



## Complete Summary

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### GUIDELINE TITLE

Administration of specialized nutrition support - issues unique to pediatrics.

### BIBLIOGRAPHIC SOURCE(S)

Administration of specialized nutrition support - issues unique to pediatrics. JPEN J Parenter Enteral Nutr 2002 Jan-Feb;26(1 Suppl):97SA-110SA. [205 references]

## COMPLETE SUMMARY CONTENT

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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT

CATEGORIES

IDENTIFYING INFORMATION AND AVAILABILITY

## SCOPE

### DISEASE/CONDITION(S)

- Neonatal and pediatric malnutrition
- Complications associated with enteral nutrition (EN) and parenteral nutrition (PN), including:
  - Electrolyte imbalances (e.g., hypernatremia)
  - Hyperglycemia and hypoglycemia
  - Hypertriglyceridemia
  - Hepatobiliary complications (e.g., PN-associated cholestasis)
  - Metabolic bone disease

### GUIDELINE CATEGORY

Prevention  
Screening  
Treatment

### CLINICAL SPECIALTY

Critical Care  
Family Practice  
Gastroenterology  
Internal Medicine  
Nutrition  
Pediatrics  
Pharmacology  
Surgery

#### INTENDED USERS

Advanced Practice Nurses  
Dietitians  
Hospitals  
Nurses  
Physician Assistants  
Physicians

#### GUIDELINE OBJECTIVE(S)

- To revise the 1993 American Society for Parenteral and Enteral Nutrition Clinical Guidelines so that:
  - The Guidelines are factually up-to-date to reflect current, evidence-based, best approach to the practice of nutrition support
  - The Guidelines support the clinical and professional activities of nutrition support practitioners by articulating evidence-based recommendations upon which to base personal and institutional practices and resource allocation
  - The Guidelines serve as tools to help guide policy makers, health care organizations, insurers, and nutrition support professionals to improve the systems and regulations under which specialized nutrition support is administered
- To assist clinical practitioners who provide specialized nutrition support to patients in all care settings

#### TARGET POPULATION

##### Enteral Nutrition

- Preterm infants (younger than 32-34 weeks gestational age) who may be too immature to coordinate sucking, swallowing and breathing
- Preterm or term infants who are too sick to nipple-feed or who are mechanically ventilated
- Infants whose nutrient and/or calorie needs cannot be met by oral feeding

##### Parenteral Nutrition

Infants and children who are unable to tolerate adequate enteral feedings to sustain their nutritional requirements including:

- Children who suffer from chronic malnutrition (failure to thrive) or who are at high risk for developing malnutrition as a result of acute medical illness or prolonged post-operative recovery (i.e., necrotizing enterocolitis, pancreatitis, graft-versus-host disease or postoperatively)
- Pediatric patients with inadequate intestinal nutrient absorption (short bowel syndrome, intestinal pseudoobstruction, postchemotherapy, etc)

## INTERVENTIONS AND PRACTICES CONSIDERED

### Screening/Prevention

1. Nutrition screening

### Treatment

1. Enteral nutrition (EN)
  - Nasogastric/orogastric tube placement
  - Gastrostomy
  - EN products including:
    - Human milk
    - Cow milk-based formulas (includes iron-fortified formulas, lactose-free formulas, low mineral/electrolyte formula, high (86%) medium-chain triglyceride (MCT) formula, follow-up formula)
    - Soy-based formula (milk-free, lactose-free)
    - Soy-based formula with fiber
    - Casein-hydrolysate formulas
    - Amino acid-based formulas
    - Human milk fortifiers (HMF)
    - Preterm formulas
    - Preterm discharge formulas
    - Amino acid-modified and other special formulas
  - Administration
    - Verify tube position
    - Use of liquid medications
    - Use of aseptic techniques
    - Encourage nonnutritive sucking during feedings
2. Parenteral nutrition (PN)
  - Use of intravenous antibiotics for catheter-site infections
  - Catheter removal as needed
3. Treatment for complications
  - Hyponatremia
    - Increased sodium intake
    - Monitor calcium and phosphorus concentrations
  - Hyperglycemia and hypoglycemia
    - Monitor dextrose infusion rates
    - Insulin administration
    - Tapering off PN
  - Hypertriglyceridemia
    - Lipid emulsion infusions
    - Monitor serum triglyceride concentrations
    - Intravenous heparin

