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## 2025 Parenteral Nutrition Product Shortage Recommendations: Intravenous Amino Acids

ASPEN has developed parenteral nutrition (PN) shortage recommendations to assist its members and other clinicians in coping with PN shortages for their patients. These intravenous amino acid product shortage recommendations were developed by the ASPEN Parenteral Nutrition Committee and approved by the ASPEN Board of Directors.

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### Important Notes:

These recommendations do not constitute medical or other professional advice and should not be taken as such. To the extent that the information published herein may be used to assist in the care of patients, the primary component of quality medical care is the result of the professional judgment of the healthcare professionals providing care. The information presented here is not a substitute or replacement for the exercise of professional judgment by healthcare professionals; rather, it is intended to supplement professional training and judgment. Circumstances and patient specifics in clinical settings may require actions different from those recommended in this document; in those cases, the judgment of the treating professionals should prevail. Use of this information does not in any way guarantee any specific benefit in outcome or survival.

These shortage recommendations are intended only for use during product shortages, when adequate product is unavailable. These measures are not ideal for ensuring safe and optimal patient care and should not be considered standard practice. Any deviation from manufacturer-recommended practices should be temporary and reversed once adequate product supply is restored. No single strategy will work for all organizations. Institutions must carefully evaluate each option, weighing potential risks and benefits before implementation. These recommendations are provided with the understanding that they are followed at the institution's own risk, and each organization assumes responsibility for any resulting outcomes.

Questions regarding these recommendations should be directed to [clinicalpractice@nutritioncare.org](mailto:clinicalpractice@nutritioncare.org).

### General Recommendations for Intravenous Amino Acid Shortage Management

During an intravenous amino acid shortage, ASPEN recommends consideration of the following general measures:

1. **For all patients**, routinely assess and reassess patient-specific indication(s) for nutrition support and requirement for PN; provide nutrition via the oral or enteral route whenever possible and when clinically appropriate.<sup>1,2</sup>
2. **Communicate with all key stakeholders.** (e.g., PN prescribers, pharmacy and nutrition departments, nursing leadership and staff, central supply). Communication is essential to understanding the current stock, procurement issues, and bedside practice. Establish a process to maintain clear communication across departments.

3. **Do not stockpile.** Maintain an ongoing evaluation of current usage and purchase only as much supply as needed in the interest of fair allocation to all patients.
4. **Ensure understanding of differences among intravenous amino acid products.** Amino acid product formulation differences should be noted, and the amino acid profiles must be evaluated for clinical appropriateness. During prolonged shortages of intravenous amino acid products, the FDA may approve temporarily importing alternative products from outside the United States. These products may have different concentrations, packaging, and labeling than United States products. The Dear Healthcare Professional Letter accompanying imported products must be read carefully. Members of the healthcare team should be educated on any differences between imported products and products approved for use in the United States.
5. **Maintain or incorporate the following sterile compounding practices:**
  - a. Compound PN in a single, central location (either in a centralized pharmacy or as outsourced preparation) to decrease inventory waste. Consider a supply outreach to other facilities in your geographic location.
  - b. Facilities must continue to observe and comply with the product labeling (e.g., package insert), USP General Chapter <797> Pharmaceutical Compounding-Sterile Preparations and associated USP chapters, and state Boards of Pharmacy and federal rules and regulations.<sup>3</sup>
6. **Ensure all ingredient modifications implemented during times of PN component shortages support the compatibility and stability of the final PN admixture.** Refer to validated compatibility and stability resources and contact manufacturers for product-specific compatibility and stability information for all components.
7. **Develop an organizational strategy.** Include PN component and product shortages in the healthcare organization's strategies and procedures for managing medication shortages. These procedures should include processes to:
  - a. identify and monitor patients who are receiving a PN regimen that has been modified due to a product shortage,
  - b. notify clinicians when a shortage of a PN component or product occurs,
  - c. notify clinicians when PN formulations are adjusted due to shortages of PN components and products,
  - d. notify patients receiving long-term (e.g., more than 1 month) PN therapy and their caregivers when their PN formulation has been adjusted for shortages of PN components and products,
  - e. notify clinicians when a PN component shortage has resolved, and
  - f. **resume standard dosing practices when a PN component shortage has resolved.**
8. **Report shortages and errors.**
  - a. Report significant drug product shortage information to the [FDA Center for Drug Evaluation and Research \(CDER\) Drug Shortage Program](#).
  - b. Report all patient adverse events or medication hazards related to shortages to the [ISMP Medication Errors Reporting Program \(MERP\)](#).

