

Nutritional considerations in patients with pressure ulcers

Addressing four essential elements can help you meet these patients' nutritional needs.

By Jill Cox, PhD, RN, APN-C, CWOCN, and Sophia Zigouras, MS, RD, CNSC



Optimizing nutritional status is a key strategy both in preventing and managing pressure ulcers. In patients across all care settings, compromised nutrition—as from poor intake, undesired weight loss, and malnutrition—increases the risk of pressure ulcers. It contributes to altered immune function, impaired collagen synthesis, and decreased tensile strength. In many cases, malnutrition also contributes to wound chronicity and increases the risk for delayed and impaired wound healing. In patients with chronic wounds, such as pressure ulcers, a chronic inflammatory

state can induce catabolic metabolism, malnutrition, and dehydration.

Adequate nutrition, on the other hand, promotes wound healing in patients with pressure ulcers. Wound healing occurs in three distinct but overlapping phases—inflammatory, proliferative, and remodeling. Each phase is time limited and marked by distinct physiologic events, with specific key nutrients playing a crucial role during that phase. (See *Understanding wound-healing phases*.)

Pressure-ulcer management must include a comprehensive nutritional care plan based on the latest practice guidelines. This article describes the four essential elements that help you address the nutritional needs of patients with pressure ulcers:

- performing a nutrition screening for potential nutrition deficits
- identifying malnutrition
- addressing the patient's macronutrient and fluid needs
- determining appropriate micronutrient supplementation. (See *Nutritional therapy recommendations for pressure-ulcer management*.)

Element 1: Nutrition screening

The goal of nutrition screening is to identify patients who need a more in-depth nutritional assessment and a comprehensive nutritional plan based on identified nutritional risk factors. On admission to a healthcare facility, the patient should undergo a complete nutrition screening, including assessment of pressure ulcer risk using a tool such as the Braden Scale (www.bradenscale.com). In the hospital setting, the nurse generally completes this initial screening.

Several validated screening tools can be

Understanding wound-healing phases

The three phases of wound healing—inflammatory, proliferative, and remodeling—overlap. During each phase, key physiologic events occur and specific nutrients play a vital role in healing.

Phase, onset, and duration	Key events	Essential nutrients
Inflammatory phase Starts at time of injury and lasts 4 to 6 days	<ul style="list-style-type: none"> • Hemostasis • Release of pro-inflammatory cytokines • Vasodilation • Phagocytosis of bacteria by neutrophils • Removal of debris and growth-factor secretion by macrophages 	<ul style="list-style-type: none"> • Vitamins A, C, and K • Iron • Zinc • Protein • Fat • Carbohydrates
Proliferative phase Starts 3 or 4 days after injury and lasts 2 to 3 weeks	<ul style="list-style-type: none"> • Fibroblast proliferation • Angiogenesis • Collagen synthesis • Collagen deposition and cross-linking • Development of granulation tissue and extracellular matrix • Epithelialization • Onset of wound closure by myofibroblasts 	<ul style="list-style-type: none"> • Vitamins A and C • Iron • Copper • Zinc • Manganese • Protein • Carbohydrates
Maturation/remodeling phase Starts about 21 days after injury and lasts up to 2 years	<ul style="list-style-type: none"> • Collagen maturation and stabilization • Increased tensile strength • Scar-tissue formation 	<ul style="list-style-type: none"> • Vitamins A and C • Zinc • Protein

used in various settings, including the Nutrition Risk Classification, Malnutrition Universal Screening Tool, and Nutrition Risk Screening 2002. Screening parameters include malnutrition risk factors, such as:

- unintentional weight loss
- changes in appetite or food and fluid intake
- poor dental health
- chewing and swallowing difficulties
- poor self-feeding ability
- GI signs and symptoms.

If the screening determines the patient is at nutritional risk, a registered dietitian (RD) conducts a timely and complete nutrition assessment. The RD determines the

patient's nutritional status and develops a comprehensive nutritional care plan in consultation with interdisciplinary team members, including the physician or a midlevel practitioner, a registered nurse, and when appropriate, a speech pathologist, occupational therapist, or dentist. The RD also provides the expertise to ensure that the plan of care is based on standard nutritional guidelines from the American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) and the Academy of Nutrition and Dietetics. This plan must be individualized to reflect the patient's comorbidities and malnutrition level. Then the RD implements the plan to address nutritional deficits and monitors macro- and micronu-

Nutritional therapy recommendations for pressure-ulcer management

This table shows therapeutic nutrition recommendations for each pressure-ulcer stage.

