**Pancreatitis**

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrition-Focused Physical Findings](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85038)

No aspects of outward physical appearance are unique to pancreatitis, but physical assessment should include steps to assess overall nutritional status, [malnutrition](http://www.nutritioncaremanual.org/topic.cfm?ncm_heading=&ncm_toc_id=145256), and micronutrient deficiency. This assessment is especially pertinent for individuals with chronic pancreatitis.

Abdominal physical assessment may include the following:

* Inspection: Color, contour, muscle development, wounds, feeding devices, and ostomies
* Auscultation: Bowel sounds
* Percussion: Tympany, dullness, density of abdominal contents
* Palpation: Texture, temperature, identification/location of organs

Physical assessment for micronutrient deficiency may include the following:

* Inspection: Color, texture for hair, eyes, nails, skin, oral mucosa

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Fluid Needs or Limits](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85054)

Unless other comorbid conditions exist (eg, renal or liver failure, septic shock, etc.), fluid intake and status are similar to that for normal healthy adults.

Estimation of fluid requirements:

* Method 1 (based on energy intake): 1 mL fluid per kcal
* Method 2 (based on body weight):

|  |  |
| --- | --- |
| **Age** | **Amount of Fluid** |
| Young adult, 16-30 years | 35-40 mL/kg |
| Average adult | 30-35 mL/kg |
| Adult 55-65 years | 30 mL/kg |
| Adult >65 years | 25 mL/kg |

Keep in mind that fluids should be provided intravenously when a patient is ordered nothing by mouth (nil per os, or NPO). Appropriate fluids may be given via total parenteral nutrition or within enteral feedings (see [Pancreatitis Nutrition Support](javascript:gotoheading(14422,14369))).

The following measures of fluid status should be monitored as often as deemed necessary by the primary health care team:

* Laboratory parameters (eg, eletrolytes)
* Clinical observations (edema, dehydration)
* Weight fluctuations
* Intake and output records

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrient Exceptions to Dietary Reference Intake (DRI)](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85064)

* Vitamin and mineral requirements should be met with appropriate oral, enteral, or parenteral feedings.
* Oral nutrition should be supplemented with a standard multivitamin/mineral formulation until oral intake is adequate to meet all nutrition needs. Some individuals may need higher amounts of antioxidants ([Quilliott, 2005](javascript:void(0);)).
* Enteral nutrition provided in sufficient quantities with polymeric formulas should meet Dietary Reference Intakes unless volume or total energy is restricted. Additional supplementation may be needed in cases where severe malnutrition is evident or specific deficiencies can be determined.
* Total parenteral nutrition should include standard multivitamin and trace mineral infusions unless otherwise contraindicated by specific patient factors.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Client History](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85041)

* Food history
  + Usual food intake
  + 24-hour recall
  + Specific food intolerances
  + Alcohol intake
  + Supplement use (including vitamins and minerals)
* Lifestyle history
  + Alcohol intake
  + Drug use
  + Smoking history
  + Exercise history
  + Social support
* Medication history
  + Pain medications
  + Pancreatic enzyme replacement
* Past medical and surgical history

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Biochemical Data, Medical Tests and Procedures](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85039)

To diagnose pancreatitis, perform the following laboratory tests:

* White blood cell count
* Serum glucose
* Serum lipase
* Amylase
* Lactic dehydrogenase (LDH)
* Aspartate aminotransferase (AAST)

The degree of inflammation (and thus the severity of the disease) may be assessed by the following:

* C-reactive protein
* Evaluation using Ranson’s criteria, Apache score or Computed Tomography Severity Index

It is also common practice to use a combination of criteria that distinguish the severity of the disease. Common criteria include Ranson’s criteria, Apache score, and the Computed Tomography Severity Index. Ranson’s criteria ([1977](javascript:void(0);)) are as follows:

Admission:

* Age >55 years
* White blood cell count >16,000/mm3
* Blood glucose >200 mg/dL (especialy in nondiabetic patients)
* LDH >350 IU/L
* AAST >250

After initial 48-hour period:

