

AAHA Nutritional Assessment Guidelines for Dogs and Cats

Special Report

Kimberly Baldwin, CVT, VTS, ECC

Joe Bartges, DVM, PhD,
DACVIM, DACVN

Tony Buffington, DVM, PhD,
DACVN, Chair

Lisa M. Freeman, DVM,
PhD, DACVN

Mary Grabow, DVM

Julie Legred, CVT

Donald Ostwald, Jr., DVM, DABVP
(Canine & Feline)

Introduction

The American Animal Hospital Association recommends these nutritional assessment guidelines because good nutrition enhances pets' quality and quantity of life, and is integral to optimal animal care. Incorporating nutritional assessment into regular animal care is critical for maintaining pets' health, as well as their response to disease and injury. It requires little to no additional time or cost.

The specific goals of this article are to provide:

- Awareness of the importance of nutritional assessment of dogs and cats.
- Guidelines for nutritional evaluation of animals to promote optimal health and response to disease.
- Evidence and tools to support recommendations.

The positive impact of proper nutrition on health and disease is well established in all animals. Appropriate feeding throughout all life stages can help prevent diet-associated diseases, as well as to assist in the management of other diseases. For example, diets formulated for dogs and cats with chronic kidney disease have been shown to provide significant benefits.^{1,2,3}

The National Research Council (NRC) of the U.S. National Academy of Sciences is the leading provider of nutrient recommendations for dogs and cats.⁴ The NRC publications form the basis for Association of American Feed Control Officials (AAFCO) nutrient profiles, which are updated routinely.⁵ AAFCO provides a mechanism for developing and implementing uniform and equitable laws, regulations, standards and enforcement policies, and establishes nutrient profiles for cat and dog foods.

Assurance of proper nutritional health, however, entails more than meeting nutrient profiles; additional factors must be considered. Figure 1 represents the "Circle of Nutrition," symbolizing the comprehensive approach to clinical nutrition used by the American College of Veterinary Nutrition (ACVN).

According to this approach, nutritional assessment considers several factors that are described in detail in this document. An *iterative process*, in which each factor affecting the animal's nutritional status is assessed and reassessed as often as required, provides a thorough nutritional assessment of the small animal.^{6,7,8} The factors to be evaluated include the animal, the diet, feeding management and environmental factors, as described below.

AAHA welcomes the endorsement of these guidelines by the American Association of Feline Practitioners, American College of Veterinary Nutrition, the Canadian Veterinary Medical Association, and the World Small Animal Veterinary Association.

These guidelines were sponsored by a generous educational grant from Hill's Pet Nutrition.



Figure 1—The Circle of Nutrition. Consider these interconnected variables during nutritional assessment. Factors specific to the animal, the diet and feeding management/environment (symbolized by the food held in the hands of the owner) should be assessed. [Provided courtesy of ACVN]

Animal-specific factors

Animal-specific factors include the age, physiological status and activity of the pet. Problems related to animal factors are referred to as *nutrient-sensitive disorders* (e.g., intolerances, allergies and organ-specific diseases). Diet choice for these animals should be restricted to those formulated to meet the disease-associated nutritional limitations of the specific animal.

Diet-specific factors

Diet-specific factors include the safety and appropriateness of the diet fed to the animal in question. Problems related to diet factors are referred to as *diet-induced disorders* (e.g., nutrient imbalances, spoilage, contamination, adulteration). Animals with these disorders may be treated by feeding a diet known to be appropriate for the animal.

Feeding management and environmental factors

Feeding factors include the frequency, timing, location and method of feeding, whereas environmental factors include space and quality of the pet's surroundings. Problems related to feeding and environmental factors are referred to as *feeding-related and environment-related disorders* (e.g., over- or underfeeding, excessive use of treats, poor husbandry, competitive eating in dogs, and lack of appropriate environmental stimulation). These situations require effective communications to produce the appropriate behavioral changes in the client.

Nutritional Assessment

Nutritional assessment is a two-part process.

1. **Screening evaluation** is performed on every animal. Based on this screening, pets that are healthy and without risk factors need no additional nutritional assessment.
2. **Extended evaluation** is performed when one or more nutrition-related risk factors are found or suspected based on the screening evaluation [Table 2].

The interview portion of the evaluation should be performed by a person trained to elicit required information from the caregiver most knowledgeable about the pet(s). A

Table 1

Definitions and Acronyms

Screening evaluation: Initial evaluation performed on all animals.

Extended evaluation: In-depth information-gathering based on issues of concern identified during initial screening.

Iterative process: Each factor is assessed and re-assessed as often as required.

Life stage: Life stages of dogs and cats refer to periods of life that may influence nutritional needs (e.g., growth, reproduction and adult, for which AAFCO provides nutrient profiles).^{44,45,46}

Satisfactory diet: Complete (all nutrients present), balanced (nutrients present in proper proportions), digestible (nutrients in the diet are available to the animal), palatable (eats willingly), sufficient (amount, see text) and safe.

MER: Maintenance energy requirements.

RER: Resting energy requirements.

BW: Body weight.

BCS: Body condition score. An evaluation of body fat.

