

2021 AAHA Nutrition and Weight Management Guidelines for Dogs and Cats*

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ABSTRACT

The guidelines discuss the components of a systematic approach to nutritional management of dogs and cats. A nutritional assessment, including a body condition score and muscle condition score, is a screening evaluation that should ideally be performed at every examination. Individualized nutritional recommendations, based on the nutritional assessment, should be designed to achieve and maintain an appropriate body weight and meet nutritional requirements. Communicating nutritional recommendations to clients is a challenging aspect of nutritional management because pet owners may interpret the practice team's guidance as advocacy for a particular pet food brand or a judgment of the client's ability to properly care for the pet or of the owner's own nutritional status. The guidelines discuss approaches for effective, nonjudgmental communication of dietary recommendations to clients and strategies to increase acceptance of and adherence to veterinary nutrition recommendations. Other pet nutrition topics of current interest include recommendations for particular pet life stages, breeds, and disease conditions; risk factors for nutritional deficiencies and obesity; and considerations for home-prepared diets. (*J Am Anim Hosp Assoc* 2021; 57:153–174. DOI 10.5326/JAAHA-MS-7232)

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These guidelines were prepared by a Task Force of experts convened by the American Animal Hospital Association (AAHA) and were subjected to a formal peer-review process. This document is intended as a guideline only, not an AAHA standard of care. These guidelines

and recommendations should not be construed as dictating an exclusive protocol, course of treatment, or procedure. Variations in practice may be warranted based on the needs of the individual patient, resources, and limitations unique to each individual practice setting. Evidence-based support for specific recommendations has been cited whenever possible and appropriate.

Other recommendations are based on practical clinical experience and a consensus of expert opinion. Further research is needed to document some of these recommendations. Because each case is different, veterinarians must base their decisions on the best available scientific evidence in conjunction with their own knowledge and experience.

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AAFCO (Association of American Feed Control Officials); ACVN (American College of Veterinary Nutrition); BCS (body condition score); BF% (body fat percentage); BW (body weight); CKD (chronic kidney disease); DCM (dilated cardiomyopathy); DEXA (dual-energy X-ray absorptiometry); DHF (diet history form); HPP (high-pressure processing); MER (maintenance energy requirement); MCS (muscle condition score); RER (resting energy requirement); WSAVA (World Small Animal Veterinary Association); USDA (United States Department of Agriculture)

The AAHA website (aaha.org/nutrition) contains supporting information and resources for practice teams.

Introduction

Nutritional management is a central component of a complete healthcare plan for canine and feline patients and is integral to a pet's longevity and quality of life. The positive impact of proper nutrition on health and morbidities such as chronic kidney disease (CKD), diabetes mellitus, and osteoarthritis is well accepted. Thus, a nutritional assessment of canine and feline patients should be performed on a regular basis throughout all pet life stages, ideally at each exam visit. With that goal in mind, the objectives of these guidelines are to:

- Describe how to perform an individualized, breed-specific, evidence-guided nutritional assessment for canine and feline patients.
- Provide recommendations for diagnosis, treatment, and management of under- or overweight pets.
- Provide a comprehensive list of nutrients of concern for specific health conditions.
- Offer suggestions on how to effectively communicate and educate owners about nutritional recommendations, including for weight control.
- Provide strategies to increase adherence to pet nutrition recommendations.
- Address several nutrition-related topics of current interest, including raw and home-prepared diets, breed-specific nutrition, and diet-associated dilated cardiomyopathy in dogs.

This report updates and complements previously published but still relevant nutrition-related guidelines produced by the American Animal Hospital Association. These include the *2010 AAHA Nutritional Assessment Guidelines for Dogs and Cats* and the *2014 AAHA Weight Management Guidelines for Dogs and Cats*.^{1,2} These prior guidelines address two essential components of nutritional management: assessment and weight control. The *2021 AAHA Nutrition and Weight Management Guidelines for Dogs and Cats* include other important topics necessary for a truly comprehensive approach to dietary management in primary-care companion-animal practice. These include step-by-step methods for performing a complete nutritional assessment and preparing an individualized nutritional plan as well as communication tips that promote optimal adherence to the dietary recommendations.

Practitioners have minimal or no control over certain aspects of pet health such as the patient's genetics and home environment. Nutrition, on the other hand, can be substantially influenced by the veterinarian's medical expertise and recommendations. Achieving this positive effect requires a partnership between the veterinarian, the practice team, and the pet-owner client. More so than many other pet healthcare topics, discussing nutrition with clients can include sensitive topics such as obesity, pet food choice, feeding habits, and food rewards. For that reason, these guidelines include a detailed discussion on communicating dietary recommendations to clients in a trust-based, nondefensive manner.

Practice guidelines are consensus statements developed by experts with decades of clinical experience, both evidence guided and anecdotal. These guidelines support the veterinary medical profession's bioethical obligation to its patients and their owners by giving clinicians the practical means to advocate for pets who cannot represent themselves. Guidelines such as those contained in this report enhance veterinarians' expertise, which they can leverage on behalf of their patients, thus honoring the principles of clinical bioethics that are the basis of their client-patient relationships.

It is worth noting that individualized nutritional assessments and dietary management require no specialized equipment and can be implemented with little additional time expenditure or cost. Using the approach described in these guidelines, practitioners and their healthcare teams can ensure that nutrition becomes a foundation of good health for their canine and feline patients.

How to Perform a Complete Nutritional Assessment

The five vital assessments of a standard physical exam for small animals include temperature, pulse, respiration, pain, and nutritional assessment.³ The World Small Animal Veterinary Association (WSAVA) recommends nutrition as the fifth vital assessment to optimize the health and wellbeing of pets. The AAHA Advisory Panel endorses this recommendation.

The nutritional assessment is an iterative process that requires **repeated** assessment over the animal's lifetime. The factors evaluated included animal- and diet-specific factors and feeding management (**Figure 1**). **Animal-specific factors** refer to the age, physiological status, and activity of the pet. **Diet-specific factors** include the safety and appropriateness of the diet for the specific patient. **Feeding management** encompasses not only the frequency, timing, location, and method of feeding but also the pet's environment and human-related factors. Specific problems related to each factor should be identified and addressed individually (**Table 1**).

Screening Evaluation

There are two overarching components to a complete nutritional assessment: a screening evaluation and an extended evaluation, if needed. A nutritional assessment starts with a **screening evaluation** followed by an extended evaluation if nutritional risk factors are identified (**Figure 2**). A screening evaluation should be performed on every pet at every visit. The elements of a screening nutritional assessment are not time consuming and are performed as part of a routine history and physical exam. The screening should include an evaluation of nutritional history, environment, activity level, body weight (BW), body condition score (BCS), and muscle condition



FIGURE 1

The Circle of Nutrition. Consider these interconnected variables during nutritional assessment. Factors specific to the animal, the diet, and feeding management/environment should be assessed. (Reprinted with permission from the American College of Veterinary Nutrition.)

score (MCS), followed by a complete physical exam. If nutritional risk factors are identified, an extended evaluation is recommended.

A **nutritional history** should include not only main meal items but also treats, table food, supplements, and foods used for

medication administration. The American College of Veterinary Nutrition (ACVN) and the WSAVA publish sample diet history forms (DHF).^{4,5} Longer examples are also available.⁶ To improve nutritional history accuracy, owners can be asked to complete the DHF at home. Practice team members can then verify DHF information that is incomplete or inaccurate.

BCS is a physical assessment of body fat mass (**Table 2**).^{7,8} The 9-point BCS scale is validated to correlate with body fat percentage (BF%) using dual-energy X-ray absorptiometry (DEXA).^{9,10} Every incremental increase in BCS is equivalent to a 5% increase in BF% while each BCS $\geq 5/9$ is equivalent to being 10% overweight (**Table 2**).⁹⁻¹¹ The authors suggest universal use of the 9-point (1-9) BCS scale with whole integers for the standardization of medical records, consistency of data collection and interpretation for research, and for consistent communication from veterinary team members to pet owners.

MCS is a physical assessment of the patient’s muscle mass, which includes visualization and palpation of the musculature over the spine, scapulae, skull, and pelvis (**Figure 4**).^{12,13} The authors suggest a narrative description of MCS that includes normal muscle mass or mild, moderate, or severe muscle loss. The MCS has been significantly correlated with ultrasonographic measurements of the epaxial musculature (cats and dogs) and DEXA (cats).¹⁴⁻¹⁶ The routine use of MCS is important to identify patients with muscle loss related to cachexia and sarcopenia (see terminology definitions in **Table 3**). Both cachexia and sarcopenia can adversely affect outcomes in veterinary patients.¹⁷ BCS and MCS are not causally related and should be assessed separately (e.g., an animal may be overweight

TABLE 1

Problems and Management for Animal-Specific, Diet-Specific, and Feeding Management Factors

Nutritional Assessment Factors	Problems	Examples	Management
Animal-specific factors	Nutrient-sensitive disorders	<ul style="list-style-type: none"> ● Adverse food reactions ● Overweight or obesity ● Organ-specific disease 	Selection of diets formulated to address the specific disease-associated nutrient limitations
Diet-specific factors	Diet-induced disorders	<ul style="list-style-type: none"> ● Nutrient imbalance ● Spoilage ● Contamination ● Adulteration 	Feeding a diet appropriate for the animal
Feeding management	Feeding-related and environmental-related disorders	<ul style="list-style-type: none"> ● Over- or underfeeding ● Excessive use of treats ● Poor husbandry ● Competitive eating ● Lack of appropriate environmental stimulation 	Effective communication with the client

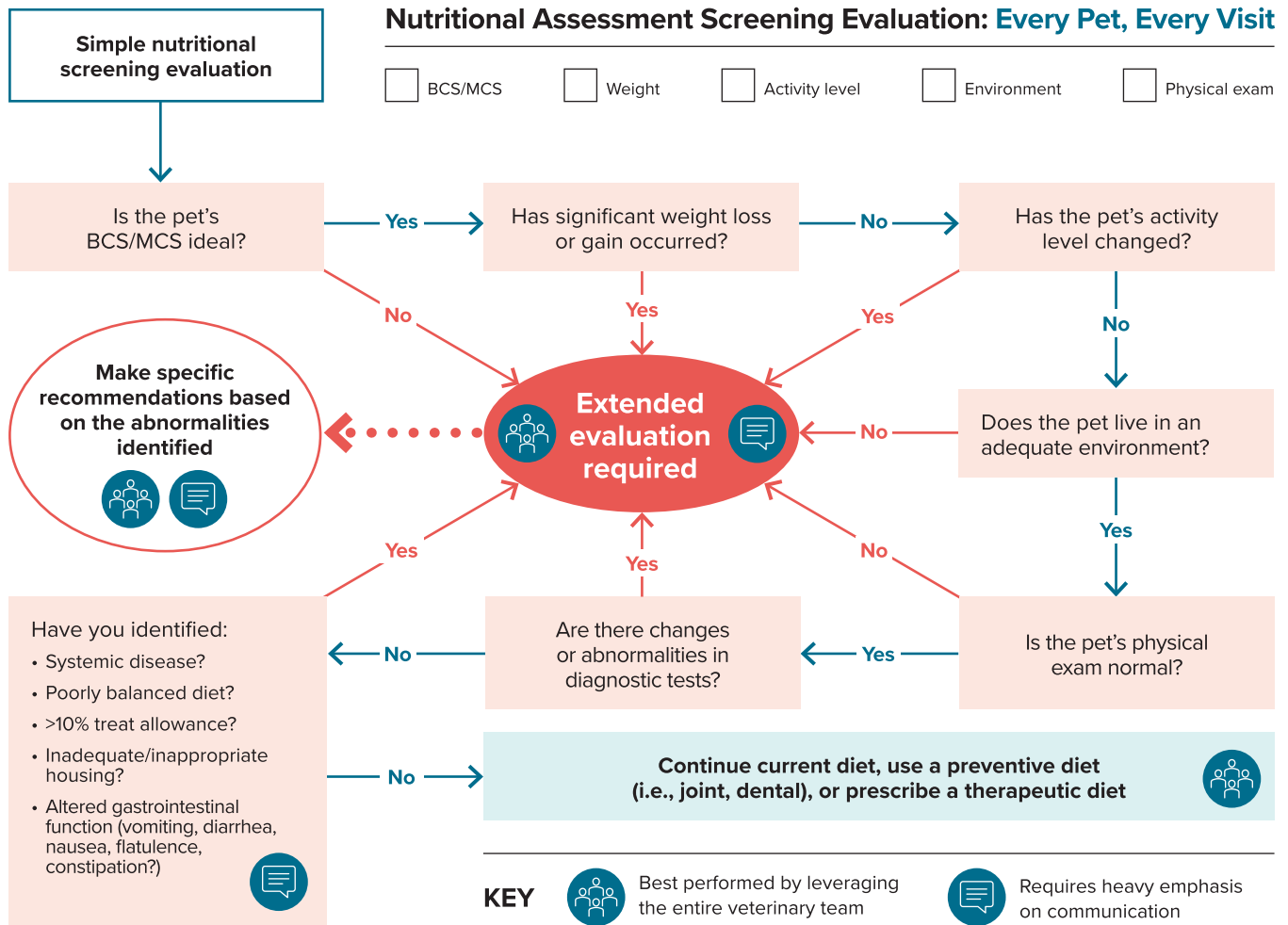


FIGURE 2

Nutritional assessment screening evaluation.

with muscle loss). Underweight patients often have loss of both body fat and muscle mass, yet BCS and MCS should still be scored separately.

