

Nutritional care of patients with pressure ulcers: Some evidence based guidelines

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SUMMARY

Malnutrition has been shown to be a significant factor in the development and deterioration of pressure ulcers (PU). However, whether nutritional intervention can be effective in the treatment of PU is still unclear and controversial mainly due to inconsistent results reported in some recent studies. The objective of this review is to evaluate the effectiveness of nutritional care in patients with PU. The review is expected to comprehend the definition, prevalence and effectiveness of nutritional care on the prevention and treatment of PU. In addition a discussion on the level of adequacy of nutritional care and the role of enteral and parenteral nutrition on the prevention and treatment of PU is also provided.

Sources of Data/Study selection: Data from survey reports, health statistics, descriptive, cross-sectional and longitudinal studies published between 1990-2008 on the topic were included. Data searches concentrated on human studies only excluding those with irrelevant and incomplete conclusions.

Data Extraction: The literature was accessed using data bases and abstracting systems including Medline, PubMed, Science Direct, Research GATE, etc. The prevalence of PU may range from 5-50%. Nutritional status is an independent risk factor for the development of pressure ulcers. Data from nutrition supplementation studies show faster recovery from PU and lesser hospital stay. Diets with high energy and protein, supplemented with vitamins, minerals and immunomodulators are generally indicated in PU. Enteral and parenteral nutrition are indicated when the patient fails to achieve nutritional needs through oral route and are recommended to be used without any contraindications.

KEY WORDS: Pressure ulcers, Nutrition, Enteral nutrition.

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INTRODUCTION

Pressure ulcers (PU) are also known as bedsores. They are caused when the skin breaks down due to lack of movement. Pressure ulcers start as reddened areas, then turn into blisters and finally become open wounds. The areas of the body they most often happen include heels, hips, back, head, buttocks, or other areas where the skin is very close to the bone. They can cause serious damage if they are not treated. A high number of hospitalized patients, particularly the elderly, suffer from pressure ulcers (PU).¹⁻³

The prevalence of PU has a direct relationship with the patient's age and the characteristics of the health institution where the patient is admitted. In general the prevalence ranges from 5-50% in hospitals, nursing homes and rehabilitation centers.¹ Pressure ulcers develop when capillaries supplying the skin and subcutaneous tissues are compressed enough to impede perfusion, leading ultimately to tissue necrosis. As it is established that normal blood pressure within capillaries ranges from 20 to 40 mm Hg, which implies that keeping the external pressure lesser than 32 mm Hg should be sufficient to prevent the development of PU. However, capillary blood pressure may be less than 32 mm Hg in patients due to a number of reasons; particularly due to hemodynamic instability and comorbid conditions, thus, even lower applied pressures may be sufficient to induce ulceration in certain patients. PU is characterized by the pain associated with other complications, and enhanced emotional and financial costs.^{2,3} The major risk factors for pressure ulcers include malnutrition, chronic diseases, immobility and the use of some drugs such as steroids.^{4,5} The nutritional care in both prevention and treatment of PU is very relevant and has an impact on the control of other comorbidities.⁶

The prevention strategies involve six key elements: 1) assess all patients for nutritional status on admission, 2) re-evaluate daily, 3) inspect the skin daily, 4) control the moisture of the skin; 5) take care of general nutrition and hydration, and 6) minimize the pressure on areas where it has already occurred.² Regarding the nutritional care, the risk factors should be identified as early as possible, most preferably at the time of admission. These risk factors include anorexia, low BMI (<18.5 kg/m²), presence of hypoalbuminemia and anemia, immune disorders, association with gastrointestinal disease and cancers should be given due consideration.⁷ Treatment should address the care of the wound, control of diseases and an improvement in the nutritional status. The provision of individualized nutritional therapy has been indicated extensively in the literature.⁸⁻¹⁰

