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When Is Parenteral Nutrition Appropriate?

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Abstract

Parenteral nutrition (PN) represents one of the most notable achievements of modern medicine, serving as a therapeutic modality for all age groups across the healthcare continuum. PN offers a life-sustaining option when intestinal failure prevents adequate oral or enteral nutrition. However, providing nutrients by vein is an expensive form of nutrition support, and serious adverse events can occur. In an effort to provide clinical guidance regarding PN therapy, the Board of Directors of the American Society for Parenteral and Enteral Nutrition (ASPEN) convened a task force to develop consensus recommendations regarding appropriate PN use. The recommendations contained in this document aim to delineate appropriate PN use and promote clinical benefits while minimizing the risks associated with the therapy. These consensus recommendations build on previous ASPEN clinical guidelines and consensus recommendations for PN safety. They are intended to guide evidence-based decisions regarding appropriate PN use for organizations and individual professionals, including physicians, nurses, dietitians, pharmacists, and other clinicians involved in providing PN. They not only support decisions related to initiating and managing PN but also serve as a guide for developing quality monitoring tools for PN and for identifying areas for further research. Finally, the recommendations contained within the document are also designed to inform decisions made by additional stakeholders, such as policy makers and third-party payers, by providing current perspectives regarding the use of PN in a variety of healthcare settings. (*JPEN J Parenter Enteral Nutr.* 2017;41:324-377)

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Key Terms and Definitions

Intestinal failure: The reduction of gut function below the minimum necessary for the absorption of macronutrients and/or water and electrolytes such that intravenous supplementation is required to maintain health and/or growth.[1]

Intestinal insufficiency (or deficiency): The reduction of gut absorptive function that does not require intravenous supplementation but may require oral supplementation, enteral nutrition, or vitamin and trace element supplementation to maintain health and/or growth.[1]

Malnutrition, adult: An acute, subacute, or chronic state of nutrition in which a combination of varying degrees of overnutrition or undernutrition, with or without inflammatory activity, has led to a change in body composition and diminished function.[2]

The etiology-based nutrition diagnoses in adults in clinical practice settings are as follows:

Starvation-related malnutrition: Chronic starvation without inflammation (eg, anorexia nervosa).

Chronic disease-related malnutrition: Inflammation is chronic and of mild to moderate degree (eg, organ failure, pancreatic cancer, rheumatoid arthritis, sarcopenic obesity).

Acute disease or injury-related malnutrition: Inflammation is acute and of severe degree (eg, major infection burns, trauma, closed head injury).[2,3]

Malnutrition, pediatric: An imbalance between nutrient requirement and intake, resulting in cumulative deficits of energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes. It is recommended that growth charts based on a standard deviation *z* score system be used to track and assess nutrition status in children.[4,5]

Nutritionally-at-risk: Consider the individual nutritionally-at-risk if any of the following is present.

Nutritionally-At-Risk Adult

- Involuntary weight loss of 10% of usual body weight within 6 months or 5% within 1 month
- Involuntary loss of 10 lb within 6 months
- Body mass index (BMI) less than 18.5 kg/m^2
- Increased metabolic requirements
- Altered diets or diet schedules
- Inadequate nutrition intake, including not receiving food or nutrition products for more than 7 days[6]

Nutritionally-At-Risk Child

- Weight for length, weight for height, or sex less than 10th percentile (–1.28 *z* score)
- BMI for age or sex less than 5th percentile (–1.64 *z* score)
- Increased metabolic requirements
- Documented inadequate provision of or tolerance to nutrients
- Inadequate weight gain or a significant decrease in usual growth percentile[6]

Nutritionally-At-Risk Neonate

High Risk

- Preterm less than 28 weeks at birth
- Extremely low birth weight less than 1000 g
- Infant establishing feeds after episode of necrotizing enterocolitis or gastrointestinal perforation
- Infants with severe congenital gastrointestinal malformations (eg, gastroschisis)[6]

Moderate Risk

- Preterm 28th–31st weeks, otherwise well
- Intrauterine growth restriction (weight less than 9th percentile)
- Very low birth weight 1000–1500 g
- Illness or congenital anomaly that may compromise feeding[6]

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Summary of Recommendations

These consensus recommendations are designed to identify best practices, guide day-to-day clinical decisions, reduce variations in practice, and enhance patient safety. They are not intended to supersede the judgment of the healthcare professional based on the circumstances of the individual patient.

1: Parenteral Nutrition Use Based on Medical Diagnosis or Disease State

Adult

1A: Do not use parenteral nutrition (PN) based solely on

1B: 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.

Neonatal

1C: 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.

Pediatric

1D: 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.

2: Circumstances Where PN Is the Preferred Method of Nutrition Support

Adult

2A: 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 (Tables 1.1 and 1.2).

Neonatal and Pediatric

2B: Initiate PN for total or supplemental nutrient provision if EN is not feasible or not sufficient to meet total nutrient needs.

3: Determining When EN Is Not Feasible

Adult

3A: Evaluate clinical factors derived from history, physical examination, and diagnostic evaluations in determining if EN is contraindicated (Table 3.1).