* Decrease in hematocrit by ≥10%
* Increase in serum blood urea nitrogen by >5 mg/dL
* pO2 of <60 mm Hg
* Base deficit >4 mEq/L
* Fluid sequestration >6 L

To follow hydration and acid-base status, monitor the following:

* Serum electrolytes
* Arterial blood gases

Other biochemical abnormalities may include the following:

* Hypertriglyceridemia
* Hypocalcemia ([Rettally, 2003](javascript:void(0);))

To determine presence of pseudocysts or necrosis, other diagnostic tests may include the following:

* Computed tomography
* Ultrasound
* Endoscopic retrograde cholangiopancreatography

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[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Laboratory](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85040)

**Biochemical Assessment**

Indices for pancreatitis

* Amylase
* Lipase
* Lactate dehydrogenase
* Serum glutamic-oxaloacetic transaminase
* Serum glutamic-pyruvic transaminase
* C-reactive protein

Other common biochemical tests for complications of pancreatitis:

* Secretin stimulation test
* Glucose tolerance

**Other Laboratory Assessments:**

* Electrolytes
* Acid-base balance assessment
* Blood urea nitrogen
* Creatinine
* Sodium
* Potassium
* Phosphate
* Chloride
* Carbon dioxide
* Bicarbonate
* Osmolality
* pH and arterial blood gases
* Urinalysis:
  + Color
  + Appearance
  + Specific gravity
  + Presence of ketones
  + Protein
  + Glucose
* Serum Glucose
* Hematological assessment:
  + White blood cell
  + Hemoglobin
  + Hematocrit

**Lipid Assessment**

* Total cholesterol
* High-density lipoprotein
* Low-density lipoprotein
* Triglyceride

**Specific Laboratory Tests for Micronutrient Status**

|  |  |
| --- | --- |
| Folate | Erythrocyte folate, free folate, urinary formiminoglutamic acid |
| Vitamin B-12 | Schilling test, erythrocyte vitamin B-12, doxyuridine monophosphate suppression test, serum vitamin B-12 |
| Vitamin C | Plasma vitamin C, leukocyte vitamin C, urinary vitamin C |
| Vitamin D | 25-hyroxy vitamin D |
| Vitamin K | Prothrombin time |
| Vitamin A | Serum carotene, retinol-binding protein |
| Vitamin E | Serum tocopherol, erythrocyte hemolysis |
| Biotin | Serum biotin, urinary biotin |
| Niacin | Urinary N-methyl nicotinamide |
| Riboflavin | Urinary riboflavin, erythrocyte glutathione reductase |
| Vitamin B-6 | Whole blood level of pyridoxal phosphate |
| Thiamin | Blood pyruvate and lactate, urinary thiamin excretion, erythrocyte transketolase, apoenzyme levels |

Source: Adapted with permission: Nahikian-Nelms M, Sucher K, Long S. Diseases of the Lower Gastrointestinal Tract. *Nutrition Therapy and Pathophysiology.* Belmont, CA:Wadsworth/Thomson Learning; 2007.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Laboratory Value Norms](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85042)

|  |  |
| --- | --- |
| **Laboratory** | **Normal Range: Adult Values** |
| Amylase | 25-125 U/L |
| Lipase | 0-417 U/L |
| Lactate dehydrogenase | 313-618 U/L |
| Serum glutamic-pyruvic transaminase | 10-60 U/L |
| Serum glutamic-oxaloacetic transaminase | 5-40 U/L |
| C-reactive protein | 0 |
| Hemoglobin | 12-16 g/dL, women; 13.5-17.5 g/dL, men |
| Hematocrit | 37% to 47% (women); 40% to 54% (men) |
| Glucose | 70-110 mg/dL |
| Blood urea nitrogen | 8-26 mg/dL |
| Creatinine | 0.6-1.3 mg/dL |
| Sodium | 135-155 mmol/L |
| Potassium | 3.5-5.5 mmol/L |
| Phosphorous | 2.5-4.5 mmol/L |
| Chloride | 98-108 mmol/L |
| Calcium | 8.7-10.2 mg/dL |
| Carbon dioxide | 24-30 mmol/L |
| Osmolality | 275-295 mOsm/kg H20 |
| Vitamin D (25-hydroxy) | 16-74 ng/dL |

