

NUTRITION FOR PATIENTS WITH ACUTE PANCREATITIS

ALGORITHM

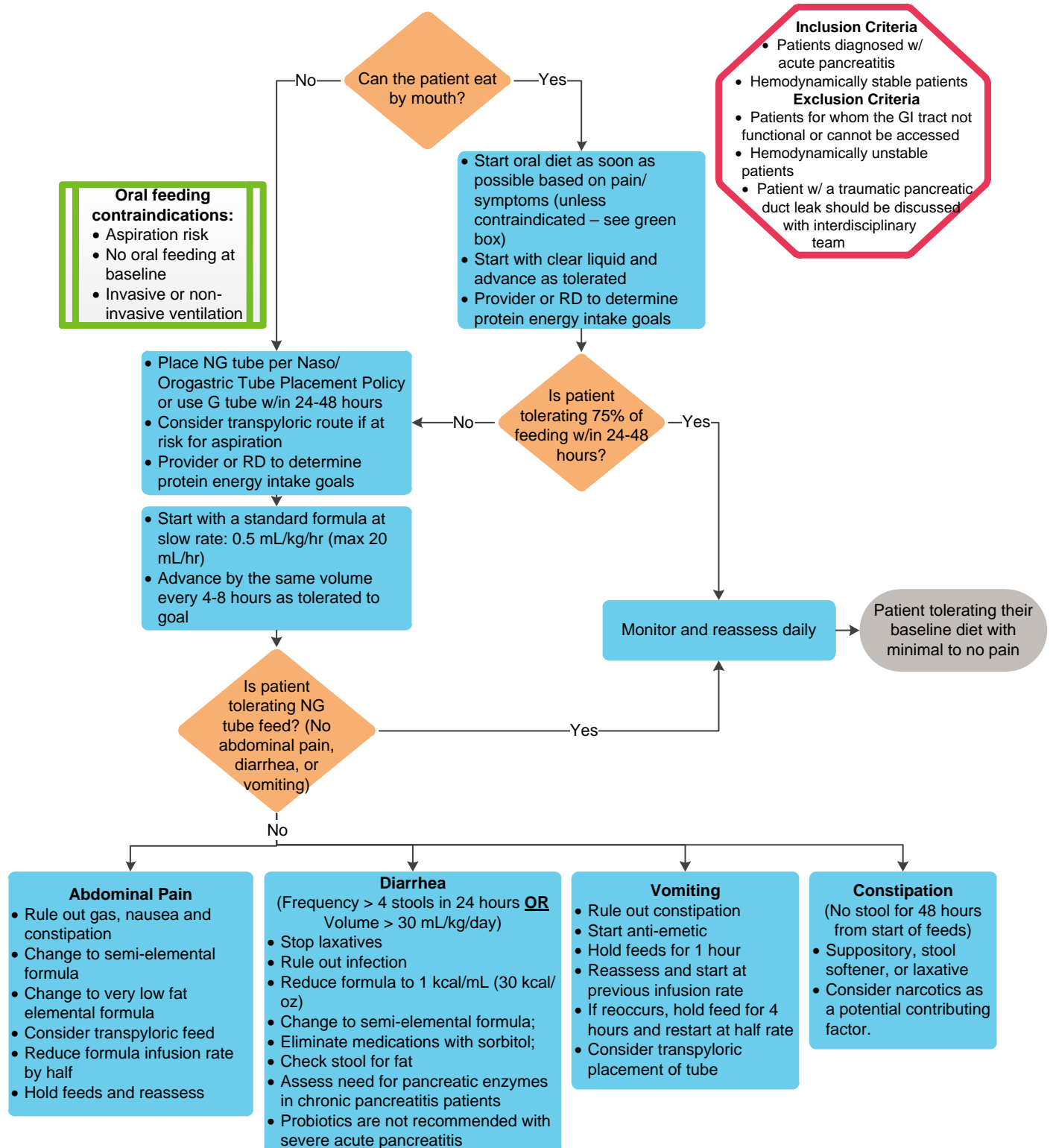


TABLE OF CONTENTS

[Algorithm](#)

