Nutritional Implications of Selected Obstructive Pulmonary Conditions

Obstructive Pulmonary Conditions with Nutritional Implications

- Chronic Obstructive Pulmonary Disease (COPD)
  - Chronic Bronchitis
  - Emphysema
- Asthma
- Cystic Fibrosis

Malnutrition and Pulmonary Disease

- Malnutrition adversely affects:
  - lung structure
  - respiratory function
  - immune defense
- Protein and iron deficiency:
  - low hemoglobin levels
  - diminished oxygen-carrying capacity
- Low levels of Ca, Mg, P, and K:
  - compromised respiratory muscle function
- Hypoproteinemia
  - pulmonary edema

Malnutrition and Pulmonary Disease

- Decreased surfactant levels
  - collapse of alveoli
- Supporting connective tissue
  - vitamin C
- Normal airway mucus
  - water, glycoproteins, and electrolytes
- Weight loss
  - inadequate energy intake
  - poor prognosis

COPD: Nutritional Requirements and Care

Primary Goals

- Nutritional well-being
- Appropriate lean body mass:adipose tissue ratio
- Correct fluid imbalance
- Manage drug-nutrient interactions

COPD: Related Conditions that May Interfere with Food Intake

- Abnormal production of sputum
- Vomiting
- Tachypnea (rapid breathing)
- Hemoptysis
- Thoracic pain
- Nasal polyps
- Anemia
- Depression
- Altered taste

COPD: Nutritional Status and Assessment

- If retaining fluids,
  - Camouflage wasting of LBM
  - Depressed lab values
- Excessive CO_2 in the blood (hypercapnia)
  - Morning headache and confusion
  - Food preparation and intake
- Other factors
  - Blood oxygen saturation, fatigue, anorexia, difficulty chewing and swallowing (dyspnea), constipation, diarrhea.

COPD: Nutritional Status and Assessment

- Nutritional depletion
  - Low body weight for height
  - Reduced triceps fat fold measurements
  - Decreased food intake
  - Pulmonary complications
    - Airflow obstruction
    - Gas diffusing capacity
    - CO_2 retention
    - Respiratory and limb muscle strength
    - Altered muscle function
  - Cor Pulmonale
    - Fluid restriction
    - Camouflages wasting

Nutritional Assessment for COPD

Historical	Medical	Nutritional	Diet History	Environmental
Medical history Nutritional history Usual weight	Respiratory status Oxygen saturation Dental status Senses of smell and taste GI function	Weight Height Skinfold measures H&H values Serum electrolytes Serum proteins Other tests	Usual home diet Use of supplements Where meals are eaten Eat alone?	Home facilities Physical abilities Financial resources

ADA Respiratory Disease Diet

- Normal weight:
  - regular diet with adequate fluid intake (2-3 L/d).
- Underweight/malnourished:
  - high-calorie/high-protein diet to promote repletion/gradual weight gain; adequate fluid intake (2-3 L.d).
- Overweight:
  - energy-restricted diet to promote gradual weight loss if appropriate; adequate fluid intake (2-3 L/d).

Additional ADA Recommendations

- Eat when energy is high
- Appetite early in the day
- Frequent, small meals
- Hyperinflation of the lungs
  - physical alteration in gastric space
- Nutrient density, eating frequency, and timing of fluid and medication intake
  - individualized

Additional Guidelines for Respiratory Disease

- Swallowed air
- Food consistency
  - Chewing fatigue
- Supplements
  - Difficulty ingesting food
- Fluid requirements
  - Medications, clinical status, other diseases
- Smoking and Vit.C
  - Stop smoking
  - More fruits and vegetables

COPD: Energy Requirements

- Increased energy requirements
- Complications
  - intake, digestion, absorption, excretion of nutrients

COPD: Energy Requirement

- Harris-Benedict equation or indirect calorimetry
- Usual body wt. if severe edema
- Increased with infections, fever, malnourishment
- Increased work of breathing
- 1.2 x REE. Monitor and adjust.

COPD: Macronutrients

- Sufficient protein 1.0-1.5 g/kg dry body wt.
- Protein 15-20% kcal
- Fat 30-45% kcal *
- CHO 40-55% kcal
- Concurrent disease processes
  - (CVD, renal disease, cancer, DM)

* Lower respiratory quotient and less CO_2 production

COPD: Diet Planning

Female, 5'6", 115 lb.

