

Chronic Kidney Disease and Obesity – Feline

Donna M. Raditic, DVM, CVA

Joseph W. Bartges, DVM, PhD, DACVIM, DACVN

Definition

Obesity is defined quantitatively as 15% to 20% above ideal body weight. Functionally, obesity impairs health and is sufficient to cause diseases. Specific distribution of fat in the body is known to be important as seen in “metabolic disease” in humans. **Chronic kidney disease** (CKD) is a more common disease in older cats and seen occasionally in younger cats. It is often irreversible and slowly progressive. For more on obesity in cats, see pages 36–37; for more on kidney failure in cats, see pages 86–87.

Key Diagnostic Tools and Measures

Current body weight, body condition scoring (BCS) (see Appendix I), and a complete diet history should be obtained in evaluation of an obese cat with suspected CKD (see Appendix II). Serum or plasma concentrations of creatinine, urea nitrogen, phosphorus, calcium, electrolytes (sodium, potassium, chloride); urine protein-to-urine-creatinine ratio (UP:UC); urinalysis (sample collected by cystocentesis), and urine sediment analysis (urine collected by cystocentesis and analyzed immediately; false results can be obtained with cooled urine) are used in the diagnosis of CKD. Additional measures include indirect arterial blood pressure for hypertension, abdominal radiography for potential uroliths or neoplasia; blood and urine glucose for primary or concurrent diabetes mellitus; and serum total T4 or free T4 for hyperthyroidism. Advanced testing could include ultrasonography, dual energy x-ray absorptiometry (DEXA) analysis for lean body mass to fat mass ratio, and blood gas analysis.

Pathophysiology

Obesity occurs when caloric intake exceeds the cat’s energy requirements, such as basal metabolic rate, exercise and other energy expenditures. Obesity is a disease with increases in inflammatory mediators, insulin resistance and abnormal blood lipids. Diseases such as diabetes mellitus, cardiovascular changes, pancreatitis, lipidosis, osteoarthritis, cancer, constipation, and lower urinary tract disease have been associated with obesity. Obesity does not cause kidney failure, but these conditions are associated. The multiple effects of obesity suggest a link between obesity and kidney failure although the exact pathophysiology is not known. Epidemiologically both obesity and kidney failure are increasing at similar rates in cats. Early glomerular changes have been documented in obese human beings. Low birth weight babies have a higher risk of reduced nephron numbers, obesity, and hypertension.

Signalment

Obesity occurs most often in cats between 5 and 10 years of age. Kidney failure typically occurs in cats over 10 years of age. Obese cats are at a greater risk of early morbidity and mortality. Cats with diabetes mellitus are often obese and have an increased risk of developing kidney failure. Neutered male cats greater than 6 years of age have a higher incidence of diabetes mellitus and the same population of cats has a higher risk for obesity. Persian cats have a higher than normal incidence of polycystic CKD.

Key Nutrient Modifications

Low-phosphorus diets have been shown to slow progression of kidney failure. Moderate levels of high-quality protein are beneficial in slowing progression of kidney failure in cats. High dietary intake of omega-3 fatty acids has anti-inflammatory effects in primary kidney failure. Diets with moderate restriction of sodium may decrease systemic arterial hypertension and degree of azotemia.

Antioxidants play a role in obesity-related inflammatory mediators and increased oxidative stress on normal cell function; therefore, diets fortified with balanced antioxidants will be beneficial. Low-calorie diets must provide all essential nutrients balanced to the calorie intake. Low-fat diets decrease dietary calorie content because fat provides two times more calories per gram than protein or carbohydrates. High-fiber diets are used to decrease caloric intake and increase satiation for weight loss and improve gastrointestinal health in kidney patients. Canned diets with more water may increase satiety and improve fluid balance in kidney patients.

Recommended Ranges of Key Nutrients

Nutrient	% DM	g/100 kcal	% DM	g/100 kcal
	Recommended dietary level		Minimum dietary requirement*	
Phosphorus	0.4–0.6	0.08–0.15	0.5	0.13
Sodium	0.1–0.36	0.03–0.08	0.2	0.05
Protein	25–36	6–10	26	6.5
Fat	7–16	2–5	9	2.3
Fiber	4–13	1.2–4	n/a	n/a

Modified intake of these nutrients may help address metabolic alterations induced by disease states. The recommended dietary composition is shown as percent of dietary dry matter (DM) and as g or mg per 100 kcal metabolizable energy. All other essential nutrients should meet normal requirements adjusted for life stage, lifestyle, and energy intake.

*Nutrient requirement for adult animals as determined by the Association of American Feed Control Officials

Therapeutic Feeding Principles

Chronic kidney disease is the primary management concern. It requires strict phosphorus restriction and moderate levels of high-quality protein, which has been shown to slow progression of CKD. Kidney diets tend to be higher in fat and lower in fiber content to ensure adequate caloric intake; cats with CKD often have poor appetites and concurrent gastrointestinal disease. Protein catabolism is seen in obese kidney cats; therefore, weight loss from lean body tissue is a concern. Obese cats need low-calorie, low-fat, and moderate- to high-fiber diets. Some obese cats seem to respond to high-protein diets for weight loss, but these diets would be inappropriate for a cat with CKD. The dietary goal of managing obese cats with kidney failure is to ensure decreased caloric intake (using a moderate- to high-fiber, low-fat approach) while maintaining low phosphorus and moderate high-quality protein levels.