- Trial of carnitine supplementation
- Hepatobiliary
  - Avoidance of overfeeding, early initiation of EN and prevention and aggressive treatment of sepsis
  - Ursodeoxycholic acid or cholecystokinin
  - Cyclic regimen of PN
- Metabolic bone disease
  - Calcium and phosphate as needed
  - Monitor serum aluminum concentrations
  - Discontinue vitamin D as needed

#### MAJOR OUTCOMES CONSIDERED

Not stated

### METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

#### NUMBER OF SOURCE DOCUMENTS

Not stated

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

A modified version of the method used by the Agency for Healthcare Research and Quality (AHRQ), US Department of Health and Human Services was used:

- A. There is good research-based evidence to support the guideline (prospective, randomized trials).
- B. There is fair research-based evidence to support the guideline (well-designed studies without randomization).
- C. The guideline is based on expert opinion and editorial consensus.

#### METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

## DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Experts selected for their detailed knowledge and experience in a chosen niche reviewed the primary literature, synthesized and summarized it, and formulated the guideline statements.

In situations where evidence-based recommendations could not be made because of a lack of relevant clinical studies, recommendations are classified as being based on class C data (see the "Rating Scheme for the Strength of Evidence" field) and reflect an attempt to make the best recommendations possible within the context of the available data and expert clinical experience.

## Issues Considered During Recommendation Formulation

- A thread running throughout many of the disease-specific guidelines is the rationale for choosing enteral over parenteral specialized nutrition support (SNS) or alternatively parenteral over enteral when a decision to use SNS has been made.
- Another fundamental issue that influenced many of the discussions and recommendations is the relationship between nutrition assessment, nutrition status, malnutrition, and severity of disease.

Refer to the companion document: Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. Section I: Introduction. JPEN J Parenter Enteral Nutr 2002 Jan-Feb;26(1 Suppl): 1SA-6SA.

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

## METHOD OF GUIDELINE VALIDATION

External Peer Review  
Internal Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Completed drafts were reviewed by the section editors (the members of the Clinical Guidelines Task Force [CGTF]), edited and/or rewritten, and then reviewed twice by the members of the CGTF as a group. The entire document was then reedited by the CGTF Chair. This four-times–edited draft was submitted to the American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) Board of Directors and more than 180 experts in the field of nutrition support (including experts and organizations outside of A.S.P.E.N.) for content, format, and style review. These reviewers were also specifically asked to check each guideline statement for appropriateness, accuracy, and strength of evidence. This review phase stimulated a final cycle of editing by the CGTF and the CGTF Chair. The final document was then approved by the A.S.P.E.N. Board of Directors and submitted to the Journal of Parenteral and Enteral Nutrition for publication.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

The strength of the evidence supporting each guideline statement is coded A, B, or C. Definitions of these classifications is provided at the end of the "Major Recommendations" field.

#### Indications, Types, and Routes of Administration: Enteral Nutrition

1. Preterm and ill newborns are at nutrition risk and should undergo nutrition screening to identify those who require formal nutrition assessment with development of a nutrition care plan. (B)
2. Infants who are greater than 32 to 34 weeks gestational age and free from respiratory disease should be nipple-fed. (B)
3. Enteral nutrition (EN) should be administered to infants through a nasogastric or orogastric tube that can either be left in for up to 3 days or placed before and removed after each feeding. (A)
4. Human milk or iron-fortified, cow milk–based infant formula should be used for most term infants. (B)
5. Fortified human milk or preterm formula should be used for preterm infants. (B)
6. Feedings for sick or preterm infants should be started within the first few days of life at 20 Cal/fl oz and at 20 mL/kg per day and advanced at 20 mL/kg per day according to the infant’s clinical condition. (B)
7. A gastrostomy should be considered for infants who will require tube feeding for longer than 2 to 3 months. (C)
8. Infants with nasogastric, orogastric, or gastrostomy tubes may be fed by either bolus or continuous method. (A)

#### Indications, Types, and Routes of Administration: Parenteral Nutrition

1. Pediatric patients unable to meet their nutrient requirements orally or with EN should receive parenteral nutrition (PN). (B)
2. PN should be initiated within 1 day of birth in neonates and within 5 to 7 days in pediatric patients unable to meet their nutrient requirements orally or with EN. (C)

3. Catheter exit site infections should be treated topically and with systemic antibiotics. (B)
4. Tunnel infections should be treated with catheter removal. (B)
5. Systemic catheter-related infections should be initially treated with at least a 10-day course of intravenous antibiotics given through the catheter, adjusting the antibiotics according to the sensitivities of the blood cultures. (B)
6. Clinical deterioration, persistent infection or Candida sepsis should be treated with prompt catheter removal. (B)

