

Managing the Senior Cat

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Aging, or senescence, is a complex biological process that is not always easy to define. Essentially, aging involves increasing damage and loss of function that occurs over time at both the cellular level and at the level of the entire animal or organism. Many age-related changes are manageable in order to maintain quality of life, and age-related diseases may be manageable or curable. In human medicine, the disciplines of geriatrics (the study of diseases of the elderly) and gerontology (the study of the social, psychological, and biological aspects of aging) are well established. This focus on the unique needs of aging individuals is becoming more important in veterinary medicine as well.

According to the most recently published figures, about one third of American and Canadian households own at least one cat.^{40,44} As most veterinarians appreciate, many of these are older cats. For example, a 2008 Canadian survey found that 35% of owned cats are greater than 8 years of age.⁴⁰ In the United States and the United Kingdom, senior cats also likely account for at least 30% of the owned cat population. Veterinarians should be familiar not only with normal aging, but also with the common medical problems in this age group and should be able to provide owners with educational support. Unfortunately, the American Animal Hospital Association (AAHA) estimates that only 14% of senior pets receive regular health screenings recommended by veterinarians.¹⁴ The main obstacle is lack of clear recommendations from the veterinary health care team.

The American Association of Feline Practitioners (AAFP)/AAHA feline life stage guidelines define a senior cat as 11 to 14 years old and a geriatric cat as 15 years and older.⁴⁸ The term “senior” is often used to refer to all cats greater than about 10 years and will be used

as such in this chapter. Owners often ask veterinarians about the human equivalent age of cats. In general, senior cats are approximately equivalent to human ages 60 to 72 and geriatric cats are approximately equivalent to human ages 76 to 100 years. Although these age comparisons are helpful, it is important to remember that the process and speed of aging varies among individuals and may be influenced by genetics, nutrition, environment, and other factors. A cat’s chronologic age is not a good indicator of functional age, and even within an individual, different organs may age at different rates.

Of course, old age is not a disease, and both veterinarians and owners must resist the temptation to ascribe signs of illness to aging. For example, pain, dehydration, or hypokalemia might lead to clinical signs that owners attribute to the “slowing down” of old age. Although knowledge of the changes in physiology and disease prevalence resulting from aging is an important part of health care for senior cats, decisions on disease management should never be made on the basis of age alone. In particular, making a diagnosis and formulating a treatment plan should never be avoided simply because of the age of the patient. Many problems of senior cats are chronic and progressive so that early diagnosis and treatment is important for pain management and preservation of quality of life.

IMPACT OF AGING

Unfortunately, little investigation into the physiology of aging has been conducted in cats, and most information is extrapolated from other species or learned through observation of disease states. The impact of aging may

be obvious (e.g., white hairs, dulling of senses) or may consist of physiologic changes that are more difficult to appreciate. Aging also brings changes in the sleep/wake cycle and a reduced ability to tolerate stressors and changes in routine and environment. Changes known to occur with aging in some body systems include

1. Immune system: Decreased phagocytic function and neutrophil chemotaxis lead to decreased immune competence. Other changes in cats greater than 10 years of age compared with younger cats include lower total leukocyte counts, as well as reduced numbers of CD4+ and CD8+ T-lymphocytes and an overall reduction in the CD4/CD8 ratio.⁹ However, the ability to mount humoral immune responses appears to be preserved even though the cell-mediated response is affected. Immune function may be further affected by the presence of chronic disease states and immunosuppressive drug therapy, leading to increased risk of infection.
2. Skin: Collagen and elastin content is reduced, leading to thinner, less elastic skin. Blood flow to the skin is also reduced. These changes may make assessment of hydration using skin turgor difficult and predispose to infection. Senior cats groom less efficiently than younger cats, leading to hair matting and dermatitis. Nails may be overgrown, thick, and brittle and require more care.
3. Special senses: Reduced vision and hearing may make older cats more easily startled. Lenticular sclerosis is a normal aging change that owners may misinterpret as a cataract. Pupillary light responses are slower, resulting in part from iris atrophy, and retinal changes may occur secondary to hypertension. Decreased olfactory function and taste sensation may impair appetite.
4. Kidney: Aging causes decrease in kidney size, blood flow, and glomerular filtration rate. Mineralization of the renal pelvis is not uncommon, although the significance is unknown, and it should not be confused with nephrolithiasis. Potassium homeostasis is impaired and hypokalemia may be common.
5. Musculoskeletal: Changes in cartilage composition and physiology are associated with degenerative joint disease. Mineralization of some areas of the skeleton, such as costochondral junctions, may be detected on radiographs, but the clinical significance is unknown. Muscle mass may decrease because of weight loss, and muscle atrophy may occur because of inactivity, leading to weakness.
6. Oral cavity: Periodontal disease, tooth resorption, tooth loss, and oral cancer occur more commonly in senior cats, and associated pain can contribute to inappetence and weight loss.

