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NUTRITION AND WOUND MANAGEMENT; FOOD FOR THOUGHT

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PROGRAM OVERVIEW AND OBJECTIVES

Discuss the role of dehydration and malnutrition impeding wound healing
Discuss barriers impeding wound healing
Explain the role specific vitamins and minerals play in the wound healing process

ACKNOWLEDGEMENTS

A. D. A. M. Medical
Mayo Foundation for Medical Education and Research
Nursing Homes
>500,000 residents may suffer from malnutrition or dehydration
>Malnutrition and dehydration rates in nursing homes are at 35% or higher
>52% of hospital patients admitted with a diagnosis of dehydration will come from a nursing home
>1999 and 2002 - 13,890 nursing home residents nationwide died from malnutrition and dehydration
>$6.5 million awarded to a Ohio widow

Nursing Home Failures
>Loss of the ability to eat independently
>Inadequate staff to properly feed the residents
>-Staff to resident ratio
>-Turn over rate (93%)
>Adequate attention to residents who need assistance with eating
>Staff education on nutrition and feeding methods
>Proper supervision during meals
>Oral deficit of necessary vitamins, minerals, protein, and calories

ISSUES
F-Tag 360
§483.35 Dietary Services
F-Tag 325
§483.35(i) Nutrition
F-Tag 364
§483.35(d) Food
F-Tag 365
§483.35(d)(3) Food prepared in a form designed to meet individual needs
F-Tag 366
§483.35(d)(4) Substitutes offered of similar nutritive value to residents who refuse food served
F-Tag 367
§483.35(a) Therapeutic Diets
F-Tag 322
§483.25(g)(2) Tube Feeding
WOUND MANAGEMENT

Skin
- Breakdown
  - Fight or flight (stress hormones)
  - General catabolic state
  - Suppression of the synthesis of protein, glycogen, triglycerides
  - Protein energy malnutrition (PEM)
- A resident with a PrU who continues to lose weight needs:
  - Additional caloric intake
  - Correction (where possible) of conditions that are creating a hypermetabolic state
- Registered Dietician or Nutritionist

Stress Response
- Catabolic hormones (cortisol and catechols)
- Metabolic rate
- Body temperature
- Glucose demand and liver gluconeogenesis
- Anabolic hormones (human growth hormones and testosterone)
- Rapid skeletal muscle breakdown
- Amino acid use as an energy source
- Lack of ketosis (fat not the major caloric source)
- Unresponsiveness of catabolic to nutrient intake
**WOUND MANAGEMENT**

*Body Mass Index*
- Sarcopenia
- Underweight and overweight
- Same nutritional risks
- Diagnostic tool
- Obesity and PEM
  - <16 = severe underweight
  - 17 - 18 = underweight
  - 19 - 24 = normal
  - 25 - 30 = grade I obesity (mild)
  - 31 - 40 = grade II obesity (moderate)
  - >40 = grade III obesity (severe)

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*WOUND MANAGEMENT*

*Loss of Muscle Mass*
- Face (temporalis and masseter)
- Hands (interosseous and thenar)
- Upper body (pectoralis, deltoids, scapular, trapezius, triceps, biceps)
- Lower body (quadriceps, gastrocnemius)
- 20% LBM loss
  - Decreased healing, weakness, increased infection, thinning of the skin, mortality increased by 30%
- 30% LBM loss
  - Too weak to sit, PrUs develop, possible pneumonia, wound healing ceases, mortality increased by 50%

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*WOUND MANAGEMENT*

*Muscle Mass Decrease*
- Energy requirements decline
- Protein reserves during periods of stress
- Total body water increases chances of dehydration
- Distribution volume of fat-soluble drugs
- Elimination of fat-soluble drugs is delayed

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**Creatine Height Index (%)**

- Marker for skeletal muscle mass
- Creatine (degradation product) formed in active muscle at a constant rate in proportion to the muscle mass of an individual
- 2% muscle creatine converted to creatinine daily
- Decreases (protein depletion)
- Amount of creatine excreted in a 24 hour period divided by the amount of creatine excreted by a normal healthy individual of the same height and sex
  - >80% = normal protein
  - 60% - 80% = moderate protein depletion
  - <60% = severe protein depletion

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**WOUND MANAGEMENT**

**WOUND MANAGEMENT**

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**WOUND MANAGEMENT**

**Anorexia**

- Loss of appetite/energy loss of interest in seeking and consuming food
- A psychiatric eating disorder
  - Physical - low body weight
  - Psychological - image distortion
  - Emotional - depression
  - Behavioral - obsessive fear of gaining weight

