

Peer Reviewed

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Nutritional Support for Critically Ill Dogs & Cats



PROFILE

Definition

- Nutritional support for critically ill dogs and cats is often delayed until diagnosis or appropriate medical/surgical intervention can occur.
- *Anorexia* is a lack of food intake. *Hyporexia* is a reduction in food intake. Lack of food intake may not be recognized until cachexia or biochemical evidence of starvation occurs.
- A 2001 survey found that, in hospitalized dogs, 73% of the days admitted were spent in negative energy balance. Reasons cited were poorly written orders (22%), orders to withhold food (34%), and the animal's refusal to eat (44%).¹
- Animals in negative energy balance may be protein-calorie malnourished and have whole-body depletion of essential nutrients.

FIND MORE

See **Body Condition Score Techniques for Dogs** in the March 2010 issue of *Clinician's Brief* available at cliniciansbrief.com.

CONTINUES





Pathophysiology

- Animals undergoing simple starvation should be differentiated from those with medical conditions that result in physiologic stress or impaired hormone balance. Withholding energy and key nutrients from critically ill patients may cloud diagnosis, hinder response to treatment, and increase risk for sepsis.
- Protein-calorie malnutrition results in decreased immune competence and catabolism of not only lean body mass, but organ and lymphatic tissues.
- *B vitamins* are necessary for energy metabolism and adequate lymphocyte function.
- *Glutamine* is important for normal enterocyte health; *arginine* and *taurine* are important for lymphocyte function.
- Deficiencies in certain minerals, such as *selenium*, *copper*, *zinc*, and *iron*, increase rates of infection and decrease cell-mediated and humoral responses.
- Deficiencies in *vitamins A* and *E* result in impaired lymphocyte function and delayed wound healing.

Causes & Risk Factors

- Animals living in multianimal households or that have several caregivers may have prolonged hyporexia that goes unnoticed for days to weeks.
- Overweight or obese animals may have significant muscle wasting that is overlooked due to degree of adiposity.
- Animals on unconventional diets (eg, unbalanced home-prepared diets) may have whole-body depletion of essential nutrients that may impact immune function, wound healing, and response to medications.

Body condition scoring for dogs: 1-3 = too thin; 4-5 = ideal; 6-9 = too heavy
 Courtesy Nestlé Purina



DIAGNOSIS

Clinical Signs

Clinical signs of anorexia and hyporexia are often evident during the initial physical examination:

- *Body condition score*—using a 9-point or 5-point scale—should be evaluated on initial presentation.
- *Muscle catabolism* is often evident along the epaxial muscles; evaluation of lean muscle mass should be performed daily on hospitalized patients.
- *Weight change* often reflects alteration in water balance and is a poor indicator of nutritional status.

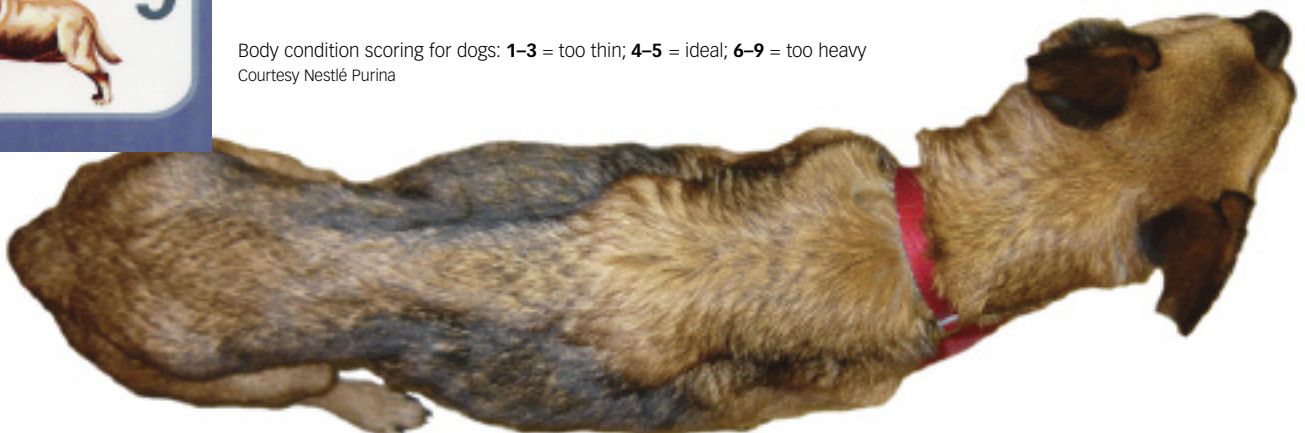
Diagnostic Tests

There are no specific diagnostic tests to evaluate nutritional status. Serum albumin, mineral, and electrolyte levels can be affected by multiple factors. Diagnostic tests should be directed at determining the underlying cause of illness.

