Vitamin and Mineral Supplementation in LTC: Quick Reference Guide

October 2024

- Long-Term Care (LTC) residents are prone to micronutrient deficiencies and are at an increased risk for malnutrition.
- It is important to consider intake from dietary sources before prescribing a supplement. Dietitians can help to determine how much or little of a particular nutrient the resident is receiving through their diet.
- Some micronutrients have evidence-based benefits, while others are prescribed without clear indication or proven benefit. In some individuals, particularly those with poor oral food intake or certain disease states, supplementation may help to prevent deficiency or confer other therapeutic benefits.
- When selecting the supplement dosing form, oral tablets/capsules should be used first. Chewable and liquid formulations are generally more expensive and should be reserved for residents who cannot swallow tablets/capsules whole.
- As with all treatments, resident-specific factors should be considered including advance care plan (ACP) status, goals of care, disease progression, bloodwork (if appropriate), quality of life, resident comfort and preferences, etc.
- Pharmacists can help to identify possible drug/nutrient interactions, contraindications, and make suggestions around dosing/formulation.
- Deprescribing supplements that do not have evidence-based benefits will help reduce pill burden and increase resident quality of life.
- This resource will continue to be updated as additional vitamins and minerals are reviewed and as new evidence becomes available.

Evidence-based Recommendations for Supplementation of Common Micronutrients:

DRIs*	Commonly used for	Recommended dose (PEN/NIH**)	LTC Recommendation	Summary of Evidence
Vitamin A				
RDA Women 700 mcg Men 900 mcg **UL:** 3,000 mcg 1 unit retinol = 0.3 mcg retinol activity equivalents (RAE)	• Vision • Immunity • Skin health	Not generally recommended as a separate supplement	• Vitamin A intake is not commonly below the RDA in older residents. • Supplementation may only be appropriate in specific cases/disease types (e.g., GI disorders, cystic fibrosis, cancer). • Consider how much vitamin A is in multivitamin before recommending separate supplementation. • **PCH coverage:** Vitamin A supplements are <u>not</u> covered in PCH	• Vitamin A is a fat-soluble vitamin so can accumulate in tissues and lead to systemic side effects. • RDAs for vitamin A are given as retinol activity equivalents (RAE) to account for the different bioactivities of retinol and provitamin A carotenoids, all of which are converted by the body into retinol. • Excess vitamin A (greater than 800 mcg/day) for extended period of time has been associated with bone loss/fracture, hair loss, dry skin, and increased risk of mortality. This is of special concern in the elderly population due to the reduced ability to clear vitamin A from the body. • No studies were found on the use, risks, or benefits of cod liver oil or palmitate. • Amounts of vitamin A in supplements vary widely, with 3,000 mcg RAE (10,000 units) being most common. • Amounts of vitamin A in multivitamins range from 750 to 1,050 mcg RAE in the forms of retinyl acetate, retinyl palmitate, provitamin A beta-carotene, or a combination. • **Drug Interactions:** retinoids (high risk of toxicity when used along with supplementation), anticoagulants (increased risk of bleeding) • **Available as:** Cod Liver Oil capsule (vitamin A 1,250 units), Vitamin A 10,000 units capsule

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Vitamin B1 (Thiamine)				
RDA Women 1.1 mg Men 1.2 mg **UL:** none	• Prevention of Wernicke's encephalopathy (WE) during acute alcohol withdrawal • Beriberi	• Acute alcohol withdrawal in acute care setting: 300 mg po or 1500 mg IV per day for 3 days • 100 mg po per day if continued alcohol use	• Reassess the need for ongoing thiamine supplementation upon PCH admission when the resident is no longer consuming alcohol and regular meals provided • **PCH coverage:** Vitamin B1 (Thiamine) 100 mg tablet	• There are no clear guidelines on dose, duration, and route of thiamine administration; recommendations are based on expert consensus and pharmacologic principles for best practice. • After acute alcohol withdrawal, oral supplementation of 100 mg/day is recommended if continued use of alcohol. • **Drug interactions:** loop diuretics (e.g., furosemide) may reduce thiamine levels • **Available as:** Vitamin B1 (Thiamine) 100 mg tablet
Vitamin B6 (Pyridoxine)				
RDA Women 1.5 mg Men 1.7 mg **UL:** 100 mg	• Microcytic anemia • Cognition	• No specific known recommendations.	• If supplementation is required, consider a multivitamin or B complex, where the amount of vitamin B6 may be adequate. • **PCH coverage:** Vitamin B6 supplements are <u>not</u> covered in PCH	• No significant evidence to support B6 supplementation for improved cognition or reduced risk of dementia. • **Drug Interactions:** levodopa (decreased effect for Parkinson's disease), phenytoin (increased risk of seizure) • **Supplied as:** Vitamin B6 (Pyridoxine) 25 mg tablet, 100 mg tablet and 250 mg tablet
Vitamin B12 (Cyanocobalamin)				