MCS: Muscle condition score. An evaluation of muscle mass.

detailed nutritional history should be obtained. A variety of forms are available for recording these findings.^{9,10}

Screening evaluation

Nutritional screening is part of routine history taking and physical examination of every animal. Information collected should include assessment of each of the parameters of the circle of nutrition.

Certain life factors, by themselves, may not call for an extended evaluation if the animal is otherwise healthy. Low or high activity level, multiple pets in the home, gestation, lactation, or age <1 year or >7 years, all create a need for closer scrutiny. Although these factors by themselves may not trigger an extended evaluation, they should cause the veterinarian to scrutinize the pet's situation more closely.

Specific risk factors known to influence nutritional status include those listed in Table 2. When features are identified that raise one's "index of suspicion" for a nutrition-related problem, an extended nutritional evaluation may be indicated.

The value of an extended nutritional evaluation increases as the number of risk factors and their severity increase.

Moreover, sufficient concern about any one parameter may be enough to warrant extended evaluation.

If no concerns are raised by the screening evaluation, then the nutritional assessment is complete.

BCS and MCS

Use a consistent method and scale to measure body weight (BW), body condition score (BCS) and muscle condition score (MCS) to assess current status and changes over time. Although different scoring systems may have situation-specific merits, the panel recommends that practices choose, and all doctors and staff consistently use, one system and record the total points on which it is based (i.e., the denominator).

The BCS evaluates body fat [Figure 2]. Various BCS systems are used to evaluate dogs and cats (e.g., scales of 5, 6, 7 or 9).^{11,12,13}

The goal for most pets is a BCS of 2.5–3 of 5, or 4–5 of 9. (This may appear too thin to some pet owners, so client education is important.) These BCS goals are based on a limited number of studies in dogs and cats^{14,15,16,17} as well as those from other species. Disease risk associations with

Table 2
Nutritional Screening: Risk Factors

Nutritional Screening Risk Factor	Check (✓) if present
History	
Altered gastrointestinal function (e.g., vomiting, diarrhea, nausea, flatulence, constipation)	
Previous or ongoing medical conditions/disease	
Currently receiving medications and/or dietary supplements	
Unconventional diet (e.g., raw, homemade, vegetarian, unfamiliar)	
Snacks, treats, table food >10% of total calories	
Inadequate information about or inappropriate feeding management	
Inadequate or inappropriate housing	
Physical Examination	
Body condition score	
5-pt scale: any score other than a 3	
9-pt scale: any score less than 4 or greater than 5	
Muscle condition score: Mild, moderate or marked muscle wasting	
Unintended weight loss of ≥10%	
Dental abnormalities or disease	
Poor skin or hair coat	
New medical conditions/disease	

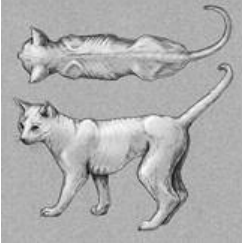
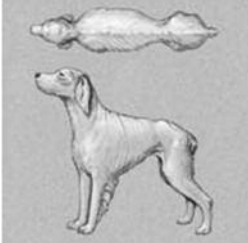
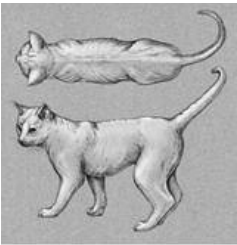
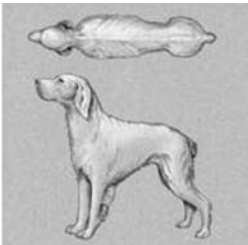
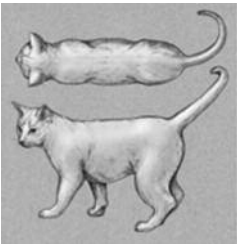
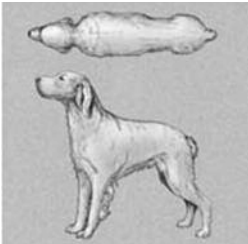
5 Point	Description		9 Point
1/5		Dogs: Ribs, lumbar vertebrae, pelvic bones and all bony prominences evident from a distance. No discernible body fat. Obvious loss of muscle mass. Cats: Ribs visible on short-haired cats; no palpable fat; severe abdominal tuck; lumbar vertebrae and wings of ilia obvious and easily palpable.	1/9 
1.5/5	Dogs: Ribs, lumbar vertebrae and pelvic bones easily visible. No palpable fat. Some evidence of other bony prominence. Minimal loss of muscle mass. Cats: Shared characteristics of BCS 1 and 3.		2/9
2/5		Dogs: Ribs easily palpated and may be visible with no palpable fat. Tops of lumbar vertebrae visible. Pelvic bones becoming prominent. Obvious waist. Cats: Ribs easily palpable with minimal fat covering; lumbar vertebrae obvious; obvious waist behind ribs; minimal abdominal fat.	3/9 
2.5/5	Dogs: Ribs easily palpable, with minimal fat covering. Waist easily noted, viewed from above. Abdominal tuck evident. Cats: Shared characteristics of BCS 3 and 5.		4/9
3/5		Dogs: Ribs palpable without excess fat covering. Waist observed behind ribs when viewed from above. Abdomen tucked up when viewed. Cats: Well proportioned; waist observed behind ribs; ribs palpable with slight fat covering; abdominal fat pad minimal.	5/9 

Figure 2—Body Condition Scoring (BCS) Systems. (Continued on next page)

higher BCS in adult animals appear to increase above 3.5 of 5 (6 of 9). Similar risk associations for other life stages in client-owned pets have not been reported, but may occur at low BCS based on studies of laboratory-housed animals, and in humans.^{16,18} Additional research on dogs and cats is

needed to more fully evaluate the effects of body condition on disease prevention.

