THE ROLE OF NUTRITION IN WOUND HEALING

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OUTLINE

- Stages of wound healing
- Impact of nutrition to wound healing
- Malnutrition in hospital
- Key Nutrients
- Med Pass program and the role of nutrition support (EN & PN)
- Challenges for adequate nutrition in hospital
- New WRHA pre-op fasting policy

TYPES OF WOUNDS

- WRHA Regional Wound Care Recommendations
  - Malignant wounds
  - Pressure ulcers
  - Venous, arterial and mixed lower leg ulcers
  - Diabetic foot ulcers
  - Surgical wounds

PHASES OF NORMAL WOUND HEALING

Figure 1: Wound healing phases

- Maturation
- Proliferation
- Migration
- Reepithelialization

Building blocks needed for wound healing

- Cells: platelets, neutrophils, monocytes, macrophages, fibroblasts, epithelia cells, endothelia cells
- Raw materials: collagen, fibrin, fibronectin, proteoglycans
- Communications: cytokines, growth factors
- Clean up: proteolytic enzymes (i.e., MMPs)

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FACTORS AFFECTING WOUND HEALING

- Local factors
  - Ischemia
  - Infection
  - Surgical technique
  - Edema
  - High tissue pressure
- System factors
  - Malnutrition
  - Diabetes
  - Cancer
  - Immunodeficiency

Antonio et al. 2008

Antonio et al. 2008

Campell K.E.&Fraser C.2013
IMPACT OF NUTRITION

- Nutrition and wound healing are closely linked.
- Nutrition deficiencies or malnutrition impede the normal process of wound healing
  - Prolonging the inflammatory phase, decreasing fibroblast proliferation, and altering collagen synthesis
  - Decrease wound tensile strength
  - Increase risk of developing chronic wounds and chronic non-healing wounds

Stechmiller J.K. 2010

IMPACT OF MALNUTRITION

PREVALENCE OF MALNUTRITION IN HOSPITAL

- Canadian Malnutrition Task Force
  - Examined nutrition status and prevalence of malnutrition in hospitalized patients
  - Impact of malnutrition on length of stay, 30 day readmission and mortality rates
  - Prospective cohort study
  - 1022 patients, include 18 academic/community/small and large centers, from 8 provinces

Duerksen D.R. 2013.

PREVALENCE OF MALNUTRITION IN HOSPITAL

- Summary of Primary Results
  - Prevalence of malnutrition ~45%
  - Nutritional status deteriorates in hospital for some
  - Food intake <50% and malnutrition are independent predictors of LOS
  - Malnutrition is an independent predictor of mortality
  - Malnutrition results in inefficiency, as ¼ return to hospital

Duerksen D.R. 2013.

THE GOALS FOR NUTRITION INTERVENTION IN WOUND HEALING

- Optimize nutritional intake to
  - Preventing wound formation
  - Promoting wound healing and recovery post-operatively

Nutrients are involved in wound healing function in cellular, structural and immune processes, and in all phases of wound healing.
KEY NUTRIENTS FOR WOUND HEALING

- Energy (calories) from non-protein sources (carbohydrates and fats)
- Protein
- Fluid
- Vitamins & minerals

ENERGY

- General Surgical population: 25-35 kcal/kg
- Pressure ulcers: 30-35 kcal/kg
- Depending on the weight status, intake history, activity level and medical conditions, such as infection, underlying disease, etc.

PROTEIN

- 1.25-1.5g/kg/day
- Depending on age, organ functions (kidney, liver), underline medical problems (such as high losses, burns)
- Additional Glutamine supplementation may be used in burn patients (assessed by dietitian)

FLUID

- Water is a nutrient
- Adequate water intake is necessary for perfusion and oxygenation of healthy and healing tissues.
- 1-1.5ml/calorie or 30mL/kg. Minimum of 1500ml/day
- May increase based on fluid losses, signs and symptoms of dehydration
- Needs adjustment with impaired renal function, congestive heart failure, SIADH, etc.

VITAMINS & MINERALS

- Standard multivitamins with minerals are recommended for patients with wounds and if deficiencies are confirmed or suspected.
- Vitamin A and C, and Zinc may need supplementation when deficient.
- Avoid excessive intake from supplementation
- Need to adjust for impaired renal function

VITAMIN A

- ↑ macrophages and monocytes in the wound during inflammation
- ↑ epithelialization and collagen deposition by fibroblasts.
- There is no evidence for routine supplementation above the Dietary Reference Intake unless deficiency is present
VITAMIN C
• Involved in the collagen synthesis
• Acts on fibroblast proliferation, capillary formation and neutrophil activity.
• Vitamin C deficiency results to poor wound healing
• 500-1000mg/day for 10-14 days when deficiency is suspected
• Excessive vitamin C may increase the risk of oxalate stone formation, particularly in individuals with renal failure.

