The Impact of Malnutrition on Skin Integrity and Wound Healing

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GENERAL PURPOSE: To recognize valuable resources from the Malnutrition Quality Improvement Initiative for acute care patients and malnutrition quality improvement measures for postacute care residents.

TARGET AUDIENCE: This continuing education activity is intended for physicians, physician assistants, nurse practitioners, and registered nurses with an interest in skin and wound care.

LEARNING OBJECTIVES/OUTCOMES: After participating in this educational activity, the participant will:

1. Distinguish the prevalence of malnutrition among acute care patients.
2. Explain the assessment guidelines for identifying malnutrition.
3. Identify the resources available for measuring malnutrition quality improvement.

ABSTRACT

Malnutrition is a global health issue that occurs in individuals across all weight categories and irrespective of healthcare resources. Researchers report that poor diet contributed to approximately 11 million deaths worldwide in 2017. Nutrition status is a modifiable risk factor in individuals at risk of or with impaired skin integrity. Incorporating best practices in identifying and treating malnutrition in a timely manner improves clinical outcomes. Valuable resources from the Malnutrition Quality Improvement Initiative for acute care patients and malnutrition quality improvement measures for post acute care residents are discussed, as well as sources for additional reimbursement.

KEYWORDS: care measures, diet, malnutrition, muscle, nutrition, pressure injury, pressure ulcer, quality, reimbursement, risk factor, sarcopenia, wound healing

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INTRODUCTION

High-quality, nutrient-dense diets are essential to optimize overall well-being and skin health.[1] The importance of healthy eating was addressed by Healthy People 2030[2] and the United Nations Sustainable Develop Goal Target 2.2 addressing malnutrition.[3] Consuming healthy diets throughout the lifespan reduces the risk of chronic disease, undernutrition, malnutrition, and death from all causes.[4,5] Provisional mortality data from the CDC report that malnutrition deaths have more than doubled from 2018 to 2022 in adults 65 years and older.[6]

Scope of the Problem

Malnutrition occurs as a result of deficiencies, excesses, and/or imbalances of macronutrients and micronutrients.[7] There are no laboratory or diagnostic tests available to diagnose malnutrition or protein status. Historic laboratory test results for albumin and prealbumin are not supported by evidence-based findings. Albumin and prealbumin are measures of inflammation and the severity of illness.[8] Micronutrient status is estimated using blood and urine tests. These values may reflect recent dietary intake without accounting for tissue stores. Laboratory tests ordered to estimate micronutrient deficiencies are noted in Table 1.

It is estimated that between 27% and 51% of adults admitted to hospitals in the US have malnutrition, and

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Table 1. LABORATORY TESTS USED TO CONFIRM MICRONUTRIENT DEFICIENCIES OR TOXICITIES RELATED TO SKIN HEALTH

Micronutrient	Laboratory Test
Ascorbic acid	Plasma ascorbate
	Leukocyte ascorbate[a]
Folate	Serum folate
	Red blood cell folate[a]
Niacin	N^1-methylnicotinamide from 24-h urine collection
Thiamine	Thiamine diphosphate in whole blood[a]
	Erythrocyte transketolase activity
Vitamin B_{12}	Serum vitamin B_{12}
	Serum or urine methylmalonic acid[a]
Vitamin A	Retinol
Iron	Hemoglobin, hematocrit, and mean corpuscular volume
Zinc	Plasma zinc
	Plasma zinc and urinary zinc excretion[a]

[a]More accurate measure.

approximately 60% of hospitalized older adults (65 years and older) experience malnutrition.[8,9] Once hospitalized, between 30% and 38% of well-nourished patients experience a decline in nutrition status during the hospitalization,[10] and 26% of patients had lost weight 1 month after hospital discharge.[11] The prevalence of malnutrition in post acute care can be as high as 50%.[12] The risk for malnutrition and/or diagnosis of malnutrition is associated with polymorbidities, frailty, impaired mobility, sarcopenia, facility-acquired infections and other complications, an increased risk for pressure injuries (PIs), and slow healing of all types of wounds.[13–15]

ADVERSE OUTCOMES IMPACTED BY MALNUTRITION

Micronutrient deficiencies or an imbalance of energy and nutrients negatively impacts overall health status, damages skin health, and impairs wound healing through various mechanisms (Figure 1). With malnutrition, the supply of essential nutrients required for tissue viability is diminished. Moreover, it pushes the body into a catabolic state, leading to tissue breakdown, compromising skin integrity, and impairing collagen production needed for skin strength, elasticity, and healing.

