Nutritional support and wound management: An overview

The purpose of this guide is to summarize the importance of adequate nutrition in the care, treatment, and prevention of wounds.

Overview

Effective wound care treatment begins with strategies and individualized plans of care that evaluate the status of a patient's clinical nutrition. Diet and nutritional condition are fundamental components of health with poor nutrition serving as a major contributor to delayed wound recovery.[1] A 2018 analysis revealed that approximately 8.2 million Medicare beneficiaries had wound related diagnoses with or without infection.[1,2] The study further cites wound management cost estimates as $28.1 billion to $96.8 billion with primary diagnoses credited to surgical complications and diabetic foot ulcers.[1,2] The Medicare cost attribution acknowledges that outpatient wound center expenses, regarded as more convenient, are higher averaging $9.9-$35.8 billion while the mean for inpatient care expenses are close $5.0-$24.3 billion.[1,2] This aligns with economic forecasts that the wound care product market will have a projected annual expense of $15-22 billion annually by 2024.[1] Therefore, increasing health care costs, the aging population, proliferation of difficult to treat infections, and underlying nutrition based causes, can make caring for wounds a challenge clinically, socially, and economically.

Wound prevention begins with early recognition. Utilization of evidence-based preemptive measures and screening tools assist with optimization of healing and risk mitigation. Skin assessment scales, pressure ulcer prevention practices and toolkits, and identification of patients at mild to moderate risk for skin impairment are utilized in conjunction with clinical assessments. Screening scores provide information on current deficits as well as potential problems that may arise should a patient's condition change. The earlier the risks have been identified is when plans for targeted preventive care can be implemented. By viewing risks as opportunities, results can be used in clinical decision making, educational resources can be formulated to address patient and caregiver knowledge gaps, care planning can be enhanced to communicate care consistency, and selective resources can better target specific interventions. The advantage of early screening is the ability to acknowledge real and potential issues so that illness is easier to identify and less expensive to treat.[3] Healthcare workers are tasked with addressing the social and self-care needs of the populations they serve.

Factors that can affect health related social and physical needs include aging populations, co- morbidities or systemic disease, and disorders that impact consumption of energy, calories, vital nutrients, or access to resources.[2,3,4]

The impact of nutrient deficiency

An important aspect of evaluating the dietary regimen of patients is the identification of the medically underserved, vulnerable, and at-risk populations. Diet challenges involving those with limited financial means and food insecurity affect 11 percent of US households or 38 million Americans.[3,4,5] As a social determinant of health, the lack of consistent access to food can lead to negative outcomes that influence psychological, physical, and emotional well-being.[3,4,5,6] Therefore, wound management poses an immeasurable burden on patients, their caregivers, and the health care industry in terms of functional deficits, psychosocial strain, and cost-effectiveness.[1]

Wounds are multifaceted with nutritional status remaining a core component of the physiological process. Less than optimal nutrition can alter immune response, collagen synthesis, and wound tensile strength which further prolongs the healing process.[7,8,9,10] Not all wounds are equal: wounds can be classified as burns, diabetic foot ulcers, pressure ulcers, or even result from a surgical-based incision like a cesarean section.

To foster wound healing for any type of wound, certain dietary components are necessary and any nutritional imbalance must be corrected as soon as possible.[8,9,10] Essential factors of a balanced diet include macronutrients (macros) and micronutrients (micros). Alternative sources of nutritional support may also be necessary in some cases.

Macronutrients (macros) are the daily nutrients needed in the largest quantity. All macros provide energy and the inflammatory phase of wound healing causes the largest increase in the body's energy demand.[9,10,11] The need for macros will vary depending on the individual's overall health status and the type and severity of each wound. Patients with unbalanced or inadequate nutrition are at risk because they lack the required nutrients and/or energy stores to assist with timely progression through the wound healing stages.

