Nutrition for Selected Respiratory Diseases

Karen Martin, MA,RD,LD
Objectives

• List two evidence-based nutrition interventions for patients with acute respiratory distress syndrome.

• Describe the complementary nature of Noninvasive Ventilation (NIV) & Percutaneous Endoscopic Gastrostomy (PEG) in the patient with ALS.

• Describe a nutritional regimen that may limit success with weaning from mechanical ventilation

• List the challenges in meeting the nutritional needs of patients with Cystic Fibrosis
4 Diagnoses with Respiratory and Nutrition Implications

- Cystic Fibrosis
- Acute Respiratory Distress Syndrome / Acute Lung Injury
- Chronic Obstructive Pulmonary Disease
- Amyotrophic Lateral Sclerosis
Cystic Fibrosis

• Affects approximately 30,000 in US, 70,000 worldwide
• Inherited Chronic Disease—affects lungs & digestion
• Thick, sticky mucus clogs lungs & impairs exocrine pancreas functions
• Increased age of survival related to aggressive management of respiratory and nutrition therapies
• Respiratory management focuses on pulmonary hygiene and airway clearance, aggressive antibiotic regimens
• Nutrition management optimizes growth and decreasing malabsorption. Pancreatic insufficiency is the norm. A small percent of patients remain pancreatic sufficient, associated with certain genotypes.
Cystic Fibrosis--Exocrine glands

- Respiratory tract
- GI tract
- Reproductive tract
  - Infertility in males; reduced fertility in females
- Sweat glands
  - Increased loss of sodium chloride in sweat
Nutrition Issues in Cystic Fibrosis

• Respiratory effort increases the metabolic rate
• Mucus impedes pancreatic enzymes in digestion: Lipase, Protease, Amylase. Exogenous coated enzyme dosed lipase units/kg/meal or fat intake
• Foods pass through undigested/unabsorbed
• Stools are foul, oily and bulky (elevated fecal fat excretion)
• Fat soluble vitamins often low
• Poor growth & weight gain—Stature associated with lung volumes, so optimizing growth is goal
• Recombinant Growth Hormone use
Gastrointestinal Manifestations

**CFTR-RELATED**
- Parotid Gland
- Biliary Cirrhosis
- Pancreatic Insufficiency
  - Pancreatitis
  - Biliary Complications
- Meconium Ileus
- Distal Intestinal Obstruction
- Appendiceal Abscess

**SECONDARY / IATROGENIC**
- Growth Failure
- Protein-Calorie Malnutrition
- Micro-Nutrient Deficiency
- Esophagitis
- Esophageal Stricture
- Gastritis
- Extrinsic Compression of Common Bile Duct
- Fibrosing Colonopathy
Poor Growth and Nutritional Status and Progressive Lung Disease

“Hallmarks of CF”

Understanding this relationship has important prognostic and therapeutic implications.
Nutrition Issues in Cystic Fibrosis

- PI patients malabsorb fat-soluble vitamins (A, D, E, K) which are supplemented and monitored.
- Monitor for liver disease, CF Related Diabetes, respiratory culture and sensitivities
- Anthropometrics: FOC, Weight, Length or Height, BMI, MAC, TSF, MAMA, growth velocity and parental height adjustments
- Monitor eating behaviors, disordered eating, altered body image.
- Surgical resection of GI tract (meconium ileus, fibrosing colonopathy)
- Alternative therapies (nutraceuticals & testimonial products)
- Calorie enhancements, Oral supplements, G-tube feedings
### FAT-SOLUBLE VITAMINS