TABLE 37-1 American Society of Anesthesiologists Physical Status Classification System

Class	Definition
1	Normal, healthy patient
2	Patient with mild systemic disease
3	Patient with severe systemic disease
4	Patient with severe systemic disease that is a constant threat to life
5	Moribund patient not expected to survive without the procedure

Drug Disposition

An important aspect of aging in cats is that responses to drug therapy change in association with alterations in renal and hepatic function, body composition, and other physiologic responses. These changes can affect the absorption, distribution, metabolism and elimination of drugs. Of these changes, renal insufficiency is probably the most important and common, leading to decreased elimination and increased toxicity of drugs cleared through the kidney. Adjustments in dose and/or frequency of dosing may be necessary in patients with chronic kidney disease (CKD) or hepatic disease. Senior cats may be administered multiple medications and supplements, making monitoring of potential drug interactions critical. More information on drug therapy in senior and geriatric cats is found in Chapter 4.

Veterinarians and owners are often reluctant to administer anesthesia to senior cats, resulting in an impaired ability to make a diagnosis or incomplete treatment. For example, senior cats may require anesthesia for assessment and treatment of oral and dental diseases on multiple occasions. Untreated dental disease is a significant cause of chronic pain and impaired quality of life. As in human medicine, age in itself is not a reason to avoid anesthesia, but changes in physiology and the presence of disease may increase risk and must be considered in formulation of the anesthetic plan (Table 37-1). Aging causes decreased lung compliance and respiratory muscles that fatigue more easily. Heart function may be affected by primary diseases, such as hypertrophic cardiomyopathy, or by changes induced by hyperthyroidism or hypertension. Anesthetic risks also increase with age in cats, independent of the American Society of Anesthesiologists (ASA) physical status grade.⁶ Senior cats may be more susceptible to the depressant effects of sedatives and anesthetic agents. As well, senior patients may be more susceptible to hypothermia because of impaired thermoregulation and to prolonged recovery because of reduced metabolic function and hypothermia. Increased anesthetic risk is also associated with decreasing body size in cats.⁷ Smaller

TABLE 37-2 Changes in Various Body Condition and Nutrition Parameters in Different Feline Life Stages

Age (Years)	Body Weight	Fat Mass	Lean Mass	Fat Digestibility	Protein Digestibility	Urine Volume
1-7	No change or ↑	No change or ↑	No change	>90%	>85%	No change
7-12	↑↑	↑↑	↑	↓	↑	?
12+	↓↓	↓↓	↓↓	↓↓	↓	↑↑

↑, Increase; ↑↑, larger increase; ↓, decrease; ↓↓, larger decrease.

Adapted from Perez-Camargo G: Cat nutrition: what is new in the old? *Comp Contin Educ Pract Vet* 26:5, 2004.

patients may be more at risk of drug overdose (especially if an accurate weight is not used to calculate drug doses), more prone to hypothermia, and more prone to perioperative management difficulties (e.g., intravenous catheter placement, endotracheal intubation).⁵ Safety can be improved by thorough preanesthetic patient assessment, stabilization of chronic diseases when possible, appropriate selection of pre-anesthetic and anesthetic drugs, and proper monitoring (e.g., pulse quality and rate, oxygen saturation). More information on anesthetic considerations for senior patients is found in Chapter 7.

Nutritional Requirements

Interestingly, changes in maintenance energy requirements with aging in cats are unlike those in humans and dogs. Short-term studies concluded that cats do not experience a decrease in maintenance energy requirements (MERs) with aging.^{8,36,46} However, longer-term studies refined the state of knowledge and concluded that MERs decrease with age by about 3% per year in cats up to about 11 years old.^{13,26} However, from about 12 years of age, the MERs of cats actually increase, and this may partly explain the tendency of older cats to be underweight.¹³ In contrast, humans and dogs experience a decline of about 20% in maintenance energy requirements with aging. This difference may be because humans and dogs tend to be more active in their younger years, whereas the activity level of most cats, especially those that live indoors, is constant throughout their lives. For most senior cats (the exception being those that are obese), energy provision should not be reduced, because they are susceptible to weight loss. Other reasons for this susceptibility to weight loss may include changing physiology, presence of diseases, and decreased appetite. Older cats are also less efficient at digesting food, particularly fats and proteins, and may need to increase their daily food intake to compensate.²⁰ Table 37-2 summarizes various body condition and nutrition parameters at different life stages.

