Tracheostomy Tubes and Speaking Valves
Mississippi Speech-Language-Hearing Association
April 1, 2015

Disclosure Statement
• Passy-Muir, Inc. has developed and patented a licensed technology trademarked as the Passy-Muir® Tracheostomy and Ventilator Swallowing and Speaking Valve. This presentation will focus primarily on the biased-closed position Passy-Muir® Valve and will include little to no information on other speaking valves.

Learning Objectives:
• Tracheotomy and Tracheostomy Tubes
• Passy-Muir® Valves
• Interprofessional Education and Practice

Indications for Tracheostomy Tube
• Prolonged intubation
• Long-term mechanical ventilation
• Permanent tracheostomy tube
• Inability to intubate due to trauma
• Airway protection/
  secretion removal
• Airway anomaly
• Patient comfort
• Facilitate weaning
• Oral feeding and communication options
• A tracheostomy tube does not prevent aspiration
There are many choices of tubes!!!

Parts of a tracheostomy tube

- Neck flange
- 15 mm connector
- Tube shaft
- Inflation line
- Pilot port with one way valve
- Cuff

Tracheostomy Tubes

- Single Lumen/Cannula
- Double Lumen/Cannula

Types of Tubes

- MATERIALS
  - PVC, Silicone, Metal
  - Metal Reinforced
- SHAPE
  - Curved, Angular, Non-pre formed
- LENGTH
  - Standard
  - Extra length
  - Proximal
  - Distal
  - Adjustable flan
- PROXIMAL
- DISTAL
- ADJUSTABLE FLANGE
- SINGLE LUMEN
- DOUBLE LUMEN
- FENESTRATED
- MRI COMPATIBLE
  - Conditional
- Subglottic Suction
- TRACH TALK
- CUFFS
  - Air, water, or foam
  - Double cuffed
  - Un-cuffed
- CUSTOM MADE

Calculating Tube Size

- ATS Consensus: The tracheostomy tube should take up no more than 2/3 the inner diameter of the trachea.
  (for pediatrics, no adult standard)

- Anterior/Posterior Diameter of trachea
  - Male: 18 +/- 5mm
  - Female: 12 +/- 3 mm

Jackson Metal Tracheostomy Tubes

- Original Style
- Improved
- Permanent 15mm Adapter
Cuff Choices

- AIR FILLED – minimal leak
- TTS™: WATER FILLED – minimal occlusion (can be air filled)
- FOME-Cuff® – self sealing
  - Contraindicated for Passy-Muir® Valve use

Not all Trach Sizes are Equal

<table>
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<tr>
<th>Size 6.0 Tracheostomy Tube</th>
<th>ID</th>
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Early Tracheostomy (7-10 days) May:

- Reduce incidence of Hospital-Acquired Pneumonia
- Reduce injury to larynx
- Improve patient comfort
- Allow for oral communication and oral diet and requirement for less sedation
- Improve oral hygiene
- Improve secretion management

Complications of the Tracheostomy Tube

- Lack of vocal production-communication
- Decreased sense of smell/taste
- Limited airflow through upper airway
- Reduced cough effectiveness
- Complications of long term cuff inflation
- Psychological complications-agony, fear, panic, frustration

(Siebens, Tippet, Kirby, & French, 1993)
Clinical Complications (Continued)

- Lack of subglottic pressure (0cmH₂O)
- Decreased physiologic PEEP (positive end expiratory pressure)

Eibling & Gross, 1996; Gross, Atwood, Grayhack, & Shaiman, 2003

Tracheostomy Tube Effect on Swallowing:

- Scar tissue formation from the tracheostomy procedure may affix the trachea to overlying tissues and the larynx may not move freely
- If the tube is too large for the patient’s trachea, patient may feel discomfort and may compensate with reduced laryngeal excursion

