

Senior Pet Nutrition and Management



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KEYWORDS

• Senior • Geriatric • Aging • Nutrition • Nutritional assessment

KEY POINTS

- Aging is a continuum with individual variation regarding the onset and degree of age-related physiologic and pathologic changes. This individual variation prevents a one-size-fits-all approach to senior nutrition.
- Physiologic changes associated with aging include changes in energy requirements, body composition, and certain nutrient requirements. In addition, senior pets are at risk of pathologic changes, risk of frailty and comorbidities that may require thoughtful nutrition planning.
- Every pet requires a nutritional assessment and specific recommendations. Frequent re-assessment of the senior population is critical to ensure the nutrition plan continues to meet the needs of the elder pet who is at risk for various age-related health issues.
- There is no established Association of American Feed Control Officials nutrient profile for a senior life stage, so the nutrient composition of products marketed for senior pets varies widely.
- As end of life approaches, recognize the importance of feeding as part of the bond with the pet. Consider shifting the focus from eating the so-called right food to nurturing with foods to provide compassionate care.

INTRODUCTION

Senior pets represent approximately one-third of the pet population.¹ The point at which an individual progresses from the mature adult to senior life stage is variable. For this reason, age groupings are arbitrary demarcations that can help veterinary health care teams (VHCTs) focus attention on physiologic changes that occur at different stages. For cats, the American Association of Feline Practitioners (AAFP)–American Animal Hospital Association (AAHA) Feline Life Stage Guidelines group cats 11 to 14 years of age as seniors and cats more than 15 years of age as geriatric.² Dogs' life expectancies vary widely depending on breed and body size, and aging

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changes are also variable. Rather than characterize the senior life stage by specific age ranges, the 2019 AAHA Canine Life Stage Guidelines define the senior life stage as the last 25% of estimated lifespan through end of life.³ Physiologic changes associated with aging may include loss of senses (hearing or vision), reduced energy requirements and lean body mass, as well as a decline in various organ functions.^{4,5} Physiologic changes associated with aging may make a pet less tolerant of nutritional deficiencies or excesses.⁶ Senior pets are more vulnerable or at risk for age-related health problems. Nutritional management can influence many of these chronic diseases. A vital component of preventive medical care should include a senior screen or health risk assessment for early detection of health problems and adjustments to care and prevent or slow the onset of age-related diseases. Every senior health screen should include a thorough nutritional assessment followed by an individualized nutritional recommendation.

NUTRITIONAL ASSESSMENT

Before recommending any diet changes, a nutritional evaluation should be performed. The goal of the nutritional assessment is to obtain the necessary information to provide a specific detailed nutrition recommendation. Nutritional assessment is an iterative process that includes evaluating the patient, all foods, and the feeding management (www.ACVN.org). Signalment, dietary and medical histories, and complete physical examination with appropriate diagnostic testing for the senior pet comprise the nutritional assessment. The AAHA and World Small Animal Veterinary Association (WSAVA) recommend a nutritional assessment and dietary recommendation every time a pet presents for veterinary consultation.^{7,8} An accurate diet history is invaluable when assessing the nutritional health of the patient and is vital to formulating an individualized diet plan. Understanding the nutritional changes that occur with aging and identifying any changes in the individual patient can help the clinician better match the appropriate food with the patient's unique needs (**Table 1**). The patient, the food, and the pet owner's feeding practices are interrelated and require reassessment. Health and nutritional status are not static, especially in senior pets, but are a dynamic process worthy of continued reevaluation and treatment modifications to match the changing needs of the pet.