Many senior cats, especially those 12 years of age and older, will benefit from being fed a palatable food that is highly digestible and energy dense and that can be offered in small amounts frequently.²⁵ Specific protein

requirements for senior cats compared with younger cats are not known. However, there is no known benefit of protein restriction in healthy senior cats. If there is no specific requirement for a restricted protein diet (e.g., late-stage CKD), current recommendations are to feed a high-quality protein in an amount that meets adult requirements (at least 2 g/lb [5 g/kg] ideal body weight). More information on nutrition for senior and geriatric cats is found in Chapter 16.

WELLNESS CARE FOR SENIOR CATS

Components of wellness care by life stage are found in Table 8-2. Comprehensive wellness examinations, history assessment, and minimum database wellness testing are recommended every 6 months for senior cats.^{14,48} This frequency is warranted because an individual's health status may change rapidly in this age group and because early detection and treatment of problems is important to preserve quality of life. As well, the signs of illness in cats are often subtle and may go unnoticed by owners until the problem is well advanced (see the 10 subtle signs of sickness in Chapter 8 and <http://www.healthycatsforlife.com>). In addition, senior cats with chronic diseases may require more frequent evaluation and laboratory testing.

The minimum database for evaluation of senior cats includes a complete blood count (CBC), full serum chemistry panel (especially total protein, albumin, globulin, alkaline phosphatase [ALP], alanine transaminase [ALT], glucose, blood urea nitrogen [BUN], creatinine, potassium, phosphorus, sodium, and calcium), full urinalysis including microscopic sediment examination, and total thyroxine (T₄). Depending on risk factors and clinical signs, fecal examination and retrovirus testing may also be included in wellness testing. It is important to recognize that serum creatinine may be within the normal reference range in cats with CKD if the patient is thin with reduced muscle mass. In one study, serum calcium, hematocrit, hemoglobin, red blood cells, albumin, and albumin/globulin ratio were significantly lower in older cats (average age 15 years) compared with young cats (average age 2.75 years).^{13a} In the same study, total serum protein, albumin, and hematocrit were

significantly lower in otherwise healthy senior cats with low body condition scores compared with senior cats of normal weight.

Blood pressure should be measured in cats with known hypertension, cats with predisposing diseases (e.g., CKD, hyperthyroidism) or cats with compatible clinical signs. Experts vary on the utility of routine blood pressure measurement in senior cats with no clinical signs or predisposing diseases because of inherent problems with the procedure, which may lead to overdiagnosis and unnecessary treatment.

It is unknown if senior cats respond to primary vaccination or revaccination in the same way as younger cats. In one study of greater than 2,000 cats receiving a primary course of vaccination against rabies virus, older cats had a significantly greater chance of failing to achieve the titer of 0.5 IU/mL required for international travel.³¹ Until more is known about vaccinal responses in aging cats, the AAFP Feline Vaccine Advisory Panel recommends that healthy senior cats and those with stable chronic diseases receive vaccinations according to the same principles as younger cats.⁴²

The home environment is critically important for feline wellness, and veterinary staff should be trained to ask questions that uncover pertinent information and counsel clients about enriched environments. This is especially true for senior cats, because they are more likely to live totally indoors than younger cats. An indoor-only life style decreases the risks of trauma and infectious diseases, but welfare may be compromised and illness induced by a stressful or sterile environment. Recent research has shown that stressors (e.g., lack of sufficient resources, presence of visitors, changes in diet, changes in routine, conflict with other cats) can induce physical signs of illness in otherwise healthy cats, including anorexia, vomiting, or diarrhea.^{45a} Indoor cats need adequate numbers of “resources”—hiding places, accessible elevated resting places, food and water stations, scratching posts, litter boxes, and stimulating toys.

Senior cats may benefit from environmental modifications, as long as they are made gradually. Examples include a sleeping area that is in a warm place (e.g., on a hot-water radiator) or that has supplemental heat (e.g., covered hot-water bottle), and resting/hiding areas that are in quiet locations away from the main activity of the household and, ideally, that are not accessible by other pets. Modifications may be necessary to allow the cat to reach a favored resting area, such as moving a chair next to a window ledge for easier access. Litter boxes should be large and shallow with low sides and should be placed in easily accessible yet quiet locations, preferably on each floor of the home. Plastic under-bed storage boxes are often better choices than commercially available cat litter boxes, which tend to be too small. Owners may need to clean the litter box more frequently, especially for the cat with polyuria. Placing a night-light near

litter boxes and in other places in the home is helpful for senior cats with declining vision.

DISEASES AND HEALTH PROBLEMS OF SENIOR CATS

Several diseases and conditions are more common in senior cats (e.g., hyperthyroidism, chronic kidney disease, neoplasia, dental, and oral diseases), and the practitioner should be aware of these issues and practice active surveillance to detect them. A brief discussion of selected diseases and health problems follows; more complete information on each topic is found elsewhere in this book.