<table>
<thead>
<tr>
<th>AGE</th>
<th>CFF Consensus Report</th>
<th>SourceCF® Drops</th>
<th>SourceCF® Chewables</th>
<th>SourceCF® Softgels</th>
<th>ADEKs Drops or Chewable</th>
<th>AQUADEKs*** Drops or Chewable</th>
<th>Vitamax Drops or Chewable</th>
<th>Poly-Vi-Sol Drops or Centrum Chewable or Tablet</th>
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<tbody>
<tr>
<td>0-12 months</td>
<td>1,500</td>
<td>3,170 / 1 ml</td>
<td>53% as beta-carotene</td>
<td>3,170 / 1 ml</td>
<td>50% as beta-carotene</td>
<td>3,751 / 1 ml</td>
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<td>1-3 yrs</td>
<td>5,000 (retinol)</td>
<td>6,340 / 2 ml</td>
<td>53% as beta-carotene</td>
<td>6,340 / 2 ml</td>
<td>50% as beta-carotene</td>
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<td>87% as beta-carotene</td>
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<td>4-8 yrs</td>
<td>5,000 – 10,000 (retinol)</td>
<td>9,000 / chewable</td>
<td>60% as beta-carotene</td>
<td>9,000 / chewable</td>
<td>60% as beta-carotene</td>
<td>For ages 4 - 10 years 18,187 / 1 softgel</td>
<td>80% as beta-carotene</td>
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<td>0-18 yrs</td>
<td>10,000 (retinol)</td>
<td>18,000 / 2 softgels</td>
<td>60% as beta-carotene</td>
<td>18,000 / 2 softgels</td>
<td>60% as beta-carotene</td>
<td>For ages 10 and up 36,334 / 2 softgels</td>
<td>92% as beta-carotene</td>
<td>For ages 10 and up 36,334 / 2 softgels</td>
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<tr>
<td>&gt;18 yrs</td>
<td>8000* (retinol)</td>
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<td>60% as beta-carotene</td>
<td>18,000 / 2 softgels</td>
<td>60% as beta-carotene</td>
<td>36,334 / 2 softgels</td>
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<td>10,000 / 2 chewables as 100% retinol palmitate</td>
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### Vitamin E (IU)

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<tr>
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<th>0 - 12 months</th>
<th>1 - 3 yrs</th>
<th>4 - 8 yrs</th>
<th>9 - 18 yrs</th>
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<tr>
<td></td>
<td>40 - 50</td>
<td>80 - 150</td>
<td>200 - 400</td>
<td>400*</td>
<td>600**</td>
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<tr>
<td>0 - 12 months</td>
<td>50 / 1 ml</td>
<td>50 / 1 ml</td>
<td>300 / 2 chewables</td>
<td>400 / 2 softgels</td>
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<tr>
<td>1 - 3 yrs</td>
<td>100 / 2 ml</td>
<td>100 / 2 ml</td>
<td>300 / 2 chewables</td>
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<tr>
<td>4 - 8 yrs</td>
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<td>9 - 18 yrs</td>
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<td>&gt;18 yrs</td>
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### Vitamin D (IU)

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<th>9 - 18 yrs</th>
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<td>400**</td>
<td>800**</td>
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<td>800**</td>
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<tr>
<td>4 - 8 yrs</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
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<td>9 - 18 yrs</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
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<tr>
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<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
<td>400 / 1 ml</td>
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### Vitamin K (mcg)

<table>
<thead>
<tr>
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<th>1 - 3 yrs</th>
<th>4 - 8 yrs</th>
<th>9 - 18 yrs</th>
<th>&gt;18 yrs</th>
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<tbody>
<tr>
<td></td>
<td>300 to 500</td>
<td>300 to 500</td>
<td>300 to 500</td>
<td>300 to 500</td>
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<tr>
<td>1 - 3 yrs</td>
<td>200 / 2 ml</td>
<td>200 / 2 ml</td>
<td>200 / 2 ml</td>
<td>200 / 2 ml</td>
<td>200 / 2 ml</td>
</tr>
<tr>
<td>4 - 8 yrs</td>
<td>600 / chewable</td>
<td>150 / chewable</td>
<td>150 / chewable</td>
<td>150 / chewable</td>
<td>150 / chewable</td>
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<tr>
<td>9 - 18 yrs</td>
<td>1000 / 2 softgels</td>
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<td>1000 / 2 softgels</td>
<td>1000 / 2 softgels</td>
<td>1000 / 2 softgels</td>
</tr>
<tr>
<td>&gt;18 yrs</td>
<td>1000 / 2 softgels</td>
<td>1000 / 2 softgels</td>
<td>1000 / 2 softgels</td>
<td>1000 / 2 softgels</td>
<td>1000 / 2 softgels</td>
</tr>
</tbody>
</table>

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* Levels recommended for ages >18 yrs by the SourceCF® Nutritional Advisory Council (SNAC)
** Based on “Guide to Bone Health And Disease In Cystic Fibrosis Consensus Conference Report” June 2002.
*** In addition to the ingredients listed on this chart, AquADEKs also contain mixed tocopherols, selenium, beta-carotene, and coenzyme Q10.
Cystic Fibrosis & Nutrition-risk Indicators