Tracheostomy Tube Effect on Swallowing

- Impaired oral-pharyngeal pressure
- Impaired hyolaryngeal elevation/excursion
- Impaired glottic closure
- Reduced subglottic pressures and reduced sensation
- Muscle disuse atrophy

Tracheostomy and Aspiration

- Does a cuff prevent aspiration?
- Definition
- Incidence of aspiration
  - 50% - 87% rate for trach and vent patients
  - 75% silent aspiration
- Aspiration around the cuff

1. Elpern et al., 1987, 1994, 2000; Tolep et al., 1996
2. Davis & Stanton, 2004; Elpern et al., 1994
3. Bone, Davis, Zuidema, & Cameron, 1974; Elpern et al., 1987; Nash, S., & White, 2003

Complications of Cuff

- Inflated cuffs can tether larynx
  - Larynx does not elevate
  - Epiglottis does project down to protect airway
  - Larynx does not move anteriorly
  - Esophagus does not increase its diameter, creating the vacuum environment for food bolus transition
  - Esophageal impingement
  - Reflux
  - Necrosis and Trauma


Cuff mismanagement associated with:

- Tracheal stenosis
- Granulation tissue formation
- Tracheal erosion
- Tracheoesophageal fistula
- Tracheal dilation
Cuff Deflation Benefits

- Reduces aspiration\(^1,2\)
- Improves laryngeal elevation\(^2,3\)
- Weaning time was shorter - average of 3 days versus 8 days\(^4\)
- Fewer respiratory infections including ventilator associated pneumonia (20% vs. 36%) \(^4\)
- Swallowing better and improved more from baseline\(^\ast\)


Cuff deflation

- Adequate ventilation can still be achieved with the tracheostomy tube cuff deflated.\(^1\)
- Cuff deflation during continuous positive airway pressure (CPAP) has been associated with stable respiratory parameters and allowed patients to vocalize and swallow.\(^2\)


The Passy-Muir® Tracheostomy & Ventilator Swallowing and Speaking Valve

PMV 2000 (clear) and PMV 2001 (Purple)

PMA 2000 Oxygen Adapter

PMV® 007 (Aqua Color™)
PMV 2020 with Jackson Improved

Care, Cleaning, and Lifetime of the Passy-Muir Speaking Valves

- Average lifetime of 2 months

How Does The Valve Work?
Patented “no leak” design
Opens only during active inspiration
Closes at end inspiration
Remains closed throughout expiratory cycle
Air is re-directed through the upper airway
Offers a buffer to secretions

DESIGN VIDEO

Physiologic Benefits of Passy-Muir® valve

- Restores Voice/Communication
- Improves Swallowing
- Restores Physiologic PEEP
- Improves Secretion Management
- Improves Oxygenation
- Promotes Weaning and Decannulation
- May Decrease Risk of Aspiration
- May improve exercise and balance
- Improves Smell & Taste

“Set Yourself and Your Patient Up For Success!”
Team Approach

Patient Selection

Placement Guidelines

Patient Assessment

To Assess for Upper Airway Patency

Factors Affecting Upper Airway Patency
**Downsizing the Tracheostomy**

- Improves expiratory pressures
- Improves speaking valve and capping recommendations, comfort and tolerance
- Associated with earlier oral intake and reduced length of stay
- Improves weaning for spontaneous breathing trials


**Other Considerations to Increase Airflow**

- Cuffless
- Fenestrated
- Consider ENT consult

**Ventilator Criteria Suggestions**

- Patient on <.60 FIO2
- PEEP requirements of <10cm H2O
- PIP less than 40cm H2O

**Patient Guidelines**

- Patient Education
- Peer Education – team approach
- Body Position and Posture
- Position of Head and Neck
- Achieve Cuff Deflation – slowly! (Pulmonary Toilet)
- 100% Cuff Deflation is Mandatory

