

# THE NUTRITION FACTOR:

NUTRITION CONSIDERATIONS FOLLOWING TRAUMATIC BRAIN INJURY

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# Objectives

- Identify nutrition concerns in 3 different phases of brain injury recovery
- Discuss emerging research regarding dietary supplements as applied to brain injury recovery
- Review research regarding obesity and cognition
- Summarize benefits of and barriers to nutrition education following brain injury

# Background

- TBI and SCI at Craig Hospital for ~3 years
  - Education development
  - Weight management
  - Policy
  - Research
- Renal transplant and pediatric acute care for 2 years
- Long term acute care



# Timeline

**Acute**



**Rehabilitation**



**Chronic**



# Acute Phase



# Reaction to Injury

- Hypermetabolism
  - Increased cortisol, glucagon, and catecholamines.
  - Can last for at least 4-6 weeks post injury
    - Decreased lean body mass (LBM)
    - Decreased albumin
    - Altered fluid and electrolytes

# Reaction to Injury

- Hypermetabolism
  - Increased cortical glucocorticoid and catecholamines.
- Calcium
  - Decreased
  - Decreased albumin
- Altered fluid and electrolytes

**Result = Rapid Weight Loss and Muscle Wasting**

# Malnutrition

- Malnutrition is associated with the following adverse outcomes:
  - Increased risk of pressure ulcers and impaired wound healing
  - Immune suppression and increased infection rate
  - Muscle wasting, functional loss, and increased fall risk
  - Increased hospital length of stay
  - Higher readmission rate
  - Higher treatment costs
  - Increased mortality

# Malnutrition

- Levels of malnutrition:
  - Acute vs Chronic vs Social/Environmental
  - Severe vs Non-severe
- Criteria for diagnosing malnutrition:
  - Weight loss
  - Energy intake
  - Body fat
  - Muscle mass
  - Fluid accumulation
  - Reduced grip strength



# Early Intervention

- Enteral Nutrition > Parenteral Nutrition
- May forestall breakdown of fat and protein stores
- Promotes immune competence
- Limits risk of bacterial translocation
- May improve outcomes at 3 months post-injury

# Supplements

Fish oil helped save our son  
**By Stephanie Smith, CNN**

Updated 1:40 PM ET, Mon  
October 22, 2012

<http://www.cnn.com/2012/10/19/health/fish-oil-brain-injuries/>

**Fish Oil Cited in Dramatic Healing  
After Severe Brain Trauma**

February 09, 2014 | 457,751 views

**“The World's #1 Natural Health  
Website”**

**“You'll save money** because I'm committed to helping you stay healthy, so you won't need expensive prescription drugs or doctor's visits so often”

<http://articles.mercola.com/sites/articles/archive/2014/02/09/fish-oil-brain-health.aspx>

**The UltraMind Solution: The 6-week Plan to Heal your Brain** by Dr. Mark Hyman MD

Here are the basic raw materials needed for everyone who wants to keep their brain healthy:

A high-quality, high-potency, highly bioavailable, broad-spectrum multivitamin that contains all the basic essential vitamins and minerals

Calcium (600 to 800 mg daily) and magnesium (400 to 600 mg a day)

Vitamin D3 (2,000 to 4,000 units a day)

Omega-3 fatty acids (EPA and DHA in a ratio of 300/200; 1,000 mg twice a day)

Methylation factors: Folate (800 mcg), B6 (50 mg), and B12 (1,000 mcg daily). Often, special activated forms of these nutrients are needed to be most effective for brain health

Probiotics or beneficial bacteria to improve your digestion, reduce food allergies, and reduce gut inflammation

<http://drhyman.com/blog/2010/08/30/the-ultramind-solution-the-6-week-plan-to-heal-your-brain-2/>

# Supplements: Omega-3 Fatty Acids

- Modulates membrane fluidity, cell wall thickness, cell signaling, and mitochondrial function
- Pre-injury supplementation may potentially reduce severity
- Limited research on post-injury supplementation

# Supplements: Vitamin D

- Emerging research indicating importance for management of musculoskeletal disorders, falls, immunity, autoimmunity, infections, cancer, glucose intolerance, and cardiovascular disease.
- Limited research
- Low levels may exacerbate “second hit” stressors following trauma
  - 65% of patients with TBI are deficient

# Supplements: Zinc

- Important for cellular metabolism
- Zinc deficiency causes oxidative stress
- Pre-injury supplementation may improve cognitive resilience
- Zinc supplementation may reduce symptoms of depression

# Rehabilitation Phase



# Focus on Transition

## Tube Feeding

- Delayed gastric emptying
- Holds for tests, medications, bathing, etc.
- Nausea and vomiting
- Liquid, involuntary bowel movements
- Combative or motor restless – pulls PEG
- Continued hypermetabolism – low protein stores, weight loss, etc.