Although typically not included in the screening evaluation, additional tools to be considered are the body fat index (BFI) and girth assessments. **BFI**, like BCS, is a validated scale to correlate with BF% in both the dog and cat.^{18,19} A BCS is limited in its assessment of patients with a high BF% (>45%). The BFI system is a useful tool in differentiating patients with a higher level of BF%. Morphometric measurements to assess lean body mass and fat mass have been established in the dog and cat. These measurements in addition to BFI are useful for patients with a BCS $\geq 8/9$.

Limb girth assessments, an objective measure of muscle mass and strength, are an emerging area of investigation and may prove to be valuable in specific patient populations or for specific patients. For example, this could be a tool for an orthopedic patient enrolled in a physical rehabilitation program.

A fecal score can be included in the screening assessment as a useful tool to assess stool quality and characteristics. Various fecal scoring systems have been proposed for veterinary patients.^{20,21} A fecal scoring system used repeatedly in a practice can be useful for consistent communication between the client and veterinary team members and to follow trends in fecal quality.

Screening Assessment for Hospitalized Patients

A nutritional assessment should be performed on admission and at least daily for hospitalized patients. Historical information should establish the patient's food preferences, unexplained weight change, and recent appetite changes including anorexia, hyporexia, and dysrexia (see terminology definitions in **Table 3**). The physical exam should include an assessment of mentation, an examination for the presence of ascites or edema, and an assessment of available diagnostics. BW needs to be checked at least daily to assess the hydration status of the patient. Specific feeding orders including



FIGURE 3
Components of a comprehensive nutrition history.

calculation of resting energy requirement, specific food(s) to be offered, feeding amount (based on a percentage of resting energy requirement [RER]), and frequency offered should be written and assessed daily.

TABLE 2
Summary of BCS Scales and Their Relationship with BF and BW

9-Point Scale	5-Point Scale	% BF*	% Overweight
4	2.5	15–19	Ideal
5	3	20–24	—
6	3.5	25–29	10%
7	4	30–34	20%
8	4.5	35–39	30%
9	5	40–45+	40%
>9	>5	—	>40%

* Current BW × (100 – % BF) ÷ 0.8. Lean mass is 80% of ideal weight, assuming 20% BF.

—, not applicable; BCS, body condition score; BF, body fat; BW, body weight.

Nutritional Risk Factors

The goal of the screening evaluation is to identify any nutritional risk factors from the patient’s life stage, medical/dietary history, or physical exam (Table 4). Once a nutritional risk factor(s) is identified, an extended nutritional assessment is recommended. Vulnerable life stages such as growth, gestation, lactation, and advancing age alter the patient’s energy and nutrient requirements. Previous or chronic medical conditions may have key nutritional factors to address when making new recommendations. Owners may use foods to administer medications or supplements, and dietary supplements may be a significant source of calories. Noncomplete or unbalanced food calories at >10% of a patient’s daily caloric intake dilute essential nutrients and provide excess calories. Unconventional diets should be assessed for nutritional adequacy and safety. Inadequate or inappropriate housing can contribute to stress or barriers that may cause changes in food intake.

A BCS <4/9 or >5/9, MCS with any degree of loss, and unexplained weight change from the pet’s previous assessment should prompt an extended assessment. Dental abnormalities or disease may impact food intake, leading to anorexia, hyporexia, or dysrexia. Poor skin or hair coat quality may indicate nutrition-related abnormalities. New medical conditions or diseases may benefit from specific nutritional interventions (Table 8).

Extended Evaluation

An extended nutritional assessment is an opportunity to gather a more comprehensive nutritional history and pursue clinical diagnostics (Table 5). The specifics of an extended assessment will depend on abnormal physical exam findings, the information obtained through the screening nutritional history, and identification of specific nutritional risk factors. The development of nutritional recommendations provides an opportunity for the skills of the entire veterinary team to be utilized.

How to Create Individualized Nutritional Recommendations

Feeding Plans for Healthy, Appropriate-Weight Cats and Dogs

For apparently healthy patients maintaining ideal weight, major diet adjustments are likely not required unless a nutritional risk factor is identified. When making new feeding recommendations, the following factors should be considered:

- Give specific feeding plans, including the new diet, feeding amount, feeding frequency, recommended daily treat-snack-table food-medication food allowance, and supplement adjustments.
- Diet adjustments over a 4- to 7-day period may reduce the occurrence of negative gastrointestinal responses.

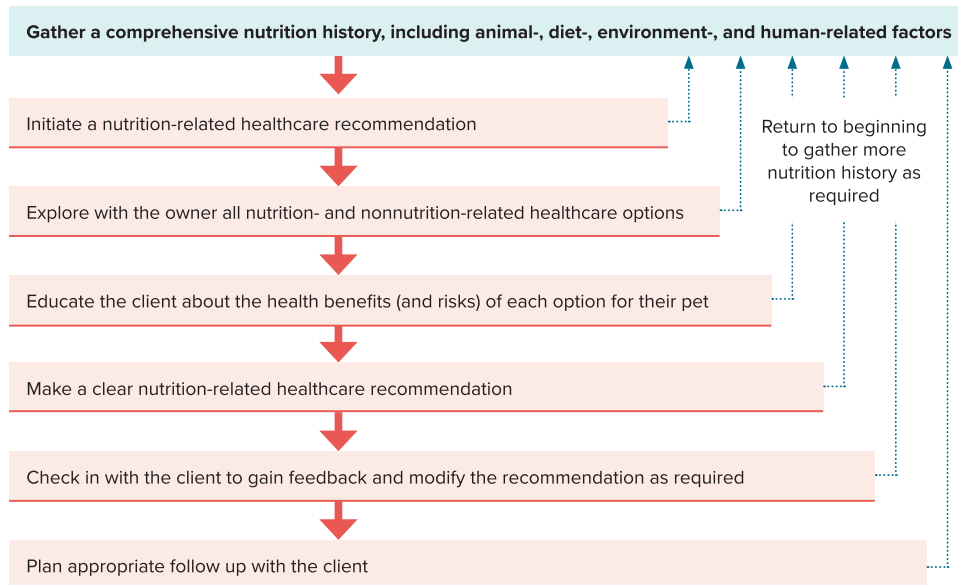


FIGURE 4

A general framework for communicating a nutrition-related healthcare recommendation.

TABLE 3

Clinically Relevant Nutrition Terms

Terminology	Definition
Cachexia	Loss of muscle mass associated with disease
Sarcopenia	Loss of muscle mass associated with aging in the absence of disease
Dysrexia	Altered food intake (e.g., altered food preferences, cyclic appetite)
Hyporexia	Decreased food intake
Anorexia	No food intake
Digestibility	The proportion of a nutrient that is digested and absorbed from the diet
Bioavailability	The proportion of a nutrient that is absorbed from the diet and used for body functions
Complete	Essential nutrients are present in the diet
Balanced	Essential nutrients are in the correct proportions in the diet

- Even with no physically apparent dietary issues, this is the opportunity to help the owner lay a better nutritional foundation for later in life. Teach owners how to assess BCS and MCS so they can recognize an undesirable change and adjust intake as needed. Owner assessment of these parameters should be verified by a member of the veterinary team.
- Discuss feeding management and other environmental factors (e.g., free-choice feeding, food competition/social hierarchy, outdoor access leading to additional calories from predation, feces, etc.) that may negatively influence their ability to adhere to the feeding plan.
- Food-dispensing toys or automated feeders are useful to control food access and amount. Feeding toys may positively affect activity level in dogs, although the benefit in cats is more related to enrichment and behavior modification.^{22–25}

When a cat or dog is healthy and maintains an appropriate weight, ensure the pet is being fed a complete and balanced diet in a suitable amount to avoid future unintended consequences. Although maintenance of ideal BW and BCS is the indicator for how well current intake meets energy needs, these parameters do not address the distribution of calories from unbalanced food items. The Association of American Feed Control Officials (AAFCO) nutritional adequacy statement indicates whether a commercial diet contains all the required nutrients in the correct ratios (i.e., “complete and balanced”) for long-term feeding to the specified life stage. Some foods, including many therapeutic diets, have an “intermittent or supplemental” use label indicating they do not meet the requirements of being “complete and balanced” or that the diet has a special nutritional or dietary purpose. Treats, snacks, and supplements do not require a nutritional adequacy statement.²⁶ If product packaging is

TABLE 4

Nutritional Screening: Risk Factors as Determined by Life Stage, Medical/Dietary History, or Physical Exam

Risk Factors	Check if Present
Life stage with specific nutritional requirements (e.g., growth, gestation, lactation, senior, geriatric)	<input type="checkbox"/>
History	
Altered gastrointestinal function (e.g., vomiting, diarrhea, reduced fecal quality, nausea, flatulence, constipation)	<input type="checkbox"/>
Previous or ongoing medical condition/disease	<input type="checkbox"/>
Currently receiving medications and/or dietary supplements	<input type="checkbox"/>
Calories from noncomplete and balanced foods > 10% of total caloric intake (e.g., commercial treats, table foods, chew bones, foods for medication administration)	<input type="checkbox"/>
Unconventional diet (e.g., raw meat based, home prepared, vegetarian, vegan)	<input type="checkbox"/>
Inadequate or inappropriate housing	<input type="checkbox"/>
Physical examination	
Body condition score < 4/9 or > 5/9	<input type="checkbox"/>
Muscle condition score with mild, moderate, or severe muscle wasting	<input type="checkbox"/>
Unexplained weight change	<input type="checkbox"/>
Dental abnormalities or disease	<input type="checkbox"/>
Poor skin or hair coat	<input type="checkbox"/>
New medical condition/disease	<input type="checkbox"/>

not available, the company’s customer service line or website may provide the information.

Assessing the overall quality of a commercial diet is challenging. Specific questions to consider asking pet food companies and their responses to a few of these questions have been published.^{27,28} The FDA also publishes searchable recall and withdrawal information, based on brand and reason for recall.²⁹

TABLE 5

Examples of Clinical Diagnostics for an Extended Nutritional Assessment

Complete blood count
Serum biochemistry
Urinalysis
Thyroid screen
Fecal flotation and antigen testing (e.g., <i>Giardia</i>)
Urine protein:creatinine ratio*
Vitamin B12 (cobalamin)*
Folate*
PLI, species specific*
TLI, species specific*
25-hydroxyvitamin D*
Whole blood or plasma taurine*
Plasma amino acids*
Abdominal and/or thoracic imaging*

*If indicated.
PLI, pancreatic lipase immunoreactivity; TLI, trypsin-like immunoreactivity.

To determine if caloric intake is suitable, calculate RER and maintenance energy requirement (MER) based on the pet’s activity and life stage factor guidelines (**Box 1**).