**Tube Position is Important**

- Gentle quarter turn twist while stabilizing the flange of tracheostomy tube

**Placement of Passy-Muir® Valve**

- Gentle quarter turn twist while stabilizing the flange of tracheostomy tube
Ventilation Terminology
“Must Knows” for Passy-Muir® Valve Use!
• $\text{F}_{\text{O}_2} =$ oxygen % (<60%)
• PEEP = positive end expiratory pressure (<10cmH$_2$O)
  – Pressure in our lungs at end exhalation (the air we can never exhale that maintains lung inflation)
• $V_t =$ volume of delivered vent breath (cc’s)
• PIP/PAP = peak airway pressure (<40)
  – How much driving pressure from the machine is required to deliver the set $V_t$

Assessment Criteria

Q: What does this indicate?
A: This assessment indicates that the patient can exhale around the properly sized tracheostomy tube, and the airway above the cuff is most likely patent.

Assessment Criteria

• 100% cuff deflation
  • Patient must be able to exhale past the tracheostomy tube and through upper airway
  • Assess air leak/decreased ventilation
  • Compensate with ventilator changes

Cuff Inflated-Closed Circuit

Cuff Deflated-Open Circuit

Q: What does this indicate?
A: This assessment indicates that the patient can exhale around the properly sized tracheostomy tube, and the airway above the cuff is most likely patent.

Assessment Criteria

• Observe pre-cuff deflation PIP
• Observe pre-cuff deflation exhaled $V_t$
• Achieve cuff deflation – slowly over 5 minutes
• Look for 40 - 50% loss of exhaled $V_t$
• Look for significant drop in PIP

• 100% cuff deflation
  • Patient must be able to exhale past the tracheostomy tube and through upper airway
  • Assess air leak/decreased ventilation
  • Compensate with ventilator changes

Cuff Inflated-Closed Circuit

Cuff Deflated-Open Circuit

Q: What does this indicate?
A: This assessment indicates that the patient can exhale around the properly sized tracheostomy tube, and the airway above the cuff is most likely patent.
Ventilator Assessment and Adjustments
- PEEP on/off
- Volume compensation during cuff deflation
  - Increase \( V_t \) in small increments to achieve pre-cuff deflation pressures (PIP)
- Use low pressure alarm as disconnect/indirect low exhaled \( V_t \) alarm (set above 10cm H\(_2\)O)
- Set high pressure limit appropriately (10–15cm H\(_2\)O above the PIP)

Ventilator Alarms for Passy-Muir® Valve Applications
- Low exhaled \( V_t \)
- Low pressure alarm – **MUST** be set 5 to 10 cm below PIP
- High pressure alarm – Should be set 10 cm above PIP

Review
- Adjust PEEP
- Slow cuff deflation
- Monitor pressure/volume loss
- Place Passy-Muir® Valve
- Compensate for volume/pressure loss
- Time limit PS breaths
- Set alarms appropriately
Humidification
- Heat/moisture exchanger (HME) is ineffective
- Use heated humidified system
- Remove Passy-Muir® Valve for medicated treatment

Ventilator Connections
- Dual-Axis Swivel
- Omni-Flex™
- 15mmx22mm Step Down Adapter
- 22/22mm Silicone Adaptor

Cuff Inflated-Closed Circuit
- PEEP: 300cc
- V̅: 5 cm H₂O
- IT: 25 cm H₂O

Cuff Deflated-Open Circuit
- PEEP: 150cc
- V̅: 0 cm H₂O
- IT: 12 cm H₂O

PMV In-line
- 300cc
- 0 cc 0 cm H₂O
- 300cc 12 cm H₂O

Ventilator Adjustments
- 450cc
- 0 cc 0 cm H₂O
- 15 cm H₂O 30 cm H₂O
Ventilator Assessment and Adjustments

- PEEP Off
- Volume compensation during cuff deflation
- Use low pressure alarm as disconnect/indirect low exhaled Vt alarm (set above 10cm H2O)
- Set high pressure limit appropriately (10-15cm H2O above the PIP)