#### Complications Unique to Neonates: Enteral Nutrition

1. Feeding tube position should be verified before feeding is initiated. (C)
2. When administered by feeding tube, medications should be given in liquid form. (C)
3. Enteral feedings (including human milk) should be handled and stored using aseptic technique. (B)
4. Nonnutritive sucking during tube feeding should be encouraged. (A)

#### Complications Unique to Neonates: Parenteral—Fluid and Electrolytes

1. Hyponatremia in premature infants should be corrected by increasing sodium intake in order to promote tissue growth and weight gain. (A)
2. Calcium and phosphate concentrations should be optimized in PN solutions to promote maximum bone mineral retention. (A)

#### Complications Unique to Neonates: Hyperglycemia and Hypoglycemia

1. Dextrose infusion rates in infants should not exceed 10 to 14 mg/kg per minute. (A)
2. Insulin administration by continuous infusion is safe and effective in controlling parenteral nutrition–associated hyperglycemia in infants. (A)
3. PN should be tapered off over 1 to 2 hours before discontinuation in infants under age 2. (B)

#### Complications Unique to Neonates: Hypertriglyceridemia

1. Lipid emulsion infusions in infants should begin at 0.5 to 1 g/kg per day and advance at rate of 0.5 g/kg per day to a maximum of 3 g/kg per day. (A)
2. Lipid emulsion infusion rates should be reduced in premature or septic infants and serum triglyceride concentrations should be monitored. (B)
3. If serum triglyceride concentrations exceed 200 mg/dL in the neonate, lipid emulsion infusion should be suspended and then restarted at a rate of 0.5 to 1 g/kg per day. (B)
4. Intravenous heparin, at a dose of 1 unit/mL of PN fluids, should be given to enhance the clearance of lipid emulsions. (B)
5. A trial of carnitine supplementation should be given to premature infants with unexplained hypertriglyceridemia. (B)
6. Infants should receive 20% lipid emulsion to improve clearance of triglycerides and phospholipids. (B)

#### Complications Unique to Neonates: Hepatobiliary

1. Avoidance of overfeeding, early initiation of enteral nutrition, and prevention and aggressive treatment of sepsis should be used to minimize the incidence of PN associated cholestasis. (B)
2. Administration of ursodeoxycholic acid or cholecystokinin should be considered if EN cannot be given. (B)
3. PN should be administered using a cyclic regimen when possible if long-term use is anticipated. (C)

#### Complications Unique to Neonates: Metabolic Bone Disease

1. Calcium and phosphate should be provided in adequate amounts to assure optimal bone mineralization in long-term PN patients. (A)
2. Serum aluminum concentrations should be measured whenever unexplained MBD is present in long-term PN patients. (B)
3. In patients with low PTH and 1,25 hydroxyvitamin D concentrations and normal 25 hydroxyvitamin D concentration with MBD, vitamin D should be removed from the PN solution. (B)

#### Definitions:

#### Rating Scheme

- A. There is good research-based evidence to support the guideline (prospective, randomized trials).
- B. There is fair research-based evidence to support the guideline (well-designed studies without randomization).
- C. The guideline is based on expert opinion and editorial consensus.

#### CLINICAL ALGORITHM(S)

Clinical algorithms of the Nutrition Care Process and Route of Administration of Specialized Nutrition Support are provided in the companion document: Nutrition care process. Section II: Nutrition Care Process. JPEN J Parenter Enteral Nutr 2002 Jan-Feb;26(1 Suppl): 7SA-8SA.

### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not explicitly stated.

### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

#### POTENTIAL BENEFITS

- Appropriate selection of neonatal and pediatric patients for enteral or parenteral nutrition support
- Appropriate selection of types and routes of enteral and parenteral nutrition to minimize complications associated with feeding and maximize nutrient retention and metabolism

## Subgroups Most Likely to Benefit

- Infants who are exquisitely allergic to intact or even hydrolyzed proteins, show symptom resolution and normal growth on amino acid–based formulas.
- Investigators have shown that very low birth weight infants who received high calcium (1.68 mM/dL) and phosphate (2 mM/dL) in their daily PN had greater calcium and phosphate retention and greater bone mineral content.