- Decreased intake/ Failure to thrive
- Diarrhea, steatorrhea, stool changes, seepage
- Diet quality
- Abdominal pain
- Weight loss or lack of weight gain
- Inadequate growth
- Reduced skeletal muscle mass

- At risk: Pedi patients <50%ile BMI  Adult male <23 BMI; Female <22
Cystic Fibrosis & Nutrition Assessment

Daily energy expenditure calculated:

- Basal Metabolic Rate $\times$ Activity Coefficients $\times$ Disease Coefficient
- Disease Coefficient is based on FEV$_1$ (>80%, 40-79%, <40% predicted)
- Coefficient of Fat Absorption (PS >93%, PI calculate fecal fat as a % of fat intake, or approximate at 85%/CFA).
CF Respiratory Therapies

- Postural drainage, percussion or CPT (vest)
- Inhaled mucolytics hydrate the airways (dornase alfa &/or hypertonic saline)
- Colonization and infection common. Isolated group due to B. cepacia & bad actors
- Bronchodilators
- Antibiotics with pulmonary exacerbation (increased cough, sputum production, decrease appetite and weight loss)
Tube Feeding Considerations

• Takes the pressure off of the child to Eat more than they would like.
• Night time feedings
• Daytime boluses
• Formula
• Enzymes
FEV1 Percent Predicted vs BMI Percentile, Patients 6 to 20

BMI Percentile

FEV1 Percent of Predicted

Males
Females
Acute Respiratory Distress Syndrome

• Lung disease characterized by inflammation and impaired gas exchange
• Pulmonary edema increased distance oxygen must diffuse to reach blood.
• Impairs gas exchange → hypoxia and increased work of breathing
• Alveoli may collapse or flood, containing less gas more blood flow w/ less oxygen → intrapulmonary shunting.
• ICU admission and Mechanical Ventilation usually required
• Often part of systemic inflammatory process (sepsis, pneumonia, trauma, burn, aspiration, pancreatitis, etc.)
ARDS—Biochemical & Nutrient Issues

- Increased risk for malnutrition given ↑ energy required for inflammatory conditions
- Excessive inflammation (AA-derived inflammatory mediators) results from ↑ pulmonary capillary permeability, edema, ↑ pulmonary vascular resistance & worsening hypoxemia.
- These mediators are metabolites of omega 6 fatty acids including AA
- Omega 3 fatty acids have may anti-inflammatory properties
- Eicosapentaenoic acid (EPA) & docosahexaenoic acid (DHA) support neutrophil recruitment and gas exchange.
- Substitution of omega 6 FA with omega-3 FA’s--proven benefit in inflammatory process.
ARDS & Fatty Acids

• Dietary fish oil with EPA and borage oil containing γ-linolenic acid (GLA) can decrease production of AA proinflammatory eicosanoids.

• Singer et al study—100 pts w/ ALI randomized to high lipid enteral formula enriched w/ EPA, GLA & antioxidant vitamins or standard pulmonary formula.

• Enriched group significantly improved oxygenation

• Study day 4 $P=0.001$ Enriched group: $\text{PaO}_2/\text{FiO}_2$ 317.3 ± 99.5
  Standard Pulmonary EN group: 214.3 ± 56.4

• Study day 7 $P=0.05$ Enriched group: $\text{PaO}_2/\text{FiO}_2$ 296.5 ± 165.3
  Standard Pulmonary EN group: 236.3 ± 79.8

• **Days of Mechanical Ventilation: 11 vs. 16.3 days $P=0.011$**
ARDS & Fatty Acids

• ICU LOS: 12.8 vs. 17.5 days $P=.16$
• New organ dysfunction 8% vs. 39% $P=.015$
• Pontes-Arruda study on high lipid EN w/ EPA, GLA & enhanced antioxidant vitamins vs. standard pulmonary
  • Reduced mortality rate in study group vs. control. Absolute mortality reduction was 19.4% $P =.037$
  • Also significant for improved days of MV 5.8 ± 1 vs. 13.4 ± 1.2 days  $P = .037$
    ICU LOS (4.6 ± .9 days vs. 10.8 ± 1.1 days, $P < .001$)
• New organ dysfunction (38% vs. 81%, $P < .001$)
• Enter ARDS specific formulas…..
ARDS & ALI Nutrition Intervention