1. Calculate current caloric intake from all food items. AAFCO requires calorie content on dog and cat food labels, including snacks and treats; however, this does not include chews, bones, or toys.³⁰ The United States Department of Agriculture (USDA) FoodData Central system provides caloric content of whole foods.³¹ The caloric content of supplements may be listed on the label or obtained by contacting the manufacturer.
2. Compare MER with total caloric intake. Ensure the calories consumed are within a reasonable level of agreement to MER and that the main source of complete and balanced nutrition represents ≥90% of total intake whereas treats and other food items make up ≤10%.
3. If there is a significant difference between calculated MER and reported intake level, review calorie intake, life stage, activity level, and MER/RER calculation accuracy.

$$\text{RER} = \text{BW}_{\text{kg}}^{0.75} \times 70$$

$$\text{MER} = \text{RER} \times \text{life stage factor}$$

Example for a 10 lb neutered cat:

$$\text{RER} = 4.5^{0.75} \times 70 = 216$$

$$\text{MER} = 216 \times 1.2 = 259$$

Nutritional Assessment Factors	Feline Life Stage Factors*	Canine Life Stage Factors*
Neutered adults	1.2–1.4	1.4–1.6
Intact adult	1.4–1.6	1.6–1.8
Inactive/obese prone	1.0	1.0–1.2
Weight loss	0.8	1.0
Gestation	1.6–2.0	3.0 (for last 21 days)
Lactation (based on number of offspring and weeks of lactation)	2.0–6.0	3.0 to ≥6.0
Growth	2.5	<4 mo: 3.0 ≥4 mo: 2.0
Work		Light: 1.6–2.0 Moderate: 2.0–5.0 Heavy: 5.0–11.0

*The above life stage factors are general guidelines for estimating caloric intake. Sedentary and/or indoor pets may require less caloric intake than indicated above. Adjustment of caloric intake should be done by monitoring BW and BCS.

BCS, body condition score; BW, body weight; MER, maintenance energy requirement; RER, resting energy requirement.

BOX 1

Energy Requirement Calculations.⁹²

4. Consider an extended nutritional assessment, especially in overweight or underweight pets.(see preceding section on How to Perform a Nutritional Assessment).

Commercial pet foods are required to contain feeding recommendations. In an ideal world, the pet owner will perform RER/MER calculations rather than relying solely on package guidelines because AAFCO does not standardize this process. However, many owners will feed a commercial pet food according to the label directions. In such cases, it is important for the practice team to assess the dog's or cat's bodyweight, BCS, and MCS on a regular basis to ensure that the patient is receiving optimal calories and protein.

Feeding Plans for Hospitalized Patients

For hospitalized patients, base feeding calculations on current weight if ideal or underweight or on ideal BW if overweight or obese in order to provide energy to current lean mass. Support anorexic or

Convert $\text{kg}^{0.75}$ by using a scientific calculator on most smartphones:

1. Open the calculator app.
2. Turn the phone sideways. This should reveal a scientific calculator.
3. Type the weight in kg.
In this example, it would be 4.5.
4. Press the x^y button.
5. Type in 0.75.
6. The answer is $\text{kg}^{0.75}$.
In this example, it is 3.11.

hyporexic patients by specific feeding techniques (e.g., various forms of food, heating meals, remove E-collars, separate food from litter boxes and pee pads). For animals in whom there are no contraindications, high-fat diets tend to have an increased caloric density, minimizing the total food consumption volume needed to meet energy requirements. Consider medication support, including appetite stimulants, antiemetics, and prokinetics. If feeding techniques and medications do not improve total voluntary intake, assisted feeding via enteral tubes (e.g., nasal, esophageal, gastric) is strongly recommended within 72 hr of consumption of $\leq 1/3$ RER including the time before hospitalization. Because of the risk of food aversion and aspiration, oral syringe feeding is no longer recommended. Feeding protocols should promote the delivery of enteral nutrition over parenteral nutrition when assisted nutrition support is needed. Parenteral nutrition is reserved for select cases, generally in referral facilities with 24-hr care.

Prevention of Obesity

Prevention of overweight and obesity aid the patient's overall quality of life and may contribute to a lengthened life span.^{32–35} It is easier to prevent weight gain than it is to treat obesity, adding to the advantages of prevention.^{36,37} Obesity discussions can be challenging, as there may be a perception that recommendations are a judgment of the owner's ability to properly care for their pet or a judgment of the owner's own body composition. It is best to enter these conversations with compassion and sensitivity, while also remaining a steadfast advocate for the pet's wellbeing (see section on Communicating with Clients).

Obesity comorbidities include osteoarthritis and endocrine diseases (e.g., hypothyroidism, diabetes mellitus, hyperadrenocorticism).^{38–41} In some cases (e.g., feline diabetes mellitus), preventing obesity may help reduce the risk of developing the comorbidity, whereas in others (e.g., hypothyroidism), the underlying condition will continue to predispose to obesity development unless adequately managed.

In order to successfully prevent obesity, an approach including risk factor assessment and mitigation is recommended. Obesity risk factors stem from both human-related and animal-related roots (**Table 6**). A main human factor is the ability to overfeed the primary diet, and owners find it difficult to make subsequent adjustments. Animals may also overeat if they have access to another pet's food bowl. Compare reported intake against calculated requirements based on ideal BW and make downward recommendations accordingly. Reassess and adjust recommendations as needed at each subsequent visit.

Owners also have the ability to overfeed food items that are not the primary diet and overestimate their pet's activity level.⁴² Advise owners to maintain all additional item intake to $\leq 10\%$ total daily caloric intake to avoid disrupting nutrient balance of the primary diet. To increase exercise in cats, consider the use of feather toys, cat trees, exercise wheels, or similar devices. Fitness trackers may increase owner motivation to increase their dog's physical activity.⁴³

Animal factors must also be considered to effectively prevent obesity (**Table 6**). Energy requirements are reduced after spaying or neutering, necessitating intake reduction.^{44–46} Certain breeds (e.g., Labrador retrievers, beagles, Norwegian forest cats, Persians) are predisposed to weight gain and the owner should be educated regarding obesity risk, even if their pet currently has an ideal BCS.^{47,48}

Increase in BW through middle age contributes to the prevalence of obesity.^{47–49} Energy requirements are thought to decrease through middle age in the dog, which contributes to this weight gain,^{50,51} although results are not consistent.⁵² Metabolic rates in the dog can also be influenced by breed and their respective life expectancy.⁵³ During senior and geriatric life stages, loss of lean body mass and overall weight loss can occur.³⁵ In cats, fat, protein, and energy digestibility can decrease with advanced aging.^{54,55} Energy intake can be higher for senior cats to compensate for this decrease in digestibility.⁵⁶ An important aspect of obesity prevention and maintenance of ideal BCS and MCS is incorporating the entire practice team in client education. Appropriate training is essential to ensure that the team speaks with a common voice (see section on Leveraging the Value of Proper Nutrition in Your Practice).

Weight Reduction in the Obese Pet

In 2014, AAHA published comprehensive weight management guidelines, including a detailed protocol for safe weight reduction.²

Because weight loss is a critical aspect of nutritional management for many pets, the 2021 Nutrition and Weight Management Guidelines include an abbreviated overview of this topic. We encourage readers to consult the 2014 Weight Management Guidelines for more complete information on this essential aspect of nutritional management.

Once an animal has gained excess weight, the veterinary team must appropriately inform the owner, gauge their willingness to institute a weight loss program, and offer guidance and support for the duration of the program. The overall design process is reviewed in the 2014 Weight Management Guidelines. Traditional methods to calculate caloric needs are included. Recent data suggest mean caloric intake for weight loss over a 12 wk period is 63 ± 10.2 kcal/kg^{0.75} in dogs and 52 ± 4.9 kcal/kg^{0.711} in cats.^{57,58} The same principles regarding feeding plans for healthy, appropriate-weight cats and dogs apply for weight loss plans. The major difference is adjusting MER calculations to account for necessary reduced calorie intake to induce weight loss (**Box 1**). Base these calculations on ideal weight and adjust as needed for the individual patient, based on current intake and lifestyle needs.

Although the correct calculations are necessary for a successful weight management program, feeding management and activity plans are essential parts of the package. Puzzle toys and automated feeders continue to be invaluable resources that may be especially useful to achieve successful weight loss via improved ease of plan implementation by owners.^{59,60} Consider collaborating with or referring to a veterinary rehabilitation practitioner (**Table 7**) to design a comprehensive exercise plan to address desired weight loss while maintaining muscle mass based on the pet's current level of physical fitness. Use the 2014 Weight Management Guidelines for things to consider with an activity plan.

Long-term monitoring and maintenance are often the most difficult aspects of a weight loss program. Failure to achieve and maintain weight loss is common, and owner nonadherence is a major factor.^{61–63} After starting a weight loss program, reach out to the owner within the first couple days to determine if there are any immediate concerns. This can be done via phone or email and may help maintain owner adherence and reduce the risk of subsequent dropout.⁶⁴ Because owners often have a strong human-animal bond with their pets, these first few days may pose the largest obstacle as the owner reconciles a “new normal” that does not involve a constant show of love and affection via provision of food items. Weight management plans should address increasing non-food-related interactions (e.g., walks, playtime, brushing). Postappointment contact can be used to reinforce these recommendations with owners who are struggling with their commitment to the feeding restriction aspect of the plan. The 2014 Weight Management Guidelines outline monitoring and maintenance options.² The goal is to be an advocate for both the pet and the owner, while maintaining a nonjudgmental style of communication (see section on Communicating with Clients).

TABLE 6

Obesity Risk Factors

Excess calorie consumption	Causes		Management	
	Human factors			
Overfeeding primary diets	<ul style="list-style-type: none"> Lack of pet owners' awareness of <ul style="list-style-type: none"> Calorie density of food Pet's caloric needs How to feed pet (ad libitum vs meal feeding) 		<ul style="list-style-type: none"> Calculate MER using ideal weight <ul style="list-style-type: none"> Compare with current intake Weigh food using a gram scale to improve precision and accuracy vs measuring cups^{79,77} Caution when following commercial product feeding recommendation labels <ul style="list-style-type: none"> May overestimate energy requirements, causing overfeeding Use kibble as treats Switch to diet with reduced energy density Use short handouts for feeding recommendations to help inform all members of the household 	
Eating the other pets' food	<ul style="list-style-type: none"> If one pet eats faster than the other or can "bully" the other pet, one pet is eating the calories of two 		<ul style="list-style-type: none"> Feed pets separately Use automated feeders or feeders that identify pets via collar tag or microchip <ul style="list-style-type: none"> Ensure they provide a measured amount Use food-dispensing and/or foraging toys to control intake and provide enrichment and activity 	
Too many treats (>10% of diet)	<ul style="list-style-type: none"> Dilute the nutrition of the primary food 		<ul style="list-style-type: none"> Use multiple terms to capture all items being fed (e.g., treats, snacks, desserts, toppers, table foods, food scraps, human food, meal leftovers, foods for medication administration) <ul style="list-style-type: none"> Use communication strategies to elicit a more complete response Supplements (e.g., fish oil, chewable tablets, soft chews) also contain calories Keep total treat intake ≤10% of daily caloric intake <ul style="list-style-type: none"> Avoids disrupting nutrient balance of primary diet Use kibble as treats by separating out a portion of the daily primary diet quantity Measure treats into a daily treat jar Mix high- and low-calorie treat items for training Educate owners that carrots, green beans, and other human foods have calories, too Consider unintentional sources (e.g., waiting by a child's highchair, licking dinner dishes, food dropped during human food preparation process) 	
Animal factors				
Spay/neuter changes in metabolism	<ul style="list-style-type: none"> Energy requirements decrease and feeding amounts change^{44,46} Because surgery usually occurs at a young age, it is challenging to feed to support sufficient growth while avoiding excess 		<ul style="list-style-type: none"> Frequent BCS monitoring Consult growth charts⁷⁸ <ul style="list-style-type: none"> Not available for cats or giant-breed dogs If predicting ≥70 lb as adult, use diet formulated for large-breed growth <ul style="list-style-type: none"> Keep large-breed puppies at ideal BCS to reduce risk of orthopedic disease^{79,80} Switch to adult formulation when pet achieves ≥80% skeletal maturity <ul style="list-style-type: none"> May stay on "all life stages" diets Switching too early may affect nutrients necessary to support development Consider "birthday visit" to evaluate pet when transitioning between growth and maintenance life stages 	
Decreased energy expenditure	Causes		Management	
	Human factors			
	Overestimate pet's activity level	<ul style="list-style-type: none"> Owners believe their pets are more active than they actually are⁴² Insufficient exercise leads to unintentional weight gain⁹¹ 		<ul style="list-style-type: none"> Ask about specific types of activity and amount to get full picture Educate owners that exercise plays a minimal role in weight loss compared with diet Up to 30–60 min walking/trotting 3×/wk can result in muscle and adipose tissue changes, suggesting improved glucose metabolism⁸³ Increasing exercise may <ul style="list-style-type: none"> Increase energy expenditure⁸⁴ Maintain lean body mass⁸⁵ Strengthen human-animal bond⁸⁶ Fitness trackers may motivate owners to exercise their dogs⁸³ Consider feather toys, laser pointers, cat trees, exercise wheels for cats
Animal factors				
Age-related issues	<ul style="list-style-type: none"> Obesity prevalence increases through middle age^{47,48} Energy requirements may decrease with age, but this is not consistent <ul style="list-style-type: none"> Influenced by breed and respective life expectancy²³ Lean body mass decreases with age in dogs Fat, protein, and energy digestibility decreases with age in cats <ul style="list-style-type: none"> Cats will compensate by increasing total caloric intake^{54,55} 		<ul style="list-style-type: none"> Always assess BCS and MCS <ul style="list-style-type: none"> Adjust feeding plan as needed as soon as changes occur Encourage routine exercise and activity Remember that cats may actually need an increased calorie intake later in life 	
Genetic predisposition	<ul style="list-style-type: none"> Certain breeds (e.g., Labrador retrievers, beagles, Norwegian forest cats, Persians) are predisposed^{47,48,82} 		<ul style="list-style-type: none"> Inform owners of breeds with known predisposition, even if currently ideal BCS Consider breed-specific diets for likely controlled energy density with at-risk breeds 	

BCS, body condition score; MER, maintenance energy requirement; MCS, muscle condition score.

