The Role of Medical Nutrition Therapy Following Brain Injury

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Today’s Webinar:
The Role of Medical Nutrition Therapy Following Brain Injury

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Webinar Overview

- Will define Medical Nutrition Therapy
- Brief overview of brain injury
- Highlight the role of nutrition from hospital to home
- Provide nutrition recommendations to promote brain health
What is Medical Nutrition Therapy?

- MNT is a comprehensive assessment of a person’s health or disease state, implementing a nutrition diagnosis, an intervention, a method of monitoring and evaluating the process to assist in the management of a disease state, chronic or acute condition or maintaining general health through nutritional intake.

- MNT is provided by a Registered Dietitian Nutritionist.
MNT in the Hospital

Gastrostomy

Abdominal wall
PEG Feeding Tube
Stomach
Esophagus

Feeding syringe

Food images

Brain Injury Alliance
www.BIANJ.org
1-800-669-4323

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Brain Injury

- Brain Injury is an insult to the brain which causes damage—Severe, Moderate, Mild.

- Acquired brain injury (stroke, aneurysms, encephalitis, anoxia, metabolic disorders, meningitis, or brain tumors); an injury to the brain that is not hereditary, congenital or degenerative.

- Traumatic brain injury (falls, MVA and being struck by or against an object); impact to the head that disrupts the normal function of the brain. The severity can range from “mild” to “severe”. This also includes mild trauma/concussion (grades 1, 2, 3).

- While the causes may differ between incident of brain injury, the effects on a person’s life can be quite similar.

- According to the CDC, In 2014 there were approximately 2.87 million TBI-related emergency department visits, hospitalizations, and deaths which occurred in the United States.

- About 75% of TBI cases in the United States are mild with complete recovery.
Result of Brain Injury

- Full Recovery
- Damage which is transient, short-term, long-term or permanent
- Deficits in cognitive executive function:
  - Memory loss
  - Decision making difficulty
  - Judgment deficit
  - Impulsivity control
  - Planning difficulty
- Lead to disability and reliance on caregiver for ADLs and/or IADLs
- Death
Consequences of primary brain injury can lead to secondary injury cascades

- Hypotension
- Hypoxia
- Brain Edema
- Cerebral Vasospasm
- Oxidative stress which can lead to damage
- Elevated intracranial pressure
- Opportunistic infections
- Hyper- and hypoglycemia
Nutritional Considerations in the ICU Setting

- Surgical Patient
- Pharmacologic/Medical Interventions
- Metabolic Alterations
- Enteral Nutrition
Nutrition Support: Enteral Feeding

- Preferred route of feeding
- Start feeding within 24-48 hours once hemodynamically stable
- General ASPEN and Academy of Nutrition and Dietetics guidelines:
  - Protein can range from 1.5-2.5 g/kg/day.
    - ABW BMI <30 (1.5-2g/kg/d)
    - IBW BMI 30-40 (2g/kg/d)
    - IBW >40 (2.5g/kg/d)
  - Energy 100-200% of baseline-predicted REE
    - Energy Needs: Indirect Calorimetry is ideal, but not always feasible. Mech Ventilation use the Penn State predictive equation which takes into account body temperature and minute ventilation, including ht, wt and age
    - Energy Needs kcal/kg; ranges will vary depending on BMI of patient, stress-mild, moderate/severe
    - When using ranges for energy needs, best to use usual body weight (UBW) if able to obtain or IBW if not.
Nutrition Support: Parenteral Feeding

- “Nutrition through the Vein”

- Calories, protein, fat, vitamins, minerals and medications administered in a fluid mixture.