Weight Loss and Dehydration

One of the easiest problems to detect is weight loss and decline in body condition. The body weight, body condition score, and percentage weight change should be determined and recorded at every opportunity, even if a cat has been presented for a nonmedical procedure, such as trimming nails. The prevalence of obesity decreases with age in cats; in fact, senior cats have a tendency to be underweight, especially those greater than the age of 10 to 12 years.^{21,39,43} However, this knowledge must not prevent assessment for causes of weight loss. For more on diagnosis and management of weight loss in senior cats, see Chapter 38.

Evaluation of muscle mass is also important, particularly in cats with chronic diseases. Identification of early muscle wasting may be important for the success of diagnostics and therapeutics. Evaluation of muscle mass includes visual examination and palpation over the temporal bones, scapulae, lumbar vertebrae, and pelvic bones. A muscle condition scoring system has been introduced for cats and is undergoing validation (Figure 37-1).^{23,33} Table 37-3 is a modified fat and muscle mass scoring system adapted for assessment of weight loss and body condition in feline cancer patients.

Another important aging change in cats is reduced sensitivity to thirst (Figure 37-2), resulting in an increased risk of dehydration even in cats with seemingly normal renal function. Even healthy young cats do not drink large amounts of water, a behavior influenced by the fact that the domestic cat originated in arid environments. The problem is exacerbated in cats with diseases causing polydipsia/polyuria, such as diabetes mellitus and CKD, as well as in cats under the stress of hospitalization or boarding. Healthy geriatric cats have higher water losses than younger cats possibly because of reduced urine concentrating ability even without obvious signs of CKD.³⁹ A common sequel to chronic dehydration is constipation, which is exacerbated by reduced colonic motility or reluctance to use the litter box because of

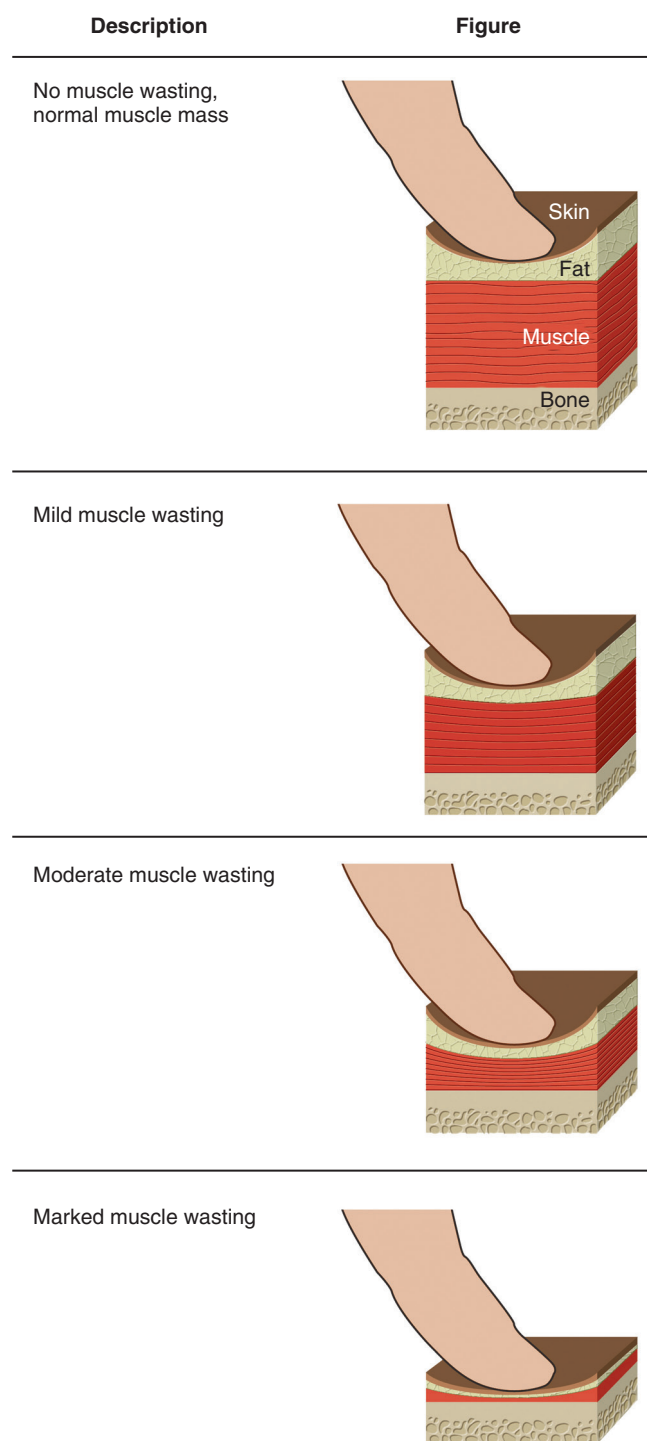


FIGURE 37-1 A muscle condition scoring system includes visual examination and palpation over the scapulae, skull, ribs, lumbar vertebrae, and pelvic bones. (Adapted from Baldwin K, Bartges J, Buffington T et al: AAHA Nutritional assessment guidelines for dogs and cats, J Am Anim Hosp Assoc 46:285, 2010.)