The MCS differs from the BCS in that it evaluates muscle mass [Figure 3]. Evaluation of muscle mass includes visual examination and palpation over the temporal bones,

5 Point	Description	9 Point
3.5/5	Dogs: Ribs palpable with slight excess fat covering. Waist is discernible viewed from above but is not prominent. Abdominal tuck apparent. Cats: Shared characteristics of BCS 5 and 7.	6/9
4/5	Dogs: Ribs palpable with difficulty; heavy fat cover. Noticeable fat deposits over lumbar area and base of tail. Waist absent or barely visible. Abdominal tuck may be present. Cats: Ribs not easily palpable with moderate fat covering; waist poorly distensible; obvious rounding of abdomen; moderate abdominal fat pad.	7/9
4.5/5	Dogs: Ribs not palpable under very heavy fat cover, or palpable only with significant pressure. Heavy fat deposits over lumbar area and base of tail. Waist absent. No abdominal tuck. Obvious abdominal distension may be present. Cats: Shared characteristics of BCS 7 and 9.	8/9
5/5	Dogs: Massive fat deposits over thorax, spine and base of tail. Waist and abdominal tuck absent. Fat deposits on neck and limbs. Obvious abdominal distention. Cats: Ribs not palpable under heavy fat cover; heavy fat deposits over lumbar area, face and limbs; distention of abdomen with no waist; extensive abdominal fat pad.	9/9

Figure 2 (cont'd)—Body Condition Scoring (BCS) Systems.

scapulae, lumbar vertebrae and pelvic bones. Assessing muscle condition is important because muscle loss is greater in animals with most acute and chronic diseases (i.e., stressed starvation) compared to healthy animals deprived of food, when primarily fat is lost (i.e., simple starvation). Muscle loss adversely affects strength, immune function, and wound healing and is independently associated with mortality in humans.^{19,20}

A simple MCS scale is currently undergoing development and validation.²¹ The authors' clinical experience suggests that early identification of subtle muscle loss, at the "mild muscle wasting" stage, is valuable for successful intervention.

Clinically, BCS and MCS are not directly related. An animal can be overweight but still have significant muscle

loss. This can make an MCS of mild to moderate look relatively normal if not carefully evaluated. In these cases, although some of the areas of the body may appear relatively normal or even have excessive fat stores (especially over the ribs or in the abdominal region), muscle wasting is readily felt over bony prominences. Palpation is required for accurately assessing BCS and MCS, especially in animals with medium- to long-hair coats.

Extended evaluation

Extended nutritional evaluation of animal, diet, feeding and environmental factors is indicated for animals identified to be at risk for any nutrition-related problems from the screening evaluation [Table 2]. Those items suggest that nutrition may play an important role in development of or

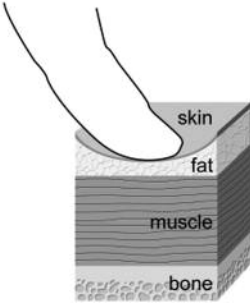
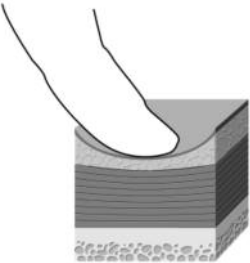
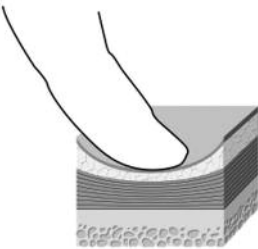
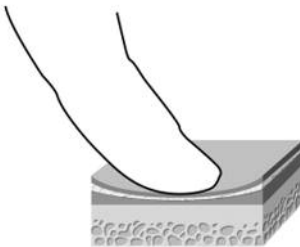
Description	Figure
No muscle wasting, normal muscle mass	
Mild muscle wasting	
Moderate muscle wasting	
Marked muscle wasting	

Figure 3—Muscle Condition Scoring. A muscle condition scoring (MCS) system. Evaluation of muscle mass includes visual examination and palpation over the temporal bones, scapulae, ribs, lumbar vertebrae and pelvic bones. [Provided courtesy of Dr. Tony Buffington] This system currently is under development and validation.

management of the animal's underlying disease, or life stage. First, review and summarize the history, medical record and information obtained during the screening evaluation. Second, obtain additional data as appropriate, as described below. A more detailed list of potentially relevant historical factors may be found in various references.