TABLE 7**Additional Resources****ACVN Diet History Form**

acvn.org/wp-content/uploads/2020/04/ACVN-Diet-History-Form-2020-FINAL_fillable.pdf

WSAVA Diet History Form

wsava.org/wp-content/uploads/2020/01/Diet-History-Form.pdf

AAFCO How to Understand a Dog or Cat Food Label

talkspetfood.aafco.org/readinglabels

ACVN Board-Certified Veterinary Nutritionist Diplomate Directory

acvn.org/directory/

PNA Manufacturer Report

petnutritionalliance.org/chart/index.php/manufacturer-report

FDA Recalls & Withdrawals

fda.gov/animal-veterinary/safety-health/recalls-withdrawals

PNA Energy Calculators

petnutritionalliance.org/dog.php?lg=en_US (dog)
petnutritionalliance.org/cat.php?lg=en_US (cat)

USDA FoodData Central

fdc.nal.usda.gov/

Waltham Puppy Growth Charts

waltham.com/resources/puppy-growth-charts

American College of Veterinary Sports Medicine and Rehabilitation Diplomate Search

vsmr.site-ym.com/search/custom.asp?id=5595

Find a Certified Canine Rehabilitation Practitioner or Certified Canine Fitness Training Professional

utvetce.com/canine-rehab-ccrp/ccrp-practitioners/
utvetce.com/canine-fitness-ccft/ccft-graduates/

Use of Therapeutic Diets Designed to Promote Weight Loss

Therapeutic weight loss diets are recommended for patients undergoing significant calorie restriction (less than or equal to RER) for weight loss. These diets are fortified in nutrients to avoid potential nutrient deficiencies associated with caloric restriction. High-protein diets can spare lean mass with calorie restriction during weight loss.^{65,66} Protein and

added fiber can promote a satiety effect.^{67,68} Added fiber to a therapeutic diet will also reduce caloric density. High-moisture diets for cats may increase satiety and help promote weight loss.⁶⁹

Use of Therapeutic Diets Not Related to Weight Loss

When the nutritional assessment indicates a patient may benefit from consuming a purpose-formulated therapeutic diet, the clinician needs to focus on specific nutrients of concern (Table 8). When a patient has a single disease condition and no additional nuanced feeding or diet requirements, it may be adequate to simply choose a therapeutic diet designed for the disease. In diseases in which diagnostics and staging affect nutrients of concern (e.g., CKD) or when patients have multiple disease conditions and/or additional feeding or diet requirements, consider all nutrients of concern before selecting a diet. Otherwise, it is easy to overlook a nutrient of concern and inhibit or negate the treatment plan for the patient's condition. For example, if a dog receiving a low-fat diet to manage chronic pancreatitis is diagnosed with CKD, a dietary change to address the CKD may result in recurrent pancreatitis symptoms if both disease conditions are not considered.

Communicating with Clients

Communicating about a dog's or cat's nutrition can be a complex topic for veterinary personnel and pet owners to navigate. Nutrition conversations start with the recognition that there are three aspects of communication to be considered.⁷⁰ First is the **content**, the medical or scientific knowledge that informs a complete and balanced nutrition recommendation, which is outlined in the majority of these guidelines. Second is the **process**, the approach used to engage a client in discussion about their dog's or cat's nutrition, which is presented throughout this section. Third is the **perceptual** aspect of communication—how the client thinks and feels about pet nutrition—which represents the assumptions, beliefs, goals, and thought process a person brings to a nutrition conversation. Although we often focus on the content of communication, it is the process and, even more often, the perceptions of staff and clients that dictate whether a nutrition conversation is successful.

What we bring to a nutrition conversation in terms of our own ideas, knowledge, and prior experiences is a critical starting point. This involves recognizing and managing our own biases and perceptions associated with pet nutrition in order to enter the conversation with an open mind. When a client's beliefs, goals, ideas, or perceptions are not aligned with our viewpoint, the client is likely to reject our viewpoint in favor of their own, regardless of the content we communicate.⁷¹ Nutrition conversations require a curiosity that allows us to be attentive and responsive to understanding our client's

TABLE 8

Nutrients of Concern for Diseases and Select Specific Conditions
















Disease Category	Specific Conditions	Nutrients of Concern	Notes	
Adverse food reaction 	Cutaneous adverse food reaction	<ul style="list-style-type: none"> Limited antigen diet <ul style="list-style-type: none"> Novel/hydrolyzed protein Limited ingredients 	<ul style="list-style-type: none"> Ingredients impact success of treatment Noningredients may also impact success (e.g., additives, Maillard production reaction) 	
	Food intolerance			
	Food-responsive chronic enteropathy			
Inflammatory skin condition 	Non-food-related skin condition	<ul style="list-style-type: none"> High n-3 fatty acids <ul style="list-style-type: none"> Consider n-6:n-3 ratio High vitamin A High vitamin E High zinc Added antioxidants 	<ul style="list-style-type: none"> Individual diseases may require different supplements and doses 	
Osteoarthritis 		<ul style="list-style-type: none"> High EPA/DHA Added glucosamine Added chondroitin Added antioxidants Low energy density if overweight/obese 	<ul style="list-style-type: none"> Additional supplementation may be required to achieve optimal dose High n-3 fatty acid supplementation may result in gastrointestinal disturbance 	
Neurologic conditions 	Cognitive dysfunction	<ul style="list-style-type: none"> Added lipoic acid Added carnitine High EPA/DHA Added antioxidants 	<ul style="list-style-type: none"> Synergistic effects of nutrients when combined. 	
	Idiopathic epilepsy	<ul style="list-style-type: none"> High medium-chain triglycerides 		
	Anxiety	<ul style="list-style-type: none"> Added L-tryptophan Added hydrolyzed casein Added antioxidants Modified fiber 		
Cardiovascular disease 	Degenerative valve disease	<ul style="list-style-type: none"> Controlled sodium High EPA/DHA Avoid low protein 	<ul style="list-style-type: none"> Supplement potassium as required Maintain optimal body and muscle condition. 	
	Hypertrophic cardiomyopathy			
	Dilated cardiomyopathy	<ul style="list-style-type: none"> Controlled sodium High EPA/DHA Avoid low protein Added taurine Added carnitine 		
Urolithiasis 	Calcium oxalate	<ul style="list-style-type: none"> Low oxalate ingredients Controlled calcium with appropriate calcium to phosphorus ratio Avoid vitamin C supplementation Low relative supersaturation Added water 	<ul style="list-style-type: none"> Many of these nutrients of concern can be incorporated into other diets but may be difficult to identify unless specifically labeled for this use Aim for USG ≤ 1.020 (dogs) or ≤ 1.035 (cats) Struve urolithiasis in dogs is typically infection related and special diet may not be required long term 	
	Struvite	<ul style="list-style-type: none"> Controlled magnesium Controlled phosphorus Controlled protein Target acidic urine pH Added water 		
	Urate	<ul style="list-style-type: none"> Low purines <ul style="list-style-type: none"> Does not necessarily mean low protein Target alkaline urine pH Added water 		
	Cystine	<ul style="list-style-type: none"> Controlled cystine Controlled methionine Target alkaline urine pH Added water 		
Lower urinary tract disease 	Matrix-crystalline plugs	<ul style="list-style-type: none"> Based on mineral content of the plug Added water 		
	Feline idiopathic cystitis	<ul style="list-style-type: none"> Added antioxidants High EPA/DHA Added water Low energy density if overweight/obese 		
Pancreatic disease 	Endocrine	Diabetes mellitus	<ul style="list-style-type: none"> High soluble and insoluble fiber Low carbohydrate (cats) High protein (unless contraindicated, e.g., proteinuria) Low energy density if overweight/obese 	<ul style="list-style-type: none"> Consistency of meal timing and insulin regimen are most important
	Exocrine	Pancreatitis	<ul style="list-style-type: none"> Low fat (dogs) Limited antigen (cats) 	<ul style="list-style-type: none"> Dietary fat recommendations may depend on baseline intake and degree of hyperlipidemia
		Exocrine pancreatic insufficiency	<ul style="list-style-type: none"> Achieve optimal body condition 	<ul style="list-style-type: none"> In most cases no specific diet is needed with appropriate enzyme supplementation Assess serum cobalamin and supplement if indicated In cases with persistent soft stool, additional fiber supplementation may be warranted

TABLE 8

Continued.

Disease Category	Specific Conditions	Nutrients of Concern	Notes	
Gastrointestinal 	Acute vomiting, diarrhea	<ul style="list-style-type: none"> Highly digestible Low to moderate fat 	<ul style="list-style-type: none"> Difficult to identify digestibility unless specifically labeled for this use 	
	Chronic enteropathy	<ul style="list-style-type: none"> Limited antigen diet <ul style="list-style-type: none"> Novel/hydrolyzed protein ± modified fiber ± low fat 	<ul style="list-style-type: none"> Assess serum cobalamin and folate and supplement if indicated 	
	Intestinal dysbiosis	<ul style="list-style-type: none"> Modified fiber 	<ul style="list-style-type: none"> Assess serum cobalamin and supplement if indicated 	
	Protein-losing enteropathy	<ul style="list-style-type: none"> Low fat ± limited antigen 		
	Fiber-responsive colitis	<ul style="list-style-type: none"> Moderate to high fiber Mixed fiber types 	<ul style="list-style-type: none"> Fiber can be separately supplemented 	
	Large bowel diarrhea			
	Constipation	<ul style="list-style-type: none"> Moderate to high fiber Mixed fiber types Low energy density if overweight/obese Increased water 	<ul style="list-style-type: none"> Investigate underlying causes (e.g., hypercalcemia, hypokalemia, obesity) 	
	Obstipation	<ul style="list-style-type: none"> Highly digestible Low energy density if overweight/obese 	<ul style="list-style-type: none"> Difficult to identify digestibility unless specifically labeled for this use Caution with high-fiber weight loss diets 	
Other endocrine 	Hyperlipidemia	<ul style="list-style-type: none"> Low fat 	<ul style="list-style-type: none"> Consider EPA/DHA supplementation 	
	Feline idiopathic hypercalcemia	<ul style="list-style-type: none"> Controlled calcium Avoid excess vitamin D Avoid excess vitamin A ± increased fiber 		
	Hyperthyroid	<ul style="list-style-type: none"> Low iodine 	<ul style="list-style-type: none"> Impossible to achieve necessary level of iodine restriction without specific formulation and production procedures Specific nutritional modification not required if hyperthyroidism is managed by other means 	
Liver disease 	Encephalopathic	<ul style="list-style-type: none"> Low protein ± B12 supplementation 	<ul style="list-style-type: none"> Avoid organ meats Consider vegetarian protein sources 	
	Nonencephalopathic	Portosystemic shunt	<ul style="list-style-type: none"> Moderate protein 	
		Microvascular dysplasia		
		Chronic hepatitis		
Copper-associated hepatopathy	<ul style="list-style-type: none"> Low copper Added zinc 	<ul style="list-style-type: none"> Only specifically designed low-copper diets are below AAFCO minimums 		
Kidney 	Protein-losing nephropathy	<ul style="list-style-type: none"> 25–50% protein reduction from current intake <ul style="list-style-type: none"> Meet essential amino acid requirements High EPA/DHA Low phosphorus if azotemic 	<ul style="list-style-type: none"> Protein recommendations will depend upon the degree of proteinuria Many medications used to address proteinuria and hypertension may exacerbate hyperkalemia, and reducing dietary potassium intake may help 	
	Acute kidney injury	<ul style="list-style-type: none"> Moderate protein 	<ul style="list-style-type: none"> Consider as a critical care disease category when hypercatabolic 	
	Chronic kidney disease	<ul style="list-style-type: none"> Low phosphorus ± potassium supplementation High EPA/DHA Increased energy density to maintain body and muscle condition (unless obese) 	<ul style="list-style-type: none"> Many medications used to address proteinuria and hypertension may exacerbate hyperkalemia, and reducing dietary potassium intake may help Consider vitamin D supplementation 	
Obesity 		<ul style="list-style-type: none"> High protein Moderate to high fiber Low energy density Increased nutrient to calorie ratio Moderate to low fat 	<ul style="list-style-type: none"> Restriction below RER is not recommended with over-the-counter products 	
Dental disease 		<ul style="list-style-type: none"> Mechanical action or masking flavor for <ul style="list-style-type: none"> Plaque or tartar reduction and/or prevention Control of bad breath odor 	<ul style="list-style-type: none"> Mechanical brushing and dental prophylaxis are most effective 	
Critical care 		<ul style="list-style-type: none"> Highly digestible Increased energy density High fat Added antioxidants Texture more amenable to tube feeding slurry use 	<ul style="list-style-type: none"> Difficult to identify digestibility unless specifically labeled for this use 	

AAFCO, Association of American Feed Control Officials; DHA, docosahexaenoic acid; EPA, eicosapentaenoic acid; RER, resting energy requirement; USG, urine specific gravity.

viewpoint. As a result, successfully communicating a nutrition recommendation to a client is heavily dependent upon understanding the client's perspective. This is gained through conducting a comprehensive nutritional history (Figure 3).