Recommended nutritional therapy and goal	Stage 1: Nonblanchable erythema of intact skin	Stage 2: Partial-thickness loss of dermis	Stage 3: Full-thickness tissue loss; subcutaneous fat may be visible	Stage 4: Full-thickness tissue loss with exposed muscle, bone, or tendon
Total calories To optimize anabolism, collagen formation, nitrogen retention, and angiogenesis	≥ 25 cal/kg	28-30 cal/kg	30 cal/kg	33-35 cal/kg. Maximum: 40 cal/kg
Protein To promote cell growth and structure, fibroblast proliferation, collagen production, and angiogenesis	1-1.2 g/kg	1.25-1.4 g/kg	1.5 g/kg	1.5-2.0 g/kg. Maximum: 2.2 g/kg
Fluid To maintain skin turgor, tissue perfusion and oxygenation, and nutrient transport	≥ 30 mL/kg with ≥ 1 mL/cal consumed. Adjust to fluid losses.		30-40 mL/kg with 1-1.5 mL/cal consumed. Adjust to fluid losses.	
Multivitamins with minerals To provide many nutrients involved in collagen production, tissue regeneration, and prothrombin synthesis	Multivitamin/mineral supplement once daily for patients with inadequate oral or enteral intake		Add multivitamin/mineral supplement once daily. Maximum dose: twice daily.	
Vitamin C To aid collagen formation, angiogenesis, and fibroblast formation and promote neutrophil activity	100-200 mg/day		1,000-2,000 mg/day in divided doses for patients who are stressed or at risk for deficiency; reassess in 10-14 days. Maximum dose: 2,000 mg/day.	
Zinc To promote cell replication and growth and serve as a cofactor for synthesis of collagen and other wound proteins	15 mg elemental zinc/day; give up to 220 mg zinc sulfate daily for 10-14 days for suspected deficiency.		25-40 mg elemental zinc per day; give up to 220 mg zinc sulfate up to twice daily for 10-14 days for suspected deficiency.	
Vitamin A To stimulate inflammatory phase of wound healing, maintain integrity of mucosal and epithelial surfaces, increase collagen formation, and inhibit detrimental effects of diabetes and glucocorticoids	<ul style="list-style-type: none"> • If patient is taking concomitant glucocorticoids, supplement with 10,000-15,000 units vitamin A daily for 7 days. • For patients with suspected deficiency, replete with 10,000-50,000 units daily for 10-14 days, based on degree of injury and malnutrition. • Maximum dose: 25,000-50,000 units daily for 10-14 days 			

cal/kg = calories per kilograms of body weight; mL/cal = milliliters of fluid per calorie consumed

Note: Requirements can be adjusted based on clinician's judgment and patient's overall clinical condition, comorbidities, and medical history.

trient interventions until the patient's nutritional status has been optimized.

Element 2: Malnutrition identification

Adult malnutrition (undernutrition) results from inadequate calories, protein, or other nutrients needed for tissue maintenance and repair. At least two of the following conditions indicate the patient has malnutrition:

- insufficient energy intake
- weight loss
- muscle mass loss
- subcutaneous fat loss
- localized or generalized fluid accumulation that may mask weight loss
- diminished functional status, as measured by handgrip strength.

The extent of these conditions determines if malnutrition is severe. Based on symptom duration and inflammation presence, malnutrition is classified further as acute, chronic, or social/environmental. Severe malnutrition of acute or chronic illness is associated with pressure ulcer development with increased severity, delayed healing, and chronicity. (See *Clinical features of severe malnutrition*.)

Be aware that using serum inflammatory biomarkers (such as albumin and prealbumin) to diagnose malnutrition isn't recommended. These values can be affected by inflammation, renal function, hydration status, and other factors (such as comorbidities and illness severity) and may not accurately reflect the patient's nutritional status.

Element 3: Macronutrient requirements and hydration

Calories, protein, fat, and fluids each play a specific role in supporting wound healing.

Macronutrients

Patients with pressure ulcers require sufficient calorie and protein intake to support anabolism, nitrogen retention, collagen formation, and angiogenesis—all of which are fundamental for wound healing. The 2014 National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel/Pan Pacific Pressure Injury Alliance (NPUAP/EPUAP/PPPIA) Nutrition Guidelines recommend providing 30 to 35 calories/kg/day to adults who have, or are at risk for, pressure ulcers and malnutrition. The guidelines suggest adjusting energy intake based on weight change, underweight, and obesity.

Pressure-ulcer healing requires adequate protein; increased protein intake is associated with improved wound healing rates.