Pagana KD, Pagana TJ. *Mosby's Diagnostic and Laboratory Test Reference*. St. Louis, MO: Elsevier-Mosby; 2004.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Anthropometric Measurements](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85043)

The following anthropometric measures should be used whenever possible to determine calculation of nutrient needs:

* Height
* Weight
* Usual body weight

Accuracy of the weight measurement is the most important value—it should be obtained upon admission and monitored frequently to evaluate hydration status. It should also be used for monitoring nutrition support.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Food/Nutrition-Related History](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85044)

A food frequency questionnaire, diet history, and 24-hour recall are the most helpful tools for achieving the following:

* Assist in confirmation of nutritional status
* Determine if there are food intolerances
* Gather evidence of nutrient deficiency
* Establish nutritional intake before admission

In acute pancreatitis, it is important to determine the amount of time that has passed without adequate oral intake in order to make appropriate recommendations for nutrition support. For chronic pancreatitis, it is important to determine if the patient has complied with the diet and medication regimen and if there are specific food intolerances associated with increased abdominal pain, signs of steatorrhea, or both.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Comparative Standards](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85045)

Calculations for individual nutrient requirements in mild pancreatitis should be based minimally on the following standards:

* Dietary Reference Intakes
* Recommended Dietary Allowances
* Adequate Intakes

In moderate to severe pancreatitis, the metabolic response is similar to other clinical scenarios with stress and trauma. This includes hypermetabolism, insulin resistance, increased rates of gluconeogenesis, and lipolysis. and it may vary depending on the following:

* Patient's clinical course
* Stage of recovery
* Current nutritional status

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrition Diagnosis](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85046)

Dietitians working with patients who have ***pancreatitis*** should review the signs and symptoms obtained in the nutrition assessment and diagnose nutrition problems based on these signs and symptoms. [Nutrition diagnoses](http://www.nutritioncaremanual.org/vault/IDNT%20e3%20NDTerms-NCM.pdf) from the list below as well as other diagnoses may be present.

* Altered gastrointestinal function (NC-1.4)
* Malnutrition (NI-5.2)
* Inadequate oral intake (NI-2.1)
* Impaired nutrient utilization (NC-2.1)
* Excessive fat intake (NI-5.6.2)

**Sample PES or Nutrition Diagnostic Statement(s)**

* Excessive fat intake (NI-5.6.2) related to decreased fat tolerance with compromised pancreatic function as evidenced by estimated oral fat intake of 70 grams per day.
* Impaired nutrient utilization (NC-2.1) related to compromised pancreatic function as evidenced by steatorrhea following fat intake.

**Note:** Terminology in the examples above is from the American Dietetic Association's *International Dietetics and Nutrition Terminology,* 3rd edition. Code numbers are inserted to assist in finding more information about the diagnoses, their etiologies and signs and symptoms. Dietitians should not include these numbers in routine clinical documentation.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrition Intervention](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85047)

Nutrition intervention is determined by severity and duration of disease. Historically, ordering the patient to be NPO (nil per os, or nothing by mouth) would allow for complete pancreatic rest and reduce the inflammatory process in pancreatitis ([Petrov, 2009)](javascript:void(0);). More recent research has demonstrated the benefit of enteral nutrition support over both continued NPO and parenteral nutrition support for those patients with severe pancreatitis.

Current standards of care indicate that patients with mild to moderate pancreatitis (determined by APACHE score or Ranson's criteria) should initially be prescribed NPO and then, as symptoms subside, progress to an oral diet ([McClave 2009](javascript:void(0);)). A recent prospective, randomized, controlled, double-blind clinical trial showed no difference between symptom relapse in patients with mild pancreatitis who progressed to a solid food diet as opposed to clear liquids or a reduced-energy solid food diet ([Moraes 2010](javascript:void(0);)). Historically, patients were progressed from a clear liquid diet to a low-fat solid diet (<50 g fat) with the rationale of reducing the stimulation of the pancreas and, thus, the symptoms that patient would experience. The level of fat restriction, once the patient has progressed to solid food, is dependent on the level of steatorrhea and abdominal pain the patient experiences. Pancreatic enzyme replacement may be required for progression to chronic pancreatitis. As indicated in this discussion, as more research is conducted, the progression of diet may be liberalized.