Patient Assessment

An initial assessment of the patient uses information collected as part of a health assessment: a complete medical and diet history, a thorough physical examination, and appropriate laboratory work (eg, complete blood count, serum biochemical profile, urinalysis, and thyroid function [feline]). Patient factors, including body weight and body condition score (BCS), are essential because food recommendations and feeding amounts are based on body condition and optimal body weight. Body weight and BCS should be recorded at each visit in a manner that allows the VHCT to observe trends. Several body scoring systems have been developed and evaluated in dogs and cats.^{9–13}

Adopting a universal 9-point BCS, which has been more extensively validated than other BCS systems,^{9,10,14–16} is preferable and is also the system that has been recommended by the WSAVA Global Nutrition Panel.¹⁷ The 9-point BCS offers several advantages compared with other BCS and zoometric measures of adiposity,^{12,13} most notably speed and simplicity to ensure consistent use in veterinary practices. A universal BCS would better enable VHCTs to interpret veterinary medical research, more consistently and accurately assess their patients' body conditions, and clearly

Table 1
Considerations to address nutritional/metabolic alterations of healthy aging pets

Key Nutrient/Metabolic Change	Feline and Canine	Rationale
Energy	Increase or decrease	Senior cats have a gradual decrease in MER through middle age (~11 y) and thereafter more commonly have an increase in MER associated with loss of body weight. Senior dogs commonly have decreased MER, but geriatric dogs are also more likely to be underweight
Water	No alteration or Increase	Reduced total body water, decreased sense of thirst, mobility conditions limiting access to water, and subclinical increases in water losses (urinary) increase risk of dehydration. Ensure easy access to water, offer higher-moisture foods, or add water/liquid to dogs' food Consider nutrient-enriched water supplement for cats
Protein	Increase (unless evidence of medical condition reducing protein tolerance)	Twenty percent of geriatric cats have decreased protein digestion Protein requirements of healthy senior cats and dogs increase with age because of compromised protein synthesis
Fat	Increase or decrease	An estimated 35% of geriatric cats have decreased fat digestion and may benefit from nutrient-dense highly digestible growth formula Dogs have no change in fat digestion with aging, and dietary fat intake should be adjusted to manage nutrient density of the diet and healthy BCS of the dog

(continued on next page)

Table 1 (continued)		
Key Nutrient/Metabolic Change	Feline and Canine	Rationale
Long-chain omega-3 polyunsaturated fatty acids	No alteration or increase	Have shown promise in dogs with osteoarthritis, renal disease (VCNA Parker) heart disease (Freeman ⁷⁹) and some forms of cancer (VCNA Saker)
Antioxidants and medium-chain triglycerides	No alteration or increase	Valarie V. Tynes and Gary Landsberg's article, "Nutritional Management of Behavior and Brain Disorders in Dogs and Cats," in this issue

Abbreviations: BCS, body condition score; MER, maintenance energy requirement.

communicate with colleagues and clients. Using the 9-point system, each unit increase in the BCS greater than ideal is approximately equivalent to 10% to 15% more than ideal body weight.¹⁸

A muscle condition score (MCS) system, as recommended by the WSAVA, is also an essential component of the patient assessment. The MCS uses palpation of the skeletal musculature over the spine, skull, scapula, and pelvis, and is independent of body fat and BCS. An MCS has been developed and evaluated in both cats and dogs.^{19,20} Senior dogs and cats experience sarcopenia, a loss of lean body mass (LBM) with age, unrelated to disease.^{4,21} Sarcopenia is commonly accompanied by an increase in body fat, which may result in stable body weight. This loss of LBM may go unrecognized if the clinician relies on body weight trends and ignores MCS.^{22,23} Evaluation of MCS in senior pets is an important first step in identifying age-related sarcopenia or cachexia (loss of muscle mass secondary to an underlying catabolic disease). Loss of LBM is important to recognize because it is associated with increased morbidity and mortality.^{21,24}

The nutritional screening process (**Table 2**) can quickly identify patients with nutritional risks. Healthy seniors without identified risks, who are eating an appropriate nutritionally balanced diet, have a healthy body weight, healthy body and muscle conditions (BCS, MCS), and are free of significant physical or laboratory abnormalities need no further evaluation at this time, but a recommendation for the client is important. A pet-specific nutrition assessment and recommendation for healthy seniors can be done quickly. Nutritional recommendations should include the specific name of foods that match the pet's current nutritional needs, the amount and frequency for feeding, and a monitoring plan. In many of these healthy patients, the feeding recommendation involves little or no change, but it should include a verification and validation for the owner that the current food and feeding plan meets the pet's needs, and a documentation of the current feeding plan in the medical record. At a minimum, the monitoring should include body weight and BCS by the owner each month in order to detect changes early.