Therefore, the impact of malnutrition extends far beyond complicated wound healing, because it leads to a cascade of adverse effects, as well as to a vicious cycle responsible for a progressive worsening of nutrition status. Emotional and economic burdens are also associated with malnutrition and related outcomes.[16] Recognizing and addressing malnutrition in a timely matter are crucial to optimize tissue regeneration, reduce complications, and enhance patient outcomes through proper nutrition interventions. Adverse outcomes impacted by malnutrition are summarized in Table 2.

DEFINING UNDERNUTRITION AND MALNUTRITION

Undernutrition and starvation-related malnutrition are the consequence of inadequate intakes of energy, protein, and micronutrients. Although these terms are often used interchangeably, they differ by degree of severity: undernutrition is less severe than malnutrition. Disease-related malnutrition is the consequence of acute inflammation due to severe injury or acute illness or sustained chronic inflammation due to chronic conditions or diseases. Both undernutrition and malnutrition are compounded by impaired nutrient utilization, drug-nutrient interaction, altered nutrient needs, cognitive and functional decline, and socioeconomic changes.[18]

To improve awareness, recognition, and diagnosis, ESPEN (the European Society for Clinical Nutrition and Metabolism), the Academy of Nutrition and Dietetics (The Academy), and ASPEN (the American Society for Parenteral and Enteral Nutrition) published criteria to define the characteristics of malnutrition. The Academy and ASPEN published characteristics for identifying and documenting malnutrition based on specific characteristics in the context of acute illness, chronic disease, or social and environmental circumstances. Because no single parameter is definitive for adult malnutrition, the identification of two or more of the characteristics outlined in Table 3 is recommended for diagnosis.[19] In 2019, the Global Leadership Initiative on Malnutrition published additional criteria to identify malnutrition, incorporating a two-step approach for screening "at-risk status" using a validated screening tool and two or more criteria or characteristics to diagnose malnutrition. The diagnosis

