

Supplementary Table 1.

Table 12 Nutrient Supplementation and Repletion After Bariatric Surgery		
Micronutrient	Supplementation to Prevent Deficiency	Repletion for Patients with Deficiency
Vitamin B ₁ (Thiamine)	≥12 mg thiamine daily; preferably a 50-100 mg daily dose of thiamine from a B-complex supplement or high-potency multivitamin	<p>Bariatric patients with suspected thiamine deficiency should be treated before or in the absence of laboratory confirmation and monitored/evaluated for resolution of signs and symptoms</p> <p>Repletion dose for thiamine deficiency varies based on route of administration and severity of symptoms:</p> <ul style="list-style-type: none"> • Oral therapy: 100 mg 2-3 times daily until symptoms resolve • IV therapy: 200 mg 3 times daily to 500 mg once or twice daily for 3-5 d, followed by 250 mg/d for 3-5 d or until symptoms resolve, then consider treatment with 100 mg/d orally, indefinitely, or until risk factors have been resolved • IM therapy: 250 mg once daily for 3-5 d or 100-250 mg monthly <p>Magnesium, potassium, and phosphorus should be given simultaneously to patients at risk for refeeding syndrome</p>
Vitamin B ₁₂ (Cobalamin)	<p>Supplement dose varies based on route of administration</p> <ul style="list-style-type: none"> • Orally by disintegrating tablet, sublingual, or liquid: 350-1,000 µg daily • Nasal spray as directed by manufacturer • Parenteral (IM or SQ): 1,000 µg monthly 	1,000 µg/d to achieve normal levels and then resume dosages recommended to maintain normal levels

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Vitamin K	<p>Dosage is based on type of procedure:</p> <ul style="list-style-type: none"> LAGB: 90-120 µg/d RYGB and SG: 90-120 µg/d DS: 300 µg/d <p>Higher maintenance doses of fat-soluble vitamins may be required for post-WLS patients with a previous history of vitamin K deficiency</p> <p>Water-miscible forms of fat-soluble vitamins are also available to improve absorption</p> <p>Special attention should be paid to post-WLS supplementation of vitamin K in pregnant women</p>	<p>A parenteral dose of 10 mg is recommended for bariatric patients with acute malabsorption</p> <p>A dose of either 1-2 mg/d orally or 1-2 mg/week parenterally is recommended for post-WLS patients with chronic malabsorption</p>
Zinc	<p>All post-WLS patients should take 4 RDA zinc, with dosage based on type of procedure</p> <ul style="list-style-type: none"> BPD/DS: Multivitamin with minerals containing 200% of the RDA (16-22 mg/d) RYGB: Multivitamin with minerals containing 100-200% of the RDA (8-22 mg/d) SG/LAGB: Multivitamin with minerals containing 100% of the RDA (8-11 mg/d) <p>The supplementation protocol should contain a ratio of 8-15 mg of supplemental zinc per 1 mg of copper to minimize the risk of copper deficiency</p> <p>The formulation and composition of zinc supplements should be considered in post-WLS patients to calculated accurate levels of elemental zinc provided by the supplement</p>	<p>A dose-related recommendation for repletion cannot be made due to insufficient evidence</p> <p>Repletion doses should be chosen carefully to avoid inducing a copper deficiency</p> <p>Zinc status should be routinely monitored using consistent parameters throughout treatment</p>
Copper	<p>All post-WLS patients should take 4 RDA copper as part of routine multivitamin and mineral supplementation, with dosage based on type of procedure:</p> <ul style="list-style-type: none"> BPD/DS or RYGB: 200% of the RDA (2 mg/d) SG or LAGB: 100% of the RDA (1 mg/d) <p>Supplementation with 1 mg copper is recommended for every 8-15 mg of elemental zinc to prevent copper deficiency in all post-WLS patients</p> <p>Copper gluconate or sulfate is the recommended source of copper for supplementation</p>	<p>Recommended repletion regimen varies with severity of deficiency:</p> <ul style="list-style-type: none"> Mild to moderate (including low hematologic indices): 3-8 mg/d oral copper gluconate or sulfate until indices return to normal Severe: 2-4 mg/d intravenous copper can be initiated for 6 d or until serum levels return to normal and neurologic symptoms resolve Copper levels should be monitored every 3 months after they return to normal

Abbreviations: 25(OH)D = 25-hydroxyvitamin D; BPD/DS = biliopancreatic diversion/duodenal switch; IM = intramuscular; IV = intravenous; LAGB = laparoscopic adjustable gastric band; RDA = recommended dietary allowance; RYGB = Roux-en Y gastric bypass; SG = sleeve gastrectomy; SQ = subcutaneous; WLS = weight loss surgery.