For those patients with severe pancreatitis, enteral nutrition is recommended to be initiated within 24 to 48 hours ([McClave, 2009](javascript:void(0);)). As discussed in the section on enteral nutrition support, numerous studies have demonstrated positive outcomes for patients who received early enteral feeding support. Parenteral nutrition is not recommended unless there is a failure of enteral nutrition and the patient has not received any nutrition support for more than 5 days ([McClave, 2009](javascript:void(0);)).

See the [Nutrition Interventions](http://www.nutritioncaremanual.org/topic.cfm?ncm_heading=&ncm_toc_id=145243) in the Resource section for more information on Goal Setting and Developing a Nutrition Prescription and further details regarding planning, setting, and using the Nutrition Intervention.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrition Prescription](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85048)

Nutrition therapy for noncomplicated mild to moderate pancreatitis consists of the following steps:

* Prescribe nothing by mouth to ensure pancreatic rest with intravenous hydration support to correct fluid and electrolyte balance and acid-base disturbances.
* Energy requirements will be determined by standard procedures using appropriate predictive equations with adjustment for the individual patient's activity level.
* Advance to liquids and/or solid foods as symptoms subside and biochemical indices begin to return to normal levels. A recent study comparing the use of liquids versus solids as a first oral feeding indicates no difference in tolerance and a statistically significant decrease in hospital stay for those individuals receiving solid food as a first oral feeding ([Sathiaraj, 2008](javascript:void(0);)).
* Choose high-protein, low-fat modifications and for other medical conditions, including the following, as necessary.
  + Diabetes
  + Obesity
  + Alcoholism
    - Alcohol should be avoided at all steps of therapy, including once recovery is complete
* Supplement the following additional micronutrients in patients with a history of alcoholism:
  + Thiamin 100 mg by mouth once a day
  + Folate 1 mg by mouth once a day
  + General multivitamin
* Supplement all patients with multivitamin and minerals until their solid food intake is adequate to meet the nutrient requirements. If fat malabsorption is present, specific supplementation with fat-soluble vitamins will be necessary.
* The use of pancreatic enzymes with each oral feeding may be necessary to ensure adequate absorption if steatorrhea is present.

([Sathiaraj 2008](javascript:void(0);))

More complicated courses of disease may indicate a need for enteral nutrition ([McClave, 2009](javascript:void(0);); [Petrov, 2008](javascript:void(0);)). (See [pancreatitis nutrition support](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85057).)

Total parenteral nutrition should be reserved for the following situation:

* Inability to progress to oral or enteral feedings after 5 to 7 days ([McClave, 2009](javascript:void(0);); [Gianotti, 2009](javascript:void(0);))

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Goal Setting](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85051)

Goals of nutrition therapy can be divided into two phases: acute and recovery.

Acute:

* Resolve symptoms with complete bowel rest
* Progress to oral feedings in a timely fashion without exacerbation of symptoms
* Provide adequate protein and energy to prevent deficiencies
* Maintain or improve nutritional status
* Prevent weight loss

Recovery:

* Prevent recurrence of disease (encourage avoidance of alcohol)
* Prevent exacerbation of symptoms
* Replenish any nutritional deficiencies that occurred during the acute phase

([Lobo, 2000](javascript:void(0);); [Abou-Assi, 2002](javascript:void(0);); [Fang, 2002](javascript:void(0);); [Clancy, 2005](javascript:void(0);); [Bengmark, 2005](javascript:void(0);); [Sathiaraj, 2008](javascript:void(0);))

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Implementation of the Nutrition Intervention - Oral Intake](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85053)

* Patients who undergo prolonged nutrition support or NPO (nil per os, or nothing by mouth) status may develop a fear of eating or aversions to specific foods that they associate an exacerbation of symptoms.
* Feeding issues may present in the opposite manner—that is, patients may have a desire to eat when it is imperative that they maintain NPO status for recovery.