Gathering a Comprehensive Nutrition History

The nutrition history is the foundation of a nutrition recommendation in which an intricate relationship exists between conducting a nutrition history and making a relevant nutrition recommendation. A comprehensive nutrition history requires exploring all animal-, diet-, environment-, and human-related factors associated with a dog's or cat's nutrition.

To gather a comprehensive nutrition history, whether using a diet-history form or during an in-person interaction, veterinary professionals should begin with open-ended questions or statements that allow clients to share information unhindered by the practice's own goals or agenda. For example, phrases starting with "Tell me ...", "Describe ...", or "Walk me through ..." allow clients to share information that the veterinary professional may not have otherwise considered. Using open-ended inquiry during the initial screening evaluation increases efficiency while also allowing for greater detection of nutritional risk factors that can signal the need for an extended nutrition evaluation. Veterinary personnel should move from these broad exploratory lines of open-ended inquiry to more focused lines of open-ended inquiry before using closed-ended inquiry to gather specific details, that is, questions often answered with one-word responses (Table 9).

When gathering information on diet-related factors, research suggests that veterinary personnel should be cautious about starting with simple *what*-prefaced questions (e.g., "What kind of food is your pet on?").^{72,73} Although a *what*-prefaced question is commonly used by practice team members, when analyzing clients' responses, the question has been found to obtain limited diet information and to encourage defensive responses from clients.⁷² In addition, treats that a dog or cat may consume have been identified as a specific component of the diet-related history that clients are less likely to disclose,^{72,73} warranting more focused questioning or use of different wording (e.g., snacks, rewards, extra foods) to avoid the threat directly associated with the word "treat."

Communicating a Nutrition Recommendation to the Client

A common obstacle that often undermines a veterinary professional's nutrition recommendation, when sufficient nutrition history is not gathered, is that the recommendation does not align with the client's own goals or beliefs. As part of the nutritional history, when asking what the pet is being fed, we should also explore the client's rationale for feeding a specific food or brand. Exploring the client's rationale

for feeding a specific food or brand gives the practice team an understanding of the pet owner's dietary viewpoints and will help avoid misunderstandings about the practice's pet nutrition recommendations. In developing a nutrition recommendation, equal consideration must be given to animal-, diet-, environment-, and human-related factors. Similar to the nutritional assessment, developing a nutrition recommendation is an iterative rather than linear process in which returning to the nutrition history at any point may be required to gather additional information to better align a nutrition recommendation with the goals and beliefs of the client (Figure 4).

Another potential barrier to a veterinary professional's nutrition recommendation is the client's suspicion of veterinary practices being businesses that make healthcare recommendations.⁷⁴ This skepticism can be fueled when a nutrition recommendation involves a commercial pet food. In this case, it is important to recognize that there are two decisions for clients and, therefore, two separate recommendations to be made. The first recommendation is the nutrition-related healthcare recommendation (a nutrition change to manage the health of the animal preventively or to address a nutrition-related health concern). The second recommendation, when required, is a product-specific commercial diet to support the nutrition-related healthcare decision. Separating these recommendations teases apart the question of motivation (business versus healthcare) behind an overall nutrition recommendation. Here is a step-by-step approach to making a nutrition recommendation to a client:

1. Initiating a Nutrition-Related Healthcare Recommendation

The first step to a nutrition-related healthcare recommendation is initiating the conversation with the client. This should involve some form of forewarning to gauge the client's receptivity to the conversation. Asking permission is one way of respectfully assessing a client's response to a topic (e.g., "Alex, I would like to spend some time discussing Harley's [diet, weight, snacks]. Would you be open to this?"). Often, clients accept the invitation and you can move directly into the nutrition conversation. Other times, the client may show apprehension, providing an opportunity to open up the conversation to develop a greater understanding of your client's apprehension. On occasion, a client will explicitly decline this request, and nothing is lost because the client would likely not have been responsive to moving forward otherwise. By asking permission, you show respect, protect your relationship, and provide an opportunity to engage with your client's perspective, all of which contribute to greater trust when pursuing a future conversation.

2. Explore with the Owner All Nutrition- and Non-Nutrition-Related Options

Once a client is on board, you can explore all nutrition- and non-nutrition-related healthcare options. Research indicates that

TABLE 9**Examples of Open-Ended and Close-Ended Inquiry**

<p>Animal Factors</p> <p><i>Open-ended inquiry</i></p> <ul style="list-style-type: none"> • “Walk me through how (he/she) has been doing since our last visit, including any changes or concerns you have.” • “Describe for me a typical day for (him/her) including all (his/her) activities.” • “What other activities or exercise does (he/she) get during a week?” <p><i>Closed-ended inquiry</i></p> <ul style="list-style-type: none"> • “Has (he/she) experienced any: <ul style="list-style-type: none"> • vomiting? • diarrhea? • flatulence? • constipation?”
<p>Diet Factors</p> <p><i>Open-ended inquiry</i></p> <ul style="list-style-type: none"> • “Tell me everything (he/she) eats throughout a day, starting from first thing in the morning right through to the end of the day.”⁷² • “Describe for me any extra foods (he/she) receives in addition to (his/her) kibble.” • “Tell me more about all supplements or medications (he/she) receives.” • “What about other snacks, treats, table food, or food rewards?” <p><i>Closed-ended inquiry</i></p> <ul style="list-style-type: none"> • “How much are you feeding (him/her)?” • “How often are you feeding (him/her)?”
<p>Environment Factors</p> <p><i>Open-ended inquiry</i></p> <ul style="list-style-type: none"> • “Describe for me all of the people involved in feeding (him/her) including snacks, treats, or table food.” • “Tell me about the challenges at home to limiting the number of calories (he/she) consumes in a day.” <p><i>Closed-ended inquiry</i></p> <ul style="list-style-type: none"> • “Where does (he/she) spend most of their time?”
<p>Human Factors</p> <p><i>Open-ended inquiry</i></p> <ul style="list-style-type: none"> • “Tell me your thoughts on (his/her) current diet.” • “What are your thoughts on altering (his/her) diet at this time?” • “What things do you look for when choosing a food for (him/her)?” • “How will changing (his/her) diet and cutting back on the little extras impact (his/her) relationship with the people in your household?”

90% of pet owners want to be made aware of all healthcare options, regardless of cost.⁸⁷ In contrast, a focus group study found that many veterinarians identified with presenting clients with only the option the veterinarian believed to be best.^{88,89} Providing all the healthcare options actively involves clients in the decision-making process and acknowledges their autonomy. It also allows for developing greater alignment with the goals and expectations of the client. As options are presented to a client, it is not uncommon to need to return periodically to gathering more nutrition history to better align your recommendation.

3. Educate the Client About the Benefits (and Risks) of Each Nutrition Option

Critical to making any nutrition-related healthcare recommendation, whether preventive or to address a specific disease, is educating the client about the benefits of each option (or lack thereof) to the health and wellbeing of the pet (e.g., longer life, improved quality of life, reduced onset of chronic disease, resolution or management of a specific condition).⁷⁴ Research suggests that veterinarians often focus on features (e.g., a product, the time, or a service),⁹⁰ without explaining why an option may or may not provide value to the dog’s or cat’s overall health and wellbeing.

4. Make a Clear Nutrition-Related Recommendation

Research in veterinary medicine examining clients’ adherence to healthcare recommendations found that clients who were provided with a clear recommendation were seven times more likely to adhere than clients receiving an ambiguous recommendation.⁹¹ Once a client is made aware of the available options and engaged in the decision-making process, it is the veterinarian’s role to use their knowledge to make a clear recommendation that takes into consideration the nutritional assessment as well as the client’s goals.

5. Check in with the Client to Gain Feedback and Modify the Recommendation

Following a recommendation, it is important to check in with the client to see how the information was received before proceeding. This approach allows the practice team member to return to gather more nutrition history as needed or further tailor their recommendation to better align with the goals of the client. Once the client has arrived at a healthcare decision, if the decision requires a change of diet involving a commercial pet food, it is at this point the veterinary professional should move into a similar decision-making process regarding a complete and balanced commercial pet food (i.e., gather information, initiate the conversation, present options, discuss the value of each option, make a clear recommendation, check in with the client).

6. Plan Appropriate Follow-Up with the Client Once a Dietary Change Has Been Implemented

Plan for a member of the veterinary team to follow up with the client within a couple of days after a change to a dog's or cat's nutrition has been made. This is a great time to answer any additional questions, troubleshoot obstacles, or revisit the nutrition recommendation.

Managing Challenging Nutrition Conversations

It is important to acknowledge the plethora of potentially sensitive topics that exist in relation to pet nutrition. An observational study analyzing veterinarians' conversations with pet owners about pet nutrition identified evidence (reflected in verbal and nonverbal cues) that patient weight, the timing of transition from one life-stage diet to another, treats, wet versus dry foods, quality of the main commercial food, and use of human foods were subjects about which clients, veterinarians, or both demonstrated sensitivity.⁷² Other challenging nutrition conversations veterinary professionals may encounter include discussing a client's unconventional food choices, preference for or disapproval of certain ingredients (e.g., grain, by-products), or use of various nutraceuticals or supplements. Navigating these conversations requires being attentive and responsive to clients' verbal and nonverbal cues that signal sensitivity to a line of discussion. Many of these challenging conversations are driven by a veterinarian's or the practice team's beliefs, goals, ideas, or perceptions that do not align with the client's own viewpoints. In response to these challenges, it is important to be aware of our own ideas, beliefs, and judgments. Acknowledging the client's beliefs, goals, ideas, or perceptions, which does not mean agreeing with them, often provides an opportunity to further explore and understand the client's perspective. This understanding can be used to identify common ground, which can be used to bring differences in perspective into greater alignment.

Intrateam Nutrition Communication

Engaging clients in conversation about pet nutrition is a perfect veterinary-team sport, in which information is passed from one team member to another as the entire team moves toward a common goal. All team members who interact with clients should be equipped with the skills needed to perform a comprehensive nutrition history and to engage clients in a conversation about their pet's nutrition. This offers the practice team the opportunity to gather nutrition information and share this information with other members of the veterinary team who are positioned to develop a nutrition recommendation. Involving your broader team in nutrition conversations increases team engagement, boosts self-efficacy, enhances efficiency,

and emphasizes to clients that the entire practice team is there and available to support them.

How to Navigate the Emotional Connections Between Pet Food Recommendations and People

A person's personal food choices are complex and influenced by biological, economical, physical, social, psychological,⁹³ and environmental determinants.⁹⁴ Furthermore, attitudes, beliefs, and knowledge about food also affect food choice. People may anthropomorphize their own nutrition ideas to their pets.⁹⁵ Across a range of studies, common factors that influence pet food purchasing decisions include the ingredients, quality, cost, company reputation, veterinary recommendation, and ease of purchasing.^{94,96,97} Pet owners and members of the veterinary team share a common interest in the health and therapeutic benefits of nutrition. It is advantageous for the veterinary team to understand a client's perspective before making nutritional recommendations.