Flow/Time Limit Pressure Support Breaths

**Flow limit**
- The pressure support breath by increasing the % flow deceleration that must be reached prior to breath termination
  - Ranges 20 to 80%

**Time limit**
- Set Ti time
  - A typical setting for most adults is 1 second

Review

- Adjust PEEP
- Slow cuff deflation
- Monitor pressure/volume loss
- Place Passy-Muir® Valve
- Compensate for volume/pressure loss
- Time/flow limit PS breaths
- Set alarms appropriately

Patient Assessment

- Oxygenation
- Vital Signs
- Breath Sounds
- Color
- WOB - abdominals
- Patient Responsiveness
- Assess for back pressure (PSSH sound)
Interdisciplinary Education and Practice

The IHI Triple Aim®


Patient/Family Engagement

- Promote patient/family engagement for self-management and assistance with functional goal setting with a focus on:
  - Function
  - Impact on the patient’s ability to participate in life
  - Outcomes that matter to the patient.

  • RESULT:
    - Quicker weaning and increased speaking valve use (Speed & Harding, 2012)
    - Shorter decannulation time and length of stay (Tobin & Santamaria, 2008)

Roles/Responsibilities

- Speech-Language Pathologist
- Respiratory Therapist
- Nurse
- Certified Nursing Assistant
- Physician
- Physical Therapist
- Occupational Therapist
- Rehabilitation Technologist
- Dietitian

Promise Tracheostomy Team
Specialized Role of the Speech-Language Pathologist

- Completing communication and swallowing evaluations and treatments specific to the patient with a tracheostomy tube and mechanical ventilation
- Leading or facilitating the communication between the team and the patients in many aspects of care, including patient education on tracheostomy care, speaking valve placement and safety for oral intake.

Things I needed to know but didn’t...

- Transdisciplinary skills
  - Oral and tracheal suctioning
  - PEG tubes
  - Nasogastric tubes
  - IVs
  - Ventilators (what it did, what the setting meant)
  - Interaction between the tracheostomy tube and ventilator

Tracheostomized/Ventilated Patient

- Tracheostomy tube size and fit
- Presence or absence of a cuff
- Upper airway patency
- Ventilator settings (mode, respiratory rate, PEEP, FiO₂)

Specialized Role of the Speech-Language Pathologist

- Result:
  - Individualized care
  - Early intervention (Burkhead, L, 2011)
  - Increase staff efficiency


Documentation/Technology

- Speech-Language Pathologists must streamline the documentation process and utilize innovative technology to reduce the per capital cost of health care (e.g., team meetings, rounds, ongoing competency trainings, policies and procedures).
  - Ad Hoc Committee on Reframing the Professions (December 2013)

Documentation

- General staffing meetings
- Tracheostomy team meetings
- Competency training
- Policies and procedures
Technology
- Benefits of cuff deflation
- Speaking valve use
- Decannulation

Collaborative Education
- Benefits of speech therapy services for the tracheostomized and ventilated patient:
  - Cuff deflation and speaking valve use
  - Tracheostomy systems
  - Augmentative and alternative communication
- Result:
  - Improved patient outcomes

Expertise of the Speech-Language Pathologist
- Higher level of skilled training and competency
  - Post-graduation through continuing education efforts and on-the-job training.
  - My expertise came from:
    - Continuing education courses
    - On-The-Job training
    - Consulting work
    - Speaking engagements

SLP can provide specialized training for other disciplines

Skills that SLP may need training on
- Suctioning
- Indications for tracheostomy
- Complications of tracheostomy tubes
- Relationship between respiration and swallowing
- Technology and interventions
- Cuff management
- Speaking valve use
- Tracheostomy care
- Ventilator settings and alarms

RT Training Group of SLPs
Things SLP can train RT on
• Speaking valve use
• Techniques for speaking and swallowing
• Airway patency
• Benefits of cuff deflation