RDA
Women 2.4 mcg
Men 2.4 mcg
 	
UL: none
	• Macrocytic anemia
	• Cognition
	• Impaired absorption due to age or medication (e.g., PPI, metformin)
	• Vegetarian diets
		• 500 – 2,000 mcg po daily
		• Food cobalamin malabsorption: 250 mcg po daily
		• Pernicious anemia: 1,000 – 2,000 mcg daily so dose is high enough for passive diffusion (not requiring intrinsic factor)
		• Intramuscular: 1,000 mcg daily for 1 week, followed by 1,000 mcg/month
			• By deprescribing PPIs, absorption of B12 may improve and supplementation may no longer be required.
			• Check vitamin B12 level in the blood if concerned about deficiency and to monitor supplementation.
			• **PCH coverage:**
			  ○ Vitamin B12 250 mcg and 1,000 mcg tablets
			  ○ Vitamin B12 1,000 mcg/mL injection
				• Long term proton pump inhibitor (PPI) use can lead to impaired vitamin B12 absorption.
				• Monitor blood work (B12 level, Hgb and MCV) for older adults over 65 years. B12 level target greater than 300 pmol/L.
				• Evidence of vitamin B12 efficacy is limited for treating mild cognitive impairment or depressive symptoms in adults over 65 years.
				• There is no evidence of additional benefits of sublingual vs oral administration of B12.
				• Proton Pump Inhibitor deprescribing resources: https://deprescribing.org/resources/deprescribing-guidelines-algorithms/
				• **Drug Interactions:** Proton-pump inhibitors, H_2-antagonists, metformin
				• **Available as:** Vitamin B12 (Cyanocobalamin) 100 mcg tablet, 250 mcg tablet, 1,000 mcg tablet; 1,000 mcg/mL intramuscular injection

Vitamin C (Ascorbic Acid)				
RDA Women 75 mg Men 90 mg	• Immune function • Antioxidant • Scurvy	• 70 – 250 mg daily • 300 mg to 1 g daily for scurvy	• Encourage vitamin C through dietary sources instead of supplementation or choose a multivitamin containing vitamin C.	• Institutionalized older adults may have lower vitamin C status and enhanced vitamin C requirements due primarily to low dietary intakes and/or chronic illnesses. These additional demands can be met with increased intake of vitamin C rich foods or a supplement containing vitamin C.

DRIs*	Commonly used for	Recommended dose (PEN/NIH**)	LTC Recommendation	Summary of Evidence
UL: 2,000 mg			• **PCH coverage:** Vitamin C 500 mg chewable tablet	• Vitamin C supplements, with or without other antioxidants, don't seem to be protective against cancer. • For vitamin C for age-related macular degeneration, see ocular vitamins below. • Vitamin C (greater than 200 mg) along with an iron supplement may cause a modest increase in iron absorption but is likely not clinically significant for the average PCH resident. • Excess ascorbic acid is metabolized to oxalic acid and may increase the risk of oxalate stone formation, particularly with renal failure. • Vitamin C supplements do not reduce the risk of getting the common cold. However, individuals who take vitamin C supplements regularly may have slightly shorter colds or somewhat milder symptoms. • **Drug Interactions:** HMG-CoA reductase inhibitors (i.e., statins), niacin (reduced effect) • **Available as:** Vitamin C (ascorbic acid) 500 mg or 1,000 mg chewable tablets / effervescent powders
Vitamin D (Cholecalciferol - D3)				