History

Diet, consumption of treats, and supplement history will help direct feeding plans. This step is not essential for initial stabilization and treatment of the acutely ill animal, but it helps in developing an appropriate feeding and treatment plan.

- Duration of acceptable starvation may differ for animals with simple starvation due to acute trauma or illness versus those with complex medical conditions.





- Animals with an ideal BCS and adequate lean muscle mass may require approaches that differ from those for obese animals with palpable muscle wasting.
- Animals with fixed flavor or texture preferences (especially cats) will continue to refuse foods with an assumed high palatability due to learned food preferences.

Tx TREATMENT

Indications for nutritional support include:

- Anorexia > 3 days; expected anorexia > 3 days
- History of hyporexia > 7 days
- Weight loss > 10% body weight
- Expected ongoing nutrient loss, high energy demands, or hypoalbuminemia.

Energy Requirements

While in the hospital, feed to meet the resting energy requirement (RER), calculated according to one of the following formulas, and adjust as needed.

Allometric formula
(preferred; can be used for all animals)

$$RER = 70 \times BW_{kg}^{0.75}$$

Linear formula
(can be used for animals between 2 and 35 kg)

$$RER = [30 \times BW_{kg}] + 70$$

Avoid overfeeding hospitalized dogs and cats—providing excess calories can result in hyperglycemia (if given parenterally) or regurgitation, abdominal cramping, vomiting, and diarrhea (if given enterally). Hyperglycemia has been shown to negatively impact recovery and subsequent discharge from the hospital; if vomiting or regurgitation occurs, there is an increased risk for aspiration.

Selecting the Feeding Method

- Planning should begin on the first day of hospital admission.
- Selection should be based on patient signalment, BCS, disease state, expected duration of inadequate intake, function of the gastrointestinal tract, and the patient's ability to tolerate anesthesia.

Voluntary Food Intake

- Avoid or minimize negative environmental hindrances to food intake, including noise, frequent disturbances, bowls near litter boxes (cats), and electronic collars.
- Do not offer several diets at one time. This may result in learned food aversion.
- Do not force-feed ill animals. This can exacerbate food aversions and may cause aspiration.
- Pharmacologic intervention may be considered if short-term intervention is needed; however, animals will not consume full RER with appetite stimulants alone.
 - Cyproheptadine
 - Megestrol acetate
 - Diazepam

Nasoesophageal or Nasogastric Tubes

- **Indications:** Short-term (< 10 days) in the hospital; indicated in animals with normal nasal, pharyngeal, esophageal, and gastric function that are unable to be placed under anesthesia. Little to no anesthesia is required.
- **Particulars:**
 - Narrow-diameter tubes (5- to 8-Fr)
 - Liquid enteral solution (eg, CliniCare Canine/Feline, abbot.com) required due to tube-size limitations. Nutrient profiles of some solutions may not be suitable for animals with certain diseases.
 - Feedings are best delivered as a constant rate infusion to minimize risk for regurgitation and aspiration.
 - Tubes placed into the stomach can also be used to relieve air trapped in the stomach.
- **Complications:** Epistaxis, facial irritation, and premature tube removal are common complications.

MORE ON WEB

Download handouts on body condition scoring for dogs and cats at cliniciansbrief.com.

BCS = body condition score; BW = body weight; RER = resting energy requirement

CONTINUES

TX AT A GLANCE

- Identify the cause of anorexia/hyporexia
- Calculate RER:
 $70 \times BW_{kg}^{0.75}$
- Select the feeding method:
 - Oral: Voluntary or prompt through pharmacologic agent
 - Assisted enteral: Nasoesophageal/nasogastric, esophagostomy, gastrostomy, or jejunostomy
 - Parenteral
- Start with 25% RER and increase to meet full RER over 2 to 4 days
- Monitor response to refeeding
 - Body weight
 - Lean muscle mass
 - Serum electrolytes
- Adjust calories and nutrients delivered as needed

BW = body weight; kcal = kilocalorie; PPN = peripheral parenteral nutrition; RER = resting energy requirement; TPN = total parenteral nutrition

Esophagostomy Tubes

- **Indications:** Placed in the hospital; maintained at home for weeks to months as needed. General anesthesia required, but placement is relatively quick and easy.
- **Particulars:**
 - Larger diameter tubes (12- to 14-Fr for cats and dogs weighing < 15 kg; 14- to 18-Fr for dogs > 15 kg)
 - Most commercial canned diets can be fed; blend with water.
 - To ensure adequate delivery, energy density of final slurry (divide final volume by number of calories contained therein) must be calculated. It should be close to 1 kcal/mL.
 - Well tolerated by most animals; can be used for medication administration at home even after the animal resumes normal food intake.
- **Complications:** Minimal risk for life-threatening complications if tubes removed early; most common complication is stomal site infection.