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**Cachexia**

- Loss of appetite in someone who is not actively trying to lose weight
  - Insidious loss of weight, muscle atrophy, fatigue and weakness
  - Directly related to inflammatory states
  - Rheumatoid arthritis, AIDS, chronic renal failure, COPD, Cancer, Immunodeficiency syndrome
  - Resistance to hypercoloric feeding
  - Tx dependent of diagnosis of underlying etiology

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**WOUND MANAGEMENT**

- Monitoring
- Assessment
- Intervention
- Evaluation
**WOUND MANAGEMENT**

**Screening Triggers**
- Resident food consumption - fluid, food and/or supplement served
- Fluid amount accepted daily
- Resident refusal of fluid, diet, meals or supplements (why, alternatives, notification, documentation)
- Frequency of RD visit and discuss the PoC with the resident or staff
- Residents weight status monitored (loss or gain)
- Laboratory values requested - appropriate
- Frequency of PoC evaluated and updated
- Hydration and nutritional component of the PoC appropriate
- Competency of resident and staff to understand the risks and benefits of the hydration and nutritional intervention

**WOUND MANAGEMENT**

**Exudate (Type)**
- **Inflammatory**
  - Serous - watery plasma, thin, clear or light color
  - Serosanguinous - plasma and red blood cells, thin, light red to pink
  - Sanguineous - thin, red, bloody
- **Infection**
  - Seropurulent - contains some white blood cells and living or dead organisms, cloudy, yellow to tan
  - Purulent - pus contains white blood cells and living or dead organisms, thick, creamy yellow, green, or brown
- **Sanguineous**
- **Exudate (Amount)**
  - Light, Moderate, Heavy - clinical judgment

**WOUND MANAGEMENT**

**Moisture-Associated Skin Damage (MASD)**
- **Incontinence-associated dermatitis**
  - Intertriginous dermatitis
  - Peri-wound or peri-stomal moisture-associated dermatitis

**Treatment**
- Establish continence training
- Bowel or bladder training programs
- Avoid skin contact with plastic surface to reduce sweating
  - Maceration, shear, friction

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WOUND MANAGEMENT

Incontinence
- Urine
  - Urinary tract infection
  - Medications
  - Confusion
- Feces
  - Bile acids and enzymes
  - Irritate the epidermis
  - Make the skin more susceptible to breakdown
  - Maceration, shear, friction
- Fecal impaction

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Support Surface (Powered)
- Moderate - high risk or resident has a PrU on turning surfaces and the ulcer
- Residents unable to assume a variety of positions
  - Flexion contractures
  - Reduce pressure on bony prominences or prevent breakdown from skin-to-skin contact
- Additional 10 to 15 ml fluid/kg of body weight
  - Prevent dehydration occurring from the drying effects of the specialty beds

WOUND MANAGEMENT

HYDRATION

Daily Fluid Intake vs. Daily Fluid Loss
- Daily fluid intake
  - Liquid consumed + fluid in foods consumed + bodily by-product water
- Daily fluid losses
  - Any body fluid
    - Kidney use (urine) + GI tract use (feces) + evaporation from skin + respiration evaporation
  - The body does not store water

Water Gain

Water Loss

<table>
<thead>
<tr>
<th>Daily Fluid Intake</th>
<th>Daily Fluid Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingested Fluids</td>
<td>Ingested Fluids</td>
</tr>
<tr>
<td>(1400 mL)</td>
<td>(1200 mL)</td>
</tr>
<tr>
<td>Metabolic Water</td>
<td>Excreted Fluids</td>
</tr>
<tr>
<td>(200 mL)</td>
<td>(1500 mL)</td>
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<tr>
<td>Ingested Foods</td>
<td>(950 mL)</td>
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<tr>
<td>(700 mL)</td>
<td>(1500 mL)</td>
</tr>
<tr>
<td>Lungs</td>
<td>Skin</td>
</tr>
<tr>
<td>(550 mL)</td>
<td>(450 mL)</td>
</tr>
</tbody>
</table>

Adapted from Krause's Food, Nutrition & Diet Therapy, 11th edition.
HYDRATION

Dehydration

- Reduction in total body water
  - Hyponatremia (water and sodium loss)
  - Hypo-osmolar (water loss - due to ↑sodium or glucose)
  - Electrolyte imbalance (3% body weight)
- Long Term Care
  - Sign of poor care
  - Combination of physiological or disease process
  - Not primarily due to lack of access to water