Does The Nutritional Status Interfere With The Prevention of PU? Hence it has a direct role in the prevention of PU. Nutritional status has been recognized as an independent risk factor for the development of PU and hence it has a direct role in the prevention of this disease. In addition, malnutrition is an important risk factor for the development of PU.^{11,12} Anorexia or other dietary restrictions imposed by the treatment of comorbidities and the

patient's own difficulties in taking advantage of the nutrients ingested are but some of the established risk factors for deterioration in nutritional status. Special attention should be directed to bedridden sick elderly patients suffering from gastrointestinal illnesses (especially diarrhea) and cancers.⁸ BMI around 18.5 kg/m² is associated with decreased body fat and therefore, reduces the pressure in protection against prominent bony areas. Several studies have shown an association between low weight and PU.^{7,13,14}

Guenter et al¹⁵ showed that the majority of newly admitted patients with stage-IV PU are malnourished. Breslow et al¹⁶ pointed out poor nutritional status, weight loss, depletion of the triceps skinfold, hypoalbuminemia, hypocholesterolemia and low levels of hemoglobin/hematocrit as independent risk for development of PU. Hypoalbuminemia causes changes in oncotic pressure and, consequently, edema, compromising tissue diffusion of oxygen and nutrients, predisposing to hypoxia and cellular death.^{11,17} Anemia can contribute to the formation of PU by decreasing the availability of oxygen to the fibroblasts and thereby reduce the formation of collagen by increasing the susceptibility of the tissue to lesion.¹⁸ The immune status is associated with increased risk of PU,¹⁹ mainly because there is a compromised diminished wound healing.

Does Nutritional Status Affect the Treatment of Patients With PU? Nutritional status plays an important role in the treatment of patients with PU. The nutritional status interferes directly in tissue repair. Malnutrition is associated with inadequate healing by reducing the production of fibroblasts, neoangiogenesis and collagen synthesis.^{10,20-23} Adequate nutritional intake is essential in various stages of healing. In the elderly in particular, the attention should be focused on early recognition of a depleted nutritional status and an adequate and supervised intake of energy (35 kcal/kg) and protein (1.5 g/kg) with provision of the recommended daily allowances of micronutrients and with correction of the nutrient deficiencies of old age.²²

What Are The Goals of Nutrition Therapy in Patients With PU? Medical Nutritional Therapy (MNT) should ensure adequate nutritional support for patients with PU. Daily recommendations for energy intake are established at 30-35 Kcal/kg/day and 1.2 g of protein/kg/day for Grade-I PU and are increased up to 40 - 45 Kcal/Kg/day and 1.5 -2.0 g of protein /Kg/day with the severity of the disease. Nutritional therapy should be directed to the optimum nutritional needs in order to maintain nutritional healthy status

Table-I: Nutritional Status Assessment at the time of admission and during stay.

<p>A: Anthropometrics and general Indicators of Nutritional Status Assessment</p> <ul style="list-style-type: none"> • Diagnosis/recent changes in condition, • Assessment/Identification of risk factors, • Height, weight, weight history is significant • Changes in weight, BMI (<18.5), • Adequacy of food/fluid intake compared to calculated nutritional needs, • Medications that may affect food/fluid intake or tolerance, • Nutrition related lab values, • Status (chewing, swallowing, GI problems, depression, etc.), • Evaluation of signs/symptoms of dehydration (dry skin, lips, enhanced thirst etc), • Current interventions (food/dining interventions, supplements, etc.), & • Interview with resident, family &/or staff for food preferences and tolerances <p>B. Laboratory Indicators of Nutritional Status Assessment</p> <ul style="list-style-type: none"> • Albumin levels that are below 3.5, • Total lymphocyte count (TLC) <1800/microliter, • Serum transferrin levels below 180 mg/dl, • Hemoglobin levels less than 12 g/dL, • Dehydration, poor food and fluid intake, • Unintentional weight loss 	<hr/> <p>Adapted from Mahan, K and Escott-Stump, S. Krause's Food, Nutrition, & Diet Therapy, Saunders, Philadelphia, PA, 2004 (cited by http://www.njha.com/)</p>
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(BMI: 18.5 - 24.9).^{1,6} Under conditions of excessive catabolism, such as in patients with multiple ulcers, protein intake can be increased up to at least 1.5 g/kg/day.^{6,24} Healing needs optimum energy hence adequate supply of calories is important so that the body does not use its own tissues in the process of protein catabolism. As glucose is the main carbohydrate in the body to supply most of the energy needed, it should be monitored closely.²⁵ Lipids are constituents of the cell membrane, and are required for tissue repair and synthesis²⁶ and hence needs to be monitored properly. Protein deficiency prolongs the inflammatory phase of healing therefore, increases the risk of infection and decreases the synthesis of collagen.²⁵ A study by Desneves et al investigated PU patients divided into three groups: the first received normal caloric diet; the second received high protein - high calorie diet; and the third received high protein- high calorie diet enriched with arginine, vitamin C and zinc. The authors found that the third group showed UP healed faster, compared to the other two groups.²⁰