Adapted from *Surg Obes Rel Dis.*13, Parrott J, et al American Society for Metabolic and Bariatric Surgery Integrated Health Nutritional Guidelines for the Surgical Weight Loss Patient 2016 Update: Micronutrients, 727-741, 2017, with permission from Elsevier.

Table 12 Continued		
Folate (Folic Acid)	<p>400-800 µg oral folate daily from their multivitamin</p> <p>800-1,000 µg oral folate daily in women of child-bearing age</p>	<p>Oral dose of 1000 µg of folate daily to achieve normal levels and then resume recommended dosage to maintain normal levels</p> <p>>1 mg/d supplementation is not recommended because of the potential masking of vitamin B₁₂ deficiency</p>
Iron	<p>Males and patients without a history of anemia: 18 mg of iron from multivitamin</p> <p>Menstruating females and patients who have undergone RYGB, SG, or BPD/DS: 45-60 mg of elemental iron daily (cumulatively, including iron from all vitamin and mineral supplements)</p> <p>Oral supplementation should be taken in divided doses separately from calcium supplements, acid-reducing medications, and foods high in phytates or polyphenols</p>	<p>Oral supplementation should be increased to provide 150-200 mg of elemental iron daily to amounts as high as 300 mg 2-3 times daily</p> <p>Oral supplementation should be taken in divided doses separately from calcium supplements, acid-reducing medications, and foods high in phytates or polyphenols</p> <p>Vitamin C supplementation may be added to increase iron absorption and decrease risk of iron overload</p> <p>IV iron infusion should be administered if iron deficiency does not respond to oral therapy</p>
Vitamin D and Calcium	<p>Appropriate dose of daily calcium from all sources varies by surgical procedure</p> <ul style="list-style-type: none"> BPD/DS: 1,800-2,400 mg/d LAGB, SG, RYGB: 1,200-1,500 mg/d <p>To enhance calcium absorption in post-WLS patients</p> <ul style="list-style-type: none"> Calcium should be given in divided doses Calcium carbonate should be taken with meals Calcium citrate may be taken with or without meals <p>Recommended preventative dose of vitamin D should be based on serum vitamin D levels</p> <ul style="list-style-type: none"> Recommended vitamin D₃ dose is 3,000 IU daily, until blood levels of 25(OH)D are greater than sufficient (30 ng/mL) 7-90% lower vitamin D₃ bolus is needed (compared to vitamin D₂) to achieve the same effects as those produced in healthy nonbariatric surgical patients 	<p>All bariatric patients with vitamin D deficiency or insufficiency should be repleted as follows:</p> <ul style="list-style-type: none"> Vitamin D₃ at least 3,000 IU/d and as high as 6,000 IU/d, or 50,000 IU vitamin D₂ 1-3 times weekly Vitamin D₃ is recommended over vitamin D₂ as a more potent treatment when comparing frequency and amount needed for repletion <p>Repletion of calcium deficiency varies by surgical procedure:</p> <ul style="list-style-type: none"> BPD/DS: 1,800-2,400 mg/d LAGB, SG, RYGB: 1,200-1,500 mg/d
Vitamin A	<p>Dosage is based on type of procedure:</p> <ul style="list-style-type: none"> LAGB: 5,000 IU/d RYGB and SG: 5,000-10,000 IU/d DS: 10,000 IU/d <p>Higher maintenance doses of fat-soluble vitamins may be required for bariatric patients with a previous history of vitamin A deficiency</p> <p>Water-miscible forms of fat-soluble vitamins are also available to improve absorption</p> <p>Special attention should be paid to post-bariatric supplementation of vitamin A in pregnant women</p>	<p>For bariatric patients with vitamin A deficiency without corneal changes, a dose of 10,000-25,000 IU/d of vitamin A should be given orally until clinical improvement is evident</p> <p>For bariatric patients with vitamin A deficiency with corneal changes, a dose of 50,000-100,000 IU of vitamin A should be administered IM for 3 d, followed by 50,000 IU/d IM for 2 weeks</p> <p>Bariatric patients with vitamin A deficiency should also be evaluated for concurrent iron and/or copper deficiencies because these can impair resolution of vitamin A deficiency</p>
Vitamin E	<p>15 mg/d</p> <p>Higher maintenance doses of fat-soluble vitamins may be required for postbariatric patients with a previous history of vitamin E deficiency</p> <p>Water-miscible forms of fat-soluble vitamins are also available to improve absorption</p>	<p>Optimal therapeutic dose of vitamin E for bariatric patients is not defined</p> <p>Potential antioxidant benefits can be achieved with supplements of 100-400 IU/d, which is higher than the amount found in multivitamins. Additional supplementation may be required for repletion</p>

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