painful conditions, such as degenerative joint disease. Senior cats may benefit from increased water content through feeding canned foods, ensuring access to fresh water, flavoring water with chicken broth, and so forth. Methods for increasing water consumption are found in

TABLE 37-3 Fat and Muscle Mass Scoring for Cats

Score	Fat Mass	Muscle Mass
0	Absence of palpable subcutaneous fat over the ribs or abdomen	Severe muscle wasting palpable over the scapulae, skull, or wings of the ilia
1	Decreased amounts of palpable subcutaneous fat over the ribs or abdomen	Moderate muscle wasting palpable over the scapulae, skull, or wings of the ilia
2	Normal amounts of palpable subcutaneous fat over the ribs or abdomen	Mild muscle wasting palpable over the scapulae, skull, or wings of the ilia
3	Increased amounts of palpable subcutaneous fat over the ribs or abdomen	Normal muscle mass palpable over the scapulae, skull, or wings of the ilia

Adapted from Baez JL, Michel KE, Sorenmo K et al: A prospective investigation of the prevalence and prognostic significance of weight loss and changes in body condition in feline cancer patients, *J Feline Med Surg* 9:411, 2007.



FIGURE 37-2 An important aging change in cats is reduced sensitivity to thirst, resulting in an increased risk of dehydration even in cats with seemingly normal renal function. One way to encourage increased water consumption is to provide large water bowls, such as ones designed for dogs, to prevent the cat's whiskers from touching the sides when drinking.

Box 18-16. Since older cats do not cope well with changes in daily routine, any changes to food and water should be made gradually.

Cognitive Dysfunction

Increasingly, older cats are being presented to veterinarians because of behavior problems, such as house soiling.³ However, owners will not always voluntarily mention changes in behavior during veterinary visits; so, it is important for the clinician to obtain a behavioral

BOX 37-1**Behavioral History Questions for Owners of Senior Cats**

1. How much does your cat play? Has the way in which your cat plays changed recently?
2. Approximately how many hours does your cat sleep in each 24-hour period? Does your cat sleep well at night? Have there been any recent changes in your cat's sleeping behavior?
3. Does your cat yowl or vocalize at inappropriate times (e.g., at night or in a room when no one is present)?
4. Have there been changes in how your cat interacts with family members or other pets in the home?
5. Does your cat ever pace or wander aimlessly, or appear to be staring into space?
6. Does your cat ever eliminate outside the litter box? Have there been recent changes in your cat's elimination behavior?

Adapted from Crowell-Davis SL: Cognitive dysfunction in senior pets, *Comp Contin Edu Pract Vet* 30:106, 2008.

history for all senior cats and ask pertinent questions (Box 37-1). Research suggests that 28% of cats 11 to 14 years old and at least 50% of cats 15 years and older develop behavior problems.²⁹ The most commonly reported problem in cats age 11 to 14 years was alteration in social interactions, and the most commonly reported problems in cats 15 years and older were alterations in activity and excessive vocalization. Behavior problems, such as nighttime yowling (Box 37-2), can be the result of many different causes in senior cats, particularly medical conditions, such as

1. Hyperthyroidism: anxiety, restlessness, yowling at night
2. Hypertension: yowling at night
3. Diabetes mellitus: decreased social interactions, decreased grooming, inappropriate elimination
4. Feline lower urinary tract disease (FLUTD): inappropriate elimination
5. Conditions causing pain (e.g., degenerative joint disease, oral/dental disease): irritability, decreased social interactions, inappropriate elimination, poor appetite, decreased mobility, yowling at night
6. Conditions causing polyuria (e.g., CKD): inappropriate elimination

Diagnosis of the cause of behavioral problems should be approached as for any medical problem, with a complete medical history, thorough physical examination, blood pressure measurement, and appropriate laboratory testing. Primary behavioral problems affecting senior cats should also be considered.²⁸ Many conditions found in senior cats cause pain, such as degenerative joint

BOX 37-2**Causes of Nighttime Yowling**

1. Hypertension
2. Hyperthyroidism
3. Pain
4. Decreased vision or hearing
5. Cognitive dysfunction

disease, neoplasia, chronic pancreatitis, and chronic oral disease. Pain is associated with impaired recovery from injury or illness as well as behavioral changes. Selection of the most appropriate treatment modality for pain in senior cats must include assessment of major organ function, especially kidney and liver. Information on pain management for chronic conditions is found in Chapter 36.