Hydration Screening

- Weight loss
- Pale skin
- Sunken eyes
- Red swollen lips
- Swollen and/or dry tongue with scarlet or magenta hue
- Dry mucous membrane
- Poor skin turgor
- Cachexia
- Bilateral edema
- Muscle wasting
- Calf tenderness
- Reduced urinary output
- Dark urine

Blunted Thirst Mechanisms

- Aging
  - Homeostasis declines
- Infection
  - Respiratory, GI, GU
- Fluid loss or increased fluid need
  - Diarrhea, fever, vomiting
- Incontinence
- Reduce fluid intake
- Fluid restriction
- Renal dialysis
- Medications
  - Diuretics, sedatives, antipsychotics, tranquilizers

Cognitive or functional impairment

- Aphasia - unable to communicate effectively
- Dementia or Alzheimer’s disease
- Neurological impairment
  - Coma or decreased sensorium
- Tube feedings
  - Dysphagia
  - Reduce fluid intake
- NPO
- Reduce fluid intake
- Use of supplementation
  - Thick
  - Difficult to swallow

Dehydration
Hyponatremia
Hyperosmolar
Electrolyte imbalance
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**HYDRATION**

### Types of Dehydration

- Persistent subclinical dehydration
  - Anxiety
  - Panic attacks
  - Agitation
- Fluctuation in tissue hydration
  - Inattention
  - Hallucinations
  - Delusions
  - Severe dehydration
  - Somnolence
  - Psychosis
  - Unconsciousness

### Functional Decline of the Renal System

- Abnormal lab values to identify dehydration
  - Abnormal glucose, calcium, potassium
  - Abnormal serum bicarbonate
  - Abnormal creatinine
  - Hemoglobin and hematocrit
  - Urine specific gravity
  - Serum sodium
  - Albumin
  - Blood Urea Nitrogen (BUN)*

* BUN is only useful in absence of renal disease

### Intervention

- Monitor fluid intake and output
  - Adult 30 - 35 mL fluid/kg body weight/day
  - Minimum of 1500 mL/day
- Maintain circulation blood volume (reduce hypovolemia - fluid/salt)
- Maintain fluid and electrolyte balance

Source: American Medical Directors Association Dehydration and Fluid Maintenance, Clinical Practice Guidelines, Columbia MD
HYDRATION

Fluids With Special Problems
- Caffeine (tea and coffee)
- Low levels of vitamin C
- Inhibition of iron
- Diet soft drinks
- Alcohol

Best Type of Fluid
- Un-concentrated
- Decaffeinated
- Beverage resident will drink
- Water is the best fluid for dehydration

NUTRITION

Weight
- Reflects the balance between intake and utilization of energy (calorie and protein)
- Before instituting a nutritional care plan assess:
  - Eating times (30 - 60 minutes)
  - Consumption (50%)
  - Severity of nutritional compromise
  - Individual's prognosis
  - Projected clinical course
  - Resident's wishes and goals (offer relevant alternatives)

NUTRITION

Malnutrition
- Deficiency, excess or imbalance of energy, protein or other nutrients causing adverse effects on body form, function and clinical outcomes
  - Due to increased total protein turnover
  - Rapid loss of lean body mass
  - Insufficient energy intake
  - Weight loss
  - Loss of subcutaneous fat
  - Localized or generalized fluid accumulation
  (may mask weight loss)
  - Diminished functional status (hand grip)

Undernutrition
- Inadequate nutrition results from lack of food or failure of the body to absorb or assimilate nutrients properly
NUTRITIONAL ASSESSMENT

Weight Measurement

❖ Admission or readmission
❖ Weekly - first 4 weeks after admission
❖ Monthly (identify changes gain or loss)
❖ Frequent
   - Food intake has declined and persisted (more than a week)
   - Evidence of altered nutritional status or fluid and electrolyte imbalance
   - Consider terminally ill patient

Severity of weight loss

❖ Severe weight loss
   ≥10% in 6 months
   ≥7.5% in 3 months
   ≥5% in one month
   ≥2% in one week

(Miller E. ed. Pocket Source for Nutritional Assessment. 4th ed; Waltham, MA)

NUTRITIONAL ASSESSMENT

Laboratory Tests

❖ None are specific or sensitive enough to warrant serial or repeated testing or determine a resident’s nutritional status
   - Determine whether the test will potentially change the resident’s diagnosis, management or quality of life
❖ Laboratory test may be affected by:
   - Age
   - Hydration status
   - Chronic disease
   - Acute illness
   - Change in organ function