Gastrostomy Tubes

- **Indications:** Animals requiring long-term nutritional support (months to year) or those with esophageal pathology (esophagitis, megaesophagus, or esophageal strictures). Can be placed endoscopically (percutaneous endoscopic gastrostomy), via percutaneous blind placement, or surgically; dogs > 20 kg or those that are obese require surgical placement.
- **Particulars:**
 - Larger diameter tubes (18- to 24-Fr)
 - Wide range of food selections; blend with water
 - To ensure adequate delivery, calculate energy density of final slurry (see calculation previously mentioned). Energy density should be > 1 kcal/mL.
 - Requires longer anesthesia +/- specialized equipment to place
 - Low-profile gastrostomy tubes well tolerated
- **Complications:** Life-threatening complications (peritonitis, gastric hemorrhage) if tube removed prematurely

Jejunostomy Tubes

- **Indications:** Animals unable to tolerate gastric feeding that have normal jejunal, ileal, and colonic function. May be indicated in animals with gastric outflow or proximal small intestine obstructions or severe pancreatitis. Requires general anesthesia; best used in a veterinary setting where continued monitoring and care can be provided.
- **Particulars:**
 - Surgical placement most common but newer percutaneous endoscopic gastrojejunostomy tube placement techniques have been described.
 - Narrow-diameter tubes (5- to 8-Fr)
 - Liquid enteral solution required due to tube size limitations. Lower-fat human monomeric liquid solutions (eg, Vivonex Plus; nestle-nutrition.com) may be required for animals requiring fat restriction.
 - Solutions are delivered as a constant-rate infusion over 12 to 16 hours to prevent complications, such as abdominal cramping and diarrhea.
- **Complications:** Include peritonitis if tube removed prematurely

Parenteral Nutritional Support

- **Indications:** Animals with protracted vomiting, severe pancreatitis, extensive gastrointestinal tract disease, and weak-to-absent gag reflexes; animals receiving mechanical ventilation; and animals that are obtunded or unable to maintain sternal recumbency.
- **Particulars:**
 - Total parenteral nutrition (TPN) must be delivered through a dedicated central catheter. Solutions should be compounded for the individual animal.
 - Peripheral parenteral nutrition (PPN) can be delivered through a dedicated peripheral catheter. Individually compounded or commercially available PPN solutions (eg, ProcalAmine, bbraunusa.com) can be used.
 - Catheters and fluid lines must be handled aseptically and disconnected only to change the parenteral solution bag. Animals should be monitored closely in the hospital for biochemical disturbances.



FOLLOW-UP

Patient Monitoring

Like any treatment plan, nutritional support should be dynamic. Start with a goal to deliver 25% of calculated RER on day 1, and increase gradually until full RER is reached in 2 to 4 days. Adjust the amount delivered every 12 to 24 hours based on body weight changes, physical examination findings, and known or expected ongoing losses.

- If the patient is receiving assisted enteral feeding, deliver food slowly to avoid vomiting, regurgitation, and abdominal cramping.
- Initial enteral feedings should provide 5 to 10 mL/kg per feeding and can be increased to 10 to 20 mL/kg in many animals.
- Measure and record body weight daily.
- Check electrolytes 24 hours after starting to monitor for hypokalemia, hypophosphatemia, and hypomagnesemia.



IN GENERAL

Relative Cost

The cost of nutritional support varies according to the underlying disease state, feeding method, and monitoring. Total cost of diagnosis, hospitalization, treatment, and assisted nutritional

support will often reach \$\$\$\$\$, depending on disease state and severity.

- Pharmacologic agents: \$/day
- Nasoesophageal/nasogastric tube: \$\$ initially; \$/day thereafter
- Esophagostomy tube: \$\$\$ initially; \$ to \$\$/day thereafter
- Gastrostomy tube: \$\$\$ to \$\$\$\$ initially; \$ to \$\$/day thereafter
- Jejunostomy tube: \$\$\$ to \$\$\$\$ initially; \$ to \$\$/day thereafter
- Parenteral nutrition: \$ to \$\$ initial catheter set-up; \$\$ to \$\$\$/day thereafter

Prognosis

The outcome for critically ill animals depends on the nature of anorexia or hyporexia, existing comorbidities, and duration of cachexia before intervention. There is evidence that early enteral nutritional intervention may shorten recovery time and minimize bacterial translocation across the gut.

See Aids & Resources, back page, for references and suggested reading.

Cost Key

\$ = < \$100

\$\$ = \$100-\$250

\$\$\$ = \$250-\$500

\$\$\$\$ = \$500-\$1000

\$\$\$\$\$ = > \$1000

Courtesy Dr. Katherine Snyder