Cognitive function involves processes such as perception, memory, reasoning, and judgment. In humans and dogs, complex types of learning and memory, such as spatial learning and spatial memory, are affected by age. Very little investigation into cognitive function and aging has been performed in cats, but the available evidence suggests that the same may not be true in this species. In one study, cats age 11 to 16 years performed better on tests of spatial learning than younger cats.³⁰ Another study found that cats did not undergo age-related declines in spatial memory function or motor function.³²

In senior cats, cognitive dysfunction (CD) is now recognized as an important problem, although formal diagnostic criteria have not been established. The most common signs of CD in cats are disorientation in time or space, altered learning and memory, house soiling, altered interactions (e.g., attention seeking, aggression, irritability, anxiety), changes in activity (including wandering or pacing), changes in sleep patterns, decreased appetite, decreased grooming, and increased vocalization (especially yowling at night). In dogs, the signs of CD are referred to by the mnemonic DISHA (Disorientation, Interactions, Sleep-wake, House-training, Activity) and this format may be useful for diagnosis of CD in cats as well.

Currently, there are no specific diagnostic tests for feline CD; it is a diagnosis of exclusion after medical and primary behavioral causes are ruled out. Various protocols have been validated using standardized apparatus for assessment of canine cognitive dysfunction, but similar equipment and protocols for assessment of cats have been lacking. Protocols and equipment are being developed for cats based on those used in dogs and horses; validation of neuropsychological testing may eventually improve diagnosis of CD in cats.^{29,34} Given that senior cats often have multiple health issues,

clinicians should be aware that diagnosis of a medical problem in a cat with behavioral signs does not rule out the possibility of concurrent CD.

The cause of feline CD is unknown, but pathologic brain aging with changes in cerebral blood flow and chronic free radical damage is suspected to play a role. Imaging studies have identified cerebral atrophy and other changes in the brains of elderly cats.²⁹ Neuron loss and decreased numbers of dendrites associated with Purkinje cells have been found in the cerebellum of old cats, which may affect motor function.⁴⁹ Decline in the activity of the cholinergic system in the locus coeruleus has been documented, which may cause cognitive dysfunction and alterations in rapid eye movement (REM) sleep.^{49,50} Inconsistent evidence suggests that Alzheimer-type changes, such as vascular and perivascular accumulation of amyloid-beta and microhemorrhage or infarcts, may also contribute to the clinical signs of CD in cats; further investigation is needed to clarify the relationship.^{4,12,18} Finally, concurrent medical conditions in senior cats may affect brain blood flow and oxygen supply, such as hypertension, anemia, and cardiac disease. Neurons are particularly sensitive to hypoxia.

Published studies on the efficacy of treatments for feline CD are lacking. Therapies extrapolated from humans and dogs include antioxidant-enriched diets and supplements combined with environmental enrichment. For example, a 3-year study of a canine senior diet containing antioxidants, L-carnitine, alpha-lipoic acid, and omega-3 fatty acids (b/d Canine, Hill's Pet Nutrition) along with environmental enrichment improved clinical signs and slowed cognitive dysfunction.^{22,35} Another study of a canine diet containing medium-chain triglycerides to provide an alternate source of energy in the brain (Purina One Vibrant Maturity 7+) improved cognitive function in senior dogs.³⁸ As of this writing, no diet has been designed to treat CD in cats although therapeutic diets supplemented with antioxidants and essential fatty acids are available for other conditions (e.g., degenerative joint disease).

Dietary supplements containing phosphatidylserine (Senilife, CEVA Animal Health, St. Louis, Mo.) have been associated with clinical improvement in dogs with CD.^{1,37} Although this product is also labeled for use in cats, no feline studies have been conducted. Another supplement containing phosphatidylserine, omega-3 fatty acids, vitamins E and C, L-carnitine, alpha-lipoic acid, and other ingredients (Aktiva; VetPlus, Lytham, United Kingdom) improved signs of disorientation, social interaction, and house soiling in dogs.²³ Alpha-lipoic acid is toxic for cats, and although a feline version of the supplement is available without this ingredient, no trials have been published to determine efficacy in cats. S-adenosyl-L-methionine (SAMe) improved activity and awareness in a placebo-controlled trial in dogs with CD.⁴¹ SAMe is commonly used in cats for treatment of

