

Prealbumin: A Marker for Nutritional Evaluation

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Determining the level of prealbumin, a hepatic protein, is a sensitive and cost-effective method of assessing the severity of illness resulting from malnutrition in patients who are critically ill or have a chronic disease. Prealbumin levels have been shown to correlate with patient outcomes and are an accurate predictor of patient recovery. In high-risk patients, prealbumin levels determined twice weekly during hospitalization can alert the physician to declining nutritional status, improve patient outcome, and shorten hospitalization in an increasingly cost-conscious economy. (Am Fam Physician 2002;65:1575-8. Copyright© 2002 American Academy of Family Physicians.)

Although the association between poor nutrition and illness has long been recognized, there is a lack of reliable, objective, short-term screening methods to evaluate nutritional risk.¹⁻⁴ Determination of the prealbumin level is a cost-effective and objective method of assessing severity of illness in patients who are critically ill or have a chronic disease. Studies suggest that early recognition of protein malnutrition and initiation of nutritional therapy can shorten the length of hospital stays and improve patient outcomes.⁵ Prealbumin is the earliest laboratory indicator of nutritional status and has emerged as the preferred marker for malnutrition because it correlates with patient outcomes in a wide variety of clinical conditions.⁶

Identifying the Problem

Chronically ill patients will be living longer because of advances in health care. Longevity, however, can accentuate the effects of anorexia, hypermetabolism, and malabsorption that predispose these patients to protein calorie malnutrition. If dietary protein is of poor biologic value or insufficient, or if calorie intake is low, dietary amino acids must be oxidized as fuel. Protein and calorie deficiencies alter insulin, growth hormone and cortisol levels, curtail hepatic function, and deplete mineral stores. In critically ill patients, these alterations can dramatically affect recovery.

One study⁵ noted that as many as 50 percent of hospitalized patients were at risk for protein calorie malnutrition. Patient care was improved by incorporating the prealbumin

level into the nutritional assessment, which enabled caregivers to begin supplementation before the patient's condition deteriorated.

At-risk patients include the following: (1) those with chronic debilitating conditions such as alcoholism, cancer, and chronic diseases; (2) those who have gone without eating for more than five days; and (3) those who have protracted nutrient losses. These patients are prone to poor wound healing, skin breakdown and infection, and have an increased risk of morbidity.

There is a poor correlation between anthropometric measurements and body composition. Unfortunately, even detailed scoring systems have not improved the clinical diagnosis of protein malnutrition beyond that of skilled observers.⁷ Physicians need a more effective tool.

Limitations of Laboratory Methods

The ideal nutritional marker should readily respond to changes in nutrient intake, be uninfluenced by other disease processes, be measurable with equipment available in most hospitals, and be relatively inexpensive to measure. The marker must have a short biologic half-life, exist in a relatively small pool, have a predictable catabolic rate, and a rapid rate of synthesis that responds only to protein intake.

Historically, albumin levels have been used as a determinant of nutritional status, but they are relatively insensitive to changes in nutrition. Albumin has a relatively large body pool and a half-life of 20 days. Serum albumin concentrations are affected by the patient's state of hydration and renal function. The level typi-

TABLE 1
Characteristics of Plasma Protein in Use as Nutritional Markers

Protein	Molar weight	Half-life	Range
Albumin	65,000	20 days	3.30 to 4.80 g per dL (33 to 48 g per L)
Transferrin	76,000	10 days	0.16 to 0.36 g per dL (0.16 to 0.36 g per dL)
Prealbumin	54,980	2 days	16.0 to 35.0 mg per dL (160 to 350 mg per L)

Adapted with permission from Spiekerman AM. Nutritional assessment (protein nutriture). Anal Chem 1995;67:429R.

cally takes 14 days to return to normal when the pool has been depleted.⁸

The preferred marker for protein malnutrition is prealbumin. It is easily quantified on laboratory instruments available in all hospitals and is less affected by liver disease than other serum proteins.⁸ Prealbumin has one of the highest ratios of essential to nonessential amino acids of any protein in the body,⁸ making it a distinct marker for protein synthesis.

Prealbumin is produced by the choroid plexus, by pancreatic islet cells in the embryonic yolk sac, and by enterochromaffin cells in the gastrointestinal mucosa, but the liver is quantitatively the most important source.⁹ Liver production is maintained until late in liver disease.

Hydration status does not affect prealbumin levels.

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min levels.⁵ A negative acute phase reactant, the prealbumin level will transiently decrease in the presence of inflammation and in the immediate postsurgical period. Serum levels also decline in patients with conditions associated with protein malnutrition, such as malignancy, cirrhosis, protein-losing enteropathy, and zinc deficiency (*Table 1*).⁸

Assessing Nutritional Status

Clinical studies⁵ indicate that determination of the prealbumin level may allow for earlier recognition of and intervention for malnutrition. Prealbumin production decreases after 14 days of consuming a diet that provides only 60 percent of required proteins.¹⁰ Synthesis of prealbumin increases above baseline levels within 48 hours of protein supplementation in children with severe protein calorie malnutrition and returns to normal levels within eight days.^{6,11} These observations and others led to the recommendation that prealbumin levels should rise 2 g per dL (20 g per L) per day with adequate nutritional support.⁸