If nutritional risk factors or age-related problems are identified, an extended evaluation and management plan is indicated. This in-depth evaluation should address

Table 2**Initial screen: assessing for nutritional risk factors**

Check When Any Risk Factors Present in the Patient	
	Require Extended Evaluation if (✓)
Nutritional Screen for Risk Factors	
<i>History of:</i>	
Treats/snacks/human foods >10% intake	
Inadequate information/inappropriate feeding/food	
Consuming unconventional diets	
Previous/ongoing medical problems	
Gastrointestinal signs	
<i>Physical Examination:</i>	
Any abnormal BCS ($\neq$ 5 out of 9)	
Any abnormal MCS	
Unintentional weight loss or gain	
New medical condition	
Poor skin hair coat	
Dental disease	

Adapted from the 2010 AAHA Nutritional Assessment Guidelines for Dogs and Cats. © American Animal Hospital Association, 2010.

changes that may indicate the onset of common age-related diseases that may be influenced by nutritional management (**Box 1**).

Diet Assessment

A comprehensive diet history is a critical component of the nutritional assessment of senior pets. To facilitate obtaining a comprehensive diet history, a form can be provided to the owner before the appointment (http://acvn.org/wp-content/uploads/2020/04/ACVN-Diet-History-Form-2020-FINAL_fillable.pdf). This form allows the caregivers an opportunity to look at pet food labels at home, measure the amount they are feeding, and perhaps keep a food diary before the visit. The diet history should identify all snacks, treats, and nutritional supplements by type and amount. The drug/supplement history should include questions about the use of food to administer medication, because it may comprise a significant portion of the pet's caloric intake. Diet history information combined with the patient assessment provides information about the patient's daily caloric requirements and specific nutrient intake. This nutrient intake should be compared with the patient's individual needs. For example, an overweight pet with a robust appetite should not be fed a calorie-dense product. Reducing the amount of a high-calorie product to limit calorie intake could lead to deficiencies of other essential nutrients^{25,26} and increase hunger or undesirable food-seeking behaviors. Such pets would benefit from a diet specifically formulated to contain lower calories and a higher nutrient/calorie ratio.

Feeding management assessment

Feeding practices and preferences influence pets' intake. Multipet households may present competition, limiting the senior pet's access to food. A senior pet with mobility issues may have difficulty or pain associated with accessing food.

Box 1**Extended screening: assessing senior dogs for nutritionally relevant age-related factors**

Extended evaluation: age-related diseases to evaluate in senior dogs

Abnormal body and muscle condition: change in weight and muscle mass?

Diet: is the pet eating appropriate amounts of balanced diet?

- Assess appetite and intake
- Assess ability to eat: prehension, mastication swallowing for those underweight and/or poor intake
- Perform oral examination: include periodontal, tonsils, or any oral abnormalities
- Assess sensory input: smell, vision, palatability of food; consider palatability enhancer if necessary

Mobility and access to food and water

- Is the pet able to walk, access food provided? Able to stand to eat and drink?
- Other pets or physical limitations impairing access?
- Mobility and exercise: is the pet's MCS normal (3 out of 3)?
- Presence of osteoarthritis, lameness, pain? Play a role in maintenance of comfort, fitness, and healthy BCS
- Activity minimizes sarcopenia
- Exercise and activity provide mental stimulation and environmental enrichment

Cognitive function

- Disorientation/confusion: becomes lost or confused, fails to recognize familiar people?
- Changed interactions with family members? Isolates or seeks attention less often?
- Change in sleep/activity cycles? Wander or pace, sleep more in day, less at night?
- Loss of house training (nonmedical reasons)

Change in clinical status to suggest disease onset

- Changes in energy, demeanor, and well-being
- Changes in urination or stool quality, frequency, or quantity

An extended evaluation is performed if more than 1 risk factor is identified in the nutritional screening process. This evaluation should include eating (both appetite and intake), oral examination, aspects of activity and mobility, sleep, cognitive function, and behavior.