Dietary carbohydrates and fat are the preferred energy sources because they spare protein for collagen production and cell structure. According to dietary reference intakes, adults should get 45% to 65% of calories from carbohydrates and 20% to 35% from fat. No recommendations exist for carbohydrate intake based on pressure ulcer stage; however, hyperglycemia is linked to impaired leukocyte production, which impedes wound heal-

Clinical features of severe malnutrition

This chart distinguishes the clinical features of severe malnutrition of acute illness from those of severe malnutrition of chronic illness.

Clinical feature	Severe malnutrition of acute illness	Severe malnutrition of chronic illness
Energy intake	• ≤ 50% of estimated needs for ≥ 5 days	• ≤ 75% of estimated needs for ≥ 1 month
Weight loss	• 2% in 1 week • 5% in 1 month • > 7.5% in 3 months	• 5% in 1 month • 7.5% in 3 months • 10% in 6 months • > 20% in 1 year
Body fat wasting (orbital, triceps, over ribs)	Moderate	Severe
Muscle wasting (temples, clavicle, scapula, thigh, calf)	Moderate	Severe
Edema (generalized, ascites, or extremities)	Moderate	Severe
Grip strength	Measurably reduced	Measurably reduced

ing and increases susceptibility to infection. In patients with diabetes mellitus or glucocorticoid-induced hyperglycemia, the interdisciplinary team should maximize blood glucose control through medication adjustment and carbohydrate restriction as needed.

Similarly, no recommendation exists for fat intake specific to patients with pressure ulcers. A dense energy source, fat provides essential fatty acids and carries fat-soluble vitamins. Nonetheless, its role in wound healing hasn't been established.

Protein is needed for cell growth and structure, collagen production, fibroblast proliferation, and synthesis of enzymes involved in wound healing. Pressure-ulcer healing requires adequate protein; increased protein intake is associated with improved wound healing rates. NPUAP/EPUAP/PPPIA guidelines recommend providing 1.25 to 1.5 g/kg/day of protein for adults who have, or are at risk, for pres-

sure ulcers and malnutrition. Patients with stage III/IV pressure ulcers or multiple wounds may need 1.5 to 2 g/kg/day. Those with a protein intake as high as 2 g/kg/day must be monitored for changes in renal function and hydration status.

Current guidelines for patients with pressure ulcers recommend supplements of specific amino acids, such as arginine, along with high protein supplementation in patients with stage III/IV pressure ulcers or multiple pressure ulcers whose nutritional needs can't be met with traditional high-calorie and protein supplements. According to A.S.P.E.N, recommendations for arginine and glutamine supplementation are lacking.

Hydration

To prevent or treat pressure ulcers, patients require adequate hydration. Sufficient fluid intake maintains skin turgor and delivery of oxygen and nutrients to

both healthy and healing tissues. Current fluid intake recommendations are 30 mL/kg/day or 1 to 1.5 mL per calories consumed. The interdisciplinary team must monitor the patient's hydration status carefully because high protein intake, fluid losses from draining wounds, elevated temperature, diaphoresis, vomiting, and diarrhea may increase fluid requirements.

Element 4: Micronutrient requirements

Micronutrients are vitamins, minerals, and trace elements that the body requires for cell metabolism in small but critical amounts. Standard multivitamin supplements with minerals are recommended for patients with pressure ulcers and inadequate oral or enteral intake. In particular, vitamins C and A and zinc play important roles in wound healing.

- Vitamin C is crucial for collagen formation, angiogenesis, and fibroblast formation; it also acts on neutrophil activity. Patients with stage I or II pressure ulcers should receive 100 to 200 mg/day in vitamin C supplementation; those with stage III or IV ulcers should receive 1,000 to 2,000 mg/day.
- Vitamin A stimulates the inflammatory phase of wound healing, maintains integrity of mucosal and epithelial surfaces, increases collagen formation, and inhibits detrimental effects of glucocorticoid therapy, diabetes, radiation, and chemotherapy. Patients with vitamin A deficiencies and pressure ulcers of any stage should receive 10,000 to 50,000 units/day for 10 days. Patients receiving glucocorticoids should receive 10,000 to 15,000 units/day for 1 week prophylactically to counter immunosuppression.

- Zinc promotes cell replication and growth and aids protein and collagen synthesis. Supplements are recommended only for patients with zinc deficiency, which commonly accompanies malnutrition, malabsorption, diarrhea, and

Standard multivitamin supplements with minerals are recommended for patients with pressure ulcers and inadequate oral or enteral intake.

hypermetabolic states. For patients with zinc deficiency, supplementation at the recommended dose of 220 mg zinc sulfate twice daily for 10 to 14 days can enhance wound healing.