ZINC
• Required for the protein and collagen synthesis
• Also plays a role in immune function
• Serum Zn may not reflect body Zn status in acute illness
• No benefit if there is no Zn deficiency
• Clinical judgment is required when determining Zn dose.
• Excessive and long term oral Zn supplementation should be avoided as it will adversely impact Copper status, possibly resulting in anemia and impaired healing

SPECIAL CONSIDERATIONS: OBESE PATIENTS
• Obese patients could be malnourished
• There is no recommendations to manage obese patients with pressure ulcer.
• The goal is to maintain body weight and optimize protein hydration and micronutrients status.

NUTRITION INTERVENTION
✓ Oral diet: diet fortification with oral supplements
✓ Nutrition support: enteral nutrition (EN) and parenteral nutrition (PN)

ORAL DIET AND SUPPLEMENT
• Hospital High protein high energy diet
• Oral supplements and fortified food items
• Medication Pass Nutrition Supplement Program (Med Pass)

MED PASS PROGRAM
• Nurses provide 60ml of a highly concentrated oral liquid supplement with or without medication four times per day.
• Usually is able to provide approximately 480 calories and 20g protein
• Consumption or refusal is recorded in the MAR
MED PASS PROGRAM

• Mostly has been used in LTC to elderly residents, in the process to get approval for the use of patients in hospital
• Benefits - more efficient
  ➢ smaller volume (60ml each time x 4 times per day vs 237-250 ml per bottle)
  ➢ Higher compliance
  ➢ Reduce the waste and cost
  ➢ Promote weight gain and prevent weight loss

THE ROLE OF NUTRITION SUPPORT

• Nutrition support should be considered when
  ➢ oral intake with the use of oral supplements still is unable to meet patients’ needs
  ➢ Severely malnourished patients before elective surgery or post surgery oral intake is expected unable to resume and be adequate soon

THE ROLE OF NUTRITION SUPPORT

❖ Every effort should be made to feed via the GI tract.

• Enteral Nutrition
  ➢ Indication: oral intake is inadequate to meet the needs or contraindicated, and the GI tract is at least partially functioning
  ➢ Benefits over TPN: safer, maintain normal gut integrity and immune function, less complications

THE ROLE OF NUTRITION SUPPORT

• Parenteral Nutrition
  ➢ Reserve to patients with non-functional gut and inaccessible or when bowel rest is required
  ➢ Needs higher level of care
  ➢ Metabolic complications are common: electrolytes imbalance, hyperglycemia, ↑TG and/or Cholesterol
  ➢ Acute/chronic complications, such as thrombosis, line infection, sepsis, PN-related liver disease

SENARIO#1

• 25 year old male, admitted with multiple traumas following a MVA
• This patient was screened as low risk of malnutrition at admission
• Awaiting OR for facial #, on E3 OR slate for stand by for over 1 week
• On a diet with oral supplements, but has been NPO from midnight to 7 pm the following day → allow to eat between 7 pm to midnight

SENARIO#2

• 34 year old severely malnourished female in SICU, has a small bowel feeding tube for feeds, on standby awaiting for tracheotomy. Had a order NPO since midnight.
• Required glucose infusion to maintain BG when TF was held for the procedure
CHALLENGES TO FEED SURGICAL PATIENTS

- Feeding interruption
  - NPO for surgical procedures and tests
  - TF stopping for certain medications (such as Dilantin)
  - Frequent interruptions during meal times for tests and exams
- Slow Diet progression

When patients have a chance to eat, symptoms may present: N/V, bloating, heartburn, diarrhea, constipation, pain, low appetite, early satiety, confusion

WRHA PREOPERATIVE FASTING

- Healthy adults for elective surgery
  - Clear fluids up to 2 hours prior to advised arrival time to hospital on the day of surgery
  - CF includes: water, apple juice, cranberry juice, (no orange juice), clear tea or black coffee (no milk, cream, powdered creamer, sugar, or sweetener), clear broth (no noodles, vegetables, meat, or solids of any kind), No sports and carbonated drinks
  - No solid food or alcohol after midnight
  - No chewing gum or chewing tobacco after midnight

Complete document can be accessed at: http://www.wrha.mb.ca/professionals/ebpt/files/PreoperativeFastingFSep2013.doc

PRACTICAL CONSIDERATIONS

- Wound healing requires inter-professional approach
- Nurses are essential at every step of assessment and healing process
- Initiate referral to dietitian
- Things to monitor:
  - Weight
  - Know your patients: need for physical assistance to eat/drink; appetite, tolerance to hospital meal trays, ins and outs
  - Blood work: s-albumin (used with caution), Hgba1C

SUMMARY

- Nutrients are involved in every stage of wound healing
- Malnutrition is a risk factor that can be modified
- Once a wound develops, malnutrition becomes a barrier to proper wound healing
- Adequate calorie, protein, fluid, and micronutrients are needed for healing
- Nutrition service should be consulted if there is a concern of malnutrition
- Strategies (MedPass, pre-op fasting guideline) have been developed to promote oral intake and reduce barriers for feeding

REFERENCE

- Stechmiller JK. Understanding the role of nutrition and wound healing. Nutrition in Clinical Practice. 2010; 25:61-68
- Campell K.E. Fraser C. The essential role of nutrition in pressure ulcer management. 2013.