Close observation and counseling is necessary in both of these circumstances, and patients should be encouraged to discuss their issues with the health care team so that an appropriate plan of care can be determined and implemented.

As the patient's amylase and lipase begin to trend downwards, oral intake may be initiated. The historical progression from NPO to oral intake has included transition from clear liquids to a low fat solid food diet. Monitoring for any gastrointestinal complaints will alert the practitioner for any intolerance to the oral diet.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Implementation of the Nutrition Intervention - Nutrition Support](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85057)

Nutrition support should be initiated for patients with moderate to severe disease in which oral trials were unsuccessful, those who present with significant malnutrition, or those who were not able to initiate oral feedings within 7 days ([McClave, 2009](javascript:void(0);); [Gianotti, 2009](javascript:void(0);)).

Systematic reviews of the literature indicate that when compared to providing no nutrition support, enteral and parenteral nutrition led to no significant increase in risk for patients with pancreatitis. Furthermore, the use of both routes of nutrition support was significantly associated with reduced mortality. Enteral nutrition was associated with a reduction in infectious complications ([Petrov, 2008](javascript:void(0);); [Doley, 2009](javascript:void(0);); [Gianotti, 2009](javascript:void(0);); [Ioannidis, 2008](javascript:void(0);); [McClave, 2009](javascript:void(0);)).

The use of enteral nutrition at a continuous rate into the jejunum is a preferred route of nutrition support as it achieves the following:

* Is cost effective
* Was associated with significantly reduced rate of
  + gastrointestinal intolerance
  + infectious complications
  + surgical interventions
  + length of hospital stay

([Petrov, 2008](javascript:void(0);); [Doley, 2009](javascript:void(0);); [Gianotti, 2009](javascript:void(0);); [Ioannidis, 2008](javascript:void(0);); [McClave, 2009](javascript:void(0);))

Enteral nutrition support should be considered first, but the final decision for route of nutrition support then should be determined by the following:

* Individual patient requirements
* Nutritional status
* Clinical course

Initiating enteral feeding within 48 hours of admission is associated with improved tolerance ([McClave, 2009](javascript:void(0);)). Enteral formula choice (hydrolyzed versus polymeric) does not appear to affect feeding tolerance or complications ([Petrov, 2009](javascript:void(0);); [McClave, 2009](javascript:void(0);)). Feeding into the stomach or duodenum versus the jejunum also does not appear to affect complications or length of hospital stay, but a continuous feeding into the jejunum appears to be associated with the lowest level of pancreatic secretions ([McClave, 2009](javascript:void(0);)). The use of probiotics as a method to reduce infectious necrosis has been controversial due to conflicting study results. This may be the result of a difference in strains of bacteria that have been studied and thus, at this time, recommendations cannot be made for inclusion in enteral supplementation ([Sun 2009](javascript:void(0);)).

Parenteral nutrition support does not stimulate pancreatic secretions and may be initiated for patients when the following occurs:

* Enteral nutrition has failed
* Fistulas are present
* Nutrition needs cannot be met completely by enteral or oral nutrition support

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Implementation of the Nutrition Intervention - Enteral or Tube Feeding](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85058)

For cases of mild to moderate acute pancreatitis, the patient may be advanced from NPO (nil per os, or nothing by mouth) to either clear liquids or a low-fat (<50 g) solid diet. Most recent evidence indicates that patients may tolerate either diet equally well ([Moraes, 2010](javascript:void(0);)). Monitoring abdominal pain and presence of steatorrhea will allow for evaluation of tolerance to an oral diet.

Enteral nutrition support is the preferred method of nutrition support for patients with severe pancreatitis who would not otherwise be able to tolerate oral feedings within a timely manner (usually within 5 to 7 days).