Figure 1. CONSTELLATION OF FACTORS CONTRIBUTING TO IMPAIRED TISSUE VIABILITY

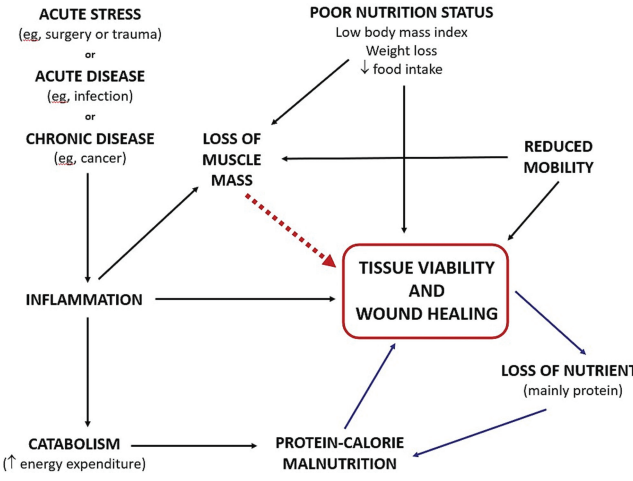

Table 2. MAJOR OUTCOMES ASSOCIATED WITH DISEASE-RELATED MALNUTRITION AND THEIR PRINCIPAL PATHOPHYSIOLOGIC MECHANISMS

Adverse Effect	Main Responsible Mechanisms
Infections	Malnutrition weakens the immune system, reducing the body's capacity to fight off infections. This occurs because of nutrient deficiencies, impaired immune cell function, and antibody production. Overall, the anergic inflammatory response hampers adequate immune response.[14]
Falls	Malnutrition can lead to muscle weakness and balance/gait problems, increasing the risk of falls. Muscle wasting and decreased bone density due to nutrient deficiencies and catabolic inflammatory response contribute to this vulnerability. Fractures are a frequent consequence, which further complicates the patient's journey.[13]
Complications	Malnutrition can result in various complications, including electrolyte imbalances, organ dysfunction, and impaired wound healing. These complications arise from nutrient deficits affecting essential body functions.[13–15]
Impaired mobility	Malnourished individuals often experience muscle atrophy and weakness, leading to limited physical mobility and a decreased ability to perform daily activities, which in turn result in further muscle loss. Immobility is a main risk factor for pressure injuries.[13]
Unplanned fat and muscle losses	Reduced protein-calorie intake and inflammation promote weight loss and substantial decreases in lean body mass. Muscle wasting is responsible for muscle dysfunction, reduced strength, and impaired mobility. Declining functional status creates a challenging environment for individuals to perform essential wound care and rehabilitation.[9]
Worsening chronic disease management	Malnutrition may contribute to anemia and reduce blood flow to wounds, limiting oxygen and nutrients to healing cells (ie, fibroblasts). Malnutrition affects medication metabolism, potentially reducing the effectiveness of treatments.[9,17]
Increased length of stay and healthcare costs	Patients who are malnourished may require longer hospital stays due to delayed recovery and experience higher healthcare costs, increased susceptibility to complications such as infections, and the need for nutrition support during treatment.[8]
Increased readmission rates	Malnutrition can lead to a higher likelihood of hospital readmissions because individuals with reduced resiliency are more prone to recurrent infections, exacerbations of chronic diseases, and overall complications (eg, falls, fractures, etc).[9,10]
Increased mortality	Malnutrition significantly elevates the risk of mortality because it undermines the body's ability to cope with illnesses, infections, and the overall stress of disease.[9,10]

is based on the evaluation of phenotypic and etiologic criteria. At least one phenotypic criterion and one etiologic criterion are required for a diagnosis of malnutrition (Table 3).[20]

MALNUTRITION, NUTRIENTS, AND SKIN INTEGRITY

Malnutrition of any type is a risk factor for issues with skin integrity such as PI or chronic wounds due to increased nutrient needs for wound healing and tissue regeneration.[21,22] Skin integrity can be significantly affected by macronutrient and micronutrient malnutrition. Macronutrients, protein, fat, and carbohydrates are more easily identified when deficient, depending on the etiology of the macronutrient malnutrition. Micronutrient malnutrition is not as easily identified or even thought to be an issue. Some micronutrients have a direct effect on skin integrity, and others can have an indirect effect due to limitations in an individual's ability to consume adequate nutrient intake and impaired nutrient utilization.[23] The process of wound healing and tissue regeneration increases nutrient requirements regardless of the etiology of the wound.[17]

Macronutrient and micronutrient malnutrition is identified by the nutrition professional using a comprehensive nutrition assessment. A nutrition-focused physical examination (NFPE) is used to identify physical signs associated with nutrient insufficiency and deficiencies that impact skin integrity/wound healing and identify the type of malnutrition present.[21,22] If a patient is malnourished, the nutrition intervention strategies include the repletion levels of nutrients needed to meet increased nutrient needs to reduce polymorbidities and for wound healing.

Key nutrients for skin integrity include protein, calories, water, vitamin A, vitamin C, thiamine (B_1), riboflavin (B_2), niacin (B_3), pyridoxine (B_6), folate (B_9), and cobalamin (B_{12}) along with zinc and iron. Of these, thiamine (B_1) and zinc have secondary effects that can limit an individual's ability to consume adequate nutrients.[17,24–30] The *International Clinical Practice Guidelines on the Prevention and Treatment of Pressure Injuries* (CPG) provides specific recommendations for energy and protein needs. Tables 4 and 5 summarize estimated macronutrient needs, functions, and signs of inadequate intake of key macronutrients involved in wound healing. The CPG

Table 3. SUMMARY OF DIAGNOSTIC CRITERIA OF MALNUTRITION

	Academy/ASPEN Criteria[a]		GLIM Criteria[b]	
Criteria	**Moderate**	**Severe**	**Moderate**	**Severe**
Phenotypic criteria				
Weight loss	x	x	x	x
Low body mass index			x	x
Muscle loss	•	•	x	x
Subcutaneous fat loss	•	•		
Fluid accumulation	•	•		
Functional status (handgrip strength)	/	•		
Etiologic criteria				
Reduced food intake or assimilation	x	x	x	x
Inflammation or disease burden			x	x