Emotions such as hesitation, frustration, anxiety, and suspicion of the pet owner may dominate conversations about pet nutrition. Social media, marketing messages, and pet food recalls may reinforce these emotions and support feelings of distrust. Clients may be suspicious that nutrition recommendations by the veterinary team are primarily influenced by financial incentive rather than health benefits for their pet. Some clients may feel uncomfortable or intimidated discussing a topic in which they perceive a conflict may exist, particularly with unconventional diet strategies. With regard to the veterinary team, frustration may exist when clients bring up preconceived notions about nutrition and the sources from which they have gained these ideas.⁹⁸

The veterinary team should focus on discussing nutrition in an open, honest, and approachable manner, in which the client feels comfortable and respected. Team members should identify the underlying emotional reaction to these conversations, recognize the impact of nonverbal cues, and listen to the client's concerns.⁹⁹ It is important to understand that validating a client's concern is different from agreeing with the client. The goal is not to reinforce false information but to validate concerns and come to a shared understanding.

The veterinary team must agree that there are different but appropriate strategies to optimally feed pets. If the concerns about unconventional diets are ignored, clients may turn to less reliable sources for nutritional information.¹⁰⁰ Although the benefits of conventional diets include nutritional adequacy and convenience, some clients may be concerned or skeptical about processed foods.¹⁰¹ Pet food manufacturers should provide transparency and details about the contents, research, and benefits of their diet. The veterinary team can help build a trusting relationship by alerting clients about pet food recalls and public health outbreaks if this is to happen.

Other Timely Nutrition Topics of Interest

Diet-Associated Dilated Cardiomyopathy

Dietary information is an evolving science. Although the Advisory Panel has provided current information on nutritional topics of interest, practitioners should make note of new developments that postdate these guidelines. For example, there has been increased reporting of diet-associated dilated cardiomyopathy (DCM) in dogs in the last few years.^{102–104} Previously identified risk factors include lamb and rice diets, low-protein diets, and high-fiber diets.¹⁰⁵ Certain breeds are predisposed (e.g., golden retrievers, Newfoundlands, Irish wolfhounds).^{102,106,107} Recently, more atypical dog breeds have been diagnosed with DCM. Some dogs have been documented to have taurine deficiency and subsequent DCM, whereas many of the dogs have had normal blood taurine concentrations.¹⁰² Some common dietary features in these cases included feeding a diet high in lentils or peas or feeding a grain-free diet.^{104,105}

Research is currently being conducted to determine what is contributing to diet-associated DCM in dogs. A few theories include:

1. Inclusion of ingredients that may negatively affect bioavailability of amino acids and other essential nutrients.
2. Low caloric intake relative to calculated energy needs, contributing to a relative decrease of nutrient ingestion.
3. A possible nutritional excess or toxicity.
4. A nonnutritional toxicity.
5. Additionally, as previously identified, there likely are some breed-related factors at play.

The only way to definitively diagnose DCM is via an echocardiogram, but this is an expensive test that may not be readily available to all dog owners. If a dog is exhibiting clinical signs of heart disease (e.g., new heart murmur, cardiac arrhythmia, exercise intolerance), thoracic radiographs should be performed. If there is suspicion for DCM or evidence of congestive heart failure, then an echocardiogram should be performed.

Many dog owners want guidance on what they should (or should not) be feeding their pets. Given currently available evidence, the most conservative approach is to avoid feeding grain-free diets or diets high in legumes. Because this is an evolving issue, pet owners should carefully consider the pros and cons of feeding a specific type of diet with their veterinarians. It is also incumbent upon veterinary professionals to stay current in this area of research.

Home-Prepared Diets

Home-prepared diets may include cooked or raw foods. Multiple veterinary studies of recipes found in books and on websites have shown that the majority of these recipes, even those written by veterinarians, do not provide complete and balanced nutrition.^{108–110} For pet owners who prefer to feed home-prepared diets, a consult with a

board-certified veterinary nutritionist is recommended. More information about requesting nutrition consults can be found online at the ACVN website (acvn.org/nutrition-consults/).

Once a recipe has been formulated and provided to the pet owner, it is imperative that the owner follow the recipe exactly as written to ensure that it provides complete and balanced nutrition. This is especially important regarding specific vitamin, mineral, and amino acid supplements to ensure that all micronutrient requirements are met. It is common for owners to gradually amend recipes over time,¹¹¹ so practitioners should be confirming at appointments that owners are still following specific instructions. Supplements can also change over time, so home-prepared diet recipes should be updated annually with a board-certified veterinary nutritionist.

Raw Protein Diet

AAHA does not advocate or endorse feeding pets any raw or dehydrated nonsterilized foods, including treats that are of animal origin.¹¹² Feeding a raw diet increases the risk of bacterial and protozoal pathogen transmission to the pets consuming the diet as well as to people and other animals. Several studies have documented the presence of pathogens in raw diets for pets and in the feces of dogs and cats eating the raw diets.^{113,114} Importantly, dogs and cats can shed *Salmonella* without exhibiting any clinical signs of disease.^{115,116}

Some pet food companies use high-pressure processing (HPP) to reduce bacterial numbers in their products. The efficacy of HPP to reduce bacterial numbers depends on several factors, including bacterial species, number of HPP cycles performed, pH, pressure achieved, processing time, and temperature.¹¹⁷ A pet food label claim of HPP does not equate to “sterile” food.

Age-Specific and Breed-Specific Diets

Puppies and kittens should be fed diets appropriate for growth until they reach skeletal maturity. For cats and small and medium-size dogs, this typically means feeding a diet for growth until approximately 1 yr of age. For some large- and giant-breed dogs, skeletal maturity may not be achieved until closer to 15–16 mo, and it is important to support a giant-breed puppy’s growth accordingly, aiming to maintain a lean BCS and avoiding excessive calcium intake.^{118,119}

Energy requirements can vary as pets age, but there are no specific nutritional requirements set by AAFCO for mature, senior, or geriatric pets. Thus, pet owners and veterinarians should not feel compelled to automatically change a pet’s diet once it reaches a certain age. If an older dog or cat is doing well with its complete and balanced adult maintenance diet, it is perfectly appropriate to continue feeding that diet until a medical condition prompts otherwise.

This becomes especially true when considering that there is no consensus among different pet food manufacturers about what should constitute a “senior” pet food. Significant variability has been documented among pet foods marketed for senior dogs.^{120,121} Although certain companies have their own standards, this is not true across the board. Thus, practitioners should use caution with the recommendation to feed any senior or mature diet to a cat with CKD who will not readily accept a veterinary therapeutic renal diet. This may result in unintentionally feeding excessive phosphorus to the patient.

Some pet food companies market breed-specific diets. These diets may be designed to accommodate certain breed predispositions (e.g., a lower-calorie food for an overweight-prone dog breed) or the kibble may be shaped in a way to help prehension. Ultimately, nutritional recommendations should be made based on the individual pet and the specific nutrient profile of the diet.

Microbiome, Probiotics, Postbiotics

The importance of a healthy gut microbiome has recently received more attention in the veterinary community. There are many ways in which the gut microbiome influences organ systems beyond the gastrointestinal tract.¹²² There are several ways to qualify and quantify an animal’s microbiome. Although the microbiome is routinely evaluated in research settings, its clinical application is currently limited.¹²² Pet owners and veterinary professionals should be wary of companies advertising to test a pet’s microbiome, especially if supplements are then recommended.

An animal’s microbiome can be affected by diet, antibiotics, probiotics, prebiotics, or fecal microbiome transplant. In many cases, soft stool or diarrhea can be effectively managed with a diet change, by modifying specific ingredients, dietary fat, or fiber intake.¹²³ Using indiscriminate antibiotics for acute diarrhea is not recommended.¹²⁴ Caution should be exercised when choosing a probiotic because there is variable quality control and efficacy among supplements.^{125,126}

Opportunities and Resources to Leverage the Value of Proper Nutrition in Your Practice

Proper nutrition is one of the most important factors in the management of health and disease in pets. Veterinary healthcare teams that understand and embrace clinical nutrition and demonstrate in-clinic behaviors consistent with that conviction will benefit not only patients and clients but also their practice and the profession.

Pet owners have access to vast information resources and are subsequently becoming more educated and bringing detailed questions to the healthcare team. This provides an excellent opportunity for the veterinary team to properly educate the client. Integrating

nutritional assessments into a practice requires commitment and engagement of the entire veterinary team. This dedication and participation in developing a strong nutrition program will promote success, optimal pet health, the client-pet relationship, and a long-term client relationship with the practice. There are many benefits to implementing a team approach to the practice mission and the veterinary team. The veterinary technician is poised to lead the initiative to provide nutritional care for all patients. Group effort increases efficiency by distributing workload and delivering an integrated cohesive message about the importance of nutrition and the value of preventive care. When roles are delegated, everyone contributes to success and individual motivation increases to accomplish results.

A Team Approach

Providing optimal nutritional management to patients requires the entire practice team with whom the client interacts. Using the entire team increases morale, utilization, and revenue for the hospital. The client service team should facilitate the completion of a diet history form before the appointment. Veterinary technicians should assess the patient’s BCS, BW, and MCS and take a history from the pet owner including a nutritional history. This information should be relayed to the veterinarian, who uses it along with further questioning, diagnostics, and the exam to make a nutritional recommendation. To ensure client adherence, the recommendation is supported and further explained to the client by the veterinary technician or assistant. This explanation is an educational process involving how the nutritional recommendation impacts the disease process and in turn the health and wellbeing of a patient, and it allows for questions from the client.

Once a nutrient profile, portion, and feeding schedule have been prescribed, the next steps toward success are follow-through by the veterinary healthcare team and accountability. An easy-to-implement program leverages the veterinary team to partner with the client to position the pet toward optimal health.

In executing this approach, the client makes an appointment (before leaving the practice) for a weigh-in and a body composition–muscle composition assessment. A member of the practice team follows up with the client by phone or email within the first couple of days. The client then returns for the subsequent visit, the pet is weighed, and the BCS-MCS is assessed and recorded in the medical record. The feeding plan is reviewed and verified with the client. The target weight is reviewed, and the goal is adjusted if needed. Questions from the client are encouraged and answered. Finally, dietary portioning is adjusted if needed and the next assessment appointment is scheduled.

There are multiple ways to fine-tune an accountability program to enhance its value to the client, to the veterinary healthcare team,

to the patient, and ultimately to the practice. Some nuances to consider include:

- Pair each patient with a specific team member. This creates continuity for the client, patient, and practice. It allows that team member to note the trend of the pet's progress toward optimal body composition. The continuity of contact builds trust with the client, potentially reduces fear for the patient, and further bonds the client to the practice. This helps to set the practice apart in a crowded marketplace and enhances the role of the team member, allowing that person to contribute to the success of the practice and the practice's nutritional goals.
- Set boundaries or "rules" for this assessment and accountability program. For instance, a formal appointment should be on the clinic's schedule and the value to the patient of checking in regularly explained to the client. Consider an appropriate interval for these visits. Four to 8 wk apart is reasonable. These assessments should stand independent of the pet's wellness or preventive care appointments.
- Consider creating a small incentive or "thank you" for the client. This acknowledges the client's investment in helping their pet to be as healthy as possible.
- Recognize that clients who involve their pets in a weight management program enter the practice more frequently. This provides multiple opportunities for the client to mention or a veterinary team member to recognize medical issues that require attention. Any of these articulated concerns can lead to scheduling a formal appointment, allowing the practice team to catch and deal with a medical issue early before it progresses and expands into something more serious.

Summary

Nutrition is the foundation of pet health and wellbeing and should be a central component of every canine and feline patient's health-care plan. An objective nutritional assessment is the initial step in a systematic approach to nutritional management. When performed at each exam visit, the assessment considers such evolving factors as the patient's age, health status, and lifestyle-related risk factors. Based on the assessment, patient-specific nutrition recommendations can be made. Besides health maintenance, these recommendations often have specific therapeutic goals such as weight loss or dietary support of chronic or acute disease conditions.

Client attitudes toward pet nutrition, informed by commercial or nonscientific information, are often based on individual biases and subjective but strongly held beliefs. For this reason, effective client communication is an important factor in achieving adherence with dietary recommendations. Nutrition conversations with clients should focus on messaging content as well as the communication process, with the goal of ensuring that the client has a positive perception of the practitioner's nutritional recommendations. A key element of productive discussions on pet nutrition is to understand the client's viewpoint on topics such as pet food choice, dietary rewards, and weight control.