Whether a disease-specific and nutrition adapted diet is better than a standard diet was examined in a study by Cereda et al.²⁷ All participants in a 12 week-long randomized multi-central study received standard diet (30 Kcal/Kg per day). The intervention group consisted of 13 subjects who received in addition to the standard diet a calorie supplement with protein, arginine, zinc and vitamin C. All participants received standard wound care and pressure-re-

lieving measures such as turning schedules on the bed and special gel cushion. In general, the participants in the intervention group showed better wound healing than subjects in the control group. At the start of 8th week of the study, wound in the intervention group reduced by 57% compared to 33% in the control group ($p < 0.02$). At the end of the trial (12th week), there was a reduction of 72% wound reduction in patients in the intervention group while the control group ended at 45% ($P < 0.005$).

Pompeo et al²⁴ demonstrated in a non-randomized study that patients receiving diets with higher protein content showed better recovery of nutritional status and tended to heal more efficiently. The need for vitamins and minerals should be at least according to their established RDA. However, some authors suggest that there is need for greater supply of some micronutrients.^{5,18,20,28} Vitamin A stimulates collagen synthesis and thus accelerates healing and is necessary for maintaining healthy skin and for the synthesis of glycoproteins and proteoglycans.²⁹ Vitamin C is required during all stages of healing. In the inflammatory stage, it enhances the role of macrophages and neutrophils, as well as participating as a reducing agent, protecting the iron and copper from oxidative damage. In the proliferative phase and maturation, ascorbic acid is essential to activate the enzyme prolyl hydroxylase that acts on the formation of hydroxyproline, a constituent of collagen. Vitamin E prevents oxidation of the phospholipids of cell

membranes, while maintaining integrity. Zinc, copper and selenium also appear to be beneficial in the process of cicatricle.^{5,29-31}

What Is The Best Way To Assess The Nutritional Status Of Patients With PU? Nutritional assessment of patients with leg ulcers should not differ from other patients. There are various techniques for nutritional status assessment in clinical settings. The techniques most suitable, however, are assessment of changes in body composition and food intake as well as functional changes in the patients.^{32,33} These methods are simple, inexpensive and noninvasive, which can be performed at the bedside by different members of the multidisciplinary team of nutritional therapy.³³ The tools for nutritional status assessment are summarized in Table-I.

When Is Enteral Nutrition (EN) Indicated? EN is indicated when the patient fails to achieve nutritional needs through oral route, similar to what occurs with other diseases in ICU. Nutritional needs are usually not met by the habitual oral route.^{21,25,34,35} Nutritional therapy in the form of individual modules (proteins, carbohydrates, lipids, vitamins and minerals) is indicated when the patient has preserved the ability to swallow, but cannot achieve at least 80% of nutritional needs through oral route.^{19,25,35,36} When swallowing is not effective, enteral nutrition by gastric tube or jejunum is indicated.^{10,37,38} Parenteral nutrition is, however, rarely indicated for these patients.