- Protein is the building block for tissues and organs and has several roles within the human body. The quality of protein consumed is principal to wound healing. Inadequate protein stores may result in further skin fragility, decreased immune response with deficient healing, decreased reserve capacity, and a lengthier recovery.[8,9,12]
- Carbohydrates serve as a major fuel source and are used more readily than protein and fat.[8,9] Adequate control of blood sugar levels is also important in wound healing as most carbohydrates are broken down into glucose. Fiber is a carbohydrate that does not provide energy but does assist with maintaining gastrointestinal function.[8,9,11]
- Fat protects organs by surrounding and serving as padding in the form of adipose tissue, insulates to assist with the maintenance of body temperature, and aids in absorption of some micros.[8,9,11]
- Fluid is needed for adequate wound healing and can be a liquid form of nutrition or water. Fluid replenishes losses thru exudate, bleeding, and dehydration, and is needed for transport and solubility properties. Oral intake must be individualized to each patient. While fluid content is a necessary component for wound healing, fluid quantity may

limited or restricted due to patient conditions involving cardiac, renal, and adrenal concerns.[8,9,11]

Micros refer to amino acids, vitamins, and trace minerals, and are generally needed in smaller amounts.[10,11] Although required for normal growth and development, micros support all forms of metabolic activity.[11] Successful wound healing requires attention to a variety of factors and the role micros play in wound healing may not be noticed until a deficit occurs. For this reason, the World Health Organization (WHO), recommends cost-effective interventions to address nutrition insufficiencies by:

- Supplementing and fortifying Vitamins A and B12, zinc, iron, and folate
- Encouraging continued breast feeding to protect babies from Vitamin A deficiencies
- Fortification of all food-grade household salt with iodine
- Providing complimentary food products
- Routinely treating diarrhea and pneumonia in children
- Arginine and glutamine are amino acids that enhance wound healing by providing the metabolic fuel for proliferating cells. These essential products are produced endogenously but also available through supplementation. Amino acids are especially beneficial in periods of increased demand such as during the inflammatory phase of wound healing by increasing collagen deposition, stimulating T cells, stimulating growth hormone, and increasing and lymphocyte mitogenesis.[11] Nevertheless, arginine and glutamine effectiveness must be associated with adequate protein intake as supplementation alone serves no value.[11]
- Vitamins and minerals play many roles in wound healing. As research continues to evolve, clinicians should follow the CDC's most current guidelines for micronutrient dosing. The recommendations for vitamins are necessary for wound closure, antioxidant benefits, immune response, and when combined with minerals, supports tissue repair and growth. Examples of essential vitamins and minerals include:
    - Iron
    - Vitamin A
    - Vitamin C
    - Vitamin D
    - Iodine
    - Folate
    - Zinc

Wound pathophysiology

A wound is described as damage or disruption to living tissue or skin integrity.[7] The four stages of the healing process are:

- hemostasis
- inflammation
- proliferation
- maturation

The first stage of wound healing involves the cascade of hemostasis which stops any bleeding and begins the initial damage repair. Alterations in this phase can lead to issues with excessive clotting or the inability to clot.[10] The inflammatory phase follows which allows the body to deliver cells and nutrients to the impaired area as it cleans and begins the repair process. In many cases, interruptions in the inflammatory stage progresses to delayed healing or the beginning of a chronic wound.[10] It is not uncommon for patients with an increased risk of delayed wound healing to have neuropathy, poor vascular circulation, or poorly controlled serum glucose levels.[9,10] The proliferative phase is an ongoing background type process without a specific time frame.[10] The final phase is maturation which starts at three weeks but can last until 12 months.[10] This phase is marked by the healthy body strengthening the tissue until the scar has reached approximately 80% of the skin's original tensile strength.[10]

When a wound or incision is formed, the stages can always overlap, prolonged inflammation may develop, and impairment or non-response to treatment can occur at any point of the sequence. While average wound healing typically occurs within four to six weeks, a chronic wound is diagnosed when falling outside of this timeframe.[10]

The healing of wounds remains complex. Once skin is injured, skin repair requires cellular and physiological synchronization that can be impacted by a variety of internal and external factors. Examples of elements that can hinder skin restoration include:

- oxygenation
- sex hormones
- stress
- medications
- substance abuse
- smoking
- nourishment