Neonatal and Pediatric

3B: Initiate PN and withhold EN in neonatal and pediatric patients when a clear contraindication to EN exists, such as intestinal injury and perforation.

3C: Assess intestinal function and perfusion, as well as overall hemodynamic stability, when evaluating readiness for EN, rather than relying on strict adherence to a list of contraindications to EN, such as the presence of umbilical catheters or use of vasoactive medications.

4: Time Frame for Initiating PN

Adult

4A: 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.

4B: Initiate PN within 3 to 5 days in those who are nutritionally-at-risk and unlikely to achieve desired oral

4C: 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.

4D: Delay the initiation of PN in a patient with severe metabolic instability until the patient's condition has improved.

Neonatal

4E: 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.

Pediatric

4F: 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.

5: Selecting Appropriate Vascular Access for PN Administration

Global Recommendations

5A: Individualize the selection of vascular access device (VAD) for PN administration based on an evaluation of the risks and benefits of the device, clinical factors, and psychosocial considerations.

5B: Choose the smallest device with the fewest number of lumens necessary for the patient's needs.

5C: Dedicate 1 lumen of the VAD for PN administration when possible.

5D: Position the tip of the central venous access device (CVAD) in the lower third of the superior vena cava near the junction with the right atrium.

5E: Confirm optimal position of the CVAD tip prior to initiating PN.

6: Peripheral PN

Adult

6A: Use peripheral PN only for short-term purposes, no more than 10–14 days, as supplemental PN or as a bridge therapy during transition periods, where oral intake or EN is suboptimal or clinical circumstances do not justify placing a CVAD.

6B: Estimate the osmolarity of peripheral PN formulations.

6C: Maintain an upper limit of 900 mOsm/L for the peripheral PN formulations.

Neonatal and Pediatric

6D: In well-nourished neonatal and pediatric patients, use peripheral PN for short-term purposes until oral intake or

7: Intradialytic PN

Global Recommendations

7A: Do not use intradialytic PN (IDPN) as the sole source of nutrition intervention in malnourished patients with chronic kidney disease (CKD).

7B: Consider IDPN for adult and pediatric patients with CKD who are malnourished and unable to tolerate adequate oral intake or EN.

8: Perioperative PN

Adult

8A: Consider preoperative PN in severely malnourished patients unable to tolerate sufficient oral intake or EN.

8B: Reserve postoperative PN for severely malnourished patients unable to tolerate EN for more than 7 days, unless initiated preoperatively.

Neonate and Pediatric

8C: Consider preoperative and postoperative PN in malnourished neonates and children who are unable to tolerate oral intake or EN.

9: PN Use in Palliative Care

Global Recommendations

9A: Do not use PN solely to treat poor oral intake and/or cachexia associated with advanced malignancy.

9B: Limit the use of PN in palliative care to carefully selected candidates, with an expected survival of 2–3 months, for whom oral intake or EN is not feasible.

9C: Evaluate clinical factors and performance status when selecting candidates for PN at the end of life.

9D: Involve patients and caregivers in a clear and complete dialogue regarding realistic goals of PN as well as the potential risks and burdens of therapy.

10: Home PN

Adult

10A: Consider home PN (HPN) for patients with intestinal failure who are clinically stable and able to receive therapy outside an acute care setting.

10B: Perform a thorough evaluation of medical and psychosocial factors that influence suitability for HPN.

10C: Address financial considerations/insurance coverage and patient responsibilities with patient and caregiver.

Pediatric

10D: Consider HPN for carefully selected, clinically stable pediatric patients who are expected to require PN for an extended period.

10E: Discharge all pediatric patients to the care of a pediatric home care team and infusion provider with pedi-

11: Initiating PN in the Home Setting

Adult

11A: Establish organizational policies that delineate circumstances in which initiation of PN can take place outside the acute care setting.

11B: Delineate patient-centered eligibility criteria for initiating PN safely in the home setting.

11C: Develop strict protocols and procedures for initiating PN in the home setting, monitoring response to therapy, and documenting outcomes.

11D: Conduct a comprehensive medical, clinical, and psychosocial assessment of HPN candidates to assess risk factors for adverse events related to initiating PN.

11E: Consider initiating PN therapy at home only when assessment confirms that the benefits greatly outweigh the risks.

Pediatric

11F: In pediatric patients, do not initiate PN in the home setting; admit all patients to the hospital for initiating HPN.

12: Reducing the Risk of PN-Associated Complications

Global Recommendations

12A: Employ standardized processes for managing PN.

12B: Incorporate measures to reduce the risk of complications into organizational policies and procedures for administering PN.

12C: Utilize an interprofessional team of clinicians with expertise in nutrition support to manage PN.

12D: Educate PN prescribers, and demonstrate prescribing competencies for all clinicians writing PN orders.

13: PN Monitoring

Global Recommendations

13A: For patients of all ages and in all healthcare settings, provide interprofessional monitoring of clinical status and response to PN therapy by clinicians with expertise in managing PN.

13B: Modify the PN prescription as indicated per ongoing evaluation of gastrointestinal function, nutrition status, electrolyte balance, and (for pediatric patients) growth.

