

# Dosing Multivitamins in PN Outside of a Shortage: Practicing the Standard of Care



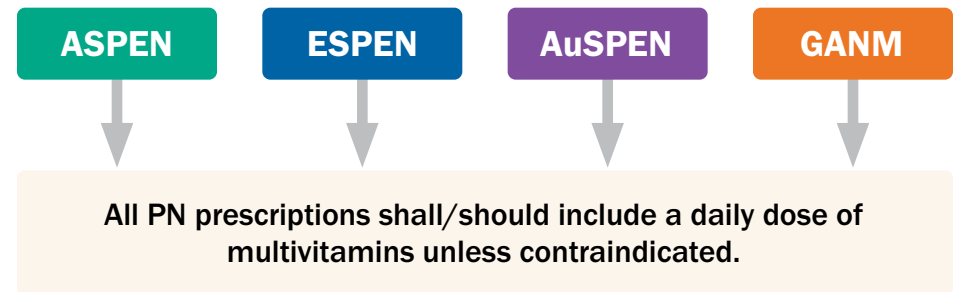
Parenteral multivitamins have been in short supply and on drug shortage lists for prolonged periods, impacting the ability to provide them in optimal doses. As shortages resolve, it is critical to return to optimized dosing to prevent vitamin deficiencies and improve patient outcomes. This practice tool for clinicians and administrators provides guidance for best practice dosing of parenteral multivitamins.

## Critical Facts

- Parenteral nutrition (PN) is made up of individual components that must be combined to make a complete nutrition regimen. Multivitamins are one of those essential components of PN.
- Parenteral multivitamins are of vital clinical importance, as they impact the physiological functions across multiple organ systems. They are:
  - » Essential to maintain fundamental functions in the body
  - » Important for neurologic development and linear growth in pediatric and neonatal patients
- All patients who depend on PN require daily multivitamin infusion regardless of the setting — hospital, home, or long-term care.
- Every daily bag of PN should include a full, patient-appropriate dose of multivitamins. This includes compounded and standardized, commercially-available (multi-chamber bag) PN. In patients who do not receive daily PN, on the non-PN days, multivitamin supplementation needs to be addressed.
- Some patients may require additional vitamins or minerals due to their clinical condition, especially in cases of short bowel syndrome, intestinal resection, micronutrient deficiencies, and malabsorption.
- Harm has been reported when multivitamins are omitted from PN or are provided in suboptimal doses.
- Plans for optimal multivitamin provision must be included in all care settings and during transitions of care between settings.

## Providing Appropriate Multivitamin Dosing

Nutrition societies around the world recommend that all PN prescriptions must include a daily dose of multivitamins from the beginning of therapy unless contraindicated.



ASPEN: American Society for Parenteral and Enteral Nutrition; ESPEN: European Society for Clinical Nutrition and Metabolism; AuSPEN: Australasian Society for Parenteral and Enteral Nutrition; GANM: German Association for Nutritional Medicine

- Use an age-appropriate multivitamin product. Products are developed and tailored to different nutrient needs across ages and also to reduce side effects.
- ASPEN provides recommendations on appropriate PN dosing, including optimal multivitamin dosing, [nutritioncare.org/PNdosing](https://www.nutritioncare.org/PNdosing).

## Risks When Multivitamin Dosing is Not Appropriate

Patients on PN:

- Become vitamin deficient if PN is the sole or major source of nutrition.
- Often have decreased absorptive capacity (e.g., malabsorption, short bowel syndrome) with oral intake. Using parenteral multivitamin does not rely on enteral absorption and is not affected by illness or missing enteral feedings.
- May have increased nutrient losses (e.g., venting j-tubes, g-tubes, diarrhea) and should be monitored for vitamin deficiencies.



**Multivitamins are part of the per diem for PN patients. They are not billed separately and are an expected part of the PN prescription.**

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## Assessing Vitamin Status

- Monitor for vitamin deficiencies which may occur within days without vitamin intake, depending on specific vitamin and patient reserves.
- Vitamin deficiencies can be harmful even if it's not physically apparent.
- Check with your institutional laboratory about appropriate vitamin level monitoring.

## Monitoring for Vitamin Deficiencies

Region of Body	Assessment of Physical Findings	Possible Vitamin Deficiencies*
Skin	• Pallor, cyanosis	• B <sub>9</sub> , B <sub>12</sub>
	• Dermatitis, red scaly rash, follicular hyperkeratosis	• B <sub>2</sub> , B <sub>3</sub> , B <sub>6</sub> , A, C
	• Bruising, petechiae, poor wound healing	• C, K
Nails	• Excessive dryness, curved nail ends	• B <sub>12</sub>
Head/hair	• Dull, sparse, alopecia	• B <sub>7</sub>
	• Corkscrew, coiled hairs	• C
Eyes	• Vision changes, particularly at night, dryness, foamy spots on eyes	• A
	• Itching, burning, corneal inflammation	• B <sub>2</sub> , B <sub>3</sub>
Mouth	• Angular stomatitis, vertical cracks of lips	• B <sub>2</sub> , B <sub>3</sub> , B <sub>6</sub>
	• Glossitis	• B <sub>2</sub> , B <sub>3</sub> , B <sub>9</sub> , B <sub>12</sub>
	• Pallor and generalized inflamed mucosa	• B <sub>2</sub> , B <sub>3</sub> , B <sub>6</sub> , B <sub>9</sub> , B <sub>12</sub>
	• Bleeding gums	• C
Extremities	• Ataxia, numbness, tingling	• B <sub>1</sub> , B <sub>12</sub>
	• Swollen, painful joints	• C, D
	• Rickets	• D

\*Not a complete list. Only vitamins in parenteral multivitamin product addressed here. B<sub>1</sub> = thiamine, B<sub>2</sub> = riboflavin, B<sub>3</sub> = niacin, B<sub>6</sub> = pyridoxine, B<sub>7</sub> = biotin, B<sub>9</sub> = folic acid, B<sub>12</sub> = cobalamin

Adapted from Esper DH. Nutr Clin Pract. 2015;30:194-202.



## Key Takeaways

- Return to normal dosing when any shortage is resolved.
- Provide daily age- and patient-appropriate doses of multivitamins with PN.
- Vitamin deficiencies may cause patient harm even if it's not physically apparent.
- If less than daily provision of multivitamins is routine in your practice outside of a shortage, re-assessment of dosing is needed to align with practice standards.

## Key Resources

- Dosing Multivitamins in PN Outside of a Shortage: Am I Practicing the Standard of Care Podcast, [nutritioncare.org/DosingPNMVPodcast](https://nutritioncare.org/DosingPNMVPodcast)
- ASPEN Recommendations on Appropriate Parenteral Nutrition Dosing, [nutritioncare.org/PNdosing](https://nutritioncare.org/PNdosing)
- 2021 Parenteral Nutrition Multivitamin Product Shortage Considerations, [nutritioncare.org/PN-MVdosingconsiderations](https://nutritioncare.org/PN-MVdosingconsiderations)

### References:

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