Joint Roles and Responsibilities
• Speech-Language Pathologist and Respiratory Therapist
  – Result:
    • Indications for early intervention.
    • Discipline-specific and transdisciplinary roles and responsibilities
    • Specialized collaborations between SLPs and Respiratory Therapists

Tracheostomy Teams
• Positive Outcomes:
  – increased speaking valve use
  – quicker weaning and decannulation
  – reduction in adverse events
  – potential for financial savings for institutions
  ◆ Cameron et al. (2009) - Tracheostomy Review and Management Service
  ◆ Wilcox and Schmidt [2009]
(Speed and Harding, 2012; Leblanc et al., 2010; Garrubba et al., 2009; Tobin and Santamaria, 2008; Norwood et al., 2004).

#2
Strategies for Reducing Per Capita Costs

Direct vs. Consultative Model
• Speech-Language Pathologists must shift the focus from direct service to a consultative model
  – (Ad Hoc Committee on Reframing the Professions of Speech-Language Pathology and Audiology, December 2013)
• The patient and family are educated and trained to practice between visits, for example: use of speaking valves, tracheostomy care, and oral/tracheal suctioning.
• Result: Continuum of Care

Interprofessional Education
• Examples of interprofessional education
  – Co-curricular education (in-services, webinars with multidisciplinary attendance)
  – Core competences for collaborative practice
  – Formal vs. informal activities
    • Staff meetings
    • Lunch and Learn with vendors
Educating Future Clinicians

• Benefits of having clinical practicum participants engaged in transdisciplinary care
• Concurrent supervision by Speech-Language Pathologists and professionals outside of communication sciences and disorders (Ad Hoc Committee on Interprofessional Education, November 2013).
  - Respiratory Therapist – tracheostomy care
  - Nurse – PEG tube
  - Dietitian – diet modifications

Strategies to Improve the Health of Populations

Facilitate Communication

• If speech-language pathologists facilitate communication between health care providers and patients
  - enhance medical environments (e.g., ICU) for better communication.
• Result: Health care providers and patients will comprehend and participate more effectively in managing their medical conditions and care

Outcome Measures

• Speech-language pathologists must utilize outcomes measures with data collection that focuses on quality care with reduced costs to patients and to healthcare.
• Results: weaning rates, decannulation rates, adverse event rates, aspiration rates, oral intake progression, and length of stay.

Team Development

• Prove process success by:
  - Collecting outcome measures
  - Obtaining media coverage for public education
  - Presentations at health care conferences to further changes in healthcare practices.
• Results:
  - Buy-In from other professionals
  - Marketing opportunities
  - Successful programs

Where we are today

• New mind sets
• Faster consults
• More aggressive treatments sooner
Interprofessional Education and Practice

Tracheostomy Teams
- Increased speaking valve use
- Improved decannulation time
- Reduce Length of Stay (LOS)
- Reduced costs

Interprofessional Practice
- What the SLP and RT can do together:
  - Co-treat during speech and swallowing treatments
  - Collaboratively reassess as needed
  - Provide interprofessional treatment plans

Multi-disciplinary Tracheostomy Weaning Protocols
- Increase amount of patients decannulated
- Reduce time to decannulation
- Assign clear responsibilities to team members
- “The tracheostomy tube decannulation process is well suited for therapist-implemented protocols.”


Christopher, KL. (2005). Respiratory Care, Vol 50
Now that my patient has on the Passy-Muir valve, and I have a successful interprofessional team in place, what treatment should I do?

Speech Techniques to Increase Vocalization

What’s the problem?
- Is the patient mouthing words?
- Airway patency issues?
- Vocal fold paresis/paralysis?
- Poor breath support?
- Poor coordination?
- Cognitive/linguistic issues?
- Candidate for downsize or decannulation?
- Candidate for vocal techniques/technologies?

Is the patient mouthing words? Yes...

