

# Changing the Malnutrition Paradigm

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**T**he Merriam Webster Dictionary defines malnutrition as “faulty nutrition due to inadequate or unbalanced intake of nutrients or their impaired assimilation or utilization”.<sup>1</sup> This classic dictionary definition may work for grade school and middle school science classes but is no longer applicable for diagnosing adult patients. In recent years, it has become clear that malnutrition is a complex syndrome that manifests in different ways. As a result of this new understanding, the definition of the condition and how to diagnose it have been subject to intense scientific scrutiny. Many clinicians struggle to understand this change and wonder what parameters to use in order to assign a diagnosis of malnutrition. In an attempt to understand the whys and wherefores of recent changes in the malnutrition paradigm, a summary of the evidence follows.

## Historical Perspective

Historically, a diagnosis of protein energy malnutrition (PEM) was made using serum albumin and/or prealbumin. Malnutrition was classified as *mild*, *moderate*, or *severe* based on a patient’s serum hepatic protein levels. Table 1 outlines the malnutrition parameters that were standard in medical, nursing, and nutrition textbooks for generations. Many patients were labeled with a diagnosis of “severe malnutrition” when their serum albumin level was below 2.0, and the appropriate ICD-9 code was applied. Persons with low serum albumin or prealbumin often were referred to a registered dietitian (RD) and/or prescribed a protein supplement in an effort to correct their malnutrition. Serial serum albumin and prealbumin levels were requested to track nutritional status in patients with pressure ulcers, surgical wounds, and a host of other medical conditions.

Fast-forward to 2013, when evidence shows that although serum albumin and prealbumin may be good indicators of morbidity and mortality, they are not accurate indicators of malnutrition.<sup>2-5</sup> The relevance of the entire class of hepatoprotein laboratory tests, including serum albumin, as indicators of malnutrition is now believed to be limited.<sup>3</sup> This information has been documented in the literature for nearly 10 years but has admittedly been slow to trickle down to practicing physicians, nurses, and dietitians. Despite the volume of evidence to the contrary, it is

still common to see a diagnosis of malnutrition based on a low albumin or prealbumin in medical records. Many clinicians still are confused by the subject and rely on albumin and prealbumin in the absence of other clear indicators of malnutrition. An understanding of the science behind the expert opinions can help practitioners understand the why serum proteins are not effective for a malnutrition diagnosis.

## Understanding Protein Lab Data

Albumin and prealbumin are negative-acute phase reactants — ie, they decrease in the presence of inflammation in the body.<sup>2,4</sup> Inflammation can be defined as “the aggregate of clinical, hematologic, and organ function abnormalities associated with sepsis, trauma, and a variety of other conditions such as pancreatitis”.<sup>2</sup> The inflammatory response is a complex series of cellular reactions that results in catabolism and breakdown of lean body mass. Inflammatory conditions that affect serum albumin levels include (but aren’t limited to) dehydration, hepatic failure, infection, cancer, bed rest, and pregnancy.<sup>2,4</sup> In reality, almost every chronic medical condition and most acute conditions can potentially result in a decrease in serum prealbumin and/or albumin because of the inflammatory response. This is one reason it is so common to see very low albumin and prealbumin levels in trauma patients, critical care patients, and persons with chronic illness and open wounds. As a normal part of the recovery process, inflammation subsides and serum albumin and prealbumin increase, often returning to normal levels. Because they are negative acute-phase proteins, serum albumin and prealbumin levels reflect the severity of the inflammatory process better than nutritional status.

So what is the relationship between nutrition and serum albumin levels? Doesn’t adding protein to the diet increase serum albumin and/or prealbumin levels? Surprisingly, even though they have been the gold standard for defining nutrition for years, no prospective, randomized studies have shown an increase in albumin and prealbumin in response to changes in protein and calorie intake.<sup>4</sup> Evidence indicates that acute-phase proteins do not consistently or predictably change with weight loss, calorie restriction, or nitrogen balance.<sup>6,7</sup> However, an indirect re-

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lationship exists between hepatic proteins and nutritional status. Inflammation contributes to an increase in net protein loss caused by catabolism, meaning a patient may need more calories and protein in the diet. Inflammation [ also can induce anorexia, reducing the possibility a patient will consume adequate nutrients.<sup>2</sup> Experts agree that patients with low serum albumin or prealbumin may have compromised nutritional status for a number of reasons; however, the conventional wisdom of increasing protein in the diet to increase serum hepatic proteins no longer is considered valid. Patients still typically receive additional calories and protein but for other reasons, such as to correct defects in nutrient utilization.