[Target Population](#)

[Background | Definitions](#)

[Initial Evaluation](#)

[Clinical Management](#)

Laboratory Studies | Imaging – N/A

[Therapeutics](#)

[Parent | Caregiver Education](#)

[References](#)

[Clinical Improvement Team](#)

TARGET POPULATION

Inclusion Criteria

- Patients diagnosed with acute pancreatitis
- Hemodynamically stable patients

Exclusion Criteria

- Patients for whom the GI tract not functional or cannot be accessed
- Hemodynamically unstable patients
- Patient with a pancreatic duct leak should be discussed with interdisciplinary team

BACKGROUND | DEFINITIONS

Definitions:

- Acute Pancreatitis: Condition diagnosed by meeting two of the following three elements: clinical symptoms such as pain, nausea, or back pain; serum levels of pancreatic amylase and/or lipase three times the upper limit of normal; and radiographic evidence of acute pancreatitis including pancreatic edema on ultrasound or computed tomography.
- Indirect Calorimetry: A technique that analyzes oxygen consumed and carbon dioxide produced by the body to determine actual energy expenditure.
- Standard Formula: Enteral product formulated with intact proteins to provide recommended dietary reference intakes for most healthy individuals.
- Semi-elemental Formula: Enteral product formulated with peptides of varying chain length instead of intact proteins and medium chain triglycerides to provide complete nutrition.
- Elemental Formula: Enteral product formulated with single amino acids instead of intact proteins or peptides and medium chain triglycerides to provide complete nutrition.
- Medium chain triglycerides: Fats that do not require pancreatic lipase or bile acids for absorption.

- **Severe Acute Pancreatitis:** Condition manifest with systemic signs and symptoms that may include acidosis, hypoxia, shock or renal dysfunction. In children, a severe acute pancreatitis may be predicted if three of the following eight parameters are met: age less than 7 years old, weight less than 23 kg, white blood cell count at admission greater than 18,500 cells/ μ L, lactic dehydrogenase at admission greater than 2000 U/L, 48-h trough Ca²⁺ less than 8.3 mg/dL, 48-h trough albumin less than 2.6 g/dL, 48-h fluid sequestration greater than 75 ml/kg per 48 h, and 48-h rise in blood urea nitrogen greater than 5 mg/dL.

General Information:

- Current literature supports a less conservative approach to nutrition interventions in adults with severe acute pancreatitis than has been accepted in the past. Oral feeding can be resumed based on hunger cues and tolerance. In 90% of adults, gastric feeding with standard formula is shown to be effective and is less expensive than semi-elemental or elemental formulas. Earlier randomized controlled trials of enteral versus total parenteral nutrition (TPN) in adults with severe acute pancreatitis showed a decrease in infections, frequency of multiple organ failure, and mortality in patients who were fed via the enteral route. However, TPN should be considered for patients with severe acute pancreatitis who are unable to tolerate or receive adequate enteral nutrition.
- Nutrition support is indicated to prevent malnutrition in children with acute pancreatitis who are unable to tolerate an oral diet. Early enteral nutrition (by mouth or feeding tube) has been shown to improve clinical outcomes in acute pancreatitis and should be initiated within 24 hours and no later than 72 hours.
- Research examining nutrition interventions in infants and children with acute pancreatitis is limited. A retrospective study observed children with mild acute pancreatitis who received oral or enteral nutrition (via existing feeding tubes) within 48 hours of admission. This study demonstrated improved clinical outcomes versus those who remained NPO.