Are There Any Contraindications To EN During PU? EN is not contraindicated in the treatment of patients with PU.^{6,23,37,38} Some authors have questioned the use of EN in patients with dementia.^{39,40} However, their arguments are mostly based on the ethical or moral dimensions of hand or tube-feeding. As indicated by Gillick et al³⁹ one overlooked reason that many families and physicians continue to opt for artificial nutrition is that the case for feeding tubes is a moral one and not a scientific one. What may be at issue for families is how best to demonstrate caring, and caring is not readily amenable to empirical study. The authors³⁹ suggested that a better approach to family members who want feeding tubes for the demented is to acknowledge the symbolic value of nutrition for them and to seek an alternative means of satisfying the need to feed. Nevertheless, the reported benefits of EN in PU are such numerous and well-established that it cannot be discarded merely on the ethical morality.

Is There Any Need Or Indication Of Using Specialized Formula Supplemented With Nutrient Therapy And Greater Amount Of Protein In The Prevention Of Pressure Ulcers? The use of

specialized formula supplemented with nutrient therapy and greater amount of protein is indicated for the prevention of pressure ulcers. Randomized studies conducted over the past few years have shown the effects of enteral nutrition formula supplemented with proteins, eicosapentaenoic acid (EPA), gamma-linolenic acid (GLA) and antioxidant vitamins (A, C and E) in the prevention of pressure ulcers. There was no significant difference between the two groups in terms of nutritional parameters. The risk of pressure ulcers was similar in both groups at baseline. However, the occurrence of new ulcers was significantly lower in the group treated with special formula in relation to the group control.⁵ In a meta-analysis study, Stratton et al³⁸ argued that adding protein equivalent to 250-500 kcal/day in formula significantly reduced by 25% the likelihood of developing new ulcers in patients who had been hospitalized for long duration.

Is There Any Need Or Indication Of Specialized Formula Supplemented With Nutrients As Immunomodulators For Treatment Of Patients With Pressure Ulcers? There is controversy about the advantage of using immunomodulatory nutrients in the treatment of patients with pressure ulcers. A randomized study using formula with arginine for four weeks had no impact on lymphocyte proliferation and production of interleukin-2 in elderly patients with PU.⁴¹ On the other hand, other authors followed 245 patients with ulcers grade II-IV, for nine weeks and found that the area of ulcer in the treated group decreased by 53% ($p < 0.01$) compared to the control group.²⁵ Other studies have also demonstrated an improvement in healing of ulcers in a small group of patients with hyper formula containing arginine, vitamin C and zinc, after three weeks of treatment. For example, it has been reported that the use of formula-protein for eight weeks in patients with pressure ulcers resulted in significantly higher PUSH (Pressure Ulcer Scale for Healing) score compared to the control group (3.55 ± 4.66 versus 3.22 ± 4.11 , $p < 0.05$).³⁶

When Should EN Be Stopped? EN should only be discontinued if patients have already achieved the ability to eat normally through oral route. Similarly in case of other diseases, nutritional therapy should only be stopped if the patients with PU have started eating by mouth and by making it sure that the patients can reach their nutritional needs orally.²⁴ However, the decision to discontinue EN should not be abrupt; rather a gradual switching-off approach is the most appropriate.

CONCLUSION

Pressure ulcers are highly prevalent and warrant vigorous intervention and treatment strategies. Nutrition is one of such strategies identified to prevent as well as cure PU. Nutritional intervention starts right with a nutritional status evaluation or nutritional screening at the time of admission and careful monitoring during the stay in the health care settings. Medical Nutritional therapy (MNT) should be provided for those who are at risk, or already have pressure ulcers. The goal of MNT is to prevent the pressure ulcer from occurring in the first place or if already present, to promote healing and restore the individual to optimal nutritional status. The established nutritional protocol is a diet both with high energy and protein, supplemented with optimal levels of vitamins and minerals. Certain amino acids (e.g. *arginine*, *glutamins*) are effective in wound healing provided there is enough calories, iron and vitamin C in the diet. Enteral or parenteral nutrition is indicated if the patients cannot take orally and continued until the patient is stable enough to take orally. A careful analysis of the review of literature suggests that EN and PEN are safe with no severe contraindications. Furthermore, specialized formulas are indicated in patients with compromised immunodeficiency.

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