Respiratory Muscle Strength Training: Early Intervention Dysphagia Therapy for Patients with Trach and Ventilator Dependence

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Objectives

➢ To understand the rationale and evidence base for the implementation of respiratory muscle strength training with patients with trach and vent dependence.
➢ To explain how to determine candidacy for participation in RMST for patients with trachs and vents.
➢ To understand how to implement RMST therapy with patients with trach and vent and how to measure functional outcomes.

What is Respiratory Muscle Strength Training?

➢ A treatment strategy aimed to strengthen the muscles of respiration by increasing their force-generating capacity (Troche, 2015)
➢ Train muscles of inspiration (Diaphragm & External Intercostals) via Inspiratory Muscle Strength Training (IMST)
➢ Train muscles of expiration (Abdominals & Internal intercostals) via Expiratory Muscle Strength Training (EMST)

Functional Outcomes—what does the evidence show?

➢ Cough Effectiveness

➢ EMST and IMST improve maximum inspiratory and expiratory pressures.
➢ Increase in force generating capacity translates to improved cough effectiveness.

Swallowing function

➢ During EMST - increased activation of the submental muscles
➢ Increased movement of the hyolaryngeal complex during swallowing
➢ Both important for airway protection

Troche, M. ASHA perspectives 2015
Vent Weaning
- IMST therapy with vent dependent patients
- MIP pressures increased by approximately 10 cmH2O
- Higher proportion of patients in treatment group weaned from mechanical ventilation. (Martin et al., 2011)

Manometer
Indirect measure of muscle strength (cmH2O)
MIP = Max Inspiratory pressure
MEP = Max expiratory pressure

RMST Devices
- Resistive Trainers
  - Have small orifices to breathe through that become progressively smaller as the treatment progresses.
  - Impacted by effort level and airflow rate
- Pressure Threshold Trainer
  - Allows ability to “load” the system to provide resistance at quantifiable levels

Examples of Resistive Flow & Pressure Threshold Devices

How to measure effort level with a flow resistive device?

Lack of Access to Devices: Inexpensive & Easily Accessible

Photo credit: www.Voiceaerobics.com
Trach / Vent application - Restore Normal Physiology

- Use of a no-leak speaking valve to restore airflow through the upper airway.
- Allows evaluation of airway patency, voice quality, secretions management, cough strength.
- Troubleshoot any trach or airway issues

Case Study #1 - Stephen

- Respiratory Failure s/p CVA
- Severe Dysphagia - recurrent aspiration of secretions
- Therapy:
  - EMST
  - Vocal cord adduction
  - Laryngeal elevation
  - Oral motor exercises
  - Thermal Stim - soft palate flaccid

Case Study #1 - Secretion Management

Case Study #2 - Vivian

- Respiratory Failure
- Critical Illness polyneuropathy
- Dysphagia - aspiration of thin liquids, impaired airway protection
- Weak inspiratory / expiratory force
- Low lung volumes

Case Study #2

Train to task

- Due to poor endurance, respiratory issues, cognitive deficits….may need to train patients to work towards therapy tasks.
Case Study #3 - Chantay

- 56 y/o female
- Respiratory failure s/p PEA arrest
- Anoxic brain injury
- Very difficulty to wean
- Marked weakness in respiratory strength
- Low lung volumes, markedly weak cough
- Dysarthria
- Dysphagia
- Cognitive deficits - required extensive training to participate in EMST

Training the Task

Use of straw with Visual feedback

EMST with Pressure Threshold Device

Factors Contributing to Success

Weaned to Aerosol Trach Collar

Success Story
Options for Measuring Outcomes

- Improvements in MIP / MEP
- Ability to inhale / exhale against increased pressure thresholds
- Penetration / Aspiration scale (pre/post instrumental assessment)
- Able to cough / manage own secretions
- Increased voice volume, max phonation times

References


Training Inspiration vs Expiration...Which Direction?

**Inspiratory Training (IMST)**
- Can improve lung volumes which can support swallowing
- May improve vocal cord opening
- Assist in weaning from vent

**Expiratory Training (EMST)**
- Improve cough strength
- Suprahyoid complex activation
- Vocal cord closure
- Breath support for speech
- Use mouth seal for weak labial seal
- Note: Can do on SIMV, PSV Modes

What is normal MIP / MEP? Adults 18-85

- Normal MIP
  - Men: -92 to -121 cmH20
  - Women: -68 to -79 cmH20

- Normal MEP
  - Men: 140 - 190
  - Women: 95 - 130

- Both higher in males and decline with age
- MEP lower than 30 cmH20 can lead to ineffective cough.

Enright et al., 1994 and Harik-Khan et al., 1998