Patient Assessment:
- The patient tolerates the valve and vitals are WFL
- No voice

Techniques:
- Ask the patient to cough, hum, blow
- For children: Play, tickle

Sebastian

Airway patency issues
- Noted by desaturation, difficulty breathing, incomplete exhalation through upper airway, pressure from trach tube upon removal of valve
- Diagnosis of tracheal malacia or stenosis
- Muffled voice

What can I do:
- Assess airway patency
- Downsize
- XLT Distal trach to bypass an obstruction
- ENT consult/bronchoscopy
Tube Position is Important

Video: Patency Issues

Video: Patency Issue Resolved

Video: Patency Issue Resolved

Vocal fold paresis/paralysis

- Vocal Folds in abducted position
  - Good tolerance of valve
  - Whispery voice
  - Cough is weak

- What can I do:
  - ENT consult
  - Vocal fold adduction exercises once assessed by ENT

Poor Breath Support

- Voice “runs out of air”
- Typical for patients with spinal cord injury, neuromuscular disorders

- What can I do:
  - Diaphragmatic breathing exercises
  - Expiratory muscle strength training

Poor breathing/speaking coordination

- Vent may cause incoordination
- Patient may speak on inhalation and exhalation

- What can I do:
  - Set i-time on ventilator
  - Increase/decrease set respiratory rate
  - Coordinate speech on exhalation
Cognitive-Linguistic Deficits:
- Traumatic brain injury
- Stroke
- Apraxia
- What can I do?
- Place the Passy-Muir® Valve
- Continue with speech therapy treatment

Patient in Coma with Passy-Muir® Valve

Application and Placement of the Passy-Muir® Valve

Downsizing the Tracheostomy Tube
- Improves expiratory pressures
- Improves speaking valve and capping recommendations, comfort and tolerance
- Associated with earlier oral intake and reduced length of stay
- Improves weaning for spontaneous breathing trials

Other Considerations to Increase Airflow
- Cuffless
- Fenestrated
- Consider ENT consult

Decannulation
- Improves cough and swallow which are indicators of decannulation
- Removal of the trach is first recommendation by CDC to reduce pneumonia
- How can we decannulate faster?
  - Early speaking valve use
  - Protocols
  - Tracheostomy team

Pre-Decannulation

Post Decannulation

Candidates for Decannulation

- Consider the original reason for the trach
- Weaned from mechanical ventilation, effective coughing, no significant upper airway lesion\(^1\)
- Absence of distress, stable arterial blood gases, hemodynamic stability, absent fever\(^1\)
- A peak cough flow of 160 liters/minute\(^2\)
- Survey: patient's level of consciousness, cough effectiveness, secretions, oxygenation\(^3\)


Vocal Technologies/Techniques:

- Technologies:
  - Blom Trach
  - Capping
  - AAC devices

- Techniques:
  - Blowing activities with visual feedback
  - Digital occlusion
  - Visual and tactile sensory feedback to elicit voice onset

Techniques for Swallow Management

Disuse Atrophy

- Mechanical ventilation can cause atrophy, and injury of diaphragmatic muscle fibers
- "Patients in intensive care lose about 2% of muscle mass a day during their illness."\(^1\)
- Muscle weakness predicts pharyngeal dysfunction\(^2\)

1. Jaber, S. et al. 2011; Griffiths, BMJ, 1999

Cuff deflation

- Cuff deflation must be achieved to fully assess the pharyngeal stage of the swallow.
- “An individual who is so medically fragile as to preclude cuff deflation is not usually a candidate for significant oral intake.”

Dikeman, K, Kazandjian, M, 2003
Effect of Mechanical Ventilation on Swallowing:

- Ventilator modes with a pre-set breath may push air at a time the patient is trying to maintain airway closure for a swallow.
- If the cuff is deflated, without a Passy-Muir® valve, a translaryngeal leak may occur on inspiration and expiration.

