PRACTICE TOOL

The Role of Parenteral Nutrition in Managing Malnutrition

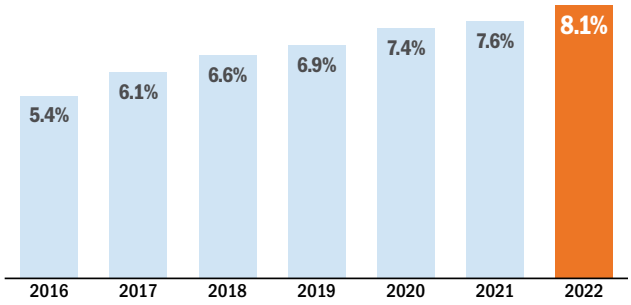
Malnutrition in Hospitalized Patients: Continues to Rise

Real-world survey data in 2022 found that in hospitalized adults, 32% were malnourished, and of those, 30% had no ordered nutrition support intervention; for pediatric patients, 27% were malnourished, and 25% of them had no ordered nutrition support intervention.[1]

- Malnutrition prevalence is often underreported in national datasets and hospital surveys (see figure on the right). Variability in documentation practices, diagnostic coding, and screening methods may lead to an underestimation of malnutrition in healthcare settings.[2]
- Malnutrition is associated with 3.4 times higher in-hospital deaths, 1.9 times longer hospital length of stay, and 2 times higher discharge rates to long-term care or rehabilitation facilities.[2]
- Malnourished patients may benefit from receiving nutrition support (enteral [EN] and/or parenteral nutrition [PN]). Yet only 0.46% of all hospital discharges and only 2.9% of those with coded malnutrition received PN as an intervention.[4]

Prevalence of Coded Malnutrition Diagnoses in Hospitalized Patients[3]

United States, 2016-2022



** Prevalence is documented malnutrition diagnosis as a percentage of non-maternal, non-neonatal hospital discharges per year.*

When Is Parenteral Nutrition Appropriate?

PN becomes the preferred method for nutrition support in patients who need nutrition support and have contraindications to oral intake or EN or who cannot meet their needs with oral intake or EN alone. ASPEN published appropriate indications listed below for PN so that providers understand when patients need this therapy.[5]

Parenteral Nutrition Use Based on Medical Diagnosis or Disease State[5]	
Adult	• Do not use parenteral nutrition (PN) based solely on medical diagnosis or disease state. • Prior to initiating PN, conduct a full evaluation of the feasibility of using enteral nutrition (EN); reserve PN for clinical situations in which adequate EN is not an option.
Pediatric	• Use PN for children when the intestinal tract is not functional or cannot be accessed or when nutrient needs to provide for growth are greater than that which can be provided through oral intake or EN support alone.
Neonatal	• Consider PN for neonates in the critical care setting, regardless of diagnosis, when EN is unable to meet energy requirements for energy expenditure and growth.
Circumstances Where PN Is the Preferred Method of Nutrition Support	
Adult	• Use PN in patients who are malnourished or at risk for malnutrition when a contraindication to EN exists or the patient does not tolerate adequate EN or lacks sufficient bowel function to maintain or restore nutrition status.
Neonatal and Pediatric	• Initiate PN for total or supplemental nutrient provision if EN is not feasible or not sufficient to meet total nutrient needs.

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Time Frame for Initiating PN[5]	
Adult	• Initiate PN after 7 days for well-nourished, stable adult patients who have been unable to receive significant (50% or more of estimated requirements) oral or enteral nutrients. • Initiate PN within 3 to 5 days in those who are nutritionally-at-risk and unlikely to achieve desired oral intake or EN. • Initiate PN as soon as is feasible for patients with baseline moderate or severe malnutrition in whom oral intake or EN is not possible or sufficient. • Delay the initiation of PN in a patient with severe metabolic instability until the patient's condition has improved.
Pediatric	• For the infant, child, or adolescent with a self-limited illness, it is reasonable to delay starting PN for 1 week. However, initiate PN within 1–3 days in infants and within 4–5 days in older children and adolescents when it is evident that they will not tolerate full oral intake or EN for an extended period.
Neonatal	• Begin PN promptly after birth in the very low birth weight infant (birth weight less than 1500 g). Insufficient data exist to suggest a specific time frame in which PN is ideally initiated in more mature preterm infants or critically ill term neonates.