Abbreviations: Academy, Academy of Nutrition and Dietetics; ASPEN, American Society for Parenteral and Enteral Nutrition; GLIM, Global Leadership Initiative on Malnutrition.
x = Clearly established cutoff and/or markers.
• = Expert subjective assessment (no threshold value indicated).
/ = Missing.
[a]In the context of three different entities (acute illness/injury, chronic diseases/conditions, and starvation-related malnutrition). A minimum of two of the six characteristics is recommended for diagnosis.
[b]At least one phenotypic criterion and one etiologic criterion are required for diagnosis.

does not include recommendations for micronutrient supplementation but addresses confirmation of suspected micronutrient deficiencies in its Implementation Considerations. Table 5 summarizes assessment for micronutrient deficiencies using dietary intake data and NFPE findings. Suspected micronutrient deficiencies should be confirmed using laboratory tests. The nutrition status of an individual is closely linked with skin integrity and the ability to progress through the normal stages of wound healing. As the adverse effects of all types of malnutrition are being identified, the use of NFPE provides additional insight into the complexity of nutrition/malnutrition and the treatment plans to provide the best quality of life and outcomes. Laboratory and diagnostic tests are available to confirm suspected micronutrient deficiencies.

MALNUTRITION CARE PROCESS/WORKFLOW

The malnutrition care process/workflow merges traditional clinical practice for evidence-based nutrition care for institutionalized patients who are at risk of or have a malnutrition diagnosis.[31] See Figure 2 for details of the malnutrition care workflow from admission to discharge from a healthcare facility. Facilities should establish a nutrition risk protocol.

A competent nurse or other member of the interdisciplinary team should conduct the nutrition screening.

Table 4. ASSESSMENT FOR MACRONUTRIENTS INVOLVED IN WOUND HEALING[16]

Macronutrient	Functions	CPG Estimated Needs/Day	Signs of Inadequate Intake
Protein	Required for all metabolic, synthesis, and structural functions	Needs per day: recommendation: 1.25–1.5 g/kg per day	Muscle mass loss as determined by NFPE, DEXA scan, or other validated method; coarse, brittle hair with slowed growth; increased hair loss; "cellophane" skin; decreased strength
Water and hydrating fluids	Regulates body temperature and moistens tissues (eg, mouth, eyes, nose); solvent and transporter for nutrients and oxygen; lessens the burden on the kidneys and liver to excrete waste products	Healthy individuals: approximately 30 mL/kg body weight or 1 mL/calorie per day	Tenting skin on sternum or forehead; dry oral mucosa; dry eyes, dry, scaly skin (not recommended on individuals with fragile, thin skin)
Calories	Provides substrate for energy production, spares protein for functional use	Should be determined by individual assessment or indirect calorimetry; if not available, recommendation is 30–35 kcal/kg per day	NFPE: Weight loss, muscle and or fat loss; decreased strength

Abbreviations: CPG, International Clinical Practice Guidelines on the Prevention and Treatment of Pressure Injuries; DEXA, dual-energy X-ray absorptiometry; NFPE, nutrition-focused physical examination.
Note: Recommendations for macronutrients are individualized to meet the unique needs of each client.

Table 5. ASSESSMENT FOR MICRONUTRIENT DEFICIENCIES USING DIETARY INTAKE AND NUTRITION-FOCUSED PHYSICAL EXAMINATIONS[17,21–30]