RDA
Under 70 yrs: 600 units
 	
70 yrs and older: 800 units
 	
UL: 4,000 units
	• Falls/fracture prevention
	• Bone health
	• Rickets
		• 800 – 2,000 units daily for adults over 50 yrs, per Osteoporosis Canada recommendations.	• Use of vitamin D for falls/fracture prevention should be assessed upon admission or at first quarterly medication review.
			• Vitamin D is recommended for residents at high risk of falls or fractures.
			• Vitamin D3 10,000 units once a week is the recommended LTC dosing to reduce pill burden.
			• Vit D supplementation for non-skeletal indications needs to be assessed by prescriber, dietitian, pharmacist on a case-by-case basis.
			• **PCH coverage:**
			  ○ Vitamin D3: 1,000 units and 10,000 units tablets
			  ○ Vitamin D3 liquid 1,000 units/drop
				• Vitamin D supplementation is effective for correcting deficiencies, which are common in LTC due to limited vitamin D food sources and limited exposure to sunlight.
				• Vitamin D supplementation is also effective for reducing the number of falls.
				• Vitamin D alone does not significantly change bone mineral density or reduce fractures.
				• Some studies show that vitamin D together with calcium can reduce fractures.
				• For more information on preventing fracture in LTC: Recommendations for preventing fracture in long-term care | CMAJ
				• Vitamin D has been studied for other reasons like inflammation, immunity, brain health, mental health with inconsistent results.
				• Vitamin D (25-HYDROXY) levels are restricted to specific conditions: See Shared Health Lab Information Manual https://apps.sbgh.mb.ca/labmanual/test/view?seedId=1337
				• D3 is the active form of vitamin D from animal sources and sunlight and is better absorbed. D2 (ergocalciferol) is a vegan (plant-based) source but requires a higher dose for efficacy. Calcitriol is the active metabolite used for patients with renal failure.
				• Minimal adverse effects of vitamin D supplementation at recommended doses.
				• **Drug Interactions:** thiazide diuretics (e.g., hydrochlorothiazide) can lead to hypercalcemia
				• **Available as:** Vitamin D3 400 units tablet, 1,000 units tablet, and 10,000 units tablet; Vitamin D drops 400 units/drop, 1,000 units/drop, and 2,500 units per drop; D2 50,000 units capsule discontinued August 2024

Vitamin E (Alpha-tocopherol)				
RDA 15 mg **UL:** 1,000 mg	• Antioxidant • Immune function • Skin health	Not generally recommended as a separate supplement	• Vitamin E supplementation in LTC residents is not recommended. • **PCH coverage**: Vitamin E supplements are not covered in PCH.	• Vitamin E supplements do not seem to prevent heart disease, reduce its severity, or affect the risk of death from this disease. • Most research indicates that vitamin E does not help prevent cancer and may be harmful in some cases. • There is insufficient evidence that vitamin E can slow cognitive decline.

DRIs*	Commonly used for	Recommended dose (PEN/NIH**)	LTC Recommendation	Summary of Evidence
1 unit synthetic vitamin E = 0.45 mg				• Vitamin E is occasionally used for leg cramps in renal patients on dialysis but is not routinely recommended or supported by evidence. • **Drug Interactions:** warfarin (increases effect of warfarin, which can lead to bleeding), HMG-CoA reductase inhibitors (i.e., statins) • **Available as:** Vitamin E 100 units, 200 units, and 400 units capsules
Calcium				

RDA 1,200 mg
 	
UL: 2,000 mg
	• Falls/fracture prevention
	• Bone health
	• Low dietary intake
		• 250 – 500 mg elemental calcium daily
		• Calcium carbonate ($CaCO_3$) – 40% elemental calcium
		• Calcium citrate – 21% elemental calcium
			• If calcium requirements are not met through diet, suggest supplementation with 500 mg or less of elemental calcium daily
			• **PCH coverage:**
			  ○ Calcium carbonate 500 tablet and 500 mg chewable table
			  ○ Calcium citrate 300 mg tablet
			  ○ Calcium liquid
				• For residents at high risk of fracture, who cannot meet the RDA for calcium through dietary intake, daily calcium supplementation up to 500 mg is recommended.
				  ○ The recommendation places a high value on the reduction in hip fractures and the small reductions in vertebral and nonvertebral fractures and in mortality that can be achieved with calcium supplementation.
				  ○ The recommendation to limit supplementation to 500 mg was based on the uncertainty about harms of calcium supplementation in studies of community-dwelling individuals who received calcium supplementation of 1000 mg or more daily.
				  ○ For more information on preventing fracture in LTC: Recommendations for preventing fracture in long-term care | CMAJ
				• Calcium carbonate supplementation is most common and least expensive, but can cause GI issues in some individuals. Calcium carbonate is absorbed best when taken with food.
				• Calcium citrate is an alternative form to $CaCO_3$ for those with GI symptoms or on acid blocking medications. Calcium citrate is absorbed well on an empty or full stomach.
				• **Drug Interactions:** fluoroquinolones, tetracyclines, levothyroxine (reduced absorption, space apart doses), lithium
				• **Available as:** Calcium carbonate 500 mg tablet and 650 mg tablet; Calcium carbonate chewable tablets: 200 mg, 500 mg, 650 mg, 750 mg, 1000 mg; Calcium citrate 300 mg tablet; Calcium liquid (calcium lactogluconate 100 mg/5 mL or calcium citrate 500 mg/15 mL)