### Defining and Diagnosing Malnutrition

As knowledge of the inflammatory process increased, experts began to realize the existing definition of malnutrition did not account for this variable. In 2010, an international consensus group<sup>8</sup> acknowledged widespread confusion among experts and worked to establish a more comprehensive definition for adults. This group proposed an etiology-based diagnosis for malnutrition, settling on three types of malnutrition: 1) pure chronic starvation without inflammation (eg, anorexia); 2) chronic diseases or conditions that impose sustained inflammation of a mild to moderate degree (eg, organ failure, pancreatic cancer, rheumatoid arthritis, or sarcopenic obesity); and 3) acute disease or injury states with marked inflammatory response (eg, major infection, burns, trauma, or closed head injury).

Despite this proposed definition, no single, universally accepted approach to the diagnosis and documentation of adult malnutrition is available. Use of the Mini Nutrition Assessment, Subjective Global Assessment, or other nutrition screening tools has become customary in many settings,<sup>9</sup> but most don't acknowledge the concept of the inflammatory response. The good news is that an effort is underway to identify and document malnutrition. In 2012, the Academy of Nutrition and Dietetics (Academy) and the American Society for Parenteral and Enteral Nutrition (ASPEN) released a joint consensus statement titled *Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)*. This groundbreaking article will likely change the world of adult malnutrition as we know it. The authors propose the three-pronged etiology-based definition of malnutrition adopted by the international consensus committee: starvation-related, chronic disease-related, and acute disease or injury-related. Table 2 outlines and defines the proposed categories.

The Academy/ASPEN consensus statement goes well beyond defining malnutrition; it suggests six characteristics for diagnosis: insufficient energy intake, weight loss, loss of muscle mass, loss of subcutaneous fat, localized or generalized fluid accumulation that may sometimes mask weight loss, and diminished functional status as measured

**Table 1. Historical perspective: albumin levels for diagnosis of malnutrition in the past (no longer considered valid)**

Condition	Albumin level
Normal	>3.5 g/L
Mild depletion	2.8-3.5 g/L
Moderate depletion	2.1-2.7 g/L
Severe depletion	<2.1 g/L

*Source: Litchford ML. The Advanced Practitioner's Guide to Nutrition and Wounds. Greensboro, NC: Case Software and Books, 2006.*

**Table 2. Proposed etiology-based definitions of malnutrition**

- 1. Malnutrition in the context of social or environmental circumstances (starvation-related malnutrition):** This may be pure starvation due to financial or social reasons, or could be caused by anorexia nervosa
- 2. Malnutrition in the context of acute illness or injury:** Examples include organ failure, pancreatic cancer, rheumatoid arthritis, or sarcopenic obesity
- 3. Malnutrition in the context of chronic illness:** Examples include major infections, burns, trauma, or closed head injury

by hand grip strength. If a patient has two or more of these criteria, he/she meets the proposed guidelines for malnutrition. Using specific parameters under each of these six criteria, the proposal recommends labeling malnutrition as non-severe or severe. The basic characteristics used to make a malnutrition diagnosis are detailed in Table 3.

The characteristics and criteria to identify malnutrition as proposed by ASPEN and the Academy rely on the age-old methods of medical history, physical examination/clinical signs, anthropometric data, food and nutrient intake, and functional assessment. Laboratory markers of inflammation (C-reactive protein [CRP], white blood cell count, and blood glucose levels) may be used to help determine if the condition is starvation-related, chronic-disease related, or acute disease or injury-related. Identifying malnutrition clearly becomes more complex with the adoption of an etiology-based diagnosis. A comprehensive assessment requires more time than a simple blood draw but can give more clues as to how best to intervene for each type of malnutrition.

It should be noted that the Academy and ASPEN recognize the standardized approach to diagnosis of adult malnutrition is a dynamic work-in-progress and characteristics are likely to change over time. Currently, ICD-9 codes for malnutrition remain unchanged, although discussion is underway regarding changes to the current language to make it consistent with etiology-based diagnostic terminology.<sup>3</sup>