### Specific Considerations for Intravenous Amino Acid Shortage Management

- A. Assess all patients for appropriate indications for PN prior to initiation; frequently reassess patients for ongoing appropriate indications for continuation of PN.<sup>1</sup>
- B. Prior to any amino acid product modification, product formulation differences should be noted, and the amino acid profiles must be evaluated for clinical appropriateness. Amino acid products vary in pH, inherent electrolyte content (e.g., sodium, acetate, and/or chloride salts), and calcium and phosphate compatibility (see Table 1. Commercially Available Amino Acid Products in the US).

- C. The electrolyte content of amino acid products varies. Refer to Table 1 if changing amino acid products to ensure the inherent electrolytes found in the amino acid product are accounted for when dosing PN.
- D. Calcium-phosphate solubility curves are not interchangeable between amino acid products. Product-specific calcium-phosphate curves should be used to assess the compatibility of the final PN admixture.<sup>4</sup> Contact the amino acid product manufacturer for product-specific curves.
- E. When compounding total nutrient admixtures (TNAs), ensure final concentrations of macronutrients are above minimum thresholds for PN stability. Stability data is both amino acid product- and ILE product-specific. Contact the ILE manufacturer for up-to-date stability information when necessary.<sup>4</sup>
- F. Consider the use of alternate amino acid brands and concentrations based on availability. **ONLY use neonatal/pediatric-specific amino acids for the indicated patient populations.**
- G. Prioritize the supply of intravenous amino acid products for the following populations:
  - a. Neonatal and pediatric patients
  - b. Adult patients with high intestinal output, severe burn and/or traumatic injuries, receiving continuous renal replacement therapy (CRRT), or those with severe malnutrition or risk for developing malnutrition who are unable to tolerate oral or enteral nutrition
- H. For institutions able to use multiple amino acid products, reserve higher concentration amino acid products (e.g., 15%, 20%) for those patients requiring fluid restriction.
- I. Strongly consider using multi-chamber bag (MCB)-PN products if clinically feasible.<sup>5</sup>
- J. Consider decreasing the dose of intravenous amino acids in PN formulations when clinically appropriate.
  - a. For example, in patients without significant protein losses through intestinal output or CRRT, ensure PN formulations target the lower end of the amino acid goal range rather than the upper end.
  - b. Excessive amino acid doses increase urinary calcium loss in long-term PN patients, increasing the risk of metabolic bone disease.<sup>6</sup> Consider targeting the lower end of amino acid goal ranges in patients receiving long-term PN.
  - c. Adjust the content of other macronutrient components (e.g., dextrose, lipid injectable emulsions [ILE]) to account for decreased kilocalories from reducing the amino acid dose as appropriate.
  - d. **Do not exceed appropriate macronutrient doses or maximum infusion rates.** Refer to [ASPEN's Recommendations for Appropriate Dosing for Parenteral Nutrition](#) and manufacturer prescribing inserts for appropriate ranges of macronutrient doses and maximum infusion rates.
  - e. Consider supplemental oral or enteral amino acid supplementation for patients able to tolerate oral or enteral nutrition.
- K. Please note that the use of any alternative products will require modification to electronic health record systems, automated compounding devices (ACDs), and ACD-supporting applications to reflect current product availability and to prevent the inclusion of incorrect or unavailable ingredients in PN orders.<sup>7</sup> This also includes ensuring appropriate stability information as referenced above.

### Pediatric-Specific Considerations for Intravenous Amino Acid Shortage Management

- A. TrophAmine® (10%), Premasol (10%), and Aminosyn™-PF (7%; 10%) are amino acid products specifically approved for neonatal/pediatric use as their amino acid profiles are intended to mimic human milk-fed term infants.<sup>8</sup> These products are higher in branched-chain amino acids (BCAAs) and lower in methionine and phenylalanine than standard amino acid products.<sup>8</sup> They also have a lower pH, which improves solubility of calcium and phosphate.<sup>9</sup> These products should be supplemented with cysteine, a conditionally essential amino acid, at the time of

compounding (Cysteine is unstable over long periods so it is not included in these products.).<sup>9</sup> Note that some amino acid products from outside the United States may contain cysteine; check with the manufacturer of any imported or temporarily approved products to verify composition.