Animal factors

- Changes in food intake or behavior (e.g., amount eaten, chewing, swallowing, nausea, vomiting).
- Condition of the integument. Nutrition-related abnormalities may include variable combinations of dry, easily plucked hair; thin, dry or scaly skin; and reduced resist-

ance to venipuncture (due to loss of normal skin collagen density).

- Diagnostic workup.
 - Minimum database/laboratory testing as appropriate.
 - Specific testing might include a complete blood count (checking for anemia), urinalysis, biochemistry profile (including electrolytes, albumin), fecal culture or evaluation of other nutrient concentrations that may be low (or high) as a result of an unbalanced diet (e.g., taurine, vitamin B12, iron).
 - Additional workup as indicated (e.g., imaging, endoscopy).
- Current medical conditions and medications.
 - Assess effects of the disease and any treatment plan on pet's nutritional status (e.g., thyroid disease).
 - Some medications (e.g., diuretics) or procedures (e.g., significant intestinal resection, drain placement) can cause a loss or malabsorption of essential nutrients.

Diet factors

- Evaluate caloric density of current pet food, particularly if pet is below or above desired BCS, or if owner has to feed unusually large or small amounts to maintain desired BCS (may have to contact pet food manufacturer for this information).
- Evaluate other sources of nutrients: treats, table food, supplements, food used for administering medication, chew toys (e.g., rawhide).
- If disease conditions exist that may be the result of tainted or spoiled food, the diet should be submitted for testing.²² Questions about having food analyzed or tested for potential toxins may be referred to the state feed control official (www.aafco.org).
 - Evaluate commercial foods.
 - Specific type, formulation, flavor, when purchased, where purchased, storage conditions.
 - Label information must include the guaranteed analysis, ingredient list, AAFCO nutritional adequacy statement, food type, manufacturers' contact information. Beware of label's role as advertisement.²³
 - The AAFCO adequacy statement provides several important facts:
 - Whether the diet is complete and balanced, and if so, for what life stages. All diets should be complete and balanced. If it says "intermittent or supplemental use only," it is not complete and balanced. That may be acceptable if it is a veterinary therapeutic diet and is being used for a specific purpose (e.g., severe kidney disease).
 - Labels may include one of two statements regarding nutritional adequacy:
 1. "[Name] is formulated to meet the nutritional levels established by the AAFCO Dog (or Cat) Food Nutrient Profiles for [life stage(s)]." (Chemical analysis of food)
 2. "Animal feeding tests using AAFCO procedures substantiate [Name] provides complete

and balanced nutrition for [life stage(s)]." (Feeding trial analysis of food)

- Formulated foods are manufactured so the ingredients meet specified levels, without testing via feeding trials; interpret with caution. However, the use of feeding trials does not guarantee the food provides adequate nutrition under all conditions.
- AAFCO provides nutrient profiles and regulates pet food labeling for growth, reproduction and adult maintenance, but not for senior/geriatric pets.
- What is the manufacturer's reputation as a food maker? Have you had positive experiences with their products? What objective (not testimonial) information do they provide about their foods to assist evaluation?
- The other information provided on the label is of little practical value in assisting nutritional assessment. Because pet owners sometimes base their purchasing decisions on the initial ingredients or on unregulated terms such as "organic," "holistic," "human grade" or "premium," veterinarians and veterinary technicians must help them make informed decisions.
- Contact the food manufacturer with any questions or concerns. Consider asking the following questions, as appropriate:
 - Do you have a veterinary nutritionist or some equivalent on staff in your company? Are they available for consultation or questions?
 - Who formulates your diets, and what are their credentials?
 - Which of your diet(s) are tested using AAFCO feeding trials, and which by nutrient analysis?
 - What specific quality control measures do you use to assure the consistency and quality of your product line?
 - Where are your diets produced and manufactured? Can this plant be visited?
 - Will you provide a complete product nutrient analysis of your best-selling dog and cat food, including digestibility values?
 - What is the caloric value per can or cup of your diets?
 - What kinds of research on your products has been conducted, and are the results published in peer-reviewed journals?
- Evaluate homemade diets.
 - Contact a board-certified veterinary nutritionist to evaluate or formulate a homemade diet [Table 3].
 - Ask client about the specific recipe, preparation, storage, recipe rotation or substitution.
 - Consider sources and amounts of protein, carbohydrates, fats, vitamins and minerals; bioavailability.
 - Consider specific needs of cats (e.g., amino acids, arachidonic acid, etc.).
- Evaluate any unconventional diet, whether commercial or homemade.

