Vitamin Supplementation: The Lingering Questions in Wound Healing

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The decision to recommend vitamin supplements to patients with wounds continues to be an open question for wound care and nutrition experts. Studies to date have not conclusively shown that routine multi- or individual vitamin supplementation in the absence of specific nutrient deficiencies hastens wound healing. The issue of vitamin supplementation is important and often discussed in the wound care world but is not extensively researched. This leaves many healthcare professionals to make treatment decisions based on the limited evidence they see in the available literature. In clinical situations, more often than not practitioners must rely on expert opinion and professional judgment as their guideline.1

Evaluating Studies

Data in the available studies are difficult to evaluate for many reasons. Some research does not include enough anthropometric information, such as patient height, weight, and body mass index (BMI); some studies lack detailed descriptions of the type of wounds involved; and many studies tend to categorize enteral or parenteral nutrition therapy as single entities without detailing their specialized nutrient profiles, making it difficult to know which nutrient combinations are responsible for any particular outcome.1

In addition, many older studies use outdated biochemical assessments, such as serum albumin and serum prealbumin. These blood values are low because of the inflammation associated with the wound and not necessarily because of protein depletion. In studies of pressure ulcers specifically, it is difficult to separate the outcomes related to nutrition status from other variables, such as topical treatments, repositioning schedule, and mobility.1

Turning to Supplements

One thing experts know for sure is that under-nutrition is a large contributor to poor or delayed wound healing2 and that adequate nutrition has been shown to promote healing.4 To date, research evidence has been strong enough to establish nutrition guidelines in the case of pressure ulcers,5 but these are just one type of wound among many, including diabetic ulcers, arterial ulcers, venous ulcers, burns, traumatic injuries, and surgical incisions. No guideline similar to what is available for pressure ulcers as yet exists for these other types of wounds.3

In the quest to achieve optimal wound care for their patients, many healthcare providers feel compelled to be as proactive as possible, turning to vitamin and mineral supplements as the answer to a faster, more complete recovery. Many healthcare professionals themselves report taking vitamin supplements and often recommend them to their patients.6 Surveyors, plaintiff attorneys, family members, and others may inadvertently influence care because lack of interventions may be misconstrued as lack of care.

Although this notion of looking to multivitamins for added healing support is not misguided, it is important for health providers to be aware not only of the benefits provided, but also the possible harm these supplements may cause and to understand the importance of obtaining an accurate nutritional assessment of their patients. Such an assessment should include a list of comorbidities, patient history, medications, usual food intake, and prior nutritional status. In addition, a detailed wound history is necessary, including evaluation of any wound drainage, use of air-fluidized mattresses, and other factors that may affect nutrition. Together, this information serves as a kind of map to help the practitioner determine possible nutrient gaps and deficiencies and to design a nutrition care plan that will promote effective wound healing.7

Enriched and Fortified Foods

In recent years, a thorough dietary assessment has become all-the-more critical because of the trend among food companies to add nutrients to a wide variety of foods that do not naturally contain these compounds. This change in food manufacturing practice has created a substantial health issue, both for the general public and for specific patient populations with respect to nutrient-nutrient interactions, drug-nutrient interactions, and problems with excess intake.8

For example, many breakfast cereals are fortified with multiple nutrients, and the public often does not take into account the cumulative effect these foods may have on daily nutrient intake or in combination with a multivitamin supplement.8 Therefore, any patient assessment of oral intake must include questions about fortified food consumption, knowledge of the nutrient information on the package, and
a tally of total intake of specific vitamins and minerals that have the potential to limit the metabolism of one because of the other, interact with medications, or reach excessive levels in the patient. It is not uncommon for a patient in long-term care to receive oral nutrition supplements such as Ensure (Abbott Nutrition, Columbus, OH) three times daily, along with a multivitamin supplement, a zinc supplement, a vitamin C supplement, and a fortified oral diet. When taken together, the cumulative amounts of certain elements such as zinc may be more than expected.

Malnutrition and Nutrient Repletion

Most patients with chronic skin ulcers also have some degree of malnutrition, which gives healthcare providers a reasonable justification to recommend multivitamin supplements for the sake of normalizing micronutrient status. Approximately 40% to 60% of hospitalized older adults are either malnourished or at risk for malnutrition, 40% to 85% of nursing home residents are malnourished, and 20% to 60% of home care patients are malnourished. Because deficiencies of trace elements and minerals are common in the presence of general malnutrition — ie, protein-energy malnutrition — clinical studies suggest patients take dietary supplement at doses five to 10 times higher than the Recommended Daily Allowance (RDA) until the nutritional imbalances resolve.