Wound prevention measures

Factors that increase skin frailty can include age, nutrition status, irritants, incontinence-based maceration, immobility, and pressure from equipment.[6,13] Hospital acquired pressure injuries (HAPI) show a 63.5% reduction when risk identifiers and screening tools are implemented with inpatient admissions.[12,13,14] The Joint Commission (TJC) mandates nutrition screening within 24 hours of admission to acute care centers as an accreditation standard. The Braden Scale is one tool that assesses reflect sensory perception, skin moisture, activity, mobility, friction and shear, and nutrition status.[12,14]

The choice of screening instrument may vary depending upon facility type, the patient setting, and available resources. Likewise, preemptive measures are also guided by holistic, systemic, psychosocial, laboratory, and physical evaluation. Indicators of nutrition-based difficulties found during initial assessment may include:

- improper or inadequate diet
- problems absorbing nutrients
- eating disorders (anorexia, bulimia, dietary supplement misuse, binge-eating disorder)
- lifestyle (sedentary, extreme athlete/exercise) decelerated or arrested physical growth (failure to thrive, cancer, kidney disease)
- lack of knowledge
- eating impediments (nausea, edentulous or dental caries, oral ulcers)
- medical conditions (pregnancy, breastfeeding, mental health conditions, dementia)

Once nutritional screening has identified patients at risk, clinically relevant interventions to improve nutritional status can begin. Wound management involves collaboration with a multidisciplinary wound care team. Clinicians with an understanding of wound healing processes, current treatment modalities and expertise in underlying deficits are a necessary competency.[15] Initial consultation with a dietitian provide the benefit of prompt, evidence-based recommendations, functional and integrative nutrition, and facilitate orders for alternative therapies.[8,15]

Nutrition support

Nutrition support, also known as enteral (tube feeding) or parenteral nutrition, is indicated when food intake or nutrient assimilation is compromised.[7,8] Consideration of nutritional support is warranted to ensure receipt of necessary amounts of nutrients to meet the metabolic needs of the patient. Tube feeding can provide 100% of the patient's nutritional needs or utilized as an adjunct to oral intake. Parenteral nutrition or intravenous nutrition may be reserved for instances where the gastrointestinal tract (GI) is not functioning

severe cases of oropharyngeal dysfunction, or permanent neurological impairment.[7,8] Benefits of nutrition support include decreased rates of sepsis and wound complications and resulting reductions in the number of hospital days and related cost.[7,8]

The role of nutrients in wound healing is the cornerstone for assessment and effective therapy. Proper nutrition helps the body to heal faster and fight infection. Nutritional deficiencies delay progression of wound healing which can cause increased morbidity and mortality for patients. Clinical emphasis on correcting the foundational nutrition deficits is fundamental to overall health. The focus on prevention, recovery of simple and complex nonhealing wounds, and the reduction in infections and further complications are necessary elements to achieving positive outcomes.

According to WHO, every country is impacted by the global challenge of nutrition imbalance. Furthermore, each patient population can be impacted by compromised wound healing and insufficient treatment. Clinicians who are able to distinguish risk factors that hinder the healing process and initialize best practice interventions early can make a difference in shortening the lengths of stay, improving a patient's quality of life, and providing cost effective service delivery.

Contracted resources

- Advanced wound care agreements
- Regenerative biologics medicine agreements
- Negative pressure wound therapy agreements
- Enteral syringe agreements
- Nasogastric feeding tubes and accessories agreements
- Gastrointestinal tubes agreements
- Medical nutritionals agreements

Additional resources

Enhanced recovery after surgery and the role of nutrition Clinical Resource Guide

American Society for Parenteral and Enteral Nutrition (ASPEN)

The Joint Commission

American Diabetes Association

Screening tools:

- Nutrition Risk in Critically Ill (NUTRIC)
- Braden Scale
- Braden Scale II
- National pressure injury advisory panel (NPIAP) pressure injury staging

Nutrition and educational resources

Nestle Medical Hub

Abbott Nutrition Health

Institute Advances in Skin and Wounds Ostomy Wound Management

Journal of WOCN (Wound, Ostomy, and Continence Nursing) Wounds

Wound care resources

National Pressure Injury Advisory Panel

Wound, Ostomy, and Continence Nurses Society™ | WOCN Society

Wound Care Learning Network

Contracted supplier-specific education

Molnlycke

Medline University

Smith & Nephew Wound Education Portal | Wound CME or resources available to HealthStream subscribers through OneSource

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