Table 3
Useful Websites for Client and Staff Education

1. AAFCO—Association of American Feed Control Officials (profiles, feeding, trials, ingredients)	http://www.aaaco.org
2. AAHA — American Animal Hospital Association	http://www.aahanet.org
3. ACVN—American College of Veterinary Nutrition (specialty college for board certification; list of institutions that provide consultation; continual updates of links to resources for diet formulation and analysis)	http://www.acvn.org
4. AVNT—Academy of Veterinary Nutritional Technicians (pending approval in 2010)	Website under construction Info: email to nutritiontechs@aol.com
5. FDA Center for Food Safety and Applied Nutrition (regulatory and safety issues, adverse event reporting, meetings, industry information)	http://www.fda.gov/aboutfda/centersoffices/cfsan/default.htm
6. FDA Pet Food Site (information, links, food safety issues, recalls, pet food labels, selecting nutritious foods, handling raw foods)	http://www.fda.gov/AnimalVeterinary/Products/AnimalFoodFeeds/PetFood/default.htm and http://www.fda.gov/AnimalVeterinary/NewsEvents/CVMUpdates/ucm048030.htm
7. Indoor Pet Initiative (comprehensive recommendations for environmental enrichment for dogs and cats)	http://indoorpet.osu.edu http://vet.osu.edu/indoorcat.htm
8. NRC—National Research Council (nutrient requirements of dogs and cats)	http://www.nap.edu/catalog.php?record_id=10668#toc
9. Downloadable booklets for pet owners Your Cat's Nutritional Needs Your Dog's Nutritional Needs	http://dels.nas.edu/banr/petdoor.html
10. NIH Office of Dietary Supplements (evaluating supplements, Internet health info, and more)	http://dietary-supplements.info.nih.gov/Health_Information/Health_Information.aspx
11. UC Davis Nutritional History Form (downloadable Word document)	http://www.vetmed.ucdavis.edu/vmth/small_animal/nutrition/newsletters.cfm
12. Pet Food Institute (information on ingredient definitions, labeling regulations, etc.)	http://www.petfoodinstitute.org/Index.cfm?Page=Consumers
13. United States Pharmacopeia Dietary Supplement Verification Program (voluntary program)	www.usp-dsvp.org
14. USDA Food and Nutrition Information Center (general supplement and nutrition information, links to various dietary supplement websites)	http://www.nal.usda.gov/fnic/etext/000015.html
15. USDA Nutrient Database (full nutrient profiles on thousands of human foods)	http://www.nal.usda.gov/fnic/foodcomp/search/

- Evaluate additional risks of raw meat diets.^{24,25,26} Pathogenic bacteria may cause gastroenteritis and can be shed in the feces for up to 1 week after ingestion of contaminated raw meat. If an animal that has been fed a raw-meat diet is hospitalized, evaluate the risk to hospital staff and other hospitalized animals. In addition, raw diets containing bones can be associated with dental damage and esophageal/gastrointestinal obstruction or perforation.
- Evaluate risks of vegetarian diets, particularly with cats but also with dogs.

Feeding management and environmental factors

- Primary feeder of pet.
- Feeding management (e.g., location, frequency).
- Issues with multiple pets (competition for food, threats).
- Other food providers and sources.
- Extent of enrichment (e.g., toys, other pets, housing, food-delivery devices).
- Activity of pet at home.
 - Type (e.g., leash walks, backyard, free roaming/spontaneous).
 - Amount (times per day/week).
 - Energy level and amount of activity.
- Environmental stressors (e.g., recent changes in the home, uncontrollable outdoor stimuli, conflict over resources such as food or access to the owner, conflict between animals, etc.).^{27,28,29}
- Environment has a direct impact on nutrition. For example, both laboratory³⁰ and clinical³¹ studies of cats with lower urinary tract syndrome show that environment plays an important role in presentation of signs regardless of the diet fed. The role of environment in other “nutrient-sensitive” disorders in cats has been reviewed, and a recent study concluded that indoor confinement and physical inactivity rather than the proportion of dry food were risk factors in the development of type 2 DM in cats.³²
- In dogs, a range of clinical situations, including competitive eating, coprophagia, and obesity, have been associated with environmental as well as with animal and dietary factors.^{33,34} Additionally, provision of food in dispensing toys may improve the welfare of indoor-housed pets,³⁵ so changes in feeding containers also may be more important than is generally perceived.

Interpretation, Analysis and Action

Following the nutritional assessment, interpret and analyze the information that has been gathered to devise an action plan. Consider the following:

Animal factors

1. Evaluate the animal's condition with respect to the current food intake. Estimate current energy needs. For inpatients, RER may be estimated using any of a variety of published formulas. For outpatients, either label rec-

ommendations or a formula may be used as a starting point. These are just population-based starting points for energy requirements, which can vary by 50% in either direction for cats, and by 30% in either direction for dogs (particularly with the MER).³⁶ These levels are further influenced by life stage, activity and environment variables.

2. Create a monitoring plan. Teach the client to monitor BW, BCS and/or MCS as appropriate. Adjust intake as needed to match changing needs over time.
3. Adjust or include dietary supplements if necessary, recommending specific types and amounts.
4. A diet change is sometimes necessary. Preferences for and recommendations about diet transition methods vary, with no clear evidence showing any one method is superior. Clinicians should use and recommend techniques based on their individual assessment of client and animal. Some animals tolerate an abrupt change in diet with little problem, although some appear to have fewer GI issues when food is gradually changed over a 7- to 10-day period.

