Nutrition and Wound Healing

Content Creators:

Members of the South West Regional Wound Care Program's Clinical Practice and Knowledge Translation Learning Collaborative

L

Learning Objectives

1. Describe the various aspects of nutritional screening and assessment
2. Describe the role of nutrients in wound healing
3. Identify nutritional requirements based on the etiology of the wound
4. Describe available nutritional supports for those unable to meet their nutritional needs orally

NUTRITIONAL SCREENING AND ASSESSMENT

Nutritional Screening[1]

- "The process of identifying characteristics known to be associated with nutritional problems"

- Purpose - to pinpoint individuals who are malnourished or at nutritional risk:
  - Malnutrition is associated with increased length of stay, costs, and morbidity/mortality
  - Nutritional supports can help:
    - Increase physical strength;
    - Speed recovery and wound closure, and;
    - Decrease the risk of infection.

Persons at Risk[1]

- Inadequate intake:
  - Cerebral vascular accident (CVA)
  - Elderly
  - Reduced access to food
  - Poor dentition or mouth sores
  - Dysphagia
  - Esophagitis

- Inadequate absorption:
  - Irritable Bowel Syndrome, Crohn's, Colitis
  - Diarrhea or vomiting

- Increased losses:
  - Colostomy, ileostomy
  - Fistula
  - Wounds

- Increased requirements:
  - Congestive Heart Failure, Chronic Obstructive Pulmonary Disease, pneumonia, asthma
  - Wound healing

Additional Risk Factors[1]

- Functional limitations
  - Difficulty chewing, swallowing
  - Inability to physically prepare meals or travel to dining room
  - Poor hearing, vision
- Altered mental status
  - Difficulty self feeding
  - Inability to understand importance of eating
  - Advanced dementia → weight loss, dysphagia, malnutrition
- Drug therapy:
  - Nausea/vomiting side effects
  - Corticosteroids inhibit protein synthesis and cause depletion of vitamin A from liver
- Impaired localized blood flow
- Poor appetite/intake
- Decreased thirst response
- Decreased ability to concentrate urine
- Intentional fluid restriction
- Advanced age

NESTLE NUTRITION INSTITUTE MINI NUTRITIONAL ASSESSMENT (MNA©)

- MNA© is a screening and assessment tool that identifies individuals age 65 and above who are malnourished or at risk of malnutrition
- Allows for earlier intervention to provide adequate nutritional support
- Six questions
- The screening score (max 14 points):
  - 12- 14 points = normal nutritional status
  - 8-11 points = at risk of malnutrition
  - 0 -7 points = malnourished

MNA© Form

Mini Nutritional Assessment

MNA®

Nestlé Nutrition Institute

Last name:		First name:		
Sex:	Age:	Weight, kg:	Height, cm:	Date:

Complete the screen by filling in the boxes with the appropriate numbers. Total the numbers for the final screening score.

Screening

A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
0 = severe decrease in food intake
1 = moderate decrease in food intake
2 = no decrease in food intake ☐

B Weight loss during the last 3 months
0 = weight loss greater than 3 kg (6.6 lbs)
1 = does not know
2 = weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
3 = no weight loss ☐

C Mobility
0 = bed or chair bound
1 = able to get out of bed / chair but does not go out
2 = goes out ☐

D Has suffered psychological stress or acute disease in the past 3 months?
0 = yes 2 = no ☐

E Neuropsychological problems
0 = severe dementia or depression
1 = mild dementia
2 = no psychological problems ☐

F1 Body Mass Index (BMI) (weight in kg) / (height in m^2)
0 = BMI less than 19
1 = BMI 19 to less than 21
2 = BMI 21 to less than 23
3 = BMI 23 or greater ☐

IF BMI IS NOT AVAILABLE, REPLACE QUESTION F1 WITH QUESTION F2.
DO NOT ANSWER QUESTION F2 IF QUESTION F1 IS ALREADY COMPLETED.

F2 Calf circumference (CC) in cm
0 = CC less than 31
3 = CC 31 or greater ☐

Screening score ☐☐
(max. 14 points)

12-14 points:	Normal nutritional status
8-11 points:	At risk of malnutrition
0-7 points:	Malnourished

Ref. Vellas B, Villars H, Abellan G, et al. *Overview of the MNA® - Its History and Challenges.* J Nutr Health Aging 2006;10:456-465.
Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. *Screening for Undernutrition in Geriatric Practice: Developing the Short-Form Mini Nutritional Assessment (MNA-SF).* J. Geront 2001;56A: M366-377.
Guigoz Y. *The Mini-Nutritional Assessment (MNA®) Review of the Literature - What does it tell us?* J Nutr Health Aging 2006; 10:466-487.