■ **Treats** – Avoid treats that are high in protein, salt or phosphorus (% ash), calories, and fat.

■ **Tips for Increasing Palatability** – Some cats prefer dry food, while others prefer canned; feed accordingly. Add low-salt, low-fat broth to the diet. Warm canned foods or offer fresh. Add low-salt tuna water for cats that prefer fish-flavored diets. Offer small meals frequently.

■ **Diet Recommendations** – Diets that meet the following criteria are recommended: Low phosphorus, moderate high-quality protein, moderate sodium, low fat, and moderate fiber.

Client Education Points

- Cats cannot be “starved” into eating a recommended diet.
- Slow diet transition is necessary.
- Management of CKD may supersede a weight loss program for obese cats with CKD.
- Close monitoring of weight is paramount in obese cats with CKD.
- “Eating some” is not enough; the cat must consume enough for maintaining weight or achieving safe weight loss if this can be a goal.
- Monitoring includes body condition scoring and body weight.
- Weight loss can signify dehydration and/or the progression of CKD.
- Cats with CKD can easily lose weight in the form of lean body mass rather than fat, which carries a poor prognosis for survival.
- Malnutrition is a major cause of morbidity and mortality in cats with CKD.

Common Comorbidities

Bacterial urinary tract infection (cystitis or pyelonephritis), nephrolithiasis (usually calcium oxalate), diabetes mellitus, hyperthyroidism, pancreatitis, hepatic lipidosis, idiopathic hypercalcemia, inflammatory bowel disease, chronic constipation, and osteoarthritis are seen in obese cats with CKD.

Interacting Medical Management Strategies

Angiotensin-converting enzyme (ACE) inhibitors are used to decrease proteinuria, but may induce hyperkalemia. **Amlodipine** is used to decrease systemic arterial hypertension, but may induce hypotension. **Phosphate binders** are used to decrease hyperphosphatemia, but may cause constipation, hypercalcemia, or hypophosphatemia depending on the type used. **Calcitriol** is used to treat kidney secondary hyperparathyroidism, but may induce hypercalcemia. **Antibiotics** used to treat bacterial infections may be nephrotoxic (e.g., aminoglycosides). **Nonsteroidal anti-inflammatory drugs (NSAIDs)** used to decrease inflammation may be nephrotoxic. **H2 blockers** (e.g., metoclopramide or ranitidine) are used to decrease nausea, vomiting, and gastrointestinal ulceration and bleeding but may cause hyperactivity or disorientation in rare cases. **Recombinant human erythropoietin (EPO)** is used to correct anemia, but can cause anti-EPO antibodies leading to a nonregenerative anemia. **Potassium salts** (e.g., gluconate or citrate) are used to treat hypokalemia or metabolic acidosis, but may induce hyperkalemia especially when used with an ACE inhibitor. **Omega-3 fatty acids** used to decrease inflammatory response can increase caloric intake. **Sodium bicarbonate** is used to treat metabolic acidosis, but is unpalatable for cats and may increase blood pressure due to increased sodium intake.

Monitoring

Adequate hydration is needed to maintain kidney perfusion. Many cats with CRD require supplemental fluid administration, including feeding

canned diets that contain more than 75% moisture; oral administration of water or flavored fluids; subcutaneous administration of lactated Ringer’s solution or other balanced crystalloid solution; or enteral administration of water by feeding tube.

Maintain a stable **creatinine** concentration. Clinical signs do not often correlate with the degree of azotemia in cats with CRD because they have adapted to it. Creatinine concentrations that increase by more than 0.2 mg/dL between measurements in cats with CRD that are adequately hydrated indicates progression.

A **urine protein:creatinine ratio (UP:UC)** maintained below 0.4 is ideal. UP:UC ratios should be followed serially; interpretation is dependent on absence of hematuria, pyuria, or infection. ACE inhibitors should be administered to cats with chronic kidney failure with UP:UC ratios greater than 0.4.

Phosphorus levels should be maintained <5.5 mg/dL. Phosphate binding agents can be used to initiate treatment if levels continue to increase.

Blood pressure (systolic) should be less than 160 mmHg, and should be measured serially over weeks or months. Initiate treatment if blood pressure continues to increase; slowly lower sodium intake further if levels are moderate. In cats on ACE inhibitors and/or amlodipine therapy, increases in creatinine > 0.5 mg/dL suggest an adverse drug reaction. ACE inhibitors or amlodipine should never be given to a dehydrated patient.