Dental disease, common in senior pets, may limit intake because of pain or difficulty prehending. Age-related decline in sensory perception or cognition may require a different feeding strategy, such as warming food or hand feeding. Determine whether food is accurately measured, how much/how often food is offered, and how much is eaten. Ask whether there have been recent changes to the feeding plan and why, as well how the pet adapted to those changes. Senior pets becoming picky may be the first clue the owners notice of an underlying medical condition.

Reassessment and Modification of Treatment Plan

Nutritional assessment of geriatric pets is an ongoing process. Dogs and cats experience a variable and wide variety of metabolic changes as they age. It is important to communicate and engage pet owners to create the expectation of continued reassessment and treatment modifications that accommodate the specific changes observed in each individual pet, rather than adopting a general senior protocol. A vigilant monitoring plan allows early detection of problems if they arise and a better opportunity to intervene or modify the pet's individualized nutritional plan to improve its health. Partner with clients to help ensure success and maintain adherence to the feeding and monitoring goals.

EFFECTS OF AGING ON NUTRITIONAL NEEDS

Energy

Aging can result in both structural and functional changes of the gastrointestinal tract. However, clinically relevant differences in nutrient absorption between young adult and geriatric dogs have not been reported.^{27,28} In contrast, approximately one-third of cats greater than 12 years of age have decreased fat digestibility and approximately 20% of cats greater than 14 years of age have reduced protein digestibility.²² Maintenance energy requirement (MER) is defined as the energy required to keep an animal at a state of energy equilibrium such that caloric intake matches energy expenditure resulting in stable body weight. MER varies depending on factors such as breed, activity level, health, neuter status, and age. As dogs age, MER decreases ~25%, with the greatest decline at middle age,²⁹ although some studies report an even greater decline in MER with age.³⁰ In cats, MER seems to decrease by approximately 3% per year for the first 11 years of life, but, after ~12 years of age, MER tends to increase, and weight loss and decreases in LBM are common.^{31–33}

Because of the wide range of individual energy requirements across the senior pet population, each senior needs frequent monitoring to adjust energy intake to match that individual's needs. Aging pets may be less active than young adults, which contributes to reduced MER. If no adjustments are made to energy intake to account for the reduced caloric requirement, the senior pet may gain unhealthy weight. A less calorie-dense diet with a higher nutrient to calorie ratio would be beneficial to promote ideal weight while delivering sufficient intake of essential nutrients. Results from a life-long study performed in dogs revealed lower disease incidence, later onset of disease, and increased life span in calorically restricted animals. Dogs fed to maintain a lean body condition lived an average of 13.0 years compared with 11.2 years in the heavier control group.³⁴ Thus, maintaining energy balance to maintain optimal body condition should be one of the most important health goals for senior pets. In 1 study following a colony of aging cats, body weight decreased starting about 2.5 years before end of life, before clinical evidence of underlying disease.²² For this reason, clinicians should take note of subtle declines in body weight and recommend appropriate diagnostics with the goal of earlier diagnosis of an underlying medical condition. Evaluating changes in body weight and body condition in conjunction with food intake also allows veterinarians to investigate possible underlying disorders. Weight loss despite increased food intake in a senior cat increases the index of suspicion for diseases such as hyperthyroidism. Weight gain with stable caloric intake may occur in a senior dog with decreased mobility because of osteoarthritis (OA) or certain endocrinopathies, such as hypothyroidism. Unhealthy weight gain exacerbates several age-related conditions, including OA, so caloric intake must be adjusted. Maintaining energy balance to maintain optimal body condition should be one of the most important health goals for senior pets.