- Enteral formula: Containing dietary fish oil w/ EPA, borage oil w/ GLA, enhanced levels of antioxidant vitamins
- Protein: 1.5 – 2 g/ kg
- Prevent weight loss even in overweight patients
- Maintain Lean Body Mass (LBM)
- Transition to a high-calorie and high protein diet upon removal from Mechanical Ventilation and improved respiratory/mental status
## ARDS / ALI & Fluids

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Fluid ml/kg</th>
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<tbody>
<tr>
<td>Adult 16 - 30 years</td>
<td>35-40</td>
</tr>
<tr>
<td>Adult 31 - 54 years</td>
<td>30-35</td>
</tr>
<tr>
<td>Adult 55 – 65 years</td>
<td>30</td>
</tr>
<tr>
<td>Adult &gt;65</td>
<td>25</td>
</tr>
</tbody>
</table>

Monitor Fluid status daily—overload may result in pulmonary edema

- **Laboratory indices:** Sodium levels (Hypernatremia may indicate fluid deficiency; hyponatremia may indicate fluid overload.
- **BUN/creatinine ratio:** Elevated BUN may indicate fluid deficiency
- **Clinical Observations:** edema, skin turgor, mucus membranes
- **I/O’s**
- **Weight Changes**
ARDS & ALI – Risk of Refeeding Syndrome

- Population is at risk for refeeding syndrome because of potential for malnutrition
- Reintroduce nutrients and fluids with close monitoring and adjustment. Initiate EN at reduced calorie rate providing basal energy needs at 50% of estimated energy needs
- PN initial w/ ½ dextrose goal with goal of protein and fat provided
- Evaluate serum phosphate, magnesium, calcium, potassium, urea and creatinine concentrations
- Correct electrolytes (phosphorus, magnesium and potassium)
COPD Nutrition Intervention

- Monitor intake, ADL’s—food procurement preparation & consumption
- Clinical data: anthropometrics (BMI, weight, body composition), labs, lung function, medical & dental exams
- Medication changes (bronchodilators, glucocorticosteroids, mucolytic agents)
- Lifestyle influences (quality of life, exercise, family, work, smoking)
COPD Nutrition Intervention

- Body composition differs from healthy controls
- Lower fat-free mass index and bone mineral density than healthy controls even when BMI >20 kg/m².
- Assess energy needs based on indirect calorimetry measurements.
- Stable COPD patients—utilize predictive equations
- Bone Density Screening—given increased risk for osteoporosis and vertebral fractures
- Frequent small meals and medical food supplements—Preferred to avoid post-prandial dyspnea and satiety to improve compliance
- Medical food supplementation for 7 to 12 days increased energy intake in the inpatient setting.
COPD Nutrition Intervention

- Medical food supplements for outpatients: low BMI, weight loss patients at nutritional risk benefit especially when combined with exercise.

- Osteoporosis: Assure adequate Calcium & vitamin D, avoid tobacco and ETOH intake

- Vitamins: Encourage diet with adequate intake (AI) vitamins A, C and E. Reduced serum or tissue levels have been reported. No studies to show needs >RDA.

- Omega-3 Fatty Acids: consume AI for Ω-3 FA’s.

- Milk and Mucus: Studies report no significant effect despite individual sensory perception

- Reinforce O₂ use to increase ability with ADL’s.
COPD Nutrition Intervention

- Physical observations: Barrel chest, digital clubbing, cyanosis
- Client History: Medical, surgical, social, nutritional
- Medication: Bronchodilators, Corticosteroids, expectorants
- Nutritional supplements: Herbals with potential interactions
- Mechanical ventilation: Timing, equipment
- Adherence with previous nutrition Rx
- QOL Assessment—low BMI may have lower lung function, more dyspnea and decreased nutrition intakes.
COPD Nutrition Assessment