- Consider PN when EN not tolerated
Transition to Oral Feeding

IDDSI Framework
Cichero et al. (2017) Dysphagia, 32: 293-314

What to consider?
- Cognitive awareness
- Swallow Evaluation by SLP
Transition to Oral Feeding

- Identify self feeding challenges
Transition to Oral Feeding

- Patient ability to consume adequate calories, protein and fluid by mouth
- Need to continue enteral nutrition
- Recommend oral nutrition supplement
- Monitor changes in swallow ability/dysphagia
Nutrients: Science of Food

Macronutrients

- Carbohydrate
  - Bread, pasta, rice
  - Dairy
  - Fruits and starchy vegetables
  - Beans and legumes

- Protein
  - Beef, chicken, pork, turkey, fish & shellfish, lamb, goat, eggs

- Fat
  - Vegetable oils
  - Avocado
  - Nuts and seeds
  - Cheese
  - Butter, lard, saturated fat, trans saturated fat

Micronutrients - some animal & seafood sources, whole grains, fruits and vegetables

- 8-B Vitamins
- Vitamin C
- Vitamins A, D, E, K
- Minerals
  - Calcium
  - Phosphorous
  - Magnesium
  - Potassium
  - Sodium
  - Chloride
  - Iron
  - Selenium
  - Copper
  - Zinc
  - Choline
  - Chromium
  - Iodine
  - Manganese
  - Fluoride
  - +trace elements
Phytonutrients

- A substance found in certain plants which is believed to be beneficial to human health and prevent various diseases.

- Examples: lycopene, resveratrol, carotenoid, isoflavone
Nutrients Identified in Brain Health: What the Research Shows

- Benefits from Omega-3 Fatty Acids and Vitamin E have been identified

- Vitamins, Minerals and Supplements in Continuing Studies (Review Article, Lucke-Wold et al, 2018):

  **Vitamin and Mineral in trials**
  - Vitamin D - when deficient had worsened outcomes after TBI in rodents; but may help with inflammation
  - Zinc - oxidative stress reduction, reduce inflammation and deficiency may be associated with depression following TBI
  - Magnesium - has been shown to improve recovery following TBI in pre-clinical trials

  **Dietary Supplements in Pre-Clinical Models of TBI**
  - Curcumin - antioxidant, normalized brain-derived neurotropic factor levels and improved motor and learning performance in animal study
  - Sulforaphane - antioxidant, improve blood-brain barrier integrity, reduce cerebral edema, improve cognition in animal study
  - Resveratrol - antioxidant; reduce reactive oxygen species, suppress excitotoxicity, reduce inflammation in animal study

  **Supplements in Clinical Trials for TBI**
  - Melatonin - hormone produced by body (pineal gland)
  - Choline - essential nutrient, regulates memory, mood and muscle control
  - Enzogenol - extract of pine bark, may improve cognition

- No recommendation at this time to take as an oral supplement. Always speak with your physician before taking or trialing any OTC oral supplements. **Good news… all of these vitamins, mineral, phytonutrients are found in whole food sources**
Omega-3 Fatty Acid and Brain Health

- Long-Chain Polyunsaturated fatty acids (LCPUFA) typically found in high concentrations in algae and fish.

- Considered “essential” as it can not be synthesized by the body and must come from food.

- Different types of Omega-3 fatty acids:
  - Eicosapentaenoic Acid (EPA) is a type of omega-3 fatty acid- plays an important functional role in the body, but the concentration of EPA in the brain is negligible.
  - Docosahexaenoic Acid (DHA) is a type of omega-3 fatty acid and is primary omega-3 fatty acid found in the brain
    - DHA has important structural role in the brain, supporting brain development and cognitive function throughout the lifespan.
    - Evidence suggests that DHA may act as a promising recovery aid for mTBI. (Barrett E, et al, 2014)

- Supplementation of DHA needs more study to determine therapeutic efficacy and most effective dosing strategy (Lucke-Wold et al, 2018).