The main micronutrients known to contribute substantially to the wound healing process are vitamin A, vitamin C, zinc, and copper. Vitamin A stimulates the immune system, maintains mucusal and epithelial integrity, and increases collagen formation. Vitamin C is critical to fibroblast proliferation and collagen formation. Zinc is important for the synthesis of granulation tissue, re-epithelialization, and has anti-inflammatory and antimicrobial effects. Copper is important for the production of enzymes involved in the cross-linking of connective tissue. Table 1 summarizes the risk factors for deficiency of these key nutrients. Table 2 summarizes dosage recommendations for repletion of key micronutrients known to be involved in wound healing.

### Table 1. Risk factors of select micronutrient deficiencies in adults

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Risk factors for deficiency</th>
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<tbody>
<tr>
<td>Vitamin A</td>
<td>Fat malabsorption, as seen in short bowel syndrome, chronic diarrhea, pancreatic insufficiency, cystic fibrosis, and celiac disease</td>
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<tr>
<td>Vitamin C</td>
<td>Low serum levels reported in critically ill patients, dialysis patients, and bariatric surgery patients</td>
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<tr>
<td>Copper</td>
<td>Deficiency is uncommon, but reported in patients with burns, celiac disease, gastric surgery, and long-term enteral and parenteral nutrition administration. Prolonged zinc supplementation may cause copper deficiency</td>
</tr>
<tr>
<td>Zinc</td>
<td>Increased gastrointestinal (GI) losses and decreased GI absorption: celiac disease, Crohn’s disease, chronic diarrhea, short bowel syndrome, and high-output GI fistulas. Copper supplementation may cause zinc deficiency. Also seen in trauma, burns, HIV, and pancreatic insufficiency</td>
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### Table 2: Dosage recommendations for vitamin repletion

<table>
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<tr>
<th>Nutrient</th>
<th>Dietary reference intake (DRI)</th>
<th>Suggested dosage for repletion</th>
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<tbody>
<tr>
<td>Vitamin A</td>
<td>3,000 IU (males) 2,333 IU (females)</td>
<td>100,000 IU/day x 3 days; then 50,000 x 2 weeks IM; then 10,000–20,000 IU/day orally for 2 months</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>90 mg (males) 75 mg (females)</td>
<td>500–1,000 mg/day in divided doses of 250 mg each</td>
</tr>
<tr>
<td>Copper</td>
<td>900 μg</td>
<td>2 mg/day orally x 6 months have been used in various deficiency etiologies</td>
</tr>
<tr>
<td>Zinc</td>
<td>11 mg (males) 8 mg (females)</td>
<td>40 mg/day elemental zinc x 10 days</td>
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In 2007, the US Food and Drug Administration (FDA) issued new regulations, known as Good Manufacturing Practices (GMPs), for dietary supplements, whereby supplement manufacturers are required to guarantee their product’s identity, purity, strength, and composition. However, because
the FDA does not have the resources to enforce those rules, one way to determine if a brand is likely to be a good product is to see if it carries a US Pharmacopeia (USP) or NSF International (NSF) designation. Brands with such verification marks indicate the manufacturer has voluntarily asked these trusted nonprofit authorities to verify the quality, purity, and potency of the raw ingredients or complete product.\textsuperscript{10,11}

Because many factors affect a dietary supplement’s digestibility, as well as the bioavailability of its nutrients, no evidence is conclusive that one supplement is superior to another based on the source of the ingredients\textsuperscript{12} or its form (tablet, chewable, capsule or liquid),\textsuperscript{10} although patients may prefer one over the other.

**Practice Points**

The jury is still out on routine vitamin supplementation for wound healing, and this issue is not likely to be solved by researchers anytime soon. Meanwhile, most clinicians agree that supplementation to correct known or suspected deficiencies is the proper course of action. The problem lies in correctly identifying deficiencies. To aid in this, a thorough nutrition history, intake analysis, and nutrition-focused clinical exam should be performed and documented in the medical record. Vitamins are essential to many steps in wound healing, but supplementation in the face of inadequate calories, protein, and fluids accomplishes nothing. Clinicians are advised to not lose sight of the larger picture while searching for a magic pill. n

**References**


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