Cuff Deflation Benefits for Swallow

- Reduces aspiration
- Improves laryngeal elevation
- Weaning time was shorter in cuff deflated-average of 3 days versus 8 days
- Fewer respiratory infections including ventilator associated pneumonia in cuff deflated group (20% vs. 36%)
- Swallowing better in cuff deflated group and improved more from baseline

Swallowing Treatment

Early placement of the Passy-Muir® Valve may provide “physical therapy” to the upper airway, helping to reduce effect of muscle atrophy, and improve pharyngeal and laryngeal swallowing function.”

Burkhead, 2007

One Way Valve Reduces Aspiration Further

- Improved scores on penetration-aspiration scale
- Restores expiratory airflow
- Improves laryngeal clearance
- Improved secretion rating scale
- Maintain lung volumes
- Restores subglottic air pressure

What’s the problem?

- Reduced base of tongue strength?
- Reduced laryngeal elevation?
- Reduced vocal fold closure?
Therapy: Frequent Swallow Techniques with the Passy-Muir® Valve

- Base of tongue weakness
  - Masako Maneuver
- Laryngeal excursion
  - Pitch gliding
  - Effortful swallow
  - Mendelsohn Maneuver

Frequent Swallow Techniques with the Passy-Muir® Valve

- Vocal fold adduction exercises
  - Forceful phonation (/ha-ha/)
  - Coughing, throat clearing
  - Pressure against a resisting force
- Vocal Fold abduction
  - Sniff and breathe out through mouth

Video from Madonna swallow exercise

https://www.youtube.com/watch?v=d168L1E8tX0&list=UUrJ_BmcqlCosF1heNCiLWKg&feature=c4-overview

Compensatory Strategies and Diet Modifications

- Generally the same as non-trach/non-ventilator dependent patients

Compensatory swallowing strategies

- No Straws
- Small Bites/Spoons
- Assistance/Supervision with Meds
- Sit Upright
- Don’t Talk While Eating
- Eat Slowly
- Alternate Solids & Liquids
- Double/Multiple Swallows
- Clear Throat after Swallowing
- Effortful Swallow
- Lingual sweep
- Straw progression
- Liquid wash
- Visual inspection s/p swallow
- Imposed rest breaks
- Chin Tuck to ___________
- Head Tilt to __________
- Chew food on the __________
- Head Turn to __________
- Check for Dentures
- Crush medications-Consult MD first
- Avoid foods with small pieces
- Remain upright for _______ minutes
- Thicken Liquids
- Avoid certain foods
- Verbal/Visual/Tactile Cues
- Bite size awareness
- Posture or position during and after eating

Modifications in diet textures

- NDD Level 1: Dysphagia-Pureed (homogenous, very cohesive, pudding-like, requiring very little chewing ability).
- NDD Level 2: Dysphagia-Mechanical Altered (cohesive, moist, semisolid foods, requiring some chewing).
- NDD Level 3: Dysphagia-Advanced (soft foods that require more chewing ability).
- Regular (all foods allowed).

Liquids

- Proposed terms for liquids and correlating viscosity ranges:
  1. Thin - 1-50 centiPoise (cP)
  2. Nectar-like - 51-350 cP
  3. Honey-like - 351-1,750 cP
  4. Spoon-thick - >1,750 cP


Treatment Considerations

- Coordinate breathing and swallowing.
- Time the swallow with higher lung volumes.
- Improve cough.
- Mobilize lung and oral-pharyngeal secretions.
- Expiratory muscle strength training.
  - The Breather
  - Acapella
  - EMT

Assessing Cough Strength

Peak Cough Expiratory Flow

- Greater than 160L/min are needed to clear secretions


Respiratory Muscle Training

- Therapy to assist in lung expansion, coughing and airway clearance
  - Acapella
  - The Breather

FEES Before and After Passy-Muir® Valve

- http://www.passy-muir.com/pmvideos

- Liza Blumenfeld, MS, CCC-SLP, Scripps Memorial Hospital, La Jolla, CA

Sensory Awareness

- Non-food taste stimulation
- Thermal stimulation
- Taste stimulation
- Tactile and verbal cues