For more information: www.mna-elderly.com

SOUTHWEST REGIONAL WOUND CARE PROGRAM

South West Regional Wound Care Program

Nutritional Assessment[1]

- The “interpretation of data from the (nutritional) screening process”
- Includes a review of data from all disciplines
- Purpose is to allow for the development of a nutritional care plan

Physical Conditions[1-2]

- Skin condition:
  - Signs of dehydration
    - Dry, flaky skin
    - Skin that tents
  - Edema
  - Ascites
  - Signs of weight loss
    - Loose skin
  - Non-healing wounds
  - Purpura/bruises

BMI[1]

- Body mass index (BMI)
- Weight to height ratio
- Indicator of obesity (highly correlated with body fat)
- A BMI of 21 with unintentional weight loss puts a person at risk for pressure ulcer development

Height and Weight[1]

- Weight and body composition change with age:
  - Weight peaks in 60's and decreases beyond 70's
  - Proportion of body fat increases with age

- Regular and frequent weight monitoring is the most non-invasive, time-efficient, inexpensive and most reliable indicator of nutritional adequacy

Significant Unintentional Weight Loss

- Significant nutrition/health risk =
  - > 5% loss of usual weight over one month
  - > 7.5% loss of usual weight over three months
  - > 10% loss of usual weight over six months

ROLE OF NUTRIENTS IN WOUND HEALING

Key Nutrients in Wound Healing

- Carbohydrates
- Protein
- Fats
- Vitamins
- Water
- Minerals

Nutrition is Paramount

Nutrients involved in wound healing function in **cellular**, **structural,** and **immune processes** and in all phases of wound healing

A wound healed without optimal nutrition will be weak and is more likely to break down again

Carbohydrates[1]

- Most readily available source of energy
- Spare protein for building and maintaining tissues
- Regulate metabolism
- Provide flavor, color, variety to the diet
- Provide 4 kcal/g energy

Food Sources of Carbs[1]

- Grains
- Cereals
- Legumes (peas and beans)
- Pasta
- Bread
- Natural sugars in fruits, veggies, and milk
- Added sugars

Sources of Carbohydrates

Images Source: National Cancer Institute (Renee Comet - Photographer

Protein[1]

- Synthesis of enzymes and hormones involved in wound healing
- Cell multiplication
- Synthesis of collagen, epidermal cell proliferation, skin integrity, and resistance to infection and immune response
- Supplies structural and binding material of muscle, cartilage, ligaments, skin, hair, and fingernails
- A component of antibodies and immune system function
- Helps to maintain the fluid and mineral composition of various body fluids
- Helps transport needed substances, such as lipids, mineral and oxygen, around the body
- Serves as building material for growth and repair of body tissues
- 4 kcal/g

Food Sources of Protein[1]

- Meat, fish, poultry
- Eggs
- Dairy products (milk, cheese, yogurt)
- Legumes
- Seeds
- Grains

*Protein from animal sources are better as they have the amino acids essential to human nutrition in adequate amounts

Sources of Protein

Images Source: National Cancer Institute (Renee Comet – Photographer)

Fats[1]

- Maintains normal cell membrane function
- Permit fat-soluble substances to move in and out of the cell
- Provide insulation under the skin
- Cushion the kidneys and other organs from injury
- Provide flavor and aroma in foot
- Carry fat soluble vitamins
- Serve as the most concentrated source of heat and energy: 9 kcal/g
- Provide energy during periods of food deprivation

Food Sources of Fat[1]

- Meat
- Dairy products
- Fish and vegetable oils
- Nuts
- Some fruits, i.e. avocados and olives

Sources of Fat

Images Source: National Cancer Institute (Renee Comet – Photographer)

Vitamins[1]

- Facilitate various chemical reactions in the body
- Key role in normal cell functioning and cell's ability to use energy
- Participate in protein synthesis and cell replication
- Various therapeutic properties:

Vitamin	Properties
Vitamin A	Required for inflammatory process
Vitamin B	Required for cross-linking of collagen fibers
Vitamin C	Can increase activation of leukocytes and macrophages

Fat Soluble Vitamins[1]