Integrating nutritional management as a vital part of the practice's culture requires the commitment and engagement of the entire

veterinary team. A unified approach to implementing an effective nutrition program will promote optimal pet health, therapeutic success, a strong veterinarian-client-pet relationship, and a long-term client association with the practice. ■

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REFERENCES

1. Baldwin K, Barges J, Buffington T, et al. AAHA Nutritional Assessment Guidelines for Dogs and Cats. *J Am Anim Hosp Assoc* 2010;46:285–96.
2. Brooks D, Churchill J, Fein K, et al. 2014 AAHA Weight Management Guidelines for Dogs and Cats. *J Am Anim Hosp Assoc* 2014;50:1–11.
3. WSAVA Nutritional Assessment Guidelines Task Force Members, Freeman L, Becvarova I, et al. WSAVA Nutritional Assessment Guidelines. *J Small Anim Pract* 2011;52:385–96.
4. American College of Veterinary Nutrition. ACVN Diet History Form. Available at: http://acvn.org/wp-content/uploads/2020/04/ACVN-Diet-History-Form-2020-FINAL_fillable.pdf. Accessed May 20, 2020.
5. World Small Animal Veterinary Association. Short Diet History Form. Available at: <https://wsava.org/wp-content/uploads/2020/01/Diet-History-Form.pdf>. Accessed May 20, 2020.
6. Murphy M, German AJ, Cline MG. Establishing a weight management program in clinical practice. In: Cline MG, Murphy M, eds. *Obesity in the Dog and Cat*. 1st ed. Boca Raton (FL): CRC Press; 2019:133–61.
7. Canine Body Condition Score. Available at: <https://wsava.org/wp-content/uploads/2020/01/Body-Condition-Score-Dog.pdf>. Accessed April 17, 2021.
8. Feline Body Condition Score. Available at: <https://wsava.org/wp-content/uploads/2020/02/Body-Condition-Score-Cat.pdf>. Accessed October 23, 2020.
9. Laflamme D. Development and validation of a body condition score system for dogs. *Canine Pract* 1997;22:10–5.
10. Laflamme D. Development and validation of a body condition score system for cats: a clinical tool. *Feline Pract* 1997;25:13–8.
11. Bjornvad CR, Nielsen DH, Armstrong PJ, et al. Evaluation of a nine-point body condition scoring system in physically inactive pet cats. *Am J Vet Res* 2011;72:433–7.
12. Canine Muscle Condition Score. Available at: <https://wsava.org/wp-content/uploads/2020/01/Muscle-Condition-Score-Chart-for-Dogs.pdf>. Accessed October 23, 2020.
13. Feline Muscle Condition Score. Available at: <https://wsava.org/wp-content/uploads/2020/01/Muscle-Condition-Score-Chart-for-Cats.pdf>. Accessed October 23, 2020.
14. Freeman LM, Michel KE, Zanghi BM, et al. Evaluation of the use of muscle condition score and ultrasonographic measurements for assessment of muscle mass in dogs. *Am J Vet Res* 2019;80:595–600.
15. Freeman LM, Michel KE, Zanghi BM, et al. Usefulness of muscle condition score and ultrasonographic measurements for assessment of muscle mass in cats with cachexia and sarcopenia. *Am J Vet Res* 2020;81:254–9.
16. Michel KE, Anderson W, Cupp C, et al. Correlation of a feline muscle mass score with body composition determined by dual-energy X-ray absorptiometry. *Br J Nutr* 2011;106(suppl 1):S57–9.
17. Freeman LM. Cachexia and sarcopenia: emerging syndromes of importance in dogs and cats. *J Vet Intern Med* 2012;26:3–17.

18. Witzel AL, Kirk CA, Henry GA, et al. Use of a novel morphometric method and body fat index system for estimation of body composition in overweight and obese dogs. *J Am Vet Med Assoc* 2014;244:1279–84.
19. Witzel AL, Kirk CA, Henry GA, et al. Use of a morphometric method and body fat index system for estimation of body composition in overweight and obese cats. *J Am Vet Med Assoc* 2014;244:1285–90.
20. Purina Veterinary Diets. Available at: <https://www.proplanveterinarydiets.ca/wp-content/uploads/2016/04/PPPVD-Fecal-Scoring-Chart-EN-FINAL.pdf>. Accessed April 19, 2021.
21. The Waltham Faeces Scoring System. Available at: <https://www.waltham.com/sites/g/files/jydp1046/files/2020-05/waltham-scoring.pdf>. Accessed April 19, 2021.
22. Su DK, Murphy M, Hand A, et al. Impact of feeding method on overall activity of indoor, client-owned dogs. *J Small Anim Pract* 2019;60:438–43.
23. Naik R, Witzel A, Albright JD, et al. Pilot study evaluating the effect of feeding method on overall activity of neutered indoor pet cats. *J Vet Behav* 2018;25:9–13.
24. Clarke DL, Wrigglesworth D, Holmes KI, et al. Using environmental and feeding enrichment to facilitate feline weight loss. *J Anim Physiol Anim Nutr* 2005;89:427.
25. Dantas LMS, Delgado MM, Johnson I, et al. Food puzzles for cats: feeding for physical and emotional wellbeing. *J Feline Med Surg* 2016;18:723–32.
26. AAFCO. Model Regulations for Pet Food and Specialty Pet Food Under the Model Bill. 2021 Official Publication of the Association of American Feed Control Officials; 2021:150.
27. World Small Animal Veterinary Association. Selecting the Best Food for your Pet. Available at: <https://wsava.org/wp-content/uploads/2020/01/Selecting-the-Best-Food-for-your-Pet.pdf>. Accessed May 20, 2020.
28. Pet Nutrition Alliance. Dare to Ask™ Nutritional Comparison Manufacturer Report. Available at: <https://www.petnutritionalliance.org/chart/index.php/manufacturer-report>. Accessed May 20, 2020.
29. Center for Veterinary Medicine. Recalls & Withdrawals. FDA 2020. Available at: <https://www.fda.gov/animal-veterinary/safety-health/recalls-withdrawals>. Accessed May 20, 2020.
30. AAFCO. Model Regulations for Pet Food and Specialty Pet Food Under the Model Bill. 2021 Official Publication of the Association of American Feed Control Officials; 2021:151–2.
31. United States Department of Agriculture (USDA) Agriculture Research Service. FoodData Central. Available at: <https://fdc.nal.usda.gov/>. Accessed June 17, 2020.
32. German AJ, Holden SL, Wiseman-Orr ML, et al. Quality of life is reduced in obese dogs but improves after successful weight loss. *Vet J* 2012;192:428–34.
33. Yam PS, Butowski CF, Chitty JL, et al. Impact of canine overweight and obesity on health-related quality of life. *Prev Vet Med* 2016;127:64–9.
34. Kealy RD, Lawler DF, Ballam JM, et al. Effects of diet restriction on life span and age-related changes in dogs. *J Am Vet Med Assoc* 2002;220:1315–20.
35. Penell JC, Morgan DM, Watson P, et al. Body weight at 10 years of age and change in body composition between 8 and 10 years of age were related to survival in a longitudinal study of 39 Labrador retriever dogs. *Acta Vet Scand* 2019;61:42.
36. German AJ, Titcomb JM, Holden SL, et al. Cohort study of the success of controlled weight loss programs for obese dogs. *J Vet Intern Med* 2015;29:1547–55.
37. Vasconcellos RS, Venturelli Goncalves KN, Borges NC, et al. Male and female cats have different regional body composition and energy requirements for weight loss and weight maintenance. *J Anim Physiol Anim Nutr* 2019;103:1546–55.
38. Smith G, Paster ER, Powers MY, et al. Lifelong diet restriction and radiographic evidence of osteoarthritis of the hip joint in dogs. *J Am Vet Med Assoc* 2006;229:690–3.
39. Greco DS, Royschuk RA, Ogilvie GK, et al. The effect of levothyroxine treatment on resting energy expenditure of hypothyroid dogs. *J Vet Intern Med* 1998;12:7–10.
40. Scarlett JM, Donoghue S. Associations between body condition and disease in cats. *J Am Vet Med Assoc* 1998;212:1725–31.
41. Cho K-D, Paek J, Kang JH, et al. Serum adipokine concentrations in dogs with naturally occurring pituitary-dependent hyperadrenocorticism. *J Vet Intern Med* 2014;28:429–36.
42. Slater MR, Robinson LE, Zoran DL, et al. Diet and exercise patterns in pet dogs. *J Am Vet Med Assoc* 1995;207:186–90.
43. Zamansky A, van der Linden D, Hadar I, et al. Log my dog: perceived impact of dog activity tracking. *Computer* 2019;52:35–43.
44. Martin L, Siliart B, Dumon H, et al. Leptin, body fat content and energy expenditure in intact and gonadectomized adult cats: a preliminary study. *J Anim Physiol Anim Nutr* 2001;85:195–9.
45. Root MV, Johnston SD, Olson PN. Effect of prepuberal and postpuberal gonadectomy on heat production measured by indirect calorimetry in male and female domestic cats. *Am J Vet Res* 1996;57:371–4.
46. Jeusette I, Detilleux J, Cuvelier C, et al. Ad libitum feeding following ovariectomy in female beagle dogs: effect on maintenance energy requirement and on blood metabolites. *J Anim Physiol Anim Nutr* 2004;88:117–21.
47. Lund EM, Armstrong PJ, Kirk CA, et al. Prevalence and risk factors for obesity in adult dogs from private US veterinary practices. *Int J Appl Res Vet Med* 2006;4:177–86.
48. Lund EM, Armstrong PJ, Kirk CA, et al. Prevalence and risk factors for obesity in adult cats from private US veterinary practices. *Int J Appl Res Vet Med* 2005;3:91.
49. Adams VJ, Watson P, Carmichael S. Exceptional longevity and potential determinants of successful ageing in a cohort of 39 Labrador retrievers: results of a prospective longitudinal study. *Acta Vet Scand* 2016;58:29.
50. Laflamme DP, Martineau B, Jones B, et al. Effect of age on maintenance energy requirements and apparent digestibility of canine diets. *Compend Contin Educ Small Animal Pract* 2000;22:113.
51. Divol G, Priymenko N. A new model for evaluating maintenance energy requirements in dogs: allometric equation from 319 pet dogs. *J Nutr Sci* 2017;6:e53.
52. Bermingham EN, Thomas DG, Cave NJ, et al. Energy requirements of adult dogs: a meta-analysis. *PLoS One* 2014;9:e109681.
53. Speakman JR, van Acker A, Harper EJ. Age-related changes in the metabolism and body composition of three dog breeds and their relationship to life expectancy. *Aging Cell* 2003;2:265–75.
54. Teshima E, Brunetto MA, Vasconcellos RS, et al. Nutrient digestibility, but not mineral absorption, is age-dependent in cats. *J Anim Physiol Anim Nutr (Berl)* 2010;94:e251–8.
55. Perez-Camargo G. Cat nutrition: what is new in the old? *Compend Contin Educ Pract Vet* 2004;26:5–10.
56. Taylor EJ, Adams C, Neville R. Some nutritional aspects of ageing in cats and dogs. *Proc Nutr Soc* 1995;54:645–56.
57. Flanagan J, Bissot T, Hours M-A, et al. An international multi-centre cohort study of weight loss in overweight cats: differences in outcome in different geographical locations. *PLoS One* 2018;13:e0200414.
58. Flanagan J, Bissot T, Hours M-A, et al. Success of a weight loss plan for overweight dogs: the results of an international weight loss study. *PLoS One* 2017;12:e0184199.