Diet factors

1. Determine if current amount and type of food are appropriate, based on life stage, lifestyle/activity, disease, body condition, concurrent medications and/or medical procedures.
2. If diet factors are determined to be inadequate, prepare a plan for food and treats that provides appropriate calories and nutrient intake for the animal.
3. Consider other food sources in total intake recommendations if necessary.
4. Recommend a specific feeding plan that incorporates pet food, treats, table food, feeding method, frequency and location.

Feeding management and environmental factors

1. Determine any changes in feeding management and any necessary environmental changes.^{37,38}
 - a. Whereas some dogs and cats can maintain good body condition when fed free choice, others require meal feeding of appropriate amounts to maintain good body condition.
 - b. Confirm the use of an appropriate food-measuring device (e.g., an 8-oz measuring cup), and provide food in measured amounts (whether feeding free choice or meals).
 - c. Management changes may include provision of feeding toys, and reducing conflict and competition for food.
 - d. Environmental enrichment may include increased opportunities for activity (play, exercise), as well as efforts to decrease perception of threat from other animals (as well as humans) and reducing the frequency of unpredictable change in the animal's environment.
2. Create a plan for hospitalized animals.

- a. Create a monitoring plan and a feeding plan as discussed under “Animal Factors” and “Diet Factors.”
 - b. Offer usual and favorite (“comfort”) foods if at all possible to promote food intake. Avoid introduction of novel diets intended for long-term feeding to avoid the risk of inducing an aversion to the diet. A food aversion is avoidance of a food that the animal associates with an aversive experience.
 - c. The optimal route required to achieve nutrient requirements should be reassessed daily, and may include:
 - i. Voluntary oral feeding.
 - ii. Coax feeding — small changes, such as warming the food, taking the animal to a quiet area for feeding, having the owner feed the animal or stroking the animal while eating, can enhance food intake.
 - iii. Syringe feeding (be careful in animals with any nausea or who are stressed, as this can induce food aversions).
 - d. Other nutritional support techniques will be required for animals that have not eaten sufficient amounts by the aforementioned routes for 3-5 days (this includes the time of reduced appetite at home before hospitalization), and are not expected to resume reasonable amounts of food intake prior to further compromise of their nutritional status.^{39,40}
 - i. Use a feeding tube with animals that are not eating adequate amounts voluntarily. Use parenteral nutrition with animals that have gastrointestinal dysfunction or in animals whereby enteral feeding has increased risk of aspiration.
 - ii. Evaluate closely and watch for complications associated with the route of nutrition used, particularly with recumbent or neurologically impaired animals.
3. Create a plan for non-hospitalized animals.
 - a. Create a monitoring plan and a feeding plan as discussed under “Animal Factors” and “Diet Factors.”
 - b. Clearly inform the client of the recommended feeding management factors to ensure success. The client is part of the decision process and implementation of the specific action plan.
 - c. If obesity is present, provide a comprehensive plan to modify the environment (e.g., exercise, behavior modification and/or prescription weight control medication).
 - d. Create specific schedule for:
 - i. Follow up via telephone to elicit questions and verify compliance/adherence to recommended feeding management or environment changes.
 - ii. Repeat examination/assessment.
 4. Consult with a specialist or refer anytime one feels unqualified to take action and monitor an animal [Table 3].

Monitoring

Healthy animals

Adults in good body condition should be reassessed regularly. Decisions regarding specific frequency of visits are made appropriately on an individual basis, based on the age, species, breed, health and environment of the pet. Healthy pregnant, lactating, senior and growing animals require more frequent monitoring. Pet owners should monitor their pet at home, including:

- Food intake and appetite
- BCS and BW
- Gastrointestinal signs (e.g., feces consistency and volume; vomiting)
- Overall appearance and activity

Animals with disease conditions and/or recommended nutritional changes

Non-hospitalized animals for which extended nutritional evaluation was indicated may require more frequent monitoring of nutritional assessment parameters. Monitoring should include the items in Table 2.

Frequent monitoring of BCS and MCS is important, as many diseases are associated with suboptimal scores. Also, animals with medical conditions are more likely to receive dietary supplements and to have medications administered with food, so specific attention to and review of these issues, with an update of the dietary plan, are important at each visit to ensure that the overall nutritional plan is optimized.

Hospitalized animals

Daily monitoring of hospitalized animals includes the items in Table 2, also evaluating these additional items:

- Specific feeding orders, which should include diet, route, amount and frequency.
- Fluid balance. Assessment of clinical signs (e.g., BW changes, pulmonary crackles) or diagnostic tests (e.g., central venous pressure).
- Addressing optimal route of intake. The optimal route required to achieve nutrient requirements could change during hospitalization and should be reassessed daily (see above).
- Quantifying and documenting nutrient intake (via all routes).

Many hospitalized animals are discharged prior to complete resolution of their underlying disease. Document and communicate to the client the feeding method, caloric intake, diet, frequency and specific monitoring parameters, and the schedule for rechecks and re-assessment.

Discuss with the client any issues that may limit adherence to dietary recommendations (e.g., feeding schedule issues, complex instructions, financial restrictions) and address appropriately (e.g., offer over-the-counter options

for appropriate diets if financial restrictions will prevent the owner from consistently feeding the prescribed diet). Create a specific schedule for follow-up via telephone to elicit questions and verify compliance/adherence.