- A, D, E, K
- Derived from fatty and oily parts of certain foods
- Stored in fatty tissue and liver until needed
- Lack of vitamin A can retard epithelialization and decrease collagen synthesis

Water Soluble Vitamins[1]

- B, C, D, E
- Derived from the water components of foods
- Distributed throughout water compartments of the body
- Not stored – excreted with concentration becomes too high
- Vitamin B needed to produce energy from glucose, amino acids, and fat
- Vitamin B6 helps maintain cellular integrity and helps form blood cells
- Thiamine and riboflavin needed for cross-linking and collagenation

Vitamin C[1]

- Required for production of strong collagen
- Facilitates leukocyte migration to the wound, increasing resistance to infection
- Needed for neutrophil superoxide formation and bacterial killing
- Increases the activation of macrophages at the wound site

Water[1]

- Aids in hydration of wound site and oxygen perfusion
- Acts as a solvent for minerals, vitamins, amino acids, glucose, and other small molecules, and enables them to diffuse in and out of cells
- Transports vital materials to cells and carries waste away from cells
- Serves as a lubricant
- Maintains body temperature

Dehydration in the Older Adult[4]

- One of the most common reasons for hospitalization
- As people age:
  - Total body water decreases
  - Kidneys can't concentrate urine as well
  - Decreased thirst sensation
  - Changes in hormone levels that affect the kidney
  - Effects of medications, i.e. diuretics
  - Changes in mobility, cognition and independence
  - Self-imposed fluid restrictions – fear of incontinence

Monitoring Fluid Status[4]

- Hydration status = intake – output
- Recommended fluid intake for average person = 27-30mL/Kg
- Minimal fluid intake for older adults = 1500mL/day
- Younger people need 35mL/Kg/day
- Consider all routes of fluid losses:
  - Gastrointestinal tract
  - Urinary tract
  - Fever/sweating
  - Wound exudate
  - Negative pressure wound therapy
  - Air-fluidized beds
  - Respiratory tract

Signs of Deficiency[1, 4]

- Decreased urine output
- Dark, concentrated and/or strong smelling urine
- Frequent urinary tract infections
- Dry lips/mouth and thick, stringy saliva
- Constipation
- Orthostatic hypotension
- Confusion or change in mental status
- Weight loss of 3.5Lbs in less than a week
- Fever
- Decreased skin elasticity
- Sunken eyeballs

Tips to Increase Fluids[1, 4]

Approximate Fluid Provision from Common Foods		
Jell-O	½ cup	120mL
Pudding	½ cup	100mL
Ice Cream/Sherbet	½ cup	60mL
Popsicle	1	90mL
Yogurt	½ cup	90mL
Canned fruit	½ cup	100mL
Soup	1 ½ cups	165mL

- Ice chips, ice cubes

Minerals[1]

- Build body structures
- Maintain fluid balance
- Activate enzyme systems
- Skeletal system depends on calcium, magnesium and phosphorus for its structural integrity

Microelements[1]

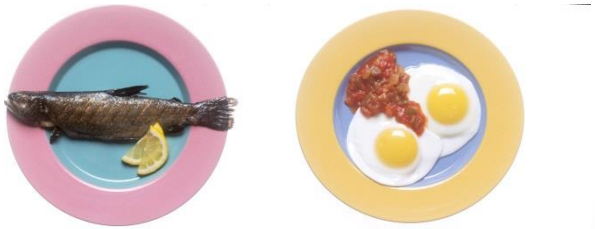
- Needed in small amounts:
  - Zinc
  - Iodine
  - Iron
  - Copper
  - Manganese
  - Magnesium

Functions of Zinc in Wound Healing[1]

- Needed for protein synthesis, collagen synthesis
- Re-epithelialization
- DNA synthesis, cell division, and proliferation
- Disposal of damaging compounds produced by leukocytes during wound debridement
- Trace mineral and component of 200 enzymes

Food Sources of Zinc[1]

- Meat, poultry, fish/seafood (especially oysters)
- Liver
- Eggs
- Milk
- Legumes
- Whole wheat products
- Wheat germ



Sources of Zinc

Images Source: National Cancer Institute (Renee Comet – Photographer)

NUTRITION BASED ON WOUND ETIOLOGY

Burns[1]

- Energy requirements can increase 100% depending on extent/depth of burn
- Hypermetabolism accompanied by exaggerated protein catabolism for energy and increased urinary nitrogen excretion forcing use of protein for energy
- Protein loss through wound exudate