Micronutrient	Estimated Needs	Time to Deficiency[a]	Function	Signs of Deficiency
Vitamin A	RDA by age	Longer term; 1–2 y	Controls cellular growth and differentiation, vision, reproductive growth; activates gene expression in more than 500 target genes; inflammation decreases absorption and increases urinary losses	NFPE: Bitot spots; hyperkeratotic skin lesions; dry caked skin on pressure points such as feet; excessive hair loss; impaired night vision Diet: infrequent vegetables and fruit intake; very low-fat diet; alterations in digestion/absorption process
Vitamin C	RDA by age; increased needs with inflammation and smoking	6 wk	Hydroxylation of glycine and proline for collagen formation; electron donation	NFPE: follicular petechiae; purpura; delayed resolution of bruising; inflamed gums/scorbutic tongue; fragile skin due to loss of collagen synthesis; wound dehiscence; Lower extremity edema; bone pain Diet: little to no fruit or vegetable intake; lower extremity edema unresolved with diuretics
Vitamin E	RDA by age	Primary deficiency is uncommon; may be secondary to other medical diagnoses	Neurotransmitter synthesis; tryptophan synthesis	Increased needs in patients with diabetes, inflammatory diseases
Thiamine (B_1)	RDA by age; increased needs with diuretic use	7–10 d; with emotional/physiologic stress: 3-5 d	CHO and energy metabolism; synthesis of cellular molecules, nucleic acids, neurotransmitters	Symptoms: nausea/vomiting, anorexia, confusion, apathy, cognitive impairment, ataxia NFPE: angular cheilosis Diet: intractable nausea without relief from anti-emetic medication(s)
Riboflavin (B_2)	RDA by age	4–6 wk	Energy production, fatty acid synthesis	NFPE: angular stomatitis; cheilosis; loss of skin integrity around scotoma and labia; ocular itching, dryness; photophobia Diet: little to no dairy product intake
Niacin (B_3)	RDA by age	4 wk	More than 400 enzymes require NAD; adenosine triphosphate synthesis; glycolysis; fatty acid and amino acid metabolism; can be synthesized from tryptophan, which requires B_6 and B_1; excessive leucine may interfere with niacin synthesis from tryptophan	NFPE: cheilosis; dry flaky skin initially; photosensitive dermatitis; diarrhea; altered mentation Suspect deficiency: vegan, vegetarian diet without whole/fortified grains
Pyridoxine (B_6)	RDA by age	3–6 wk	Coenzyme for more than 160 enzymatic reactions affecting CHO, lipid, and protein metabolism; biosynthesis and degradation of amino acids; gluconeogenesis; neurotransmitter synthesis	NFPE: glossitis; reddened oral mucosa; periorificial dermatitis; eczema Diet: vegan, vegetarian diet
Folate (B_9)	RDA by age	3–6 wk	Required for DNA synthesis; metabolism of nucleic acids; methylation reactions, RBC synthesis; vitamin C improves folate availability	NFPE: beefy red tongue, glossitis; angular stomatitis, oral ulcers; anorexia; fatigue; cognitive impairment

(continues)

Table 5. ASSESSMENT FOR MICRONUTRIENT DEFICIENCIES USING DIETARY INTAKE AND NUTRITION-FOCUSED PHYSICAL EXAMINATIONS,[17,21–30] CONTINUED

Micronutrient	Estimated Needs	Time to Deficiency[a]	Function	Signs of Deficiency
Cobalamin (B_{12})	RDA by age	12 mo	Enzyme cofactor for mitochondrial metabolism; preservation of DNA integrity; red blood cell and neurotransmitter synthesis	NFPE: pallor; beefy red oral mucosa with glossitis; peripheral neuropathies; vertigo; fatigue; cognitive impairment Suspect deficiency: vegan, vegetarian diet; acid reduction medication, use of metformin
Iron	RDA by age	Varies based on medical status	Energy and substrate metabolism, collagen synthesis, oxygen transport/binding; DNA synthesis; thyroid hormone activation, innate and adaptive immunity; drug metabolism	NFPE: pallor, pale conjunctiva, fragile fingernails; thinning hair, pale oral mucosa and lips, angular stomatitis Diet: vegan, vegetarian diet
Zinc	RDA by age	Varies based on medical status. Increased urinary losses with physiologic/emotional stress; diarrhea increases losses	Three classes of functions: structural, catalytic, and regulatory; 85% of body stores are in skeletal muscle and bone; excreted in bile; present in more than 300 metalloenzymes; RNA and DNA synthesis, hormone synthesis; structural component of cytoplasmic superoxidase dismutase	NFPE: muscle wasting; nasolabial seborrhea; dry flaky skin; ecchymosis, reddened/darkened knuckles without sun exposure Diet: anorexia and early satiety with decreased sense of taste present early in deficiency; lack of interest in eating