BMI $52.3/(1.7)^2 = 18.1$

REE=655+9.56W

+1.85H-4.68A=1174.8

Energy = 1.2 REE

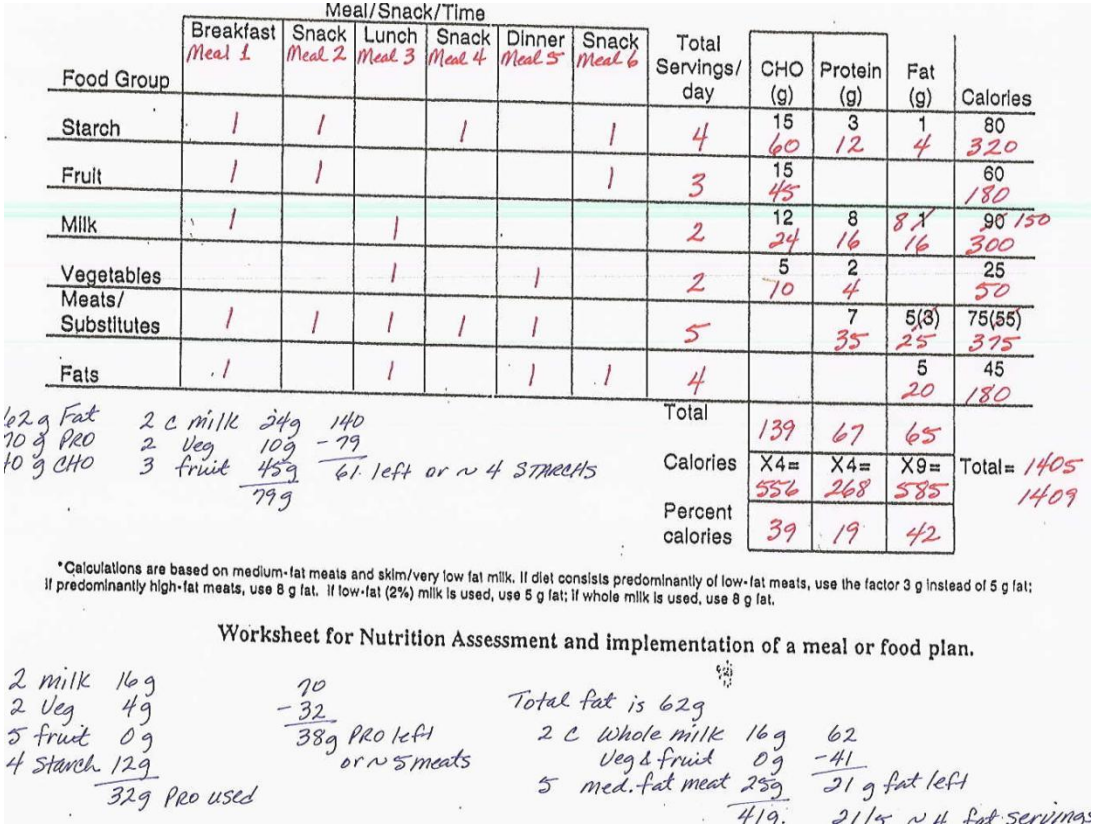
~1400 KCAL

Protein 20% kcal = 280/4= 70g

Fat 40% kcal = 560/9= 62g

CHO 40% kcal = 560/4=140g

6 small meals



Meal/Snack/Time

Food Group	Breakfast Meal 1	Snack Meal 2	Lunch Meal 3	Snack Meal 4	Dinner Meal 5	Snack Meal 6	Total Servings/ day	CHO (g)	Protein (g)	Fat (g)	Calories
Starch	1	1		1		1	4	15 / 60	3 / 12	1 / 4	80 / 320
Fruit	1	1				1	3	15 / 45			60 / 180
Milk	1		1				2	12 / 24	8 / 16	8 / 16	90 / 150 / 300
Vegetables			1		1		2	5 / 10	2 / 4		25 / 50
Meats/ Substitutes	1	1	1	1	1		5		7 / 35	5(3) / 25	75(55) / 375
Fats	1		1		1	1	4			5 / 20	45 / 180
Total								139	67	65	
Calories								X4= 556	X4= 268	X9= 585	Total= 1405 / 1409
Percent calories								39	19	42	