## Dysphagia

- Lack of appetite
  - Tube feeding interference
  - General lack of hunger
- Poor food acceptance
- Strong feelings regarding types of food eaten
- Taste and smell issues
- Poor tolerance to tube feeding with inadequate PO intake

# Cognition and Diet

- Decreased cognition =
  - Decreased safety and awareness
  - Increased difficulty receiving education
- Attention
  - Unaware of food
  - Distractibility may slow rate of intake
- Memory
  - Forget safety precautions
  - Forget eating or remember incorrectly
- Under or over eating
- Combativeness
  - Refusal to be fed
- Impulsivity

# Decreased Appetite and Weight Loss

- Elderly Male
  - 71" Admit weight 133lb      UBW 150lb      IBW 172lb
  - Diagnosis:
    - Traumatic brain injury, secondary to car versus bike accident
    - Complex facial fractures
    - Right posterior parietal subdural hematoma
    - Subarachnoid hemorrhage
    - Traumatic encephalopathy
    - Multiple fractures
  - No significant past medical history

# Decreased Appetite and Weight Loss

- Elderly Male
  - Estimated needs: 1900-2100kcal (Harris-Benedict Equation x 1.3 stress factor), 72-85g protein (1.2-1.4g/kg)
  - Diet order at admission:
    - Dysphagia Mechanical, thin liquids
      - Demonstrates very poor appetite
    - Jevity 1.2 @ 40ml/hr via PEG, admitted with possible ileus
      - Recommend Jevity 1.2, bolus 1 can after meals for PO intake <50%, nocturnal tube feeding at 70ml/hr x10hr to better meet needs
  - Struggles with involuntary bowel movements and poor appetite
    - Develops behavior of spitting out food
  - Trial multiple tube feeding formulas due to bowel issues
  - During time of poor tube feeding tolerance and poor appetite, weight decreases to 125lb, BMI 17.5

# Decreased Appetite and Weight Loss

- Elderly Male
  - Midway through stay pt demonstrates adequate PO intake to come off tube feeding
  - Dietary preferences:
    - Cheetos, donuts, fast food, sweets
  - Involuntary bowel movements continue after discontinuing tube feeding likely related to diet preferences.
  - At discharge pt has severely impaired memory, attention, and problem solving per speech therapy
  - Discharged to SNF at weight of 138lb

# Decreased Appetite and Weight Loss

- Address the most immediate issue
  1. Preventing weight loss
  2. Improving bowels
  3. Correcting diet
- Balance between dietary preferences and nutrition needs



# Hyperphagia and Weight Gain

- Young Male
- 72” Admit weight 136lb UBW 155lb IBW 157lb
- Diagnosis:
  - Subdural hematoma
  - Right frontal hemorrhagic contusions secondary to MVA
  - s/p right-sided frontotemporal decompressive craniotomy and evacuation of the subdural hematoma
  - Unstageable pressure ulcer (PU) to coccyx, stage 2 PU to left heel
- Past medical history: ADHD

# Hyperphagia and Weight Gain

- Young Male
  - Estimated Needs: 2226-2568kcal (HBE x 1.3-1.5) 80-93g protein (1.3-1.5g/kg)
    - Higher needs related to weight loss and pressure ulcers
  - Diet order at admission:
    - NPO
    - Jevity 1.5 @ 70ml/hr continuous via PEG
  - Initiates dysphagia mechanical diet with honey thick liquids 3 weeks into admission
    - Tube feeding reduced to nocturnal cyclic feeding with daytime boluses dependent on PO intake
    - 1 week after initiating diet, completes calorie count averaging 3700kcal and 147g protein, tube feeding is discontinued

# Hyperphagia and Weight Gain

- Young Male
  - When diet is initiated pt weighs 126lb. After initiating diet, weight increases rapidly:
    - 136lb at 1 week
    - 151lb at 2 weeks
    - 168lb at 4 weeks
    - 182lb at 8 weeks
  - Typical diet order: 1-2 entrees, multiple sides, dessert, 3-4 chocolate milks
    - Snacks in between meals

