related changes, the neurologic changes due to B<sub>12</sub> deficiency should not be missed. Note signs of malignancy in typical areas — breast, lung, prostate and abdomen.

**Laboratory Studies**

Laboratory analysis should help assess the presence of diseases known to affect weight loss or cause loss of appetite. A complete blood count screens for infection and anemia, particularly megaloblastic anemia related to B<sub>12</sub> or folate deficiency. A thyroid level screens for hypo- and hyperthyroidism. A comprehensive metabolic panel includes total protein and albumin, along with electrolytes and liver function tests. Urinalysis screens for a common infection that does not appear in classic ways in older adults. Collect a stool sample for fecal occult blood screens for colon cancer.

**Serum Proteins**

The liver synthesizes many proteins, but in the evaluation of malnutrition, albumin and prealbumin are the most common focus. Production of these proteins reflects nutrition status. The half-life of albumin and prealbumin can help estimate how long the malnutrition has been present. Albumin has a half-life of 15 to 20 days. Prealbumin has a half-life of 1 to 2 days, so it is useful for the evaluation of short-term protein calorie malnutrition (Table 3).

Serum proteins are also decreased in an inflammatory reaction, so in an acute illness, hypoalbuminemia may occur but not be representative of malnutrition. Lower values of prealbumin can also occur in liver function disorders. Regardless of the cause of serum protein decrease, this event is linked to increased morbidity and mortality. Certainly, inflammatory processes and acute illness can affect appetite and caloric intake. Do not ignore low serum protein levels.

**Micronutrients**

Age-related changes in the gastrointestinal system, combined with increased vitamin demand and reduced intake, place older adults at increased risk for hypovitaminosis. Two nutrients that have been the focus of attention are B<sub>12</sub> and vitamin D. Vitamin B<sub>12</sub> deficiency and malnutrition often coexist in older adults. The presence of macrocytosis requires further assessment for B<sub>12</sub> or folate deficiency. Folate supplementation without replacement of B<sub>12</sub> can result in masking of B<sub>12</sub> deficiency and risking the neurologic complications related to that deficit. Between 5% and 20% of older adults are deficient in vitamin B<sub>12</sub>. Meat is an excellent source of this nutrient, as are dairy products. When intake is inadequate, replacement may be accomplished with 12 mcg to 25 mcg (1,000 IU) in crystalline form per day; some older adults require intramuscular replacement of B<sub>12</sub>.

Vitamin D is necessary to good skeletal health, muscle strength and protection against cardiovascular disease and cancer. Synthesis of vitamin D occurs in the skin and depends on exposure to sunlight. With aging, the skin's ability to convert vitamin D declines. Dark-skinned people require more sunlight to stimulate the production of vitamin D.

Vitamin D is not present in many foods, but it is often fortified in dietary sources. A level less than 10 ng/mL is defined as deficiency, and levels below 30 ng/mL require treatment. The current recommended daily allowance for vitamin D is 400 IU for people ages 51 to 70 and 600 IU for people older than 70. This dose has not been proven adequate in many older adults, resulting in new recommendations for a minimum of 800 IU to 1,000 IU a day. High doses of vitamin D are contraindicated in hyperparathyroidism, so a parathyroid level may be necessary before initiating therapy if symptoms or signs of that disorder are present.

**Nutrition Options**

Caloric requirements decline with aging, but required nutrients remain unchanged or increase. The Harris Benedict equation is a method for calculating caloric need that includes height, weight, age, activity and stress levels. View this tool at www-users.med.cornell.edu/~spon/picu/calc/beecalc.htm and www.bmi-calculator.net/bmr-calculator/harris-benedict-equation/.

A dietitian can be valuable for developing individual plans of care for malnourished patients. To meet nutritional requirements as well as caloric needs, dietary fat should not exceed 30% of total calorie intake (goal 20% to 25%). Fat contains twice the calories of protein or carbohydrates.

Fiber increases stool bulk and decreases transit time, assisting in the prevention of constipation and restoration of good bowel health. A good source of soluble fiber is oatmeal. Soluble fiber decreases total cholesterol and low-density lipoproteins and improves bile acid absorption. Wheat bran is an example of an insoluble fiber that is effective in regulating bowel activity.

Water is a nutritional need. Thirst declines with age or due to medications. In many settings, access to fluid is limited. In acute and long-term care settings, write specific orders for fluid, not just “push fluids,” with a goal of 30 mL/kg or 1.5 L/day to 2 L/day. Blood urea nitrogen (BUN) is an indicator of dehydration. Urine color can also be a guide, but the specific gravity of urine obtained in BUN testing is more quantitative.

The body requires 500 mg of sodium a day. One teaspoon of salt equals 2.3 g of sodium. Evidence does not support a link between excess sodium intake and hypertension, except in the salt-sensitive patient who is most likely overweight. Indiscriminate restriction of salt may result in malnourishment.

**Interventions**

After completing a comprehensive geriatric assessment, address any reversible causes of malnutrition. Meeting the nutritional needs of older adults requires creativity and patience. Some practical interventions are effective, such as making meals social events and serving them in pleasant environments. Many long-term care institutions have changed their dining rooms to achieve this. Research supports the effectiveness of these environmental changes. When the use of utensils is compromised by physical or mental limitations, offer finger foods.

Providing undernourished patients with the foods they want may stimulate appetite. Studies have shown that snacking increases nutritional status. Nutritional supplements offered between meals can increase nutritional status, but they should not be offered in place of meals. Liquid products such as Ensure or Boost may be cost prohibitive to

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**Table 3: Interpreting Albumin and Prealbumin**

<table>
<thead>
<tr>
<th>SERUM PROTEIN</th>
<th>ALBUMIN</th>
<th>PREALBUMIN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Half-Life</strong></td>
<td>15–20 days</td>
<td>1–2 days</td>
</tr>
<tr>
<td><strong>Mild Depletion</strong></td>
<td>2.8–3.5 g/dL</td>
<td>10–15 g/dL</td>
</tr>
<tr>
<td><strong>Moderate Depletion</strong></td>
<td>2.1–2.7 g/dL</td>
<td>5–10 g/dL</td>
</tr>
<tr>
<td><strong>Severe Depletion</strong></td>
<td>&lt;2.1 g/dL</td>
<td>&lt;5 g/dL</td>
</tr>
<tr>
<td>False lows: liver disease, infection, fluid imbalance, nephrotic syndrome, postoperative states, metabolic stress</td>
<td>Increase of 4–5 g/dL per week is goal of treatment.</td>
<td></td>
</tr>
</tbody>
</table>