Examples of Prealbumin Uses

Prealbumin response correlates with patient outcome. Among 102 patients whose average daily in-hospital intake was less than 50 percent of calculated maintenance requirements, persons who developed low prealbumin levels had a higher rate of mortality.¹²

In a study¹³ of patients on hemodialysis, the serum prealbumin level correlated with other measures of nutrition, including serum albumin, but appeared to be the single best nutritional predictor of survival. Patients at severe risk (i.e., prealbumin levels below 10 mg per dL [100 mg per L]) averaged hospital stays of 22 days compared with an average of six days in patients at moderate risk (prealbumin levels between 10 and 17 mg per dL [100 and 170 mg per L]).⁵

In a study in Spain,¹⁴ patients in an intensive care unit who were receiving formulas rich in branch chain amino acids recovered

TABLE 2
Prealbumin Risk Stratification

<i>Prealbumin level</i>	<i>Risk level</i>
<5.0 mg per dL (<50 mg per L)	Poor prognosis
5.0 to 10.9 mg per dL (50 to 109 mg per L)	Significant risk; aggressive nutritional support indicated
11.0 to 15.0 mg per dL (110 to 150 mg per L)	Increased risk; monitor status biweekly
15.0 to 35.0 mg per dL (150 to 350 mg per L)	Normal

Adapted with permission from Bernstein L, Bachman TE, Meguid M, Ament M, Baumgartner T, Kinosian B, et al. Measurement of visceral protein status in assessing protein and energy malnutrition: standard of care. Prealbumin in Nutritional Care Consensus Group. Nutrition 1995;11:170.

more rapidly from sepsis. Their recovery was associated with a rise in prealbumin levels.

Limitations of Using Prealbumin Level

In acute alcohol intoxication, a leakage of proteins from damaged hepatic cells may cause a rise in the prealbumin level. Consequently, alcoholics may have elevated levels of prealbumin after binge drinking. A more realistic picture of the prealbumin level can be noted after one week, when levels return to baseline.¹⁵ Serum prealbumin levels may rise during prednisone therapy and in patients using progestational agents.¹⁶ Zinc deficiency may lower prealbumin levels, but vitamin deficiencies do not.¹⁰

Recommendations for Nutritional Evaluation

In a 1995 consensus statement,¹⁷ a panel recommended checking serum prealbumin levels in all patients admitted to the hospital with malnutrition or nutritional risk factors such as advanced age, diabetes, hypertension, and renal disease. The panel also recommended that patients with prealbumin levels below 15 mg per dL (150 mg per L) receive a consultation from the hospital's nutritional team (*Table 2*).¹⁷

Failure to show an improvement in the prealbumin level of 4.0 mg per dL (40 mg per L) in eight days indicates a poor prognosis and the need for additional intervention, including oral or intravenous hyperalimentation, if possible.¹⁷ However, if prealbumin levels are rising, at least 65 percent of protein and energy requirements are probably being provided. We have initiated the use of this protocol at our institution and have found that determination of the prealbumin level has improved overall

recognition of a patient's need for nutritional support and has sensitized the staff to the nutritional support needs of all patients.

ILLUSTRATIVE CASE

A 62-year-old woman was admitted to the hospital with confusion, weakness, dehydration, and congestive heart failure. The patient had shown a progressive decline in ability to take oral nutrition. Her usual weight of 58.5 kg (130 lb) had declined to 45.5 kg (101 lb) over the previous six months. She had been unable to take any oral nutrition during the three to five days before her admission to the hospital.

Her albumin level was suboptimal at admission. Percutaneous endoscopic gastrostomy (PEG) tube feeding was commenced at 1,700 kcal per day. Progressive rises in the patient's prealbumin levels were noted. With the rise in prealbumin level, the patient's mental status improved, and she began taking an adequate amount of nutrition orally. As oral alimentation was resumed, PEG feedings were discontinued, and within five days the prealbumin level declined. The need for additional nutritional supplements was noted, and proper supplementation was reinstated.

The patient's condition was medically stabilized. The prealbumin level signaled the patient's nutritional requirements long before clinical changes were noted, and it is likely that response with nutritional supplementation avoided a worsening of her medical condition.

If prealbumin levels are rising, it is likely that at least 65 percent of protein and energy needs are being provided.

In patients who are receiving nutritional supplementation, a rise in prealbumin levels is normally seen within four to eight days.

DISCUSSION

If left undiagnosed, protein-calorie malnutrition can lead to increased risk of morbidity and mortality. Although anthropometric measurements and traditional laboratory testing of a multitude of factors may assist in the recognition and treatment of malnutrition, the use of the prealbumin level, which is easily determined, can allow for quick identification of patients who are at risk. Physicians might consider obtaining prealbumin measurements in all patients who are at risk for protein malnutrition, including the elderly, those with an albumin level of less than 3.2 g per dL (32 g per L) and those with poor food intake.

Patients selected for aggressive nutritional support can be monitored for success using the prealbumin level as an indicator. A response can be anticipated as early as four days after supplementation is started, with a definite response at eight days.

Final Comment

Although the prealbumin level is a sensitive indicator of inadequate nutrient intake, it should be used only as an integral part of an overall assessment program. Such factors as acute alcoholism, steroid use, and zinc deprivation may affect the prealbumin level. In patients at nutritional risk, prealbumin levels assessed twice weekly during hospitalization can efficiently sensitize the physician to the patient's nutritional status.⁵

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