INITIAL EVALUATION

- Patients with acute pancreatitis are screened at high nutrition risk and assessed by a dietitian.
 - Indications for enteral nutrition:
 - Unless contraindicated, start with oral diet as soon as possible based on pain/symptoms. Start with clear liquid diet and advance to regular diet as tolerated. A recent study in pediatric patients with mild acute pancreatitis indicates low-fat diet does not reduce lipase levels or reduce pain.
 - If intolerant to oral diet, or oral diet is contraindicated (due to aspiration risk, no oral feeding at baseline, invasive or non-invasive ventilation), provide enteral nutrition via NG tube or gastrostomy tube, if available. Failure of oral diet indicated by: abdominal pain, nausea, or vomiting limiting oral intake to less than 50% of meals in the first 24-48 hours of admission.
 - If at high risk for aspiration, use transpyloric tube
 - Contraindications to feeding:
 - GI tract not functional or cannot be accessed (i.e. bowel obstruction, ileus)
 - Hemodynamic instability
 - Enteral nutrition may be contraindicated for patients with a traumatic pancreatic duct leak. Management of nutrition support should be discussed with interdisciplinary team.

CLINICAL MANAGEMENT

Nutrition Requirements

- Individualize based on patient's baseline needs and acuity
- Initial energy target: Low end of the RDA (resting energy expenditure if invasive mechanical ventilation)
- Increased protein intake is needed to support nitrogen balance.
 - Patients with acute pancreatitis may have hypermetabolism due inflammatory mediators, fever and sepsis; however, not all have increased caloric needs.
 - Indirect calorimetry may be used if available
 - Negative nitrogen balance is associated with poor clinical outcomes with severe acute pancreatitis.

Table 1: Estimate Energy and Protein Needs

Estimated Energy and Protein Needs				
Age	Low end of RDA (kcal/kg/day)	Resting Energy Expenditure (Invasive Ventilation) (kcal/kg/day)	Protein: (g/kg/day)	Protein: (Patients with obesity) (g/kg/day x IBW)
Term Birth-1 year	100-120 (RDA Range)	60-80 (REE x 1.1-1.45)	2-3	3-4
2-3 years	75-90	55	2-3	2-2.5
4-6 years	65-75	45	1.5-2	2-2.5
7-10 years	55-65	40	1.5-2	2-2.5
11-14 years	40-50	30	1.5-2	2-2.5
15-18 years, Males	40-50	30	1.5-2	2-2.5
15-18 years, Females	30-35	25	1.5-2	2-2.5
Adult	25-30	25	1.2-2	2-2.5

Nutrition Monitoring

- GI symptoms: Abdominal pain, nausea, vomiting, diarrhea
- Daily labs until enteral nutrition is at goal for 24 hours: electrolytes, glucose, calcium, phosphorus, magnesium
- ICU patients: hyperglycemia
- Fluid status, edema
- Weight: daily in PICU; Sunday, Wednesday on ward
- Weekly nitrogen balance if has urine catheter or ability to collect 6-hour urine

THERAPEUTICS

Start Enteral Nutrition

Within 24-48 hours of onset

- Place nasogastric tube (NGT) or consider transpyloric tube if at high risk for aspiration or NGT feeds are not tolerated.
- Start formula at 0.5 ml/kg/hour (no higher than 20 ml/hour) and advance by the same volume every 4-8 hours as tolerated to meet goal.
- If possible: Elevate head of bed by 30-45°, continue enteral nutrition during procedures

Enteral Nutrition Formulas

A recent study in pediatric patients with mild acute pancreatitis indicates low-fat diet does not reduce lipase levels or reduce pain.

- Standard formula is indicated for most patients.
 - Age less than 1 year: Breastmilk or home infant formula
 - Age 1-10 years: Nutren Junior, Boost Kid Essentials, Compleat Pediatric
 - Age 11 years and older: Nutren 1.0
- If standard formula is not tolerated, use a semi-elemental formula.
 - Age less than 1 year: Order 20 kcal/oz
 - Alimentum (50% of kcals as fat, 33% of fat as medium chain triglycerides), or
 - Pregestimil (50% of kcals as fat, 55% of fat as medium chain triglycerides)
 - Age 1-10 years: Peptamen Junior (34% of kcals as fat, 60% of fat as medium chain triglycerides)
 - Age 11 years and older: Peptamen with Prebio (35% of kcals as fat, 70% of fat as medium chain triglycerides)
- Consider elemental, low fat formula if other formulas are not tolerated.
 - Age less than 1 year: Order 20 kcal/oz
 - Age 1 year and older: Order 30 kcal/oz
 - Vivonex Pediatric (26% of kcals as fat, 70% of fat as medium chain triglycerides)
 - Tolorex: very low fat (2% of kcals as fat, no medium chain triglycerides), high carbohydrate