Provide choices in diets that meet nutrient goals. Create a plan with the client about what to do if calorie/nutrient goals are not achieved.

When abnormal parameters have returned to normal or stabilized, the animal may continue on a therapeutic diet or be transitioned to a non-therapeutic diet. If a new diet is necessary, it may be introduced gradually, as previously described.

Client Education

Client communication and rapport are important for achieving desired outcomes.^{41,42,43} Technicians should be involved in the nutrition-evaluation process when they have knowledge and skills in both nutritional concepts and in communication.

Engage the client in decision making and defining expectations. Recommendations may be modified by the client's time, lifestyle and financial limitations. Use communication techniques that include various forms based on client preferences. Use various educational approaches and tools.

Demonstrating and teaching the client to evaluate the BCS and MCS are effective in engaging the client in their pet's care. Expectations and goals should be specific, achievable and include specific follow-up to monitor progress and compliance, and to adjust recommendations.

Inform clients about specific foods, and potential advantages, risks and concerns. Include recommendations on amount and frequency of diet fed, accounting for snacks, treats, table food, foods used for medication administration, and dietary supplements. Clients may enrich their pet's nutritional experience by interacting with them at feeding, providing food toys and playing and exercising with their pet.

Summary

Nutritional assessment is an important aspect of optimal animal care. This document provides guidance for appropriate, effective assessment, evaluation, action monitoring and education. With little practice, this approach can be efficiently incorporated into daily practice without additional time or expense. Stay tuned for further developments and expanding knowledge.

References

1. International Renal Interest Society Guidelines. Available online at www.iris-kidney.com/guidelines/en/treatment_recommendations.shtml.
2. Elliott J, Rawlings J, Markwell PJ, *et al*. Survival of cats with naturally occurring chronic renal failure: effect of dietary management. *J Small Anim Pract* 2000;41(6):235-242.
3. Ross RJ, Osborne CA, Kirk CA, *et al*. Clinical evaluation of dietary modification for treatment of spontaneous chronic kidney disease in cats. *J Am Vet Med Assoc* 2006;229:949-957.
4. Subcommittee on Dog and Cat Nutrition, Committee on Animal Nutrition, National Research Council. Nutrient Requirements of Dogs and Cats 2006. Available online at www.nap.edu/catalog.php?record_id=10668#toc. Accessed 12/19/09.
5. Association of American Feed Control Officials. Official publication. Oxford, Ind: Association of Feed Control Officials 2010. Available online at www.aafco.org.
6. Thatcher CD, Hand MS, Remillard RL. Small animal clinical nutrition: an iterative process. In: Hand MS, Thatcher CD, Remillard RL, *et al*. *Small Animal Clinical Nutrition* 5th Ed. Marceline, Mo.: Walsworth Publishing Co 2010;3-21.
7. Bauer JE, Olson WG. Development of a modular curriculum for education in nutrition. *J Am Vet Med Assoc* 1994;205(5):681-684.
8. Bauer JE, Buffington CA, Olson WG. ACVN highlights common principles of nutrition. *Vet Forum* 1995;(12):55-58.
9. Michel KE. Using a diet history to improve adherence to dietary recommendations. *Compendium of Continuing Education For Veterinarians* 2009;31(1):22-26.
10. University of California Davis Nutrition Support Services Diet History Form. Available online at www.vetmed.ucdavis.edu/vmth/small_animal/nutrition/newsletters.cfm.
11. German AJ, Holden S, Moxham GL, *et al*. Simple, reliable tool for owners to assess the body condition of their dog or cat. The WALTHAM International Nutritional Sciences Symposia. *J Nutr* 2006;136:2031S-2033S.
12. Laflamme, D. Development and validation of a body condition score system for dogs. *Canine Practice* 1997;22:10-15.
13. Laflamme, D. Development and validation of a body condition score system for cats: a clinical tool. *Feline Practice* 1997;25:13-18.
14. Lund EM, Armstrong PJ, Kirk CA, *et al*. Prevalence and risk factors for obesity in adult dogs from private US veterinary practices. *Intern J Appl Res Vet Med* 2005;4(2):177-186.
15. Lund EM, Armstrong PJ, Kirk CA, *et al*. Prevalence and risk factors for obesity in adult cats from private US veterinary practices. *Intern J Appl Res Vet Med* 2005;3(2):88-96.
16. Kealy RD, Olsson SE, Monti KL, *et al*. Effects of limited food consumption on the incidence of hip dysplasia in growing dogs. *J Am Vet Med Assoc* 1992;201:857-863.
17. Scarlett JM, Donoghue S. Associations between body condition and disease in cats. *J Am Vet Med Assoc* 1998;212:1725-1731.
18. Gulsvik AK, Thelle DS, Mowe M, *et al*. Increased mortality in the slim elderly: a 42 year follow-up study in a general population. *Eur J Epidemiol* 2009;24(11):683-690.
19. Anker SD, Ponikowski P, Varney S, *et al*. Wasting as independent risk factor for mortality in chronic heart failure. *Lancet* 1997;349:1050-1053.
20. Freeman L, Roubenoff R. Nutrition implications of cardiac cachexia. *Nutr Rev* 1994;52:340-347.
21. Michel KE, Anderson W, Cupp C, *et al*. Validation of a subjective muscle mass scoring system for cats. *J Anim Physiol Anim Nutr* 2009;93:806.
22. Stenske K, Smith J, Newman S, *et al*. Aflatoxicosis in dogs and dealing with suspected contaminated commercial foods. *J Am Vet Med Assoc* 2006;228(11):1686-1691. Available online at www.avmajournals.avma.org.
23. Bren L. Pet food: the lowdown on labels. *FDA Veterinarian Newsletter* July/August 2001;XVI(IV). Available online at www.fda.gov/animalveterinary/newsevents/fdaveterinariannewsletter/ucm130726.htm. Accessed 4/26/10.
24. 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.
25. Weese JS, Rousseau J. Survival of salmonella copenhagen in food bowls following contamination with experimentally inoculated raw meat: effects of time, cleaning, and disinfection. *Can Vet J* 2006;47:887-889.
26. Finley R, Reid-Smith R, Ribble C, *et al*. The occurrence and antimicrobial susceptibility of salmonellae isolated from commercially available canine raw food diets in three Canadian cities. *Zoonoses*