Water

The prevalence of dehydration in elderly humans is 20% to 30%. It is mainly secondary to reduced thirst sensation and reduced ability to concentrate urine. Hypohydration or chronic mild dehydration in human elders is associated with frailty, morbidity, and mortality.³⁵ Mild dehydration has also been associated with impaired cognition, mood, and pain sensation in humans.^{36–38} Although optimal water recommendations for senior dogs and cats remain unknown, it is prudent to closely monitor water intake in this population. Older pets with decreased mobility may need management modifications, including an increased number of water bowls in multiple locations to facilitate access to clean fresh water at all times. Water intake should be monitored or

ensured when older dogs are exercising or exposed to hot environments. Senior pets may also be at risk of dehydration if they have subclinical renal insufficiency. When a senior pet has a good appetite but water intake is suspect, changing to a moist food, adding water to the food as the pet tolerates it, or considering a nutrient-enriched water supplement to improve hydration should be considered.

Protein

Protein requirements increase with age because of increased protein turnover and reduced protein synthesis.^{39,40} Healthy senior pets do not benefit from protein restriction⁴¹ and may be harmed by limiting dietary protein.^{42,43} Insufficient or marginal protein intake contributes to sarcopenia. Thus, protein restriction of seniors could be more detrimental than protein deficiency in younger animals.⁴⁴ Although nutrition alone does not prevent loss of LBM, providing adequate dietary protein is an essential component to limit this loss. As a general guideline for estimating adult daily protein needs, provide at minimum 2.55 g protein per kilogram body weight (or ~ 1 g protein per pound body weight) for dogs,^{8,20,21} and ~5 g protein per kilogram body weight (~2 g per pound body weight) for cats.^{45–48} There is growing support that, like healthy senior people, senior pets may require approximately 50% more dietary protein than adults.⁴⁹ This level of protein intake should minimize risk of protein deficiency, help minimize loss of LBM, and should only be restricted when medically indicated.

Because of the wide variation in energy needs as pets age, protein intake should be assessed in the context of the individual's energy needs. For example, older dogs generally require fewer calories, or less food, than younger dogs, whereas senior cats may or may not need calorie adjustments to maintain healthy body weight. In general, diets for older dogs should contain not only lower calories but a higher percentage of protein or a higher protein/calorie ratio in order to meet the dog's age-related nutritional needs. Based on the diet history, ensure that the pet is meeting daily protein needs. Regular reassessment of MCS to monitor LBM is important in managing the nutritional health of seniors.

WHAT IS A SENIOR PET FOOD?

Pet owners perceive that most pets, including senior dogs, are healthy and do not require a therapeutic food,⁵⁰ but they are still left with hundreds of pet foods options. Advice and information recommending the best food is available almost anywhere, from trainers to pet food retailers, from magazines, Internet sources, and social media. In a survey of pet owners' opinions about nutritional requirements of senior dogs, most responded that senior dogs have different nutritional needs than adults, with seniors needing fewer calories and less fat, sodium, protein, and carbohydrates.⁵¹ However, the Association of American Feed Control Officials (AAFCO) has established nutrition guidelines for growth, reproduction, and adult maintenance, but there is no established nutrient profile to meet the geriatric life stage needs.⁵² The nutrient and caloric content of products marketed for both senior dogs and cats is widely variable.^{51,53} There is a wide discrepancy between perceived needs of senior pets and actual diet composition of products marketed for senior pets. This discrepancy makes it even more critical for the VHCT to play an active role in providing credible nutritional advice, especially for senior dogs and cats that have unique nutritional concerns.

NUTRITIONAL INTERVENTION OF SELECTED AGE-RELATED DISEASES

Although the most common age-related conditions in pets are best managed with a multimodal approach combining nutritional strategies, exercise or environmental

enrichment, and medical management, the following discussion focuses on nutritional management. This issue of *VCNA* has several chapters devoted to the nutritional management of specific disease conditions. Therefore, this article highlights nutritional concerns of generally healthy senior pets. The following discussion focuses on comorbid conditions that occur commonly in aging pets and are often overlooked or dismissed as simply aging changes, when nutritional intervention for these conditions can play an important role in optimizing health.