Folic Acid (Vitamin B9)				
RDA 400 mcg **UL:** 1,000 mcg	• Anemia • Residents on methotrexate	1 mg daily or 5 mg weekly on different day than methotrexate dose	• Folic acid supplementation recommended for residents on methotrexate • 5 mg once a week, 2 days prior or 1 day after the weekly oral or subcut methotrexate dose • **PCH coverage:** Folic acid 1 mg and 5 mg tablets	• Folic acid fortification of food has made deficiency in Canada rare. Routine testing of folate levels is not recommended. See Shared Health Lab Information Manual: https://apps.sbgh.mb.ca/labmanual/test/view?seedId=44038 • Individuals taking methotrexate for autoimmune conditions should receive folic acid supplementation to reduce adverse effects (e.g., nausea and vomiting, mouth sores, liver function abnormalities), improve tolerance, and prevent megaloblastic anemia. • Folic acid supplementation does not seem to improve cognitive function or prevent dementia. • Folic acid supplementation lowers levels of homocysteine, which is linked to a higher risk of cardiovascular disease, but the supplements don't appear to directly decrease the risk of heart disease. • More research is needed to better understand the role of folate in depression and whether

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				folic acid supplements are helpful when used in combination with standard treatment. • **Drug Interactions:** anticonvulsants e.g., phenytoin, phenobarbital (increased risk of seizures) • **Available as:** Folic acid 1 mg and 5 mg tablets
Iron				
RDA 8 mg/day **UL** 45 mg/day	• Iron deficiency anemia	• 15 – 100 mg elemental iron daily • Ferrous gluconate: 300 mg tablet = 35 mg elemental iron • Ferrous sulfate: 300 mg tablet = 60 mg elemental iron • Ferrous fumarate: 300 mg tablet = 100 mg elemental iron	• First line treatment of iron deficiency anemia should be with oral iron supplementation of ferrous gluconate, sulfate, or fumarate at a dose of 1 tablet/day. • Alternate day dosing can be used if once a day is not tolerated • Morning dosing is recommended to reduce the negative impact that hepcidin has on absorption. • For more details, refer to the *LTC Clinical Pearl: Oral Iron Dosing (Oct 2024)* • **PCH coverage:** ○ Ferrous gluconate 300 mg tablet ○ Ferrous sulfate 300 mg tablet ○ Ferrous fumarate 300 mg tablet ○ Ferrous sulfate 15 mg/mL syrup	• If iron deficiency is suspected, suggest bloodwork to test HgB, MCV, CBC, ferritin, and %TSAT (includes iron, TIBC). • The cause of iron deficiency anemia must be identified and addressed. Supplementation only replaces iron stores and not the root cause of the iron deficiency. • One tablet daily of an iron supplement is recommended for treating iron deficiency anemia, but some older adults may experience GI related side effects (e.g., constipation). • If not tolerated, consider administration with food, changing to alternate day dosing, or changing to a formulation with lower elemental iron. • Controlled/modified release, polysaccharide, and heme polypeptide formulations are not more effective than iron salts, are expensive, and are not covered for PCH residents. • Vitamin C in doses of 200-1000 mg taken alongside an iron supplement may cause a modest increase in iron absorption but is likely not clinically significant for the average PCH resident. • Daily doses higher than 120 mg of elemental iron are unlikely to offer benefit. • Check Hgb 2-4 weeks after initiating iron and with dose changes. Monitor for side effects and adjust dosing accordingly. • Continue iron therapy for an additional 4 to 6 months after correction of anemia to replenish the iron stores. If ongoing need for iron supplementation (e.g., bleeding), continue maintenance dose. • **Drug Interactions:** Iron absorption can be decreased by various medications and supplements such as multivitamins, calcium, or antacid tablets. Space administration at least 2 hours apart. Avoid taking iron supplements with tea, coffee or milk. • **Available as:** Ferrous gluconate 300 mg tablet, ferrous sulfate 300 mg tablet and 15 mg/mL liquid (contains 6 mg elemental iron/mL), ferrous fumarate 300 mg tablet and 60 mg/mL liquid (contains 20 mg elemental iron/mL)
Multivitamins +/- Minerals				
N/A	• Insufficient dietary intake	1 tablet daily	• 1 tablet daily if resident's food intake is not sufficient to meet their nutritional needs. • **PCH coverage:** ○ Multivitamin with minerals tablet ○ Multivitamin with minerals chewable tablet ○ Multivitamin tablet ○ Multivitamin liquid	• For older adults on medications such as diuretics, metformin and proton pump inhibitors, the status of vitamin B12, vitamin C and folate improved with multivitamin supplementation, but remained in normal ranges in blood work. • For most residents, a multivitamin with minerals is preferred over a multivitamin alone and may eliminate the need for multiple micronutrient supplements reducing pill burden. • A B Complex can be considered instead of a multivitamin with minerals if only B vitamins supplementation is required. • B Complex with vitamin C is used for residents with renal dysfunction instead of a multivitamin with minerals.