Abbreviations: CHO, carbohydrate; DEXA, dual-energy X-ray absorptiometry; EPUAP, European Pressure Ulcer Advisory Panel; NAD, nicotinamide adenine dinucleotide; NFPE, nutrition-focused physical examination; NPIAP, National Pressure Injury Advisory Panel; PPPIA, Pan Pacific Pressure Injury Alliance; RBC, red blood cell; RDA, recommended daily allowance.
Note: EPUAP/NPIAP/PPPIA 2019 CPG does not include specific recommendations for micronutrients. Recommendations for increased micronutrient needs are individualized based on NFPE findings, dietary intake, and laboratory test results.
[a]Time to deficiency is the time required for a nutrient to become deficient with inadequate nutrient intake and adequate nutrient tissue stores present.

The results of the screening should be recorded in the electronic health record. Individuals considered at risk of malnutrition should be referred, within 24 hours, to the registered dietitian/nutritionist (RDN) for an in-depth assessment. The nutrition assessment should be conducted within 24 to 48 hours after the malnutrition screening is completed. Data to be evaluated include food and nutrition patient history, anthropometric measurements, body composition assessment (if available), biochemical data, and NFPE findings.[20,31]

The RDN identifies the nutrition diagnosis in the problem list or other section of the medical record for cosignature by medical provider. Data collected through the nutrition assessment, other patient data, and conditions unique to the patient should be used to identify the root cause of the malnutrition. Nutrition providers should share the nutrition diagnoses with the attending physician, the patient's family, and/or caregivers.[31]

An individualized care plan, specific to the patient's preferences, should be put in place. All care providers, the patient, and the patient's family should be involved in the care plan development process.[31] Individuals identified as at risk of or with malnutrition should receive nutrition interventions within 24 hours of risk identification.

Figure 2. MALNUTRITION CARE/WORKFLOW

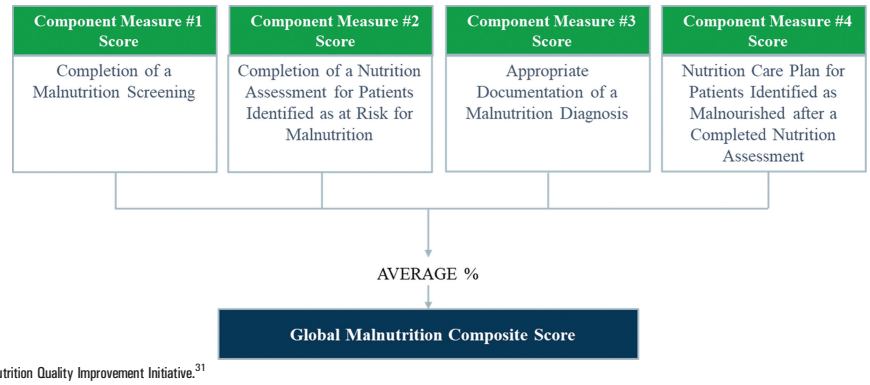

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Table 6. eCQMs AND DESCRIPTIONS[36]

eCQMs	Description
NQF #3087	Completion of a malnutrition screening within 24 h of admission
NQF #3088	Completion of a nutrition assessment for patients identified as at risk for malnutrition within 24 h of a malnutrition screening
NQF #3089	Nutrition care plan for patients identified as malnourished after a completed nutrition assessment
NQF #3090	Appropriate documentation of a malnutrition diagnosis

Abbreviations: eCQMs, electronic clinical quality measures; NQF, National Quality Forum.

Monitor and evaluate the effectiveness of the interventions put in place. Seek feedback from the patient, family, and caregiver as to the effectiveness of the plan. Be sure to evaluate any changes in condition, including new diagnoses.[31]

RESOURCES TO MEASURE MALNUTRITION QUALITY IMPROVEMENT

Acute Care

The prevalence of malnutrition in acute care patients is associated with increased morbidity, mortality, and healthcare costs.[8] The fact that malnutrition is not identified and/or treated as part of admission to an acute care facility emphasizes the need to improve care for this segment of the population.[32]