- In a review by Barrett et al, it is noted that the current state of the science regarding LCPUFA supplementation for the treatment of concussion is based primarily on animal models. Additional human studies are warranted.
Good Sources of Omega-3

Include these Fish:
- Albacore Tuna
- Salmon - farmed and wild
- Atlantic Herring
- Anchovies
- Sardines
- Atlantic Mackerel
- Mussels (shellfish)
- Algae (edible seaweed versions)

Avoid:
Due to high levels of methyl mercury
- Swordfish
- Shark
- Tilefish
- King Mackerel (AKA Kingfish)
- Marlin
Non Fish Omega-3 Sources

- Chia Seeds
- Hemp Seeds
- Flax Seeds
- Edamame
- Soybean Oil
- Walnuts
- Kidney Beans

OK Sources, but not great as a sole source for Omega-3
Vitamin E and Brain Health

- Fat soluble vitamin

- Potent anti-oxidant as it is able to cooperate with a network of endogenous and exogenous anti-oxidant sources.
  - Stop oxidative damage
  - Peroxyl radical scavenger (protect cells from damage caused by free radicals, which are unstable molecules made during normal cell metabolism)
  - Protect phospholipid membrane from breakdown of PUFAs within layer
Food Sources of Vitamin E

- Plant seeds (ex: sunflower, sesame, pumpkin, flax seeds)
- Nuts (ex: almonds, walnuts, pecans, pistachios)
- Peanuts
- Vegetable Oils (ex: canola, sunflower, peanut, soybean)
Food Sources of Vitamins and Minerals in Brain Health

- **Vitamin D** - fatty fish, beef liver, cheese, egg yolks, fortified foods (some dairy products, orange juice, soy milk, cereals)

- **Zinc** - meat, shellfish, legumes (chickpeas, lentils), beans, seeds, nuts, dairy, eggs, whole grains

- **Magnesium** - green leafy vegetables, fruits, nuts & seeds, legumes, vegetables (peas, broccoli, cabbage, green beans, artichokes, asparagus, brussels sprouts, seafood)
Food Sources of Phytonutrients Connected to Brain Health

- **Curcumin** - ingredient in turmeric
- **Sulforaphane** - found in cruciferous vegetables
- **Resveratrol** - skin of berries and grapes, peanuts
- **Choline** - considered an essential nutrient: eggs, liver and peanuts; primarily in animal-based foods
Mediterranean Eating Plan

- Well known for:
  - Cardiovascular & anti-inflammatory benefits.
  - Association with healthy aging
  - Reduced risk of certain cancers
  - Type 2 diabetes
  - Parkinson’s disease

- New research suggests this healthful eating pattern also protects brain health and cognitive performance
Mediterranean Eating Plan

Focus on:
- Whole minimally processed plant foods
- Cereal grains
- Legumes
- Vegetables and fruits
- Nuts
- Fish
- Olive Oil (EVOO)

Small Amounts of:
- Red Meat & Poultry
- Milk and dairy products (whole)
- Modest alcohol amount (wine)
DASH Diet/Eating Plan  
(Dietary Approach to Stop Hypertension)

**Focus on:**
- Fruits and vegetables
  - berries and green leafy vegetables
- Low-fat dairy products
- Whole grains
- Poultry and fish
- Nuts

**Small Amount of:**
- Fats
- Red meats
- Sweets
- Sugar-containing beverages
MIND Diet/Eating Plan
(Mediterranean-DASH Intervention for Neurodegenerative Delay)

- Hybrid diet
- High intake of plant foods
- Limit meat consumption
- EVOO- extra virgin olive oil as primary source of fat
- Rich in antioxidants
- Monounsaturated fats
- Omega-3 fats
- Great emphasis on fish and overall fruit and vegetable intake- especially green leafy vegetables and berries

- Brain Healthy
  - Green leafy vegetables
  - Other vegetables
  - Nuts
  - Berries
  - Beans
  - Whole grains
  - Fish
  - Poultry
  - Olive Oil
  - Wine (in moderation)

- Unhealthy
  - Red meats
  - Butter and stick margarine
  - Cheese
  - Pastries and Sweets
  - Fried and fast foods
Carbohydrate: Whole Grains
Carbohydrate:
Vegetables and Fruits
Carbohydrate: Dairy
Carbohydrate: Beans and Legumes
Protein
Don’t Forget Fluid
Physical Exercise
Have a Healthcare Team to Support You
Stay in Touch

- Follow Me on Twitter: @wmhoodis
- Email: wmhoodis@gmail.com
References


https://www.cdc.gov/traumaticbraininjury/get_the_facts.html
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