TABLE 37-4 Drugs Used for the Treatment of Cognitive Dysfunction in Cats

Drug	Dose*
Selegiline (Anipryl, Pfizer Animal Health)	0.25-1.0 mg/kg, every 24 hours
Nicergoline (Fitergol, Merial)	1.25 mg/cat, every 24 hours
Propentofylline (Vivitonin, Intervet/Schering-Plough Animal Health)	12.5 mg/cat, every 24 hours
Oxazepam	0.2-0.5 mg/kg, every 12 hours
Lorazepam	0.02-0.1 mg/kg, every 12 hours
Clonazepam	0.1-0.2 mg/kg, every 12 to 24 hours
Buspirone	2.5-5.0 mg/cat, every 12 hours
Fluoxetine	0.5-1.0 mg/kg, every 24 hours

*All drugs are given orally.

hepatic disease, but no trials for treatment of CD have been published.

Although no drugs are licensed for the treatment of CD in cats, several have been used anecdotally (Table 37-4). Selegiline, also known as L-deprenyl, is a selective monoamine oxidase B inhibitor licensed for the treatment of CD in dogs (Anipryl; Pfizer Animal Health, Overland Park, Kansas). The exact mechanism of action is unclear, although it may enhance the effects of dopamine and have antioxidant effects. In dogs, it has been shown to improve disorientation, sleep patterns, and social interactions in numerous studies. Selegiline has anecdotally been reported to improve signs of disorientation, vocalization, decreased interaction, and repetitive activity in cats with CD.²⁷ Onset of efficacy may take several weeks. Certain drugs should not be administered at the same time as selegiline, such as selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants (TCAs).

Propentofylline (Vivitonin; Intervet/Schering-Plough Animal Health, Summit, NJ) is a xanthine derivative licensed in some countries for treatment of clinical signs, such as dullness and lethargy, in older dogs, supposedly through improvement in cerebral blood flow and other effects. The drug has anecdotally been reported as useful in cats at a dose of 12.5 mg/cat/day, PO.¹⁷ Another drug available in some countries for canine CD is nicergoline (Fitergol; Merial, Duluth, Ga.). This drug is an ergoline derivative that increases cerebral blood flow and may act as a free radical scavenger. It has been anecdotally used to treat cats with CD at a dose of 1.25 mg/cat/day, PO.¹⁷

Other drugs may be useful for treatment of specific clinical signs. Antidepressants and anxiolytics may be useful for cats that are yowling and active at night, once medical causes have been ruled out (see Box 37-2). There

is evidence of cholinergic decline in senior cats⁵⁰ so that drugs with anticholinergic activity (e.g., some SSRIs, such as paroxetine and TCAs) should be avoided. In addition, SSRIs and TCAs should not be combined with selegiline. Drugs that could be considered in senior cats with CD include fluoxetine, buspirone, and the benzodiazepines (see Table 37-4).²⁹ Selegiline, SSRIs, and TCAs all have long half-lives, so switching from one drug to another requires a prolonged washout period. Changing from selegiline to a TCA or SSRI requires a minimum 2-week washout period, and changing from a TCA or SSRI to selegiline requires a 5-week washout period.¹¹

In dogs with CD, dietary therapy is combined with environmental enrichment. No studies have evaluated the use of environmental enrichment for cats with CD. Once signs of CD are apparent, attempting to manipulate the cat's environment may actually have a negative effect because of the stress of change. Therefore change should be kept to a minimum for cats with CD, and when it is necessary, it should be done slowly and patiently. Regular and predictable daily routines are important. Some cats may benefit from restriction of their resources and living space to one room to provide a quiet and controlled environment. Use of Feliway (CEVA Animal Health) is often recommended, but no studies have evaluated efficacy in cats with CD.

Neoplasia

A major component of feline medicine in this era of aging pets is diagnosis and treatment of cancer. Fortunately, recent advances in feline oncology have led to improved treatments and survival times (see Chapter 28). As well, components of palliative care, including nutritional support and pain management, are now better understood in feline oncology patients. The American Association of Feline Practitioners has published a position statement on hospice (palliative) care as an alternative to premature euthanasia for terminally ill cats.⁴⁷

However, many owners are still unaware of the signs of cancer in cats (Box 37-3), the benefits of early detection and the improvements in diagnostics and therapeutics. Accurate diagnosis using cytology or histopathology and disease staging are critical for treatment planning. Owners should be apprised of the prognosis, risks and benefits of treatment, and costs before starting therapy. When possible, an oncologist should be consulted. Discussion of euthanasia is also appropriate, both when treatment is pursued and when treatment is not desirable in a given patient (see Chapter 36).