Micronutrient supplementation

- Micronutrients at risk for deficiency: Vitamins A, C, D, E, selenium
- Multivitamin:
 - Age less than 2 years: See CHCO Formulary for dosing guideline
 - Age 2 years and older: See CHCO Formulary for dosing guideline

Managing GI Symptoms

Secondary to initiation of feeds

- Abdominal pain
 - Rule out gas, nausea and constipation
 - Change to lower fat formula (see list above)
 - Consider transpyloric feed
 - Reduce formula infusion rate by half
 - Hold feeds and reassess
- Diarrhea (Frequency greater than 4 times in 24 hours OR volume > 30 ml/kg/day)
 - Stop laxatives
 - Rule out infection
 - Change to lower fat formula (see list above)
 - Reduce formula concentration
 - Assess need for pancreatic enzymes in patients with chronic pancreatitis: check stool for fat

- Eliminate medications with sorbitol
- Probiotics are not recommended with severe acute pancreatitis
- Vomiting
 - Rule out constipation
 - Start anti-emetic
 - Hold feeds for one hour, reassess and restart feeds at same rate; if reoccurs, hold feeds for 4 hours and restart at half rate
 - Consider transpyloric placement of feeding tube
- Constipation (No stool for 48 hours from start of feeds)
 - Consider narcotics as a potential contributing factor
 - Suppository, stool softener, or laxative

Resolution of Acute Pancreatitis

- Oral diet is initiated according to hunger cues and toleration.
 - In mild or resolved acute pancreatitis, a regular diet (i.e. not low fat) is not associated with increased pain or lipase levels
- Continue tube feeding until tolerating adequate oral intake (Greater than 75% of estimated protein/energy needs)

PARENT | CAREGIVER EDUCATION

- Prior to discharge, Dietitian to meet with family and caregiver to discuss healthy eating guidelines.
- Consider sharing the following In Care of Kids handouts:
 - Healthy Feeding for your Toddler (1-2 years old) – [English](#) and [Spanish](#)
 - Healthy Feeding for your Toddler (2-3 years old) – [English](#) and [Spanish](#)
 - Healthy Feeding for your Preschooler (4-5 years old) – [English](#) and [Spanish](#)
 - Healthy Feeding for your Child (6-11 years old) – [English](#) and [Spanish](#)