62 g Fat
70 g PRO
40 g CHO

2 c milk 24g 140
2 Veg 10g -79
3 fruit 45g 61 left or ~ 4 STARCHES
79g

*Calculations are based on medium-fat meats and skim/very low fat milk. If diet consists predominantly of low-fat meats, use the factor 3 g instead of 5 g fat; if predominantly high-fat meats, use 8 g fat. If low-fat (2%) milk is used, use 5 g fat; if whole milk is used, use 8 g fat.

Worksheet for Nutrition Assessment and implementation of a meal or food plan.

2 milk 16g
2 Veg 4g
5 fruit 0g
4 starch 12g
32g PRO used

70
-32
38g PRO left
or ~ 5 meats

Total fat is 62g
2 c Whole milk 16g 62
Veg & fruit 0g -41
5 med. fat meat 25g 21 g fat left
41g.

Diet Prescription: 1400 kcal, 62g fat, 70g Protein, 140 g CHO

COPD: Menu Planning

Meal 1: 1 c. milk, whole
1 egg, scrambled
1/2 c applesauce
1 slice bread, toasted
1 tsp. butter

Meal 2: 1 oz. chicken
1 small roll
1 small banana

Meal 3: 1 c. milk, whole
1/2 c. carrots, cooked
1 tsp. margarine
1 oz. veal cutlet, ground

Meal 4: 1 c. tomato soup
1 oz. mozarella cheese

Meal 5: 1 oz. ground turkey
1 cup raw salad greens
1 Tbsp. salad dressing

Meal 6: 1 brownie (1 CHO, 1 Fat)
1 pear, 4 oz.

COPD: Diet Modification

- Small portions of nutrient-dense foods
- Medication time versus mealtimes
- Assistance
  - food shopping
  - meal preparation
- Prepared meals or “Meals on Wheels”

COPD: Diet Modification

- Enteral nutritional supplementation
  - Total caloric and nutrient intake
- Improved nutritional status
  - Reverts if discontinued.

COPD: Diet Modification

- Nocturnal tube feedings
  - Potential for aspiration
- Oxygen consumption
  - Decreased during sleep

How COPD Patients Can Help Themselves

- Stop smoking.
- Avoid work-related exposures.
- Avoid air pollution.
- Avoid excessive heat, cold, and very high altitudes.
- Drink plenty of fluids.
- Maintain good nutrition.

COPD: Results of Recent Studies

- Excessive CHO calories
  - Lipogenesis
  - Increase in CO_2
  - Respiratory quotient above 1.0.
  - Respiratory failure
- Fat content of 30-50%
  - Lower respiratory quotient
  - Less CO_2 production

COPD: Results of Recent Studies

- Protective effect of fruit
- Protective effect of vitamin E
- Abdominal fat loss and airflow limitation
- Beneficial effects of fruits, whole grains and moderate alcohol

Asthma

- Common chronic condition
- Affects 14.9 million
  - 1.5 million emergency room visits
  - 500,000 hospitalizations
  - 5,500 deaths

Nutrition and Asthma

- Healthy diet
  - Feel better
  - Breathe better
- Food Guide Pyramid.
- Allergen exposure
- Persistent mouth breathing
  - Interference with eating

Asthma: Results of Recent Studies

- Weight loss in Obese
  - Reduced obstruction
  - Reduced PEF (Peak Expiratory Flow) variability
  - Improved pulmonary mechanics
  - Better control of airways obstruction
- Eating fresh, oily fish
  - Reduced incidence of childhood asthma

COPD and Asthma: Eating Can Be Hard Work

- Six small meals
- Diaphragm
- Too hungry or tired
- Breathing while chewing
- Prepared foods
- Shopping
- Sitting
- Assisted living
- Universal design housing
- Avoiding gas

Cystic Fibrosis

1. Bronchoscopy
2. Obstruction Clearing
3. Vest used for treatment