**Table 3. Proposed clinical characteristics used to identify and categorize malnutrition<sup>a</sup>**

- 1. Energy intake:** Malnutrition is the result of inadequate food and nutrient intake or assimilation, thus recent intake compared to estimated requirements is a primary criterion defining malnutrition. The clinician may obtain or review the food and nutrition history, estimate optimum energy needs, compare them with estimates of energy consumed and report inadequate as a percentage of estimated energy requirements over time
- 2. Interpretation of weight loss:** The clinician may evaluate weight in light of other clinical findings, including the presence of under- or overhydration. The clinician may assess weight change over time reported as a percentage of weight loss from baseline
- 3. Body fat:** Loss of subcutaneous fat (eg, orbital, triceps, fat overlying the ribs)
- 4. Muscle mass:** Muscle loss (eg, wasting of the temples (temporalis muscle); clavicles (pectoralis and deltoids), shoulders (deltoids), interosseous muscles, scapula (latissimus dorsi, trapezius, deltoids), thigh (quadriceps) and calf (gastrocnemius))
- 5. Fluid accumulation:** The clinician may evaluate generalized or localized fluid accumulation evident on exam (extremities, vulva/scrotal edema, or ascites). Weight loss often is masked by generalized fluid retention (edema), and weight gain may be observed
- 6. Reduced grip strength:** Use standards supplied by the manufacturer of the measurement device (dynamometer)

*A minimum of two characteristics is required for a diagnosis of malnutrition. Based on criteria proposed by the Academy/ASPEN, malnutrition can be identified into one of three categories (malnutrition in the context of acute illness or injury, malnutrition in the context of chronic illness, and malnutrition in the context of environmental circumstances) and can be classified as severe or non-severe within each category. Refer to source for more information.*

<sup>a</sup> Adapted from: White JV, Guenter P, Jensen G, Malone A, Schofield M. Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition). *J Acad Nutr Diet.* 2012;112:730–738.

## Practice Points

Clinicians are hungry for a simple, clear way to diagnose malnutrition. Unfortunately, no single biological marker (such as albumin or prealbumin) can provide that information. Albumin and prealbumin levels, although still commonly used to diagnose malnutrition, are no longer considered reliable assessment mechanisms. These laboratory tests alone should not be used as a basis for nutrition interventions. Clinicians should recognize the need to use comprehensive diagnostic criteria to assess and document nutritional status in adults. Medical professionals in all healthcare settings must work together to begin to implement new ways to identify and classify malnutrition using the Academy and ASPEN proposal as a template. ■

## References

1. Merriam-Webster online dictionary. Available at: [www.merriam-webster.com/dictionary/malnutrition](http://www.merriam-webster.com/dictionary/malnutrition). Accessed January 14, 2013.
2. Furlan MP, Charney P, Mueller CM. Hepatic proteins and nutrition assessment. *J Am Diet Assoc.* 2004;104:1258–1264.
3. White JV, Guenter P, Jensen G, Malone A, Schofield M. Consensus Statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition). *J Acad Nutr Diet.* 2012;112:730–738.
4. Bahn Le. Serum Proteins as Markers of Nutrition: What are We Treating? Nutritional Issues in Gastroenterology, Series #43. *Pract Gastroenterol.* 2006;October.
5. Pressure Ulcer Prevention and Treatment Clinical Practice Guideline. European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. Available through [www.npuap.org](http://www.npuap.org).
6. Academy of Nutrition and Dietetics Evidence Analysis Library. Does Serum Albumin Correlate with Weight Loss in Four Models of Prolonged Protein-Energy Restriction: Anorexia nervosa, Non-malabsorptive Gastric Partitioning, Bariatric Surgery, Calorie-restricted Diets or Starvation? Available at: [http://andevidencelibrary.com/conclusion.cfm?conclusion\\_statement\\_id=251263&highlight=albumin&home=1](http://andevidencelibrary.com/conclusion.cfm?conclusion_statement_id=251263&highlight=albumin&home=1). Accessed January 24, 2013.
7. Academy of Nutrition and Dietetics Evidence Analysis Library. Does serum prealbumin correlate with weight loss in four models of prolonged protein-energy restriction: anorexia nervosa, non-malabsorptive gastric partitioning bariatric surgery, calorie-restricted diets or starvation? Available at: <http://andevidencelibrary.com/search.cfm?keywords=prealbumin&x=0&y=0>. Accessed January 24, 2013.
8. Jensen GL, Mirtallo J, Compher C, Dhaliwal R, Forves A, Grijalba RF, et al. Adult starvation and disease-related malnutrition: a proposal for etiology-based diagnosis in the clinical practice setting from the International Consensus Guideline Committee. *Clinical Nutrition.* Available at: <http://download.journals.elsevierhealth.com/pdfs/journals/0261-5614/PIIS0261561409002386.pdf>. Accessed January 17, 2013.
9. Tsai AC, Wang JY, Change TL, Li TY. A comparison of the full Mini Nutritional Assessment, short-form Mini Nutritional Assessment, and the Subjective Global Assessment to predict the risk of protein-energy malnutrition in patients on peritoneal dialysis: a cross-sectional study. *Int J Nurs Stud.* 2013;50(1):8309.