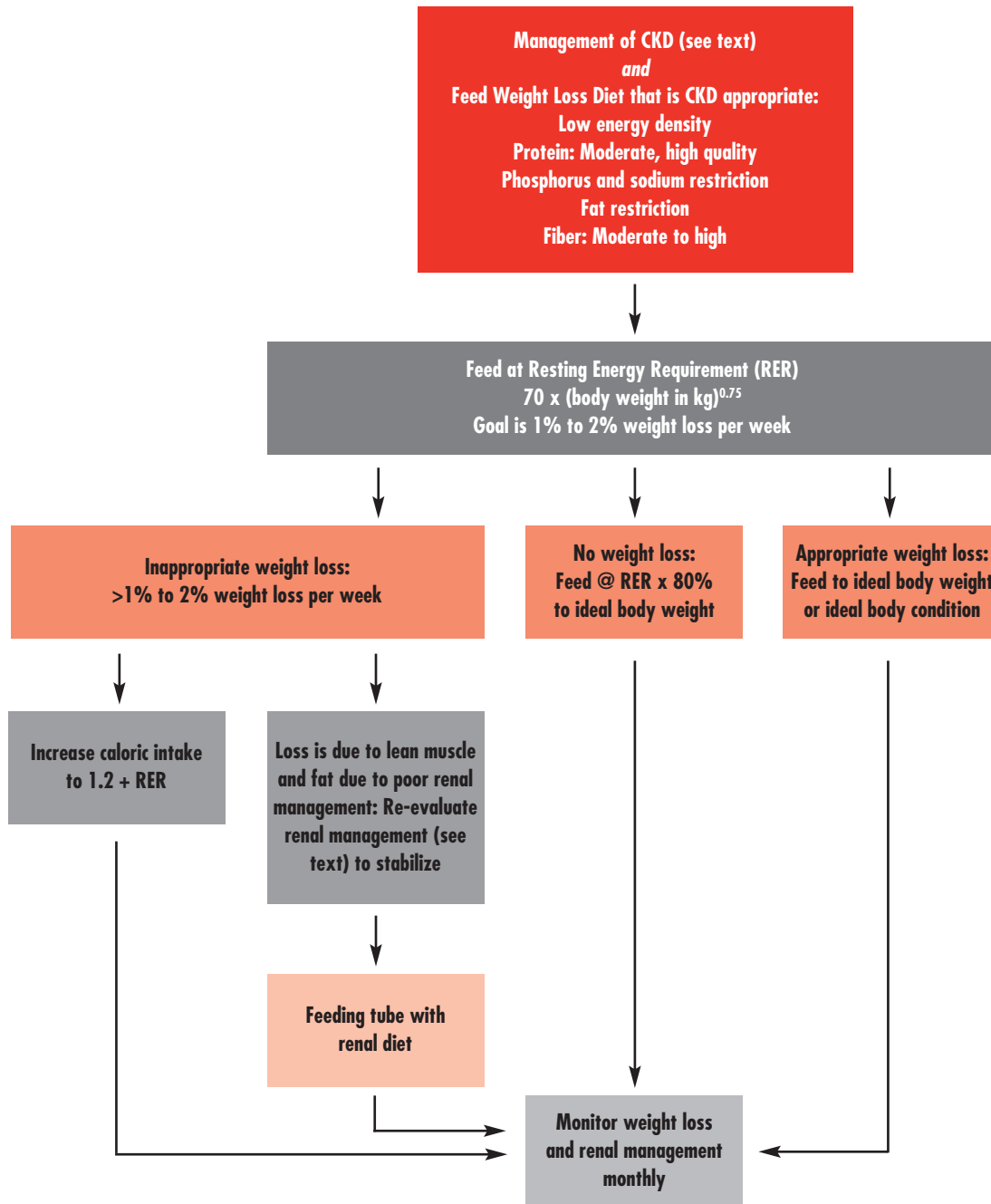
Hematocrit should be maintained between 30% and 40%. The use of recombinant human EPO or darbepoetin may be appropriate. Other factors, such as gastrointestinal ulcerations, iron deficiency, poor nutrition, hyperparathyroidism, and infections, should be considered in anemic cats.

Serum potassium levels should be between 3.5 and 5.5 mEq/L. **Hypokalemia** is more common in cats, and can be treated with oral potassium gluconate or citrate. For **hyperkalemia**, decrease dietary intake of potassium and consider reduction in dosage of ACE inhibitors or potassium supplement. If **metabolic acidosis** is not controlled by diet, initiate treatment with oral sodium bicarbonate or potassium citrate.

Malnutrition is a concern; an obese cat with CKD that experiences rapid weight loss (more than 1% to 2% body weight per week) is losing lean muscle mass (which can increase azotemia) in addition to fat or is severely dehydrated. Enteral feeding tubes should be considered to supply enough calories to prevent rapid weight loss. The enteral diet should be formulated with adequate calories, but low in phosphorus, sodium, and moderate high-quality protein or as necessitated by the patient and kidney staging. Aggressive rehydration via intravenous fluid administration is needed.

See **Algorithm: Nutritional Management of Concurrent Feline Obesity and Chronic Kidney Disease** on page 115.

Algorithm – Nutritional Management of Concurrent Canine Obesity and Chronic Kidney Disease (CKD)



Algorithm – Nutritional Management of Concurrent Feline Obesity and Chronic Kidney Disease (CKD)