Degenerative Joint Disease

Degenerative joint disease (DJD), or osteoarthritis, is a progressive disease where the articular cartilage is

BOX 37-3

Ten Common Signs of Cancer in Small Animals

1. Abnormal swellings that persist or grow
2. Sores or skin lesions that do not heal
3. Weight loss
4. Loss of appetite
5. Bleeding or discharge from any body opening
6. Offensive odor
7. Difficulty eating or swallowing
8. Decreased activity
9. Persistent lameness or stiffness
10. Difficulty breathing, urinating, or defecating

Adapted from the Veterinary Cancer Society (<http://www.vetcancer.org>).



FIGURE 37-3 Bilateral degenerative joint disease of the elbow in a 10-year-old spayed female cat. The lesions were found incidentally when the cat was radiographed because of clinical signs referable to the lower respiratory tract.

slowly destroyed and the underlying bone reacts with remodeling and production of osteophytes. The most commonly affected joints are the shoulder, elbow, and hip (Figure 37-3).¹⁰ Most affected cats are greater than 10 years of age.^{10,15,16,19} DJD is an important and under-recognized cause of chronic pain in cats. Clinical signs associated with feline DJD include reduced activity, anorexia and weight loss, irritability and aggression, inappropriate elimination and constipation, decreased grooming, lameness, and alopecia over affected joints. Decreased mobility is less likely to be noticed by cat owners than dog owners, because they are less likely to walk or interact physically with their pet. Some of the clinical signs of DJD overlap with those of cognitive dysfunction. A mobility questionnaire is helpful for early detection of musculoskeletal problems and to increase owner awareness (Box 37-4).

The prevalence of DJD in cats varies with the age of the population studied. In one study, radiographic evidence of DJD was found in 90% of cats greater than 12

BOX 37-4**Mobility Questionnaire for Owners of Senior Cats**

Owners should be encouraged to determine whether the answer to each question is “all of the time,” “some of the time,” or “none of the time.”

1. Does your cat sleep more and/or is less active?
2. Is your cat less willing to jump up or down?
3. Will your cat jump up or down only from heights closer to the ground?
4. Is your cat reluctant to use stairs?
5. Does your cat show signs of stiffness, lameness, or limping?
6. Is your cat less likely to greet you or interact with you?
7. Does your cat play with other pets or toys less?
8. Does your cat spend less time grooming and/or have a matted hair coat?
9. Does your cat urinate or defecate outside the litter box?
10. Does your cat have difficulty getting in or out of the cat flap?

Adapted from WellCat for Life, Feline Advisory Bureau (<http://www.fabcats.org>).

years old.¹⁹ The diagnosis of DJD is achieved through assessment of the medical history, physical examination, and radiography. Many signs of chronic pain are not obvious to owners, or may be misinterpreted as resulting from aging. The goals of treatment for cats with DJD include reduction of pain and inflammation, improvement in joint function and mobility, and slowing the disease process if possible. Treatment options include weight loss if indicated, drug therapy (primary non-steroidal antiinflammatory drugs [NSAIDs], such as meloxicam, and analgesics), chondroprotectants, nutraceuticals, and dietary therapy. Management of pain has evolved dramatically in the last 10 years, and guidelines have been published by the AAEP/AAHA.^{24,45} More information on the treatment of DJD is found in Chapter 26.

Concurrent Disease Management

Senior cats have an increased likelihood of suffering from more than one disease, making management a complex process. The clinician should always have an index of suspicion that another disease may be present in a senior cat, especially if the patient is not responding to treatment as expected. It is most important to remember that as the number of medications administered or the number of interventions (e.g., subcutaneous fluid administration) increases, the human–animal bond and the patient’s quality of life may suffer. Prioritizing

treatments may mitigate this stress. Treating senior cats may require investigation of novel routes of drug administration and simplified treatment schedules. In addition, the effect of polypharmacy must be monitored, because the administration of some drugs may cause confounding clinical signs (e.g., anorexia, nausea). Age-related changes may also affect the absorption, distribution, and metabolism of drugs, making dose adjustments necessary in some cases. Treatment of concurrent diseases is discussed in Chapter 35.

CONCLUSION

Although both diagnostic and therapeutic tools to help senior pets are more readily available than ever, common sense must be used to assess the quality of life for these patients. Senior cats are less tolerant of change, of interventional treatments, and of hospitalization than younger cats. The degree of tolerance will vary from cat to cat, and in some cases, plans will have to be changed to accommodate the temperament of the individual. It is also important to be proactive in discussing end-of-life issues with owners of senior cats, so that decisions about palliative care and euthanasia can be made at a time that is less stressful than in a life-threatening crisis. For more on palliative care, quality of life and euthanasia decisions, see Chapter 36.

References

1. Araujo JA