Skin Tears[1]

- If limited improvement of wound after seven days, consider addition of:
  - Protein
  - Calories
  - Fluids

Leg Ulcers[1]

- Diagnose the cause
- Improve tissue perfusion if possible
- Provide compression
- Manage concurrent diseases
- Support alterations in lifestyle:
  - Weight loss
  - Proper diet
  - Smoking cessation

Dermatitis[1]

- Candida albicans
- Normally found in mouth, vaginal tract, gut
- Candidiasis results from:
  - Pregnancy
  - Oral contraceptives
  - Antibiotic therapy
  - Diabetes
  - Skin maceration
  - Steroid therapy
  - Endocrinopathies

Pressure Ulcers

- Depending on severity of the ulcer:
  - Multivitamin supplementation if intake inadequate
  - Vitamin C 500mg PO BID
  - Elemental zinc 25mg PO BID
    - Zinc should be reassessed at 10 days and discontinued if normal
  - Protein: 1-2g/Kg
  - Calories: 25-40Kcal/Kg
  - Fluids: 20-45cc/Kg

Diabetic Foot Ulcers[6]

- Hyperglycemia may be induced by:
  - Wound occurrence
  - Presence of infection

- People with diabetes are at greater risk of infection due to their host resistance:
  - When blood glucose is high, chemotaxis and phagocytosis are compromised
  - This prolongs the inflammatory phase and impedes resolution of infection

- “The achievement of optimal glucose control is the most important factor affecting wound healing in patients with diabetes”

NUTRITIONAL SUPPORTS

The Med Pass Program[3]

- The provision of a liquid nutritional supplement in lieu of water with each medication pass
- Take medications with 60mL a 2-calorie per mL formula
- 1 can/day = 500 calories, 20 grams protein, + vitamins and minerals
- Can use pudding supplements, thickened liquid supplements
- Obtain physician order; enter on medication record
- Limits taste fatigue, decreases product wastage; small portions multiple times/day; improves tolerance, improves nutritional status
- Specialized formula for wound healing available

Other Practical Considerations[3]

- Address impairments in dentition
- Liberalization of diet restrictions if intake poor[7]
- Address impairments in swallowing
- Supplement dysphagia diets
- Conduct supplement/snack audits

Practical Considerations[3]

- Address physical and cognitive impairments
- Incorporate foods/fluids into therapy and/or recreation sessions
- Encourage friends and family to bring in appropriate favorite/familiar/cultural foods and beverages

Consider Other Ideas[3]

- Switch to Homo milk from skim
- Add dry milk powder to milk, cereal, pudding, casseroles, cream soups, etc.
- Switch to a higher calorie content nutritional supplement
- Add nutrient dense supplements to hot cereals, cream soups and mashed potatoes

Review

1. Various aspects of nutritional screening and assessment
2. Role of nutrients in wound healing
3. Nutritional requirements based on the etiology of the wound
4. Nutritional supports for those unable to meet their nutritional needs orally

SWRWCP Nutrition Resources

- Nestle Mini Nutritional Assessment (MNA©) Tool
- A Guide to Completing the MNA© Short Form
- Procedure: Mini Nutritional Assessment (MNA©) Tool
- Patient Pamphlet: The Importance of Nutrition in Wound Healing

References

1. Posthauer ME. Nutritional assessment and treatment. In: Sussman C, Bates-Jensen B. Wound Care: A collaborative practice manual for health professionals. 3rd Ed. Baltimore, MA: Lippincott Williams & Wilkins, 2007:52-71.
2. Niedert K, Dorner B. Nutrition care of the older adult. Chicago: American Dietetics Association, 2004:125.
3. Fraser C. Enhancement of nutrition and hydration in patients. Wound Care Canada. 2008;6(1):54-55, 81.
4. Fraser C. The importance of monitoring hydration status in our clients. Wound Care Canada. 2009;7(1):18-20.
5. Fraser C. The identification of barriers to pressure ulcer healing. Using nutrition/hydration-related blood work. Wound Care Canada. 2010;8(2):20-25.
6. Fraser C. Nutrition and wound care: The importance of investigating hyperglycemia in individuals with wounds. Wound Care Canada. 2007;5(2):20-21.
7. Dorner B, Niedert C, and Welch P. Liberalized diets for older adults in long-term care. J Am Diet Assoc 2002;102:1316-1323.