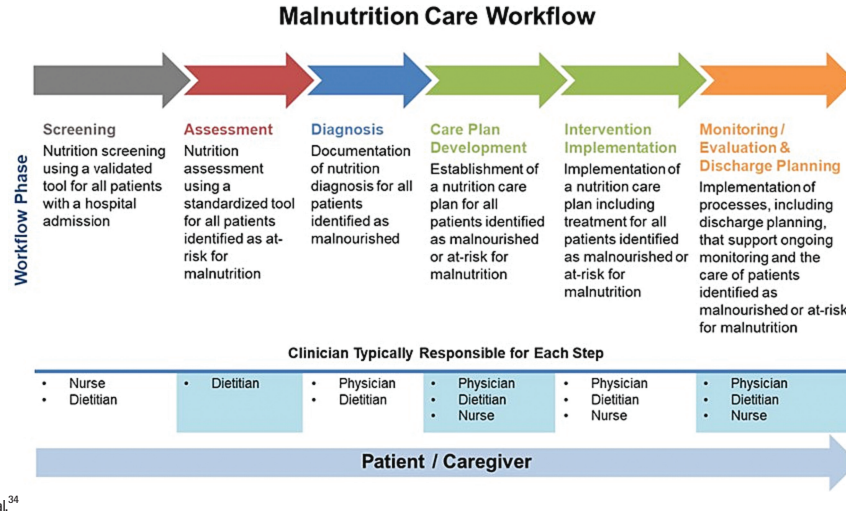
The CMS defines quality measures as tools to help institutions quantify the quality of healthcare processes, outcomes, patient perceptions, and/or organizational structure and systems that are associated with the capacity to deliver high-quality healthcare as it relates to the organization's quality goals.[33] Quality goals are associated with effective, safe, efficient, patient-centered, equitable, and/or timely care. Quality measures and outcomes have an impact on regulatory oversight and payment/reimbursement for services rendered by individual healthcare providers and healthcare organizations.[33,34]

To mitigate the issue of malnutrition in the inpatient setting for the older adult population, The Academy (in collaboration with Avalere Health and other stakeholders) developed the Malnutrition Quality Improvement Initiative (MQii) in 2013.[35] The main goal of this initiative is to expand evidence-based, high-quality, patient-centered care for older adults who are admitted to acute care facilities malnourished or at risk of malnutrition.[34]

The MQii provides a toolkit to help acute care facilities implement best practices when providing care to patients with malnutrition. It also provides nutrition-focused electronic clinical quality measures (eCQMs) based on the nutrition care process used in electronic health records to help track performance improvement and outcomes.[35] Intended to be used by the entire healthcare team, the MQii toolkit provides evidence-based best practices and resources to be used in the care of individuals who are malnourished or at risk of malnutrition.[36]

The Academy and Avalere Health developed and tested four malnutrition eCQMs (Table 6). The malnutrition-specific quality measure, the Global Malnutrition Composite Score (GMCS), was endorsed by the National Quality Forum in 2021. Developed by MQii, the GMCS

Figure 3. COMPONENTS OF THE GLOBAL MALNUTRITION COMPOSITE SCORE



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is the average of four component measures: malnutrition screening, nutrition assessment, malnutrition diagnosis, and nutrition care plan (Figure 3).[33,34] These evidence-based outcome statements are valid and reliable.[37] In 2022, the CMS included the GMCS in the Inpatient Prospective Payment System for acute and long-term care facilities, which was to be fully implemented in fiscal year 2023.[33] The CMS has adopted the GMCS and the eCQMs as part of the Hospital Inpatient Quality Reporting Program (QRP).

Postacute Care

The postacute care QRP defines reporting requirements as mandated by the IMPACT (Improving Medicare Post-Acute Care Transformation) Act of 2014. Data for this report are collected through the entries made on the Minimum Data Set Assessment, information collected from the CDC National Healthcare Network, and Medicare Fee-for-Service Claims. Although the QRP does not include nutrition-specific indicators, it does include indicators related to overall nutrition status including skin integrity and changes in skin integrity and functional status; cognitive function and mental status; special services, treatments, and interventions (ie, total parenteral nutrition); and impairments (ie, dysphagia).[38,39] Selected data points support the value of the RDN as an integral part of the Medicare Quality Initiatives and incorporated in the postacute care facilities' quality improvement program.[40]