- **Indirect Calorimetry (IC)**
- **Weir equation:** \( EE = (3.94 \times VO_2) + (1.11 \times VCO_2) \)
- IC not for unstable conditions w/ hyper or hypoventilation, or supplemental oxygen, MV w/ FiO\(_2\) > 60%, MV with PEEP > 12 cm H\(_2\)O
- **RQ** is ratio of CO\(_2\) production to O\(_2\) consumption
- O\(_2\) consumption is 80% REE, though small body pool of 1.2L. CO\(_2\) production 20% but 16 L body pool.
- REE by IC correlates closely with true REE (10% above BMR)
- Physiologic range for the RQ in humans is 0.67 to 1.3. Outside range possible alert invalid study.
### Traditional Interpretation of RQ

<table>
<thead>
<tr>
<th>Substrate Utilization</th>
<th>RQ</th>
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<tbody>
<tr>
<td>Ethanol</td>
<td>0.67</td>
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<tr>
<td>Fat oxidation</td>
<td>0.71</td>
</tr>
<tr>
<td>Protein oxidation</td>
<td>0.82</td>
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<tr>
<td>Mixed substrate oxidation</td>
<td>0.85</td>
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<tr>
<td>Carbohydrate oxidation</td>
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<tr>
<td>Lipogenesis</td>
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COPD—Dietary Guidance

- Airway clearance 1 hour before mealtime
- Eat slowly, small bites, breathe deeply while chewing
- 5-6 small meals vs. 3 large
- Liquids at the end of meal
- Eat while sitting upright
- Use pursed-lip breathing
- Liquids may be easier to consume.
- Limit empty calorie foods
- Accept meal prep help, MOW, freeze extra portions, rest before eating
Amyotrophic Lateral Sclerosis

- Progressive neurodegenerative disease affects nerve cells in the brain and the spinal cord.
- 5-10% Familial, 90-95% Sporadic
- 2/3 have no mental impairment, while 1/3 have mild cognitive dysfunction called FTD or FTLD
- Impaired speaking, swallowing, breathing, and moving
- Limb or bulbar
Amyotrophic Lateral Sclerosis

- Practice Parameter update: The care of the patient with amyotrophic lateral sclerosis (an evidence-based review) Report of the Quality Standards Subcommittee of the American Academy of Neurology  R. G. Miller, MD, FAAN; C. E. Jackson, MD, FAAN; E. J. Kasarskis, MD, PhD, FAAN
Limb Onset

- **Foot drop** — Graphite AFO’s
- **Loss of balance** — Cane, 4 wheeled walker (Avant)
- **Tripping/Falling** — Manual/electric Wheelchair
- **Twitching/Cramping** — Baclofen, Quinine
- **Weakness** — Assistive devices
- **Fatigue** — Energy conservation
Bulbar Onset

- **Slurred speech** – Hi/low tech Communication devices, PATIENCE!
- **Impaired swallowing/choking** – swallowing techniques, thicken liquids, puree foods, feeding tube
- **Excessive saliva** – Medication, suction machine, Botox injection
- **Inability to cough** – Cough Assist machine
Respiratory Decline

• Fatigue
• Disturbed Sleep
• Shortness of Breath
• Morning Headaches
• Confusion
• Panic attacks
Pseudobulbar Affect

• Involuntary Emotional Expressive Disorder
  – Crying and laughing inappropriately or excessively due to lack of nerve cell inhibition over the brain center involved in laughing or crying
  – Respiratory concerns
  – Nudexta – FDA approved
  – Antidepressants used
Frontotemporal Lobe Dementia (FTD)

- This type of dementia is a change in personality and in mental processes.
- Memory stays intact, but other higher order functions such as decision making, foresight and speech can become severely impaired.
- Seen in 25-30% of ALS patients.
- Screening for FTD is available at the ALSA Clinic in San Antonio.
Nutrition Challenges

• Impaired intake/ dysphagia (length of meals, dehydration, choking, aspiration, medications)
• Constipation and motility issues
• Fasciculations
• Increased REE & Metabolic Rate
• Difficulty with activities of daily living (procurement, preparation, toileting)
PEG—Percutaneous Endoscopic Gastrostomy Feeding Tube

• Indications:
  • Difficulty swallowing
  • Weight loss
  • Decline in FVC (50% or less)

• Outpatient procedure

• Stabilizes weight

• If able to swallow, food may still be taken by mouth.

• Many resist initially and then choose to get the tube when necessary.