Enteral feedings have been shown to achieve the following:

* Minimize therapy duration
* Reduce infectious complications ([Petrov, 2009](javascript:void(0);); [Binnekade, 2005](javascript:void(0);))
* Reduce severity of symptoms, especially when initiated within 24 to 48 hours of admission ([McClave, 2009](javascript:void(0);); [Stanga, 2005](javascript:void(0);))
* Reduce cost when compared with parenteral nutrition

Initiating enteral feeding within 48 hours of admission is associated with improved tolerance ([McClave, 2009](javascript:void(0);)). Feeding into the stomach or duodenum versus the jejunum also does not appear to affect complications or length of hospital stay, but a continuous feeding into the jejunum appears to be associated with the lowest level of pancreatic secretions ([McClave, 2009](javascript:void(0);)). The use of probiotics as a method to reduce infectious necrosis has been controversial due to conflicting study results. This may be the result of a difference in strains of bacteria that have been studied and thus, at this time, recommendations can not be made for inclusion in enteral supplementation ([Sun, 2009](javascript:void(0);)).

**Formula Selection**

Enteral formula choice (hydrolyzed vs. polymeric) does not appear to affect feeding tolerance or complications ([Petrov 2009](javascript:void(0);); [McClave 2009](javascript:void(0);)).

**Chronic Pancreatitis**

Patients with chronic pancreatits should consume a regular diet with the highest level of fat that does not cause an increase in abdominal pain, steatorrhea or signs of malabsorption. Pancreatic enzyme replacement should be consumed at each meal or snack. There should be a strict avoidance of all alcohol.

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Implementation of the Nutrition Intervention - Parenteral Nutrition](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85060)

Parenteral nutrition (PN) in pancreatitis should be reserved for severe pancreatitis and for those cases of prolonged NPO (nil per os, or nothing by mouth) status (more than 5 to 7 days) or when the following occurs:

* Enteral access cannot be obtained
* Enteral nutrition (EN) support is not tolerated
* Patient's nutrition needs cannot be met by EN support alone

PN formulation is prescribed with standard recommendations based on the patient's individual requirements for the following:

* Nutrients
* Fluids
* Electrolytes

Standard doses of lipids are not contraindicated. Serum triglycerides should be measured for baseline and then until the patient is stable. Daily lipids should not be provided for patients with triglyceride levels over 400 mg/dL. Laboratory monitoring should direct decisions for nutrient composition ([McClave, 2009](javascript:void(0);); [Gianotti, 2009](javascript:void(0);); [Krenitsky, 2007a](javascript:void(0);)).

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Complications of Nutrition Support](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85061)

Complications of nutrition support for pancreatitis are similar to the use of nutrition support in other conditions, which may include any of the following ([Malone, 2007](javascript:void(0);)):

* Catheter occlusion (parenteral nutrition [PN])
* Catheter-related infection (PN)
* Hyperglycemia (from high-dextrose infusion or glucose intolerance)
* [Hypertriglyceridemia](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=72921)
* Intestinal atrophy (usually only from long-term PN without any oral intake)
* Electrolyte disturbances (see [pancreatitis refeeding syndrome](file:///H:\Pancreatitis%20is%20a%20complex%20condition%20involving%20an%20inflammation%20of%20the%20pancreas.docx))

**Refeeding Syndrome**

Refeeding syndrome can be a major concern for patients with pancreatitis receiving nutrition support.

The following three metabolic events characterize refeeding syndrome and lead to serious respiratory and/or cardiac compromise if not detected and treated in a timely manner:

* Hypophosphatemia
* Hypomagnesemia
* Hypokalemia

Patients with pancreatitis caused by alcoholism are the most at-risk group for developing refeeding syndrome, but any [malnourished](http://www.nutritioncaremanual.org/topic.cfm?ncm_heading=&ncm_toc_id=145256) patient is at potential risk.

Patient laboratory analysis should be monitored daily during the initial phase of nutrition support, with electrolyte replacement to occur according to standard protocol ([Flesher, 2005](javascript:void(0);); [McClave, 2009](javascript:void(0);)).