1: Wean PN when oral intake and/or EN achieves 50%–75% of requirements for energy, protein, and micronutrients, unless impaired gastrointestinal function precludes 100% absorption of nutrient needs.

2: Consider using a weaning protocol during the transition from PN to EN.

14: Tracking Appropriateness of PN Use

Adult

14A: Conduct a clinical review for each patient to assess PN

14B: Implement a quality improvement process (eg, clinical audit, plan-do-study-act cycle, medication use evaluation) to ensure appropriate use of PN based on the best available evidence.

Pediatric

14C: Emphasize the measurement of PN appropriateness in neonates, children, and adolescents as a priority in institutional quality improvement efforts.

14D: Design metrics for monitoring PN appropriateness for each pediatric healthcare network or institution with available information technology and personnel resources to measure and adjust local practices.

15: Areas for Further Research

Introduction

Background

Since its inception nearly 50 years ago, PN has transformed clinical care while triggering an enduring debate about the role of intravenous nutrition in a variety of patient populations.[1] PN offers a life-sustaining option in situations where impaired gastrointestinal function prevents oral intake or EN. Yet, randomized controlled trials have not consistently demonstrated the effectiveness of PN administration, including studies comparing PN with EN or PN with the standard progression from intravenous fluids to an oral diet, with no nutrition intervention.[2] In fact, in some cases, PN administration appeared to contribute to unfavorable clinical outcomes.[2] It has been suggested that disparities in study design and the use of clinical practices now considered suboptimal may have contributed to the unfavorable results of these studies.[3,4] The use of PN in patients with sufficient gastrointestinal function to allow successful EN may also contribute in unfavorable outcomes in comparisons of PN with EN. In addition, a failure to consider metabolic and pathophysiologic patient characteristics when interpreting and designing nutrition studies may be a factor in the lack of evidence supporting the effectiveness of PN.[5]

Historical prescribing patterns for PN may also have influenced outcomes. Early enthusiasm for intravenous feeding led to extensive use of PN for a broad range of medical conditions, at times irrespective of nutrition status or gastrointestinal function.[3,4,6,7] More recent studies conducted with modern protocols for management of PN suggest that PN can be safely administered to critically ill patients without adversely affecting outcomes.[8,9] Although many questions about PN therapy remain unanswered, it is clear that judicious selection of candidates and adherence to evidence-based clinical practice guidelines form the foundation of appropriate PN therapy.

Trends in PN Use

Comprehensive data related to patterns of PN utilization are revealed that PN was administered most frequently in non–critical care settings, followed by neonatal intensive care units and intensive care units.[10] In this study, duration of PN averaged 6.5 days and 6.1 days for noncritical care patients and critically ill patients, respectively, with a longer duration (8.9 days) in neonatal intensive care units. The average age of adults receiving PN was 66 years, older than the mean age of the entire study population.[10] Another recent report of PN use found that 12.8% of adults receiving PN were 80 years of age or older with outcomes similar to those of their younger counterparts.[11]

Information derived from hospital discharges regarding trends in PN use indicates that after more than tripling in the years from 1993 to 2010, PN use has declined for 4 consecutive years.[12,13] Figure 1 depicts this trajectory. In 2014, the most recent year for which data are available, the *ICD-9* code for PN was linked to 292,655 hospital discharges, a statistically significant drop from levels reported in 2010 ($P < .01$). This downward trend persists when the data are normalized for total hospital discharges, which have also fallen in recent years.[13] As shown in Figure 2, PN use fell from 0.93% of hospital discharges in 2010 to 0.82% in 2014. When stratified by age, the data show that PN utilization has remained stable in patients less than 1 year of age, at approximately 0.3% of hospital stays. The steepest decline—from 0.24% to 0.19%—took place in adults aged 65 years or older. Additional data gathered in a large retrospective cohort study from 2001–2008 suggest that a decline in PN use occurred among critically ill adults in the years before the downward trend became evident in national database statistics.[14]

No studies have examined the reasons underlying these trends, but a number of factors in today's healthcare environment could play a role, including greater adherence to guidelines and practice recommendations, changing perceptions regarding the risks and benefits of PN administration, cost-containment efforts, drug shortages, and concern regarding the hazards of excess fluid administration in critically ill patients.[12,14] Although this information sheds some light on current trends in PN use, the available data address only PN administered in hospitals and do not include individuals who receive PN outside the acute care setting, which has expanded across the continuum of care to include long-term acute care, skilled nursing facilities, rehabilitation centers, and home care. However, no comprehensive data are available to suggest an increased use of PN outside of hospitals.

Appropriate PN Therapy

The broad range of healthcare settings in which PN therapy currently takes place, combined with the decline in dedicated nutrition support teams, raises the potential for gaps to exist in the expertise of the clinicians initiating and managing PN therapy.[15] Within this context, efforts to delineate appropriate PN use aim to promote clinical benefits while minimizing the risks associated with the therapy.[16] This process begins with recognizing clinical indications for PN as well as situations in which PN is not likely to be of benefit. After the judicious selection of candidates, appropriate PN use continues with developing a PN prescription that

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