# Hyperphagia and Weight Gain

- Young Male
  - Intervention:
    - Reevaluate estimated needs: 2291kcal (HBE x 1.2), 76-92g protein (1-1.2g/kg)
    - Provide structure
      - Provide guidelines for meal selection
      - Fill out menus ahead of time
      - Pt receives only what is preselected
      - Meal time cannot cut into therapy times
    - Educate pt and family
    - Behavior meeting with team
    - Challenges:
      - Pilfering
      - Food seeking from family and through therapy activities

# Hyperphagia and Weight Gain

- Address the most immediate issue:
  1. Heal pressure ulcers and promote weight gain to IBW of 155lb
  2. Transition off of tube feeding
  3. Slow weight gain
- Engage family and therapists in supporting each new nutrition goal

# Chronic Phase



# Ongoing Recovery

- Dysphagia
- Memory
- Appetite change
- Taste and smell
- Self-regulation
  - Limit ability to apply strategies
  - Difficulty being independent with diet selection and meal planning

# Related Health Issues

## TBI

- Heart Disease
- Obesity
- Metabolic Syndrome
- Altered skin integrity
- Age related problems

## Obesity

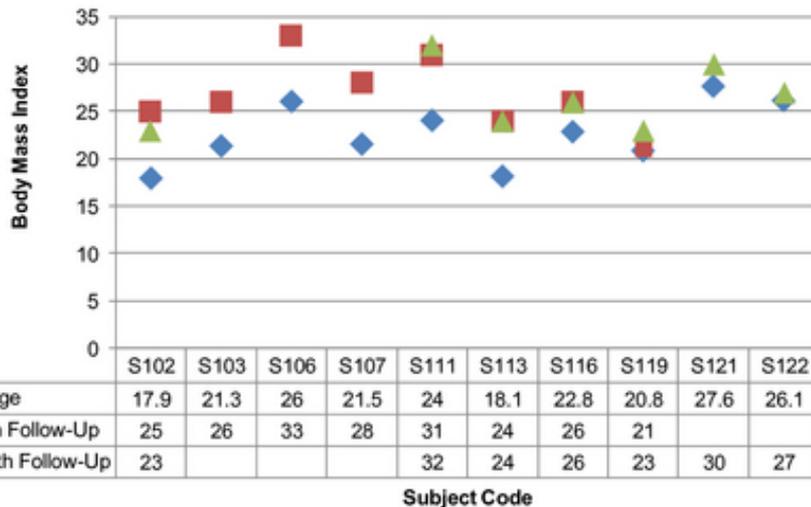
- Heart disease
- Stroke
- Type 2 diabetes
- Certain type of cancer



# Obesity and Brain Injury

- Cost:
  - Obesity cost \$147 billion in 2008.
  - The medical costs for people who are obese in 2008 were \$1,429 higher than those of normal weight.
  - Brain injury costs \$48.3 billion annually in the U.S.

# Obesity and Brain Injury



BMI classification	
Underweight	< 18.5
Normal range	18.5 - 24.9
Overweight	≥ 25.0
<i>Preobese</i>	25.0 - 29.9
Obese	≥ 30.0
<i>Obese class I</i>	30.0 - 34.9
<i>Obese class II</i>	35.0 - 39.9
<i>Obese class III</i>	≥ 40.0

- 26 patients with TBI
- Information collected at 3, 6, 9, and 12 months after discharge from rehab:
  - Height
  - Weight
  - Disability rating
  - Diet
  - Activity
- 30% showed increasing body mass index (BMI)

# Obesity and Aging

- Elevated Body Mass Index (BMI) linked to increased risk of Alzheimer's disease and structural changes
- Larger body composition is associated with poorer performance of measures of:
  - Global cognitive assessment function, memory, and language
  - No association between body composition and executive function
- Obesity may be an independent risk factor for poor neurocognitive outcome



# Combating Obesity

- Combination of diet and activity
- Motivational Interviewing
- Setting specific, measurable goals
  - Caution against goals that are too rigid
- Identify support system
- Provide structure
  - Including follow-up



# Summary

- Nutrition support and education is vital at each stage of brain injury recovery.
- After initial rehabilitation managing diet and weight can be difficult and requires ongoing support and education.
  - Using nutrition professionals to translate information is key to preventing unrealistic expectations and causing adverse outcomes.
- Barriers to nutrition support and education are similar to those faced by the general population but are compounded by problems with cognition and function.
- A healthy lifestyle is the result of structure, motivation, and a supportive environment

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# Questions?