## POTENTIAL HARMS

### Enteral Nutrition

- The continuous feeding method of enteral nutrition (EN) is associated with reduced nutrient delivery when compared with the bolus feeding method.
- Nasogastric tubes may cause nasal congestion or erosion.
- Gastrointestinal complications of EN in the neonate include emesis, abdominal distension, and diarrhea. Although occurrence of these symptoms may be a harbinger for necrotizing enterocolitis, they are frequently signs of less severe feeding intolerance. Emesis and/or abdominal distension may be an indication of obstruction, intolerance of the rate of feeding or impaired gastric emptying.
- In severely malnourished infants, overzealous nutritional rehabilitation may be hazardous. Refeeding may result in hyperglycemia, hypokalemia, hypophosphatemia, and hypomagnesemia.

### Parenteral Nutrition

- Various components in parenteral nutrition (PN) may induce major metabolic disturbances, end organ dysfunction, and drug interactions that mandate periodic monitoring, and meticulous surveillance.
- Full PN support in children typically requires central venous access. This may pose significant technical challenges and complications in the pediatric population. Moreover, the care and maintenance of these indwelling venous catheters is associated with infectious and mechanical complications that may create significant morbidities and, rarely, mortality. Despite the obvious benefits of PN, numerous complications (metabolic, infectious, and mechanical) may arise as a result of PN use. Consequently, the multiple risks of PN should be weighed against the benefits of nutrition support prior to the initiation of therapy in each individual patient.

## CONTRAINDICATIONS

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#### Contraindications/Cautions for Enteral Feeding Products for Infants

- Human milk: Many inborn errors of metabolism; maternal infection with milk-transmitted organisms; maternal ingestion of certain medications
- Cow milk-based formulas, iron-fortified: Cow milk protein intolerance; lactose intolerance; clinical conditions for which special products are more appropriate

- Cow milk-based, lactose-free formulas: Cow milk protein intolerance; galactosemia (enough galactose remains)
- Cow milk-based, low mineral/electrolyte formula: Cow milk protein intolerance
- Cow milk-based, high (86%) MCT (medium-chain triglyceride) formula: Monitor for signs of essential fatty acid deficiency if used for prolonged periods.
- Soy-based formula (milk-free, lactose-free): Birth weight < 1800 g; prevention of colic or allergy; cow milk protein-induced enterocolitis or enteropathy
- Soy-based formula with fiber: Constipation
- Casein-hydrolysate formulas: Infants with severe cow milk protein allergies may react to whey-protein hydrolysate formula
- Amino acid-modified and other special formulas: Incomplete sources of nutrition

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

These American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) Clinical Guidelines are general statements. They are based upon general conclusions of health professionals who, in developing such guidelines, have balanced potential benefits to be derived from a particular mode of medical therapy against certain risks inherent with such therapy. However, the professional judgment of the attending health professional is the primary component of quality medical care. The underlying judgment regarding the propriety of any specific procedure must be made by the attending health professional in light of all of the circumstances presented by the individual patient and the needs and resources particular to the locality. These guidelines are not a substitute for the exercise of such judgment by the health professional, but rather are a tool to be used by the health professional in the exercise of such judgment. These guidelines are voluntary and should not be deemed inclusive of all proper methods of care, or exclusive of methods of care reasonably directed toward obtaining the same results.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better  
Living with Illness  
Staying Healthy

## IOM DOMAIN

Effectiveness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Administration of specialized nutrition support - issues unique to pediatrics. JPEN J Parenter Enteral Nutr 2002 Jan-Feb;26(1 Suppl):97SA-110SA. [205 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

2002 Jan-Feb

### GUIDELINE DEVELOPER(S)

American Society for Parenteral and Enteral Nutrition - Professional Association

### SOURCE(S) OF FUNDING

Not stated

### GUIDELINE COMMITTEE

Clinical Guidelines Task Force

### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Primary authors: Edward M. Barksdale, Jr., MD; Imad F. Btaiche, PharmD, BCNSP; Sheila Gahagan, MD; Alan Stanford, MD; Melody Thompson, RD

### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

### GUIDELINE STATUS

This is the current release of the guideline.

### GUIDELINE AVAILABILITY

Electronic copies: Not available at this time.

Print copies: Available from the American Society for Parenteral and Enteral Nutrition (ASPEN), 8630 Fenton St, Suite 412, Silver Spring, MD 20910-3805; (800) 741-8972. For details, please see the [ASPEN Web site](#).

#### AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. JPEN J Parenter Enteral Nutr 2002 Jan-Feb;26(1 Suppl): 1SA-6SA.
- Nutrition care process. JPEN J Parenter Enteral Nutr 2002 Jan-Feb;26(1 Suppl): 7SA-8SA.

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#### PATIENT RESOURCES

None available

#### NGC STATUS

This summary was completed by ECRI on May 5, 2004.

#### COPYRIGHT STATEMENT

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