NUTRITIONAL ASSESSMENT

❖ Serum Albumin
   - Long half life (12-21 days)
   - Poor indicator of visceral protein status
   - Negative acute phase reactants
   - Down regulated in inflammatory states
   - Decrease albumin levels reflect the presence of inflammatory cytokine production
   - 3.5 - 5.0 g/dL
❖ Prealbumin (transthyretin/ thyroxine-binding albumin)
   - Short half life (2 - 3 days)
   - Subject to the same influences as albumin
   - Decreases rapidly when caloric/protein intake decreases
   - 15.0 – 25.0 mg/dL
❖ HgBA1c
   - Glycemic control
NUTRITIONAL ASSESSMENT

2. Probably inadequate: Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement, OR receives less than optimum amount of liquid diet or tube feeding.

Care Requirements
- Baseline Labs
- Dietitian evaluates and recommends intake goals
- Supplements are provided, intake counted and recorded
- Provide support with eating
- Time meals, encourage family to feed
- Encourage favorite food and snacks

NUTRITIONAL ASSESSMENT

3. Adequate: Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered, OR is on a tube feeding or TPN regimen, which probably meets most of nutritional needs.

Care Requirements
- Monitor intake of food, tube feeding, TPN
- Food intake decreases - offer supplement
- Tube feeding or TPN decreases - monitor and ensure infusion of prescribed amount
- Evaluate adequacy of prescribed amount
- Dietitian evaluates intake of calories and protein if food intake is low
- Consider vitamin supplement
- Provide assistance with feeding as needed
NUTRITIONAL ASSESSMENT

Braden <18
- Inadequate hydration, protein and/or weight loss
- Complete nutrition assessment
- Meet fluid needs
- Visual assessment
- Follow up weekly
- Food preferences, constipation, illness depression, pain, medication causing poor appetite
- Anabolic agent and/or nutrition support
- BMI <20 change diet to high calorie, high protein
- Add therapeutic multivitamin/minimum supplement

At risk: 15 to 18
Moderate risk: 13 to 14
High risk: 10 to 12

NUTRITIONAL ASSESSMENT

Assessment Tool
- ASPEN
- Nutritional risks (six areas)
- Oral health status
- Ability to eat
- Proper diet
- Eating patterns
- Chronic diseases affecting appetite
- Medications affecting appetite
- Current weight status
- Detect under and over nutrition
- Malnutrition Screening Tool

NUTRITIONAL ASSESSMENT

Assessment Tool
- Mini-Nutritional Assessment (Short)
- Dietary intake – foods, patterns
- Weight change, BMI, Muscle circumferences
- Functional impairment, Independence, Living arrangements
- Psychological issues, Self assessment
- Simplified Nutritional Appetite Questionnaire (SNAQ)
- Appetite
- Satiety
- Taste
- Meal frequency

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**NUTRITIONAL ASSESSMENT**

**Proposed**
- Energy intake
  - Review food and nutrition history
  - Estimate energy needs over time
- Interpretation of weight loss
  - Under or overhydration
  - WT. change over time
  - Percent wt. loss from baseline
- Body fat
  - Loss of subcutaneous fat
  - Orbital, triceps ribs
- Muscle mass
  - Wasting of temples, clavicles shoulders, scapulaes, thigh and calf
- Fluid accumulation
  - Extremities, scrotum/vulva edema
  - WT. loss masked by fluid retention
- Reduced grip strength
  - Measuring device
NUTRITIONAL ASSESSMENT

Oral Health Status
- 60 - 90% of residents have severe periodontal disease
  - Gum recession
  - Tooth loss (80%)
  - Ill-fitting dentures (50%)
  - Mouth ulcers (30%)
  - Oral pain
  - Chewing abnormalities
  - Dry mouth
  - Gingivitis
  - Periodontal disease
  - Dysphagia
  - Disease of the oropharynx and esophagus
  - Dementia
  - Stroke

KEY MACRONUTRIENTS

Calories
- Consuming enough calories, "spares" the use of protein for energy
- 30 calories/kg (15 calories/pound) prevent protein breakdown in non-obese
- Resident with PrUs or at-risk for development
  - 25 - 35 kcal/kg body weight/day*


