Surgical Nutrition

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- Surgical patients with malnutrition are two to three times more likely to suffer complications and mortality after surgery

Who is malnourished?

- Subjective Assessment
  - Careful and thorough history and physical
  - Mild, moderate, severe
    - Weight loss (5-15% lost over previous six months)
    - Dietary intake (robustly adequate to "tea and toast")
    - Functional capacity (fully active to bedridden)
    - Physical exam (loss of subcutaneous fat, muscle wasting)
      - Ironically the morbidly obese can be malnourished
- Objective Assessment
  - Albumin less than 3.5g/dL (normal 4-5g/dL)
  - The ONLY verified predictor of post operative complications

Who is malnourished?

- In addition to Albumin, other proteins have value
  - Albumin 21 day half life
  - Transferrin 8 day half-life
  - Pre-albumin 2 day half-life
  - Retinol binding protein 2 hour half-life

- The most important predictive parameters
  - Recent weight loss
  - Pre-operative albumin < 3.5g/dL

The Basics

- Nutrition is from three sources
  - Carbohydrates – 4kcal/gram
  - Proteins – 4 kcal/gram
  - Fats – 9 kcal/gram
  - Alcohol – 7kcal/gram

- Blood cells, brain cells, renal medulla all rely o exclusively on glucose, other tissues can use lipids

- Hydration is equally important
  - Maintenance fluids 4 - 2 -1 rule
  - 4 cc/kg/hr (1st 10kg) + 2 cc/kg/hr (next 2nd 10kg) + 1 cc/kg/hr
  - 80 kg patient needs 40 + 20 + 60 = 120 cc/hr

The Basics

- Normal caloric needs are 25 kcal/kg/day
  - 80 kg patient needs 2000 kcal/day
  - Based on Harris-Benedict equation
    - BMR = 66.5 + 13.7W + 5H – 6.8A (do not learn this)
  - Stress will increase this to 30 - 35 kcal/kg/day
    - Surgery, trauma, burns, sepsis, etc.
    - Injured 80 kg patient will need 2800 kcal/day
- Normal protein needs are 1 gm/kg/day
  - Stress will increase this to 2.5 gm/kg/day
- Necessary ratio
  - 2 kcal (non-protein) to 1 kcal protein (approximately)
  - Why?

Why is nutrition important?

- An operation is a big deal
  - Some bigger than others

- Stress of Surgery
  - Anesthesia
  - Operation
  - Recovery
  - Healing

Why is nutrition important?

- Surgery in malnourished patients
  - Poor response to anesthesia
  - Poor healing
  - Poor immune response (cellular and humoral)
  - Increased rate of complications
    - Death
    - Wound infections
    - Pneumonia
    - Sepsis
    - Fistula

What can we do?

- Nutritional assessment
  - Pre operative H&P, albumin level
- Severely malnourished may be admitted to hospital and given pre operative nutrition
  - Elective cases
  - Minimum 7 days
  - Can be done as outpatient
  - Enteral or parenteral

What can we do?

- Post operative considerations
  - Place feeding tube at time of surgery
  - If GI tract is able, use it!
  - If not, consider TPN

- Most normal well nourished post operative patients can tolerate 5-7 days NPO without loss of proteins

Delivery

- Enteral
  - Surgical feeding tubes
  - Naso or oro enteral tubes
- Parenteral
  - Central line
  - PICC line

Formulations

- Enteral
  - Many formulations available
    - Best and most universal is 1kcal/cc mixed formulation
      - Includes balanced calories and vitamins/nutrients
      - Includes about half required hydration
- Parenteral
  - Customized formulation for individual patients
    - Standard forms available at all hospitals

Immunonutrition

- Glutamine
  - Feeds small bowel
- Arginine
  - Augments immune system
- Omega-3 fatty acids
  - Augments immune system
- Nucleic acids
  - Building blocks for RNA

Micronutrients

- Fatty acids
- Calcium
- Phosphorus
- Magnesium
- Chromium
- Copper
- Iodine
- Iron
- Manganese
- Selenium
- Zinc

- Vitamins
  - C
  - B1
  - B2
  - B6
  - B12
  - Niacin
  - Folate
  - A
  - D
  - E
  - K

Questions?