REFERENCES

1. Abu-El-Haija M, Wilhelm R, Heinzman C, Siqueira BN, Zou Y, Fei L, Cole CR. Early enteral nutrition in children with acute pancreatitis. *J Pediatr Gastroenterol Nutr.* 2016;62:453-6.
2. Besselink MGH, van Santvoort HC, Buskens E. Probiotic Prophylaxis in predicted severe acute pancreatitis: a randomised, double-blind, placebo-controlled trial. *Lancet* 2008;371:651-59.
3. Bradley E. A Clinically Based Classification System for Acute Pancreatitis: Summary of the International Symposium on Acute Pancreatitis, Atlanta, Ga, September 11 Through 13, 1992. *Arch Surg* 1993;128(5):586-590.
4. DeBanto J, Goday P, Pedroso M, Iftikhar R, Fazel A, Nayyar S, Conwell D, DeMeo M, Burton F, Whitcomb D, Ulrich C, Gates L. Acute Pancreatitis in Children. *Am J Gastroenterol* 2002;97(7):1726-1731.
5. Horibe M, Nishizawa T, Suzuki H, Minami K, Yahagi N, Iwasaki E, Kanai T. Timing of oral refeeding in acute pancreatitis: A systematic review and meta-analysis. *UEG J* 2015;2015. Published online: ueg.sagepub.com
6. Kumar A, Singh N, Prakash S et al. Early Enteral Nutrition in Severe Acute Pancreatitis: A Prospective Randomized Controlled Trial Comparing Nasojejunal and Nasogastric Routes. *J Clin Gastroenterol* 2006;40:431-4.
7. Li X, Ma F, Jia K. Early enteral nutrition within 24 hours or between 24 and 72 hours for acute pancreatitis: Evidence based on 12 RCT's. *Med Sci Monit* 2014;20:2327-35.
8. Morinville V, Husain S, Bai H, Barth B, Alhosh R, Durie P, Freedman S, Himes R, Lowe M, Pohl J, Werlin S, Wilschanski M, Uc Aliye. Definitions of Pediatric Pancreatitis and Survey of Current Clinical Practices: Report From INSPPIRE. *J Pediatr Gastroenterol Nutr* 2012;55(3):261-265.
9. Nally DM, Kelly EG, Clarke M, Ridgway P. Nasogastric nutrition is efficacious in severe acute pancreatitis: a systematic review and meta-analysis. *Brit J Nut* 2014;112:1769-78.
10. Petrov MS, Loveday BPT, Pylypchuk RD, McIlroy K, Phillips ARJ, Windsor JA. Systematic review and meta-analysis of enteral nutrition formulations in acute pancreatitis. *Brit J Surg Soc* 2009;96:1243-52.
11. Szabo FK, Fei L, Cruz LA, Abu-el-Haija M. Early Enteral Nutrition and Aggressive Fluid Resuscitation are Associated with Improved Clinical Outcomes in Acute Pancreatitis. *J Pediatr* 2015;167:397-402.
12. Zou L, Ke L, Li W, Tong Z, Wu C, Chen Y, Li G, Li N, Li J. Enteral nutrition within 72 h after onset of acute pancreatitis vs delayed initiation. *Euro J Clin Nut* 2014;68:1288-93.

CLINICAL IMPROVEMENT TEAM MEMBERS


- Lindy Lemieux, RD | Clinical Nutrition
- Heather Skillman, RD | Clinical Nutrition
- Jen Millard, RD | Clinical Nutrition
- Robert Kramer, MD | Gastroenterology
- Nancy Krebs, MD | Clinical Nutrition
- Sherry Archuleta, RD | Clinical Nutrition
- Kristin Brown, RD | Clinical Nutrition
- Elise Rolison, RRT-NPS | Clinical Effectiveness
- Sarah Nickels, PhD | Clinical Effectiveness

REVIEWED BY THE FOLLOWING EXPERTS

- Jenny Reese, MD | Hospital Medicine
- Jen Bruny, MD | Pediatric Surgery

APPROVED BY

- Pharmacy & Therapeutics Committee – July 6, 2017
- Clinical Pathways and Measures Committee – July 11, 2017

MANUAL/DEPARTMENT	Clinical Care Guidelines/Quality
ORIGINATION DATE	July 11, 2017
LAST DATE OF REVIEW OR REVISION	July 11, 2017
APPROVED BY	 Lalit Bajaj, MD Medical Director, Clinical Effectiveness

REVIEW | REVISION SCHEDULE

Scheduled for full review July 11, 2021.

Clinical pathways are intended for informational purposes only. They are current at the date of publication and are reviewed on a regular basis to align with the best available evidence. Some information and links may not be available to external viewers. External viewers are encouraged to consult other available sources if needed to confirm and supplement the content presented in the clinical pathways. Clinical pathways are not intended to take the place of a physician's or other health care provider's advice, and is not intended to diagnose, treat, cure or prevent any disease or other medical condition. The information should not be used in place of a visit, call, consultation or advice of a physician or other health care provider. Furthermore, the information is provided for use solely at your own risk. CHCO accepts no liability for the content, or for the consequences of any actions taken on the basis of the information provided. The information provided to you and the actions taken thereof are provided on an "as is" basis without any warranty of any kind, express or implied, from CHCO. CHCO declares no affiliation, sponsorship, nor any partnerships with any listed organization, or its respective directors, officers, employees, agents, contractors, affiliates, and representatives.

