness for oral intake
- Ability to functionally meet nutrition/hydration needs

## Pre-Assessment of Swallowing

- Referral
- History
- Baseline swallowing function
- Prerequisites
  - Alertness
  - Ability to sit up
  - Endurance
  - Able to tolerate cuff deflation

## Clinical Assessment

- Observe the patient
  - Secretion
  - Spontaneous swallowing
  - Spontaneous coughing
  - Level of Alertness
  - Vital: BP, respiratory rate, O<sub>2</sub> sats
- Oral mechanism assessment
- Cuff deflation: dependent on goals of care

## Feeding Trials

- Oral residue
- Vocal quality
- Swallows
- Cough with and without cues
- Changes in vitals
- Patient response
- Presence of food/liquids in tracheal secretions through the tube or around the tracheostomy tube baseplate

## Blue dye

- The incidence of aspiration evaluated in patients with trach's by putting a few drops of Evans blue dye. 69% had a positive dye test within 30 hours  
Cameron JL, Reynolds J, Zuidema GD., (1973)
- Modified Blue Dye Test
  - Tint food and liquids and suction immediately following
  - Add dye to enteral feeding formula for assessment of post prandial aspiration Dikeman and Kazandjian, (2003)

### Modified Evans Blue Dye Test

- Assessment of swallowing using blue dye
- FD&C Blue #1 resulted in a adverse effects in a few patient
  - Discoloration of the body
  - Death
  - Cross contamination
- FD&C Blue #1 was pulled from the healthcare market
- Overall sensitivity is poor. Overall specificity is a little better than sensitivity. *O'Neil-Pirozzi et al., (2001)*
- Does not give you any information about swallowing biomechanics

### Instrumental Assessment

- | Yes   | No   |
|---|--|
| <ul style="list-style-type: none"> <li>• <i>may</i> be indicated for diagnosis and/or planning treatment in patients with suspected swallowing dysfunction</li> <li>• The patient has a medical condition or diagnosis associated with a high risk for dysphagia</li> </ul> | <ul style="list-style-type: none"> <li>• <i>not indicated:</i> if clinical examination fails to identify dysphagia</li> <li>• If clinician determines:                             <ul style="list-style-type: none"> <li>• Pt. is not medically stable enough to tolerate a procedure</li> <li>• Pt. is unable to cooperate or participate in an instrumental examination</li> <li>• An the instrumental examination would not change the clinical management of the patient</li> </ul> </li> </ul> |

### Independent Judgement

- A collaborative environment should be fostered, but SLP's are free to exercise independent professional judgment to protect patient welfare
- Don't allow yourself to be bullied. You are the expert when it comes to communication and swallowing

### Instrumental Assessment

- Videofluoroscopic Swallow Study (VFSS)
- or Fiberoptic Endoscopic Evaluation of Swallowing Function (FEES)
  - Normal vs. abnormal anatomy
  - Discrete structural movement
  - Temporal coordination of anatomic movements relative to bolus advancement
  - Trajectory of the bolus through the aero-digestive pathway
  - Efficacy of adjustments to bolus consistency, volume and rate of delivery of overall swallowing safety and efficiency.
  - Adjustments in positioning
  - Implementation of maneuvers/strategies

*Murray 1999*

### Maneuvers/Strategies

- | Try   | May try with caution  |
|---|---|
| <ul style="list-style-type: none"> <li>• Trach occlusion if appropriate: (gloved finger, speaking valve, capped tube)</li> <li>• Effortful swallow</li> <li>• Texture modification</li> <li>• Bite/sip size</li> <li>• Pacing</li> <li>• Alternating liquids and solids</li> <li>• Coughing after swallows</li> </ul> | <ul style="list-style-type: none"> <li>• Chin tuck, head turns, head tips may create a risk for tube dislodgement or tracheal irritation</li> <li>• Supraglottic and super supraglottic may not be successfully executed with an open trach</li> <li>• Vocal fold adduction may stress respiratory and cardiac systems</li> </ul> |

### Across the Finish Line: Questions





## Conclusion

- Management of trach patients best accomplished in a multidisciplinary environment
- Trach population is on the rise and patients are becoming more and more medically complex
- There are inherent risks involved in treating this population
- Clinicians need proper training and mentoring
- It is essential to use Evidence Based Practice
  - Best research evidence available
  - Your own evolving clinical experience and expertise
  - Patient values

## The End