ABNORMAL BODY WEIGHT

Overweight/Obese

Hyperadiposity, the most prevalent form of malnutrition, contributes to many of the diseases linked to obesity.^{54–56} However, pets that are overweight often go unrecognized or may not have this health concern addressed. The canine lifespan study³⁴ showed the benefits of maintaining a lean body condition and many negative health consequences with as little as 25% weight gain above healthy ideal BCS (4.5–5 out of 9). For information regarding maintaining or achieving healthy body weight, see Megan Shepherd's article, "Canine and Feline Obesity Management," in this issue. In contrast with dogs, evidence suggests cats with BCS up to 6 out of 9 may be associated with longevity.⁵⁷

Underweight

Cats greater than 12 years old more commonly experience weight loss with advancing age and have a greater likelihood of being underweight than young adult cats.^{58,59} Identifying weight loss or underweight senior cats is important because underweight cats are more likely to have a greater morbidity and mortality.⁵⁷ Weight loss has been shown to precede diagnoses of disease in cats,^{60,61} and early detection may provide an opportunity for early diagnosis and nutritional or medical intervention. To address unintentional weight loss, either increase the amount of the current food or transition to a more calorie-dense diet.

DEGENERATIVE JOINT DISEASE

OA is common in senior cats⁶² and is the most prevalent joint disorder in dogs, affecting as many 1 in 5 dogs, with OA increasing in incidence and severity with advancing age.⁶³ Being overweight or obese is recognized as a primary risk factor.⁶⁴ Poor mobility and decreased activity are each components of a frailty score in dogs. Increased frailty is associated with shorter time to death.⁶⁵ Nutritional strategies for improving geriatric health span and minimizing OA include weight and muscle management, and provision of omega-3 fatty acids.

Weight and Muscle Management

Correction of hyperadiposity can improve clinical signs of lameness in arthritic dogs.⁶⁶ Scientific data are limited regarding cats with OA; however it is assumed, as in other species, that obesity management is important in reducing inflammatory mediators and pain associated with OA. Strategies to maintain healthy body weight, BCS, and LBM and prevent sarcopenia should be prioritized for senior pets. This management can be achieved by selecting a complete and balanced diet that supplies protein and other nutrients while providing the number of calories to prevent excess body fat gain. The nutritional goal is to delay onset and prevent progression of OA, maintain LBM, and delay frailty.

Long-Chain Omega-3 Polyunsaturated Fatty Acids

Intake of omega-3 polyunsaturated fatty acids (n-3-PUFAs) shows the greatest evidence for synovial antiinflammatory effects in dogs^{67–69} and cats^{62,70} compared with other nutraceuticals. The n-3-PUFAs eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) compete with arachidonic acid in cell membranes to yield fewer inflammatory leukotrienes, prostaglandins, and thromboxanes, which reduce the pain of OA. Marine oils (EPA>DHA)⁷¹ are more effective compared with shorter-chain plant-source n-3 oils. Studies have shown the beneficial effects of supplementing n-3-PUFAs in dogs with lameness secondary to OA.^{68,69,72} There is currently no standard accepted dose of omega-3 fatty acids for dogs or cats. In dogs, a general recommended range of doses for OA is a combination of EPA and DHA of 230 to 310 mg/kg of metabolic body weight, whereas doses of 90 to 110 mg/kg body weight were also effective.^{68,69,73} In cats with OA, a diet containing 188 mg of omega-3 fatty acids/100 kcal or a similar amount of added supplement alone improved owners' perception of their cats' activity.^{62,70} Veterinary diets formulated to help pets with OA have enriched concentrations of n-3-PUFA with EPA and DHA. The therapeutic joint diets also include some combination of proteoglycan precursors (glucosamine and chondroitin sulfate) and antioxidants. Consumption of therapeutic diets may allow reduction in nonsteroidal antiinflammatory drug use. Note that these diets are better suited for pets that are not significantly overweight, because the therapeutic joint diets are not intended for weight reduction, and limiting food to achieve weight loss may not only lead to nutrient deficiencies but may also not deliver the therapeutic level of supplements. For this reason, a new generation of combination therapeutic diets formulated as combination weight loss and mobility supplements are entering the market.