In the hospital care setting, malnutrition quality measures have been developed and tested. Quality improvement programs with a nutrition focus in acute care have proven to reduce the cost of care and promote positive clinical outcomes. This type of data is not readily available for quality initiatives implemented in postacute care.[38]

REIMBURSEMENT

Patient-Driven Payment Model

The Patient-Driven Payment Model (PDPM) is the newest CMS payment system for rehabilitation therapy providers under Medicare Part A. It replaces the previous Resource Utilization Group system. It marks a change in the CMS system from volume-based to value-based care. The PDPM changes the process used to classify patients and calculate reimbursement rates.[41] In this reimbursement system, therapy minutes are no longer used as the basis for calculating payment.[41]

The PDPM system reimburses for services provided to patients in five disciplines: physical therapy, occupational therapy, speech-language pathology, nursing, and nontherapy ancillary (NTA). The care provided by RDNs is classified as NTA. Because the system is designed to more accurately capture the acuity level and level of care provided, facilities will be reimbursed for services provided by RDNs.

Some NTA comorbidities such as PIs, morbid obesity, diabetes, HIV, malnutrition, and parenteral nutrition can qualify facilities for additional reimbursement based on services provided. Each NTA comorbidity has a point score; for example, parenteral IV feeding has a high-level score of seven points (eight is the highest comorbidity score); parenteral IV has a low-level score of three points; and PI, morbid obesity, and malnutrition are worth one point. To qualify for the additional reimbursement, conditions need to be documented in the Minimum Data Set, have a physician's diagnosis, and have an accurate *International Classification of Diseases, Tenth Revision* code documented.[41]

Hospital Inpatient Prospective Payment System

The CMS reimburses for hospital inpatient stays under the Hospital Inpatient Prospective Payment System utilizing predetermined hospital rates for discharges. This system varies based on severity-adjusted diagnosis-related groups that are used to describe the patient's conditions. Some conditions are designated as a major complication/comorbidity or complication/comorbidity. Acute care facilities can bill and receive higher reimbursement for malnutrition based on the severity of the condition (mild, moderate, or severe). To qualify for higher reimbursement, the diagnosis must be assigned to the patient by a physician, and a care plan must be put in place during the hospitalization (ie, before discharge). Table 7 lists the *International Classification of Diseases, Tenth Revision, Clinical Modification* codes for malnutrition that have been designated as major complication/comorbidity or complication/comorbidity under the diagnosis-related group system.[42]

Table 7. *INTERNATIONAL CLASSIFICATION OF DISEASES, TENTH REVISION* CODES FOR MALNUTRITION[42]

Code	Description	Major Complication/Comorbidity	Complication/Comorbidity
E43	Unspecified severe protein-calorie malnutrition	X	
E44.0	Moderate protein-calorie malnutrition		X
E44.1	Mild protein-calorie malnutrition		X
E45	Retarded development following protein-calorie malnutrition		X
446	Unspecified protein-calorie malnutrition		X

CONCLUSIONS

The Academy, ASPEN, ESPEN, and other international clinical nutrition societies have made great strides in standardizing the diagnosis of malnutrition and documenting improvements in malnutrition care and in increasing reimbursement for nutrition services in all healthcare settings. The support of stakeholders has been invaluable, and more collaborative efforts between wound care leaders and medical societies are vital. More research is needed to identify specific nutrition services that contribute to identifying and treating malnutrition in vulnerable individuals at risk of or with skin integrity issues.

PRACTICE PEARLS

- Malnutrition and nutrient deficiencies are significant risk factors for skin integrity issues but are often overlooked and underdiagnosed in clinical settings.
- Facilities should implement a nutrition protocol for efficient screening, assessment, and timely interventions for individuals at risk of or with malnutrition.
- Measures of nutrition care are a vital part of quality improvement initiatives in all healthcare settings.
- The MQii toolkit is a great resource to help facilities implement best practices for individuals who are malnourished.
- More research is needed to demonstrate the most effective nutrition strategies to meet the needs of vulnerable individuals at risk of and with impaired skin integrity.
- Collaboration between wound care leaders, The Academy, ASPEN, other international clinical nutrition societies, and stakeholders is vital to address the unique nutrition needs of vulnerable individuals.

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