Gary’s second piercing…
Management of Enteral Feedings for Respiratory-Compromised Patients on Noninvasive Ventilation

Karen A. Martin, MA, RD, LD; South Texas ALS Association, University of Texas Health Science Center and Walgreens Home Care, San Antonio, TX; Lisa Jackson, RRT, Walgreens Home Care, San Antonio, TX

Background

Patients with compromised respiratory systems often present unique challenges to the nutrition support team, particularly in regard to enteral feedings. Patients with decreased pulmonary function may require more calories to support the difficult task of breathing. While certain respiratory therapies may decrease metabolic demands, they may also increase air in the gastrointestinal (GI) tract, decreasing patients’ feeding tolerance and ability to meet nutritional goals. Neuromuscular disease progression increases the need for additional pressure support and the number of hours of prescribed therapy, which might worsen feeding intolerance. In addition, ineffective swallow increases the risk for aspiration pneumonia, which is further deleterious to a fragile neuromuscular patient.

Methods

Certain respiratory interventions, such as bilevel positive airway pressure (BiPAP) support, along with other factors, such as immobility, weakened GI muscles, patient positioning or concurrent treatments can compound delayed gastric emptying. The resulting gas and distention can pose treatment and nutritional challenges. In the below case study (Figure 1), a patient with amyotrophic lateral sclerosis, while receiving BiPAP therapy, developed gastric distension and was not meeting volume goals for feeding. The patient started oral feeding prior to initiation of meals or feedings.

Figure 1: Case Study of a 78-Year-Old Man with Amyotrophic Laterals Sclerosis on BiPAP and Respiratory Therapies

A 78-year-old male diagnosed with amyotrophic laterals sclerosis (ALS) presented for his quarterly ALS clinic visit. The patient was previously very active, and 73-inches tall with a body mass index of 19.8. He had recently undergone placement of a percutaneous endoscopic gastrostomy (PEG) tube for weight loss related to increased caloric demand from declining pulmonary function and declining inside, the patient’s feeding tube was ordered and completed for use and care of the gastrostomy tube. He was increasingly dependent on BiPAP for respiratory support due to declining pulmonary functions.

During the encounter with the dietitian, it was discovered that the patient was experiencing escalating anorexia, nausea, vomiting, frequent episodes of aspiration, pneumonia, and severe volume intolerance to both oral and PEG feeds. The option of starting enteral nutrition was proposed. However, the patient insisted on starting enteral nutrition due to the respiratory muscle fatigue and decreased ability of the diaphragm and accessory muscles and aspiration肺炎. The patient was still able to tolerate one feeding each day, while the PEG feeds were reduced to one feeding each day.

Conclusions

Pharmacological strategies, including pharmacologic manipulations, dietary aids, and behavioral strategies for patients with ALS, are important to consider when initiating enteral nutrition. However, close monitoring and adjustment of feedings are necessary to ensure optimal nutrition delivery. In this case, the transition to a PEG tube feeding allowed for increased caloric intake and improved overall nutrition status. It is important to consider the patient’s overall clinical status and goals of care when making decisions about enteral nutrition in this population.
Mark - 40 years old
Married with 3 children
Timeline

April 2007 - Twitches in right bicep. Soon after in left bicep. Delayed going to doctor because they were expecting their third child. Twitches continued and spread to legs.

July 17, 2007 - Third child, Abby, was born.
August 2007 - Went to my primary care physician. He knew something bad was going on. He referred me to a Neurologist.

October 2007 - Dr. Yankov, neurologist, ran tests. I am sure he knew what I had. He referred me to Dr. Jackson.

November 17, 2007 - Dr. Jackson diagnosed us. 

Shock!
Since then….

November 2008 – stopped driving

November 1, 2009 – stopped working

May 2010 – stopped walking.

• Lost the use of my hands and arms gradually.

• A few falls (10-12)

• My breathing has steadily fallen from a 90% FVC to 27% FVC

• Totally dependent for everything:
  Hygiene
  Eating
  Transfers
People:

Wife and kids
Family
Friends
Boss/co-work
Caregivers

Faith:

**Philippians 4:11**
Not that I speak from want, for I have learned to be content in whatever circumstances I am.

**2 Cor 4:17**
For this momentary light affliction is producing for us an eternal weight of glory beyond all comparison.
Conclusions

- These diseases are best managed by a multi-disciplinary team.
- Respiratory Therapists working in concert with Registered Dietitians can optimize both nutrition and respiratory outcomes in many diseases.