COGNITIVE DYSFUNCTION

As many as 20% to 68% of middle-aged to elderly dogs are thought to experience cognitive dysfunction or behavioral changes, which can manifest in varying degrees of mental decline⁷⁴ (see **Table 2**). Nutraceuticals may have potential use both in prevention and treatment but are best when combined with environmental enrichment.^{75–77} Antioxidants and medium-chain triglycerides have shown promise in helping dogs with cognitive dysfunction, as addressed in the Valarie V. Tynes and Gary Landsberg's article, "Nutritional Management of Behavior and Brain Disorders in Dogs and Cats," in this issue.

SUPPLEMENTS VERSUS ENRICHED DIETS

One caveat for the use of nutraceutical supplementation is that they have not been adequately assessed for efficacy, optimal doses, or nutrient interactions. When considering whether to select a diet containing the supplement or to prescribe a supplement, consider the nutrient composition of the base diet. Ensure that the base diet meets the macronutrient needs of the patient and determine whether it will provide an adequate dose of the intended supplement when fed to meet the energy needs of the individual pet. If not, it is prudent to select a more appropriate diet and give the intended dose of supplement (**Box 2** Provides an example of supplement dosing).

THE CONUNDRUM OF COMORBIDITIES

Making a nutritional recommendation seems straightforward when the senior pet is healthy or has only a single problem. Challenges arise when patients present with multiple seemingly competing or conflicting comorbidities, such as overweight patients

Box 2**Examples of supplement dosing with enriched food versus supplement administration**

Two senior 10-kg mixed-breed dogs with OA

Both dogs are at their healthy weight with a body condition of 5 out of 9

A hypothetical joint supplement (Y) has been recommended for both dogs at a standard dose of 50 mg/kg body weight

The daily dose for each dog: $10 \text{ kg} \times 50 \text{ mg/kg} = 500 \text{ mg}$ of supplement Y per day

One pet food company just released a new therapeutic food formula BegoneOA. This therapeutic dog food has a caloric density of 370 kcal/cup, which contains 75 mg supplement Y/100 kcal.

Is it better to give each dog the Y supplement or feed a food with the Y supplement incorporated into the formulation?

Dog A: current daily intake of 1.5 cups/d of an adult maintenance food (380 kcal/cup) for a total of 770 kcal/d to maintain his healthy weight

The BegoneOA food fed at 770 kcal would provide:

$75 \text{ mg/100 kcal} \times 7.7[100 \text{ kcal}] = 577.5 \text{ mg}$ of supplement Y

The food would provide an appropriate daily supplement dose for dog A.

Dog B: current daily intake is 1.5 cups/d of a healthy weight product (300 kcal/cup) for a total of 450 kcal/d

The BegoneOA food fed at 450 kcal would provide:

$75 \text{ mg/100 kcal} \times 4.5[100 \text{ kcal}] = 337.5 \text{ mg}$ of supplement Y

The food would not provide the 500-mg recommended daily supplement dose for dog B.

The dog should continue eating his current food and receive 500 mg of supplement Y per day or change to the therapeutic food and supplement an additional 163 mg of supplement Y per day to achieve the recommended dose.

with renal disease or cancer and pancreatitis. Except for obesity and OA, there is little research in how to manage multiple problems. However, in the absence of evidence, patients must eat. A general approach to prioritizing comorbidities is described in **Box 3. Table 3** lists typical ranges of nutrient modification to consider when managing multiple medical conditions. For example, an overweight senior cat or dog with early kidney disease may benefit from a modestly high-protein, lower-phosphorus diet.⁴¹ Once a diet plan is implemented, the patient is monitored to see whether the desired effect is achieved with a repeated nutritional assessment and modifications to the plan as necessary in an iterative process.