Specific Use of PN for Neonates

A significant number of hospitalized infants less than one year old without coded diagnosis malnutrition (CDM) receive EN and PN. Although these infants may not have a documented diagnosis of malnutrition, they remain at risk if aggressive nutrition support is not promptly and adequately provided to maintain normal growth and development.[1]

Very low birth weight neonates admitted to the NICU often receive supplemental PN to support optimal growth and neurodevelopment. Numerous studies have demonstrated that initiating PN within the first 1–2 days after birth in very low birth weight infants is crucial to maximize growth outcomes, achieve a positive nitrogen balance, decrease the days required to regain birth weight, and shorten hospital length of stay.[6]

Initiation and Timing

- Start PN as soon as appropriate after birth for preterm infants.[7]

Macronutrient Support

- Provide parenteral amino acids at a minimum of 3g/kg/day and do not exceed 3.5g/kg/day to support neurodevelopment and growth.[7]
- To improve growth, it recommended to advance lipid injectable emulsion (ILE) daily to a dose of 3g/kg/day if using soybean oil ILE (SO-ILE) or multicomponent ILE.[6]
- Currently, there is no evidence of benefit from any specific ILE composition for growth enhancement.[7]
- There is no specific ILE composition recommended to reduce the incidence of parenteral nutrition-associated liver disease (PNALD) in preterm infants.[7]

**Note: Omegaven (fish oil triglycerides) injectable emulsion is FDA-approved as a source of calories and fatty acids for pediatric patients with parenteral nutrition-associated cholestasis (PNAC).[8]*

Parenteral Nutrition Preparation Methods

Parenteral nutrition can be prepared in several ways that have advantages and disadvantages for each method.

- **Compounded PN:** custom-made PN solution that is prepared and tailored towards individual patient's specific daily nutritional and fluid requirements.[9] These are compounded in the pharmacy and dispensed to the patient.
- **Multi-chamber bags (MBCs):** standardized PN formulations that are available commercially from a manufacturer.[9] These products are activated, injected with some additives, labeled, and dispensed to the patient.

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Advantages and Disadvantages of PN Preparation Methods[10]

Compounded Custom PN

Advantages

- Can customize nutrients and volume to meet patient needs
- Can provide exact prescription to patients with non-standardized needs
- Limited waste of PN with exact volume prepared
- Complete PN when dispensed to the bedside

Disadvantages

- May cost more due to pharmacy compounding time
- More manipulation and additives that might be prone to error
- May be subject to shortages of specific components
- May require different ordering system from MCB

Multi-chambered Bag PN

Advantages

- Reduced risk of prescribing and compounding errors
- Cost advantage including reduced pharmacy preparation time
- Less manipulation and reduced infection rates
- Can be used in times of macronutrient or additive shortages
- Convenient for patients when traveling

Disadvantages

- Limited formulations in those patient populations with non-standard requirements
- Not completed PN (needs activation and additional components, i.e., multivitamins and trace elements)
- May have wasted volume or need multiple bags
- May require different ordering system from compounded PN

Supplemental PN

- In some cases, EN or oral intake may not provide enough energy and protein to meet an individual's nutritional requirements. Supplemental PN is defined as PN provided in addition to EN or oral intake that can be added to help meet calorie and protein requirements when these methods alone are insufficient.
- Supplemental PN significantly increases daily caloric intake during and after ICU stay, meaning, it is effective in increasing calorie and protein delivery.[11]
- Meeting full energy goals by enteral and supplemental PN intake was associated with protection against hospital-acquired infections.[12]
- ASPEN critical care guidelines recommend not initiating supplemental PN prior to day 7 of ICU admission.[13]

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