59. Rollins AW, Murphy M, Moyers TD. Use of an automatic feeder for weight loss in multiple cat households: preliminary results [abstract]. *J Anim Physiol Anim Nutr (Berl)* 2020;104:405.
60. Lambrecht KJ, Hardar BN, Bernardo TM. Preliminary results using home pet health technology in a multiple cat household weight management program. Abstracts of the 20th AAVN Clinical Nutrition & Research Symposium [abstract]. *J Anim Physiol Anim Nutr (Berl)* 2020;104:1588.
61. Porsani MYH, Teixeira FA, Amaral AR, et al. Factors associated with failure of dog's weight loss programmes. *Vet Med Sci* 2020;6:299–305.
62. Deagle G, Holden SL, Biourge V, et al. Long-term follow-up after weight management in obese cats. *J Nutr Sci* 2014;3:e25.
63. German AJ, Holden SL, Morris PJ, et al. Long-term follow-up after weight management in obese dogs: the role of diet in preventing regain. *Vet J* 2012;192:65–70.
64. American Animal Hospital Association. Compliance: taking quality care to the next level: a report of the 2009 AAHA compliance follow-up study. Lakewood (CO): American Animal Hospital Association; 2009:18. Available at: <https://secure.aahanet.org/eweb/images/student/pdf/Compliance.pdf>.
65. des Courtis X, Wei A, Kass PH, et al. Influence of dietary protein level on body composition and energy expenditure in calorically restricted overweight cats. *J Anim Physiol Anim Nutr (Berl)* 2015;99(3):474–82.
66. Blanchard G, Nguyen P, Gayet C, et al. Rapid weight loss with a high-protein low-energy diet allows the recovery of ideal body composition and insulin sensitivity in obese dogs. *J Nutr* 2004;134(suppl 8):2148S–50S.
67. Bissot T, et al. Novel dietary strategies can improve the outcome of weight loss programmes in obese client-owned cats. *J Feline Med Surg* 2010;12:104–12.
68. Weber M, Bissot T, Servet E, et al. A high-protein, high-fiber diet designed for weight loss improves satiety in dogs. *J Vet Intern Med* 2007;21:1203–8.
69. Wei A, Fascetti AJ, Villaverde C, et al. Effect of water content in a canned food on voluntary food intake and body weight in cats. *Am J Vet Res* 2011;72:918–23.
70. Kurtz S, Silverman J, Draper J. *Teaching and Learning Communication Skills in Medicine*. 2nd ed. Oxford (UK): Radcliffe; 2005.
71. Tuckett D, Boulton M, Olson C, et al. *Meeting between Experts: An Approach to Sharing Ideas in Medical Consultations*. London: Tavistock Publications; 1985.
72. MacMartin C, Wheat HC, Coe JB, et al. Effect of question design on dietary information solicited during veterinarian-client interactions in companion animal practice in Ontario, Canada. *J Am Vet Med Assoc* 2015;246:1203–14.
73. Coe JB, O'Connor R, MacMartin C, et al. Effects of three diet history questions on the amount of information gained from a sample of pet owners in Ontario, Canada. *J Am Vet Med Assoc* 2020;256:469–78.
74. Coe JB, Adams CL, Bonnett BN. A focus group study of veterinarians' and pet owners' perceptions of the monetary aspects of veterinary care. *J Am Vet Med Assoc* 2007;234:1418–24.
75. German AJ, Holden SL, Mason SL, et al. Imprecision when using measuring cups to weigh out extruded dry kibbled food. *J Anim Physiol Anim Nutr* 2011;95:368–73.
76. Murphy M, Lusby AL, Bartges JW, et al. Size of food bowl and scoop affects amount of food owners feed their dogs. *J Anim Physiol Anim Nutr* 2012;96:237–41.
77. Coe JB, Rankovic A, Edwards TR, et al. Dog owner's accuracy measuring different volumes of dry dog food using three different measuring devices. *Vet Rec* 2019;185:599.
78. WALTHAM Petcare Science Institute. Puppy Growth Charts. Available at: <https://www.waltham.com/resources/puppy-growth-charts>.
79. Kealy RD, Lawler DF, Ballam JM, et al. Effects of diet restriction on life span and age-related changes in dogs. *J Am Vet Med Assoc* 2002;220:1315–1320.
80. Kealy RD, Lawler DF, Ballam JM, et al. Five-year longitudinal study on limited food consumption and development of osteoarthritis in coxofemoral joints of dogs. *J Am Vet Med Assoc* 1997;210:222–5.
81. German AJ, Blackwell E, Evans M, et al. Overweight dogs exercise less frequently and for shorter periods: results of a large online survey of dog owners from the UK. *J Nutr Sci* 2017;6:e11.
82. Corbee RJ. Obesity in show cats. *J Anim Physiol Anim Nutr* 2014;98:1075–80.
83. Herrera Uribe J, Vitger AD, Ritz C, et al. Physical training and weight loss in dogs lead to transcriptional changes in genes involved in the glucose-transport pathway in muscle and adipose tissues. *Vet J* 2016;208:22–7.
84. Warren BS, Wakshlag JJ, Maley M, et al. Use of pedometers to measure the relationship of dog walking to body condition score in obese and non-obese dogs. *Br J Nutr* 2011;106(suppl 1):S85–9.
85. Vitger AD, Stallknecht BM, Nielsen DH, et al. Integration of a physical training program in a weight loss plan for overweight pet dogs. *J Am Vet Med Assoc* 2016;248:174–82.
86. Curl AL, Bibbo J, Johnson RA. Dog walking, the human-animal bond and older adults' physical health. *Gerontologist* 2017;57:930–9.
87. American Animal Hospital Association. *The Path to High-Quality Care. Practical Tips for Improving Compliance*. Lakewood (CO): American Animal Hospital Association; 2003.
88. Coe JB, Adams CL, Bonnett BN. A focus group study of veterinarians' and pet owners' perceptions of veterinarian client communication in companion animal practice. *J Am Vet Med Assoc* 2008;233:1072–80.
89. Janke N, Coe JB, Bernardo TM, et al. Pet owners' and veterinarians' perceptions of information exchange and clinical decision-making in companion animal practice. *PLoS One* 2021;16:e0245632.
90. Coe JB, Adams CL, Bonnett BN. Prevalence and nature of cost discussions during clinical appointments in companion animal practice. *J Am Vet Med Assoc* 2009;231:1510–8.
91. Kanji N, Coe JB, Adams CL, et al. Effect of veterinarian-client-patient interactions on client adherence to dentistry and surgery recommendations in companion-animal practice. *J Am Vet Med Assoc* 2012;240:427–36.
92. Gross KL, Jewell DE, Yamka RM, et al. Macronutrients. In: Hand MS, Thatcher CD, Remillard RL, et al., eds. *Small Animal Clinical Nutrition*. 5th ed. Topeka (KS): Mark Morris Institute; 2010:61.
93. The European Food Information Council (EUFIC). The Determinants of Food Choice. Available at: <https://www.eufic.org/en/healthy-living/article/the-determinants-of-food-choice>. Accessed May 30, 2020.
94. Conway DMP, Saker KE. Consumer attitude toward the environmental sustainability of grain-free pet foods. *Front Vet Sci* 2018;5:170.
95. Boni SE. Anthropomorphism: how it affects the human-canine bond. *J Appl Compan Anim Behav* 2008;2:16–21.
96. Schleicher M, Cash SB, Freeman LM. Determinants of pet food purchasing decisions. *Can Vet J* 2019;60:644–50.
97. Simonsen JE, Fassenko GM, Lillywhite JM. The value-added dog food market: do dog owners prefer natural or organic dog foods? *J Agric Sci* 2014;6:86–97.
98. Morelli G, Bastianello S, Catellani P, et al. Raw meat-based diets for dogs: survey of owners' motivations, attitudes and practices. *BMC Vet Res* 2019;15:74.

99. Michel KE, Willoughby KN, Abood SK, et al. Attitudes of pet owners toward pet foods and feeding management of cats and dogs. *J Am Vet Med Assoc* 2008;233:1699–703.
100. Parr JM, Remillard RL. Handling alternative dietary requests from pet owners. *Vet Clin North Am Small Anim Pract* 2014;44(4):667.
101. Laflamme D, Izquierdo O, Eirmann L, et al. Myths and misperceptions about ingredients used in commercial pet foods. *Vet Clin North Am Small Anim Pract* 2014;44(4):689.
102. Kaplan JL, Stern JA, Fascetti AJ, et al. Taurine deficiency and dilated cardiomyopathy in golden retrievers fed commercial diets. *PLoS One* 2018;13(12):e0209112.
103. Adin D, DeFrancesco TC, Keene B, et al. Echocardiographic phenotype of canine dilated cardiomyopathy differs based on diet type. *J Vet Cardiol* 2019;21:1–9.
104. Food and Drug Administration. FDA Investigation into Potential Link between Certain Diets and Canine Dilated Cardiomyopathy. Available at: <https://www.fda.gov/animal-veterinary/outbreaks-and-advisories/fda-investigation-potential-link-between-certain-diets-and-canine-dilated-cardiomyopathy>. Accessed October 23, 2020.
105. Freeman LM, Stern JA, Fries R, et al. Diet-associated dilated cardiomyopathy in dogs: what do we know? *J Am Vet Med Assoc* 2018;253(11):1390–4.
106. Backus RC, Cohen G, Pion PD, et al. Taurine deficiency in Newfoundland dogs fed commercially available complete and balanced diets. *J Am Vet Med Assoc* 2003;223:1130–6.
107. Vollmar C, Vollmar A, Keene BW, et al. Dilated cardiomyopathy in 151 Irish wolfhounds: characteristic clinical findings, life expectancy and causes of death. *Vet J* 2019;245:15–21.
108. Larsen JA, Parks EM, Heinze CR, et al. Evaluation of recipes for home-prepared diets for dogs and cats with chronic kidney disease. *J Am Vet Med Assoc* 2012;240(5):532–8.
109. Heinze CR, Gomez FC, Freeman LM. Assessment of commercial diets and recipes for home-prepared diets recommended for dogs with cancer. *J Am Vet Med Assoc* 2012;241(11):1453–60.
110. Stockman J, Fascetti AJ, Kass PH, et al. Evaluation of recipes of home-prepared maintenance diets for dogs. *J Am Vet Med Assoc* 2013;242(11):1500–5.
111. Johnson LN, Linder DE, Heinze CR, et al. Evaluation of owner experiences and adherence to home-cooked diet recipes for dogs. *J Small Anim Pract* 2016;57:23–7.
112. American Animal Hospital Association. Raw Protein Diet. Available at: <https://www.aaha.org/about-aaha/aaha-position-statements/raw-protein-diet/>. Accessed October 23, 2020.
113. Davies RH, Lawes JR, Wales AD. Raw diets for dogs and cats: a review, with particular reference to microbiological hazards. *J Small Anim Pract* 2019;60:329–39.
114. van Bree FPJ, Bokken GCAM, Mineur R, et al. Zoonotic bacteria and parasites found in raw meat-based diets for cats and dogs. *Vet Rec* 2018;182:50.
115. Finley R, Ribble C, Aramini J, et al. The risk of salmonellae shedding by dogs fed Salmonella-contaminated commercial raw food diets. *Can Vet J* 2007;48:69–75.
116. Reimschuessel R, Grabenstein M, Guag J, et al. Multilaboratory survey to evaluate Salmonella prevalence in diarrheic and nondiarrheic dogs and cats in the United States between 2012 and 2014. *J Clin Microbiol* 2017;55(5):1350–68.
117. Considine KM, Kelly AL, Fitzgerald GF, et al. High-pressure processing-effects on microbial food safety and food quality. *FEMS Microbiol Lett* 2008;281(1):1–9.
118. Salt C, Morris PJ, German AJ, et al. Growth standard charts for monitoring bodyweight in dogs of different sizes. *PLoS One* 2017;12(9):e0182064.
119. Larsen J. Feeding large-breed puppies. *Compend Contin Educ Pract Vet* 2010;32(5):E1–4.
120. Summers SC, Stockman J, Larsen JA, et al. Evaluation of phosphorus, calcium, and magnesium content in commercially available foods formulated for healthy cats. *J Vet Intern Med* 2020;34:266–73.
121. Hutchinson D, Freeman LM, Schreiner KE, et al. Survey of opinions about nutritional requirements of senior dogs and analysis of nutrient profiles of commercially available diets for senior dogs. *Intern J Appl Res Vet Med* 2011;9:68–79.
122. Barko PC, McMichael MA, Swanson KS, et al. The gastrointestinal microbiome: a review. *J Vet Intern Med* 2018;32(1):9–25.
123. Rudinsky AJ, Rowe JC, Parker VJ. Nutritional management of chronic enteropathies in dogs and cats. *J Am Vet Med Assoc* 2018; 253(5):570–8.
124. Marks SL, Rankin SC, Byrne BA, et al. Enteropathogenic bacteria in dogs and cats: diagnosis, epidemiology, treatment, and control. *J Vet Intern Med* 2011;25(6):1195–208.
125. Weese JS, Martin H. Assessment of commercial probiotic bacterial contents and label accuracy. *Can Vet J* 2011;52(1):43–6.
126. Dzanis DA. Regulatory aspects of diets, supplements, and nutraceuticals. *Clin Tech Small Anim Pract* 1998;13(4):193–6.