- Public Health 2008;55:462-469.
27. Wojciechowska JI, Hewson CJ, Stryhn H, *et al*. Development of a discriminative questionnaire to assess nonphysical aspects of quality of life of dogs. *Am J Vet Res* 2005;66(8):1453-1460.
 28. Buffington CA. External and internal influences on disease risk in cats. *J Am Vet Med Assoc*. 2002;220 (7):994-1002.
 29. Yeates J, Main D. Assessment of companion animal quality of life in veterinary practice and research. *J Small Anim Pract* 2009;50(6):274-281.
 30. Stella JL, Lord LK, Buffington CAT. Sickness behaviors in domestic cats. *J Am Vet Med Assoc*, In Press, 2010.
 31. Buffington CAT, Westropp JL, Chew DJ, *et al*. Clinical evaluation of multimodal environmental modification in the management of cats with lower urinary tract signs. *J Feline Med Surg* 2006;8:261.
 32. Slingerland LI, Fazilova VV, Plantinga EA, *et al*. Indoor confinement and physical inactivity rather than the proportion of dry food are risk factors in the development of feline type 2 diabetes mellitus. *Vet J* 2009;179:247.
 33. Landsberg GM, Hunthausen W, Ackerman L. *Handbook of Behavior Problems of the Dog and Cat*. Philadelphia: Elsevier 2003;554.
 34. Overall, K. *Clinical Behavioral Medicine for Small Animals*. St. Louis: Mosby 1997;160-194.
 35. Taylor J. Puzzling petfood. *Pet Food Industry Magazine* 2010;52(2):34-39. Available online at www.Petfoodindustry-Digital.Com/Petfoodindustry/201002/#Pg36.
 36. Subcommittee on Dog and Cat Nutrition, Committee on Animal Nutrition, National Research Council. *Nutrient requirements of dogs and cats*, 2006. Available online at www.Nap.Edu/Catalog.Php?Record_Id=10668#Toc.
 37. Milgram NW, Siwak-Tapp CT, Araujo J, *et al*. Neuroprotective effects of cognitive enrichment. *Ageing Res Rev* 2006;5(3):354-369.
 38. Overall KL, Dyer D. Enrichment strategies for laboratory animals from the viewpoint of clinical veterinary behavioral medicine: emphasis on cats and dogs. *ILAR J* 2005;46(2):202-215. Available online at www.Dels.Nas.Edu/Ilar_N/Ilarjournal/46_2/Pdfs/V4602overall.Pdf.
 39. Chan D, Freeman LM. Nutrition in critical illness. *Vet Clin North Am Small Anim Pract* 2006;36:1225.
 40. Eirmann L, Michel KE. Enteral nutrition. In Silverstein DC, Hopper K, editors: *Small Animal Critical Care Medicine*. St Louis: Saunders Elsevier:53-62.
 41. Frankel RM. Pets, vets, and frets: what relationship-centered care research has to offer veterinary medicine. *J Vet Med Educ* 2006;33:20-27.
 42. Cornell K, Brandt JC, Bonvicini K. Effective communication in veterinary practice. *Vet Clin North Am Small Anim Pract* 2007;37(1).
 43. The Bayer Animal Health Communication Project. Available online at www.Healthcarecomm.org/Bahcp/Homepage.Php.
 44. Vogt AH, Rodan I, Brown M, *et al*. AAFP-AAHA feline life stage guidelines. *J Feline Med Surg* 2010;12:43-54.
 45. Epstein M, Kuehn N, Landsberg G. AAHA senior care guidelines for dogs and cats. *J Am Anim Hosp Assoc* 2005;Mar/Apr(41).
 46. Association of American Feed Control Officials. *Official publication*. Oxford, Ind: Association of Feed Control Officials 2010. Available online at www.aafco.org.