KEY MACRONUTRIENTS

Protein
- Building block for repair
  - Angiogenesis
  - Collagen synthesis
  - Granulation tissue
  - Epidermal cell proliferation
  - Tensile strength
  - Resistance to infection
- RDA
  - 0.8 g/kg body weight
  - Stress 1.2 to 1.5 g/kg body weight

**KEY MACRONUTRIENTS**

Protein Requirement
- Stage 1 = 1.0 gm/kg
- Stage 2 = 1.1-1.2 gms/kg
- Stage 3 = 1.25-1.5 gms/kg
- Stage 4 = 1.5 - 2.0 gms/kg
- Protein above 2.0 gm/kg
  - May not help protein synthesis
  - May cause dehydration, particularly in the elderly or those with impaired renal function

**KEY MICRONUTRIENTS**

Inflammatory
- Macrophages, neutrophils, blood clotting, vasodilatation
- Vitamins and amino acids: A, K, Bromelain

Proliferative
- Angiogenesis, fibroblasts, collagen deposition
- Vitamins and minerals: A, B6, C, D, Cu, Fe, Mg, Zn

Remodeling
- Collagen maturation, stabilization, scar tissue mature
- Vitamin and minerals: A, C, Cu, Fe, Zn

**KEY MICRONUTRIENTS**

Vitamin A
- Facilitates macrophage entry into the wound and enhances angiogenesis
- Antagonizes inhibitory affects of glucocorticoids (corticosteroids)
- Stimulates fibroplasia to increase collagen synthesis
- RDA
  - 5000 - 25000 International Units (IU) X 10 days
**KEY MICRONUTRIENTS**

**Vitamin C (Ascorbic acid)**
- Not stored in the body
- Enhances leukocyte, macrophage activation, fibroblast, collagen synthesis
- Depressed levels found in elderly, smokers, and certain cancers
- RDA
  - 75 mg/day for females and 90 mg/day for males
  - Supplementation 500-1000 mg/day for 2 weeks if deficiency suspected

**Vitamin D**
- Fat soluble
- Calcium balance
- Immunity (infection)
- Modulates cell differentiation
- Proliferation of keratinocytes
- RDA
  - Males/Females 15 mcg (600 IU)

**Vitamin E**
- Scar formation – conflicting reports
- Adversely affects vitamin A benefits
- May interfere with the healing of some types of wounds

**Vitamin K**
- Co-factor for coagulation
- Monitor prothrombin times (PT) ratios (INR)
- Antibiotics may limit vitamin K
KEY MICRONUTRIENTS

L-Arginine
- Immune stimulant for lymphocytes
- Stimulates release of insulin-like growth factor-I (IGF-I)
- Precursor collagen and connective tissue synthesis and cell multiplication
- Therapeutic dose to promote healing is ~9 g/day

Copper
- 10 days till depletion following injury
- Formation of red blood cells
- Vitamin C + copper = elastin production
- RDA
  - 900 μg/day

Zinc
- Increased demand during collagen and protein synthesis
- RDA
  - 11-15 mg/male (elemental zinc)
  - 8-12 mg/female (elemental zinc)
  - Limit 40 mg/day
- Hypermetabolic state
  - Urinary loss of zinc
  - Zinc sulfate 220 mg tid
- Supplementation with 25 - 50 mg elemental zinc/day x 2 weeks (not indicated)
  - Stage III - IV pressure ulcer
- D/C in 3 - 6 weeks - may impair copper absorption

Glutamine
- 60% intracellular amino acid pool
- Primary fuel source for epithelial cell division
- Stimulates lymphocytic proliferation
- wound infection
  - 2.0 g - HGH release
  - 0.3 - 0.4 g/kg/day (burn patients)
- Caution
  - Excess may result in ↑ ammonia levels
NUTRITION

Current evidence does not definitively support any specific dietary supplement unless the resident has a specific vitamin or mineral deficiency.

- Multivitamins contain 7.5 to 15 mg of elemental zinc.

WOUND HEALING AND NUTRITION

FOOD FOR THOUGHT

In Conclusion

- Nutrition plays an essential role in wound healing.
- Implementing the nutritional plan and providing appropriate nutritional support to the individual requires involvement of the whole wound management team.
- By combining knowledge of the wound healing process together with best practice provision of nutrition, healthcare professionals can help decrease the morbidity and mortality associated with chronic wounds as well as reducing their cost and impact.

THANK YOU

QUESTIONS?
REFERENCES


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REFERENCES


42 CFR 483.25(i), Tag F325, Nutrition.


REFERENCES


REFERENCES


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