DRIs*	Commonly used for	Recommended dose (PEN/NIH**)	LTC Recommendation	Summary of Evidence
			○ B Complex tablet ○ B Complex with vitamin C tablet (Replavite or equivalent)	• **Drug Interactions:** capecitabine, fluorouracil • **Available as:** Multivitamin with minerals tablet, multivitamin with minerals chewable tablet, multivitamin tablet, multivitamins for specific populations, multivitamin liquid, B complex tablet, B complex with vitamin C.
Ocular Vitamins				
No DRIs available	• Eye health • Age-related macular degeneration (AMD)	Vitalux Advanced (or equivalent) 2 tablets per day with a fat-containing meal Contains: • Vitamin C and E, zinc and copper • 10 mg of lutein and 2 mg of zeaxanthin • No beta-carotene	• For residents with intermediate age-related macular degeneration (AMD): Vitalux Advanced (or equivalent) 2 tablets per day with a fat-containing meal. • Other ocular multivitamin formulations are not recommended. • **PCH coverage:** Vitalux Advanced caplet and Vitalux Advanced chewable tablet	• Two clinical trials, called the Age-Related Eye Disease Studies (AREDS and AREDS2), found that people with intermediate or late AMD who took the supplements every day were less likely to lose their central vision. • For individuals with intermediate AMD, there is evidence that Vitalux Advanced 1 tablet twice a day is effective for slowing progression of AMD. • Taking lutein alone (+/- zeaxanthin) may have little or no effect on progression of AMD and vision loss. • Products containing beta-carotene are not recommended as they may increase risk of lung cancer in both smokers and ex-smokers. • No evidence to support Vitalux for individuals with progression to late AMD and vision loss. • **Available as:** Vitalux Advanced caplet, Vitalux Advanced chewable tablet, Vitalux Advanced Plus Omega, Vitalux-S, Vitalux Advanced Plus multivitamin, Ocuvite
Zinc				
RDA Women 8 mg Men 11 mg **UL:** 40 mg	• Gastrointestinal disorders or post bariatric surgery • Vegetarian diets • Wound healing • Immune system	Uncertain/Not known	• Use of supplemental zinc for wound healing in residents with adequate nutrition is not recommended. • **PCH coverage:** Zinc supplements are not currently covered in PCH.	• Zinc may improve healing of pressure injuries, but there is not enough evidence to recommend a supplementation dose or duration. Further research is needed to determine the efficacy, optimal dosage, and safety of oral zinc supplementation. • High-calorie, high-protein oral nutrition supplements with arginine, **zinc** and antioxidants may have benefits for adults with a category/stage II or greater pressure injury who are malnourished. • Serum zinc may not accurately reflect true zinc status in acute illness. Testing for zinc level is restricted to gastroenterologists, general and bariatric surgeons – See Shared Health Lab Information Manual: https://apps.sbgh.mb.ca/labmanual/test/view?seedId=903 • Supplemental zinc over 25 mg/day may cause GI discomfort, nausea, dizziness, headaches, vomiting. Prolonged high doses can interfere with copper and magnesium absorption. • In combination with other osteoporosis treatments, 25 mg of oral zinc supplementation may contribute to the improvement of bone mineral density. • Excess copper or iron can interfere with zinc absorption. • **Drug Interactions:** diuretics, fluoroquinolones, tetracyclines, NSAIDS, immunosuppressants • **Available as:** Zinc 25 mg and 50 mg tablets

**Dietary Reference Intakes (DRIs): Recommended Dietary Allowance (RDA) / Tolerable Upper Intake Level (UL)*
***PEN = Practice Based Evidence in Nutrition (https://www.pennutrition.com/) | NIH = National Institutes of Health (https://ods.od.nih.gov/)*

Developed in collaboration between LTC Clinical Nutrition and LTC Clinical Pharmacy