- a. These products should NOT be used in adult patients.
- b. If in very short supply, further prioritization to very low birth weight (VLBW) and extremely low birth weight (ELBW) infants should be considered.
- c. In pediatric patients who do not require an amino acid profile that mimics human milk-fed term infants, use a conventional amino acid product if pediatric-specific amino acid products are in short supply. No specific age for this substitution can be recommended given a lack of data; however, pediatric-specific amino acid solutions contain taurine, which, when inadequately provided, can cause retinal dysfunction and impairment of long-term neurodevelopment in the preterm and term infant population.<sup>10,11</sup>
- d. If all pediatric-specific amino acids are depleted, adult products may be considered; however, these products are not adequately formulated to provide conditionally essential amino acids to preterm and term infants. Cysteine should still be added, but separate sources of taurine are unavailable commercially. Preterm and term infant patients should return to pediatric-specific amino acid formulations as soon as possible.

Table 1. Commercially Available Amino Acid Products in the US

Commercially Available Amino Acid Product	Acetate Content (mEq/L)	Sodium Content (mEq/L)	Chloride Content (mEq/L)
<b>Conventional amino acid products</b>			
Aminosyn™ II 10% (ICU Medical Inc.)	71.8	38	-
Travasol 10% (Baxter)	88	-	40
<b>Conventional amino acid products for fluid-restricted patients</b>			
Aminosyn™ II 15% (ICU Medical Inc.)	107.6	50	-
Clinisol 15% (Baxter)	127	-	-
Plenamaine™ 15% (B. Braun)	147.4	-	-
ProSol 20% (Baxter)	140	-	-
<b>Pediatric-specific amino acid products (contain taurine)</b>			
Aminosyn®-PF 7% (ICU Medical Inc.)	32.5		
Aminosyn®-PF 10% (ICU Medical Inc.)	46	-	-
Premasol 10% (Baxter)	94	-	< 3
TrophAmine® 10% (B. Braun)	96.2	-	< 3

<https://www.bbraunusa.com/en/products/b4/amino-acids-solutions/specialtyandstandard.html>

<https://ushospitalproducts.baxter.com/amino-acid-injections>

<https://www.icumed.com/iv-solutions/?&&type=nutritional#results>

## ASPEN Resources

PN/EN Indications:

- [When Is Parenteral Nutrition Appropriate?](#)
- [When is Enteral Nutrition Indicated?](#)

PN Dosing and Safe Practices:

- [Appropriate Dosing for Parenteral Nutrition: ASPEN Recommendations](#)
- [ASPEN Clinical Guidelines: Parenteral Nutrition Ordering, Order Review, Compounding, Labeling, and Dispensing](#)
- [ASPEN Parenteral Nutrition Safety Consensus Recommendations](#)

PN Compatibility and Stability:

- [Parenteral Nutrition Compatibility and Stability: A Comprehensive Review](#)
- [Parenteral Nutrition Compatibility and Stability: Practical Considerations](#)

Multi-Chamber Bag Parenteral Nutrition (MCB-PN):

- [Multi-Chamber Bag Parenteral Nutrition: Indications, Product Availability, and Patient Safety](#)

## References

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11. Lima L, Obregon F, Cubillos S, Fazzino F, Jaimes I. Taurine as a micronutrient in development and regeneration of the central nervous system. *Nutr Neurosci*. 2001;4(6):439-443. doi: 10.1080/1028415X.2001.11747379.

## About ASPEN

The American Society for Parenteral and Enteral Nutrition (ASPEN) is dedicated to improving patient care by advancing the science and practice of nutrition support therapy and metabolism. Founded in 1976, ASPEN is an interdisciplinary organization whose members are involved in the provision of clinical nutrition therapies, including parenteral and enteral nutrition. With members from around the world, ASPEN is a community of dietitians, nurses, nurse practitioners, pharmacists, physicians, PAs, researchers, scientists, and students from every facet of nutrition support clinical practice, research, and education. For more information about ASPEN, please visit [www.nutritioncare.org](http://www.nutritioncare.org).