END-OF-LIFE CONSIDERATIONS

Nutrition and nurturing are intimately linked, and food is a primary way of caring for pets. When the pet approaches end of life and is facing advanced stages of a progressive life-limiting illness or disability, realigning nutrition goals is usually indicated. Nutrition is a component of the integrated end-of-life treatment plan outlined in the 2016 AAHA/International Association for Animal Hospice and Palliative Care (IAAHPC) End-of-Life Care Guidelines.⁷⁸ Provide empathetic nonjudgmental communication regarding nutrition with the goal of maximizing patient comfort and minimizing suffering while supporting the caregiver. The veterinarian should assess and monitor the patient's hydration status, food intake, and feeding behaviors. Address underlying causes of hyporexia or dysrexia such as nausea or discomfort when possible. Help set expectations with the caregiver that will reduce stress for both the patient and family during this critical time. Consider giving the pet and caregiver permission to skip a meal or resume favorite foods that might have been discouraged in the past because

Box 3**Nutritional prioritization process for comorbidities**

There is little evidence for best practices for managing senior pets with multiple conditions or comorbidities, but patients must eat to support their needs and support their quality of life. One approach is to perform a nutritional triage or prioritization, considering the following elements of the patient's status:

- Consider nutrients of concern or nutritional evidence to:
 - Try to meet needs for species and senior life stage
- Consider medical condition's onset: is it acute or chronic?
- Prioritize conditions affecting clinical signs and the patient's quality of life, and the degree or severity.
- Prioritize medical problems next based on the prognosis and/or progressive nature of each.
 - Build a key nutrient profile wish list
 - Nutrient profile for management of each disease
 - Consider contraindications or intolerance
 - Find a balance or prioritize management of diseases
 - Check **Table 3** to consider key nutrient ranges desired to manage the patient's individual needs
 - Select a therapeutic diet or seek board-certified veterinary nutritionist assistance for homemade formulation
- Make a nutritional recommendation
 - Exact product name, form, and flavor
 - Specific amount to feed
 - Frequency to feed
 - Monitoring or follow-up plan

Table 3**Information^b for assessing products with nutrient modifications**

Nutrient Modification	AAFCO^a			
	Minimum	Low	Moderate	High
Protein: Dog (g/100 kcal)	4.5	<5	6–7	>9
Protein: Cat (g/100 kcal)	6.5	<7	7–8	>10
Fat: Dog (g/100 kcal)	1.4	<2 (ultralow)	2.5–3.5 (low)	>5
Fat: Cat (g/100 kcal)	2.3	<3	4–4.5	>5
Phosphorus: Dog (mg/100 kcal)	100	<100	<150	>200
Phosphorus: Cat (mg/100 kcal)	125	<125 (ultralow)	<160 (low)	>200
Sodium: Dog (mg/100 kcal)	20	<70 (ultralow)	<100 (low)	>250
Sodium: Cat (mg/100 kcal)	50	<70 (ultralow)	<100 (low)	>250
Combined EPA and DHA: Dog (mg/100 kcal)	NA	NA	~ 10–15	>15 (wide variation)
Combined EPA and DHA: Cat (mg/100 kcal)	NA	NA	—	15 (wide variation)

Typical nutrient ranges and AAFCO minimum levels for adult canine and feline maintenance to use as reference when selecting products with nutrient modifications to either enrich or restrict a particular nutrient.

^a AAFCO 2020 Official Publication adult maintenance minimums.

^b There are no currently established values for low, moderate, and high nutrient ranges. The specific ranges provided in this table are based on the authors' opinions and clinical experience with commercially available foods.

of the underlying medical condition. Veterinary professionals are aware that decreased water and food intake are often part of the normal end-of-life process. However, caregivers may be under the impression that they just have not found the right food the pet will eat. This false assumption can be highly stressful to both the pet and the caregiver. Discourage force-feeding, which may lead to food aversion and is stressful to both the pet and caregiver. Instead, reframe realistic expectations of food intake and encourage coaxing and reassurance to both the pet and caregiver.

SUMMARY

Senior pets are increasingly becoming a sizable proportion of patients seen in primary care. Therefore, an iterative, proactive approach to making nutrition assessments and patient-specific recommendations to support optimal health and body condition contributes to their health spans. More frequent health and nutritional screens beginning when pets are middle aged improve disease surveillance and early detection, allowing medical and nutritional intervention.

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