Strategies to improve nutritional intake

For patients with pressure ulcers who can't achieve an adequate dietary intake, NPUAP/EPUAP/PPPIA guidelines recommend these additional strategies to improve overall nutritional status:

- Liberalize dietary restrictions if those restrictions lead to inadequate nutritional intake.
- Offer high-calorie, high-protein oral supplements between meals.
- Consider providing enteral or parenteral nutrition support to patients who can't

achieve a satisfactory oral nutritional intake.

When considering whether to implement these strategies, keep in mind the patient's comorbidities and overall care goals.

A comprehensive nutritional plan based on the latest clinical practice guidelines can improve outcomes for patients who have pressure ulcers or are at risk for developing them. All healthcare team members are responsible for optimizing nutrition for these patients. The RD is central to developing and refining a successful nutritional plan. As frontline caregivers, nurses are in a unique position to identify nutritional deficiencies, evaluate pressure-ulcer healing, and communicate assessment findings to the medical team and RD. ■

The authors work at Englewood Hospital and Medical Center, in Englewood, New Jersey. Jill Cox is an advanced practice nurse and WOC nurse; Sophia Ziguoras is a clinical dietitian. Dr. Cox is also an assistant professor of nursing at Rutgers University in Newark.

Selected references

- Bergstrom N, Braden BJ, Laguzza A, et al. The Braden scale for predicting pressure sore risk. *Nurs Res*. 1987;36(4):205-10.
- Doughty DB, Sparks-DeFries B. Wound healing physiology. In: Bryant R, Nix D, eds. *Acute and Chronic Wounds: Current Management Concepts*. 4th ed. St. Louis, MO: Elsevier; 2012.
- Iizaka S, Okuwa M, Sugama J, et al. The impact of malnutrition and nutrition-related factors on the development and severity of pressure ulcers in older patients receiving home care. *Clin Nutr*. 2010; 29(1):47-53.
- Institute of Medicine. Panel on Macronutrients, Panel on the Definition of Dietary Fiber, Subcommittee on Upper Reference Levels of Nutrients, Subcommittee on Interpretation and Uses of Dietary Reference Intakes, and the Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. Food and Nutrition Board. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids. Washington, DC: National Academies Press; 2005.
- Kondrup J, Allison SP, Elia M, et al. ESPEN guidelines for nutrition screening 2002. *Clin Nutr*. 2003;22(4):415-21.
- Kovacevich DS, Boney AR, Braunschweig CL, et al. Nutrition risk classification; a reproducible and valid tool for nurses. *Nutr Clin Pract*. 1997;12(1):20-5.
- Lee SK, Posthauer ME, Dorner B, et al. Pressure ulcer healing with a concentrated, fortified, collagen protein hydrolysate supplement: a randomized controlled trial. *Adv Skin Wound Care*. 2006;19(2):92-6.
- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, and Pan Pacific Pressure Injury Alliance. *Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline*. Haesler E (ed.). Perth, Australia: Cambridge Media; 2014.
- Patel V, Romano M, Corkins MR, et al; American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.). Nutrition screening and assessment in hospitalized patients: a survey of current practice in the United States. *Nutr Clin Pract*. 2014;29(4):483-90.
- Posthauer ME, Banks M, Dorner B, et al. The role of nutrition for pressure ulcer management: National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, and Pan Pacific Pressure Injury Alliance White Paper. *Adv Skin Wound Care*. 2015;28(4):175-88.
- Stechmiller JK. Understanding the role of nutrition and wound healing. *Nutr Clin Pract*. 2010;25(1): 61-8.
- Stechmiller JK. Wound healing. In: Mueller C, ed. A.S.P.E.N. *Adult Nutrition Support Core Curriculum*. 2nd ed. Silver Spring, MD: American Society for Parenteral and Enteral Nutrition; 2012: 348-63.
- Stotts N. Nutritional assessment and support. In: Bryant R, Nix D, eds. *Acute and Chronic Wounds: Current Management Concepts*. 4th ed. St. Louis, MO: Elsevier; 2012
- Todorovic V, Russell C, Elia M. The MUST explanatory booklet: A Guide to the "Malnutrition Universal Screening Tool" ("MUST") for Adults. www.bapen.org.uk/pdfs/must/must_explan.pdf
- White JV, Guenter P, Jensen G, Malone A, Schofield M; Academy Malnutrition Work Group; A.S.P.E.N. Malnutrition Task Force; A.S.P.E.N. Board of Directors. Consensus statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: characteristics recommended for the identification and documentation of adult malnutrition (undernutrition). *JPEN J Parenter Enteral Nutr*. 2012;36(3):275-83.