Laboratory values to be monitored daily (until stable) include the following:

* Glucose
* Potassium
* Chloride
* Blood urea nitrogen
* Creatinine
* Carbon dioxide
* Magnesium
* Phosphorus
* Ionized calcium

Vitamin and mineral deficiencies are not common but individuals with a history of alcohol abuse are at higher risk. Therefore:

* Vitamin and mineral requirements should be met with appropriate oral, enteral, or parenteral feedings.
* Oral nutrition should be supplemented with a standard multivitamin/mineral formulation until oral intake is adequate to meet all nutrition needs. Some individuals may need higher amounts of antioxidants ([Quilliot, 2005](javascript:void(0);)).
* Enteral nutrition provided in sufficient quantities should meet Dietary Reference Intakes unless volume or total energy is restricted ([Bankhead, 2009](javascript:void(0);)). Additional supplementation may be needed in cases where severe malnutrition is evident or specific deficiencies can be determined.
* PN should include standard multivitamin and trace mineral infusions unless otherwise contraindicated by specific patient factors ([Gianotti, 2009](javascript:void(0);)).

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrition Therapy Efficacy](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85049)

In patients with severe pancreatitis, early enteral nutrition support within 24 to 48 hours of admission and after fluid resuscitation has been shown to successfully address nutrition needs and for minimizing the following:

* Recovery duration
* Infectious complications
* Cost
* Length of stay
* Severity of symptoms

([Petrov, 2009](javascript:void(0);); [McClave, 2009](javascript:void(0);); [Gianotti, 2009](javascript:void(0);); [Stanga, 2005](javascript:void(0);), [Binnekade, 2005](javascript:void(0);))

Efficacy of nutrition therapy following recovery depends on individual response to therapy and can be influenced by the following factors:

* Level of compliance
* Severity of disease during the acute phase
* Duration and tolerance of nutrition support
* Nutrition prescription upon discharge

**Adequacy of Nutrition Therapy**

Nutrition therapy in pancreatitis should meet all nutrient requirements specific to the patient's needs based on the following factors:

* Weight
* Height
* Age
* Preexisting nutrient deficiencies

No nutrient should be omitted or provided at amounts lower than what is recommended in the [Dietary Reference Intakes](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=81121). Provision of all nutrients should occur within 5 to 7 days of initiation of nutrition support.

**Nutrients Below Target Due to Nutrition Prescription**

* Carbohydrate, protein, and fat should be balanced according to standard guidelines when nutrition support is provided unless hyperglycemia, hypertriglyceridemia, or other metabolic complications necessitate substrate modification. Special attention to fat-soluble vitamin status may be needed when steatorrhea and other signs of malabsorption are present.
* Dietary fat intake may be lower as a result of steatorrhea and malabsorption.
* Standard multivitamin/mineral therapy should be considered during the recovery phase until normal eating habits have been well established and signs and symptoms of deficiency are not present.
* Micronutrient deficiencies common in chronic alchoholism include thiamin; pyridoxine; folate; vitamins C, A, and K; zinc; and magnesium ([Sucher, 2011](javascript:void(0);) in press).

[http://www.nutritioncaremanual.org/lib/img/icon/icon_minus.gif](javascript:void(0);)[Nutrition Monitoring & Evaluation](http://www.nutritioncaremanual.org/content.cfm?ncm_content_id=85082)

Monitoring of nutritional status should be ongoing during the course of pancreatitis until the condition is completely resolved. The frequency and type of monitoring (eg, laboratory values) depend on the following:

* Which nutrition treatment is utilized
* How severe is the case
* What is the duration of nutrition therapy
* Generally, weight measurements should be obtained at least weekly and adjustments in nutrition regimen made accordingly to prevent rapid weight loss as well as excessive gain.
* Pancreatitis is an inflammatory state causing a reprioritization of hepatic proteins; the following laboratory values do not reflect the nutritional status of the patient:
  + Albumin
  + Prealbumin
  + Transferrin
* Overall improvement in symptoms with progression toward resuming oral feedings is the primary outcome goal in nutrition treatment of pancreatitis. Monitoring tolerance of solid food will include observation of any physical symptoms occuring after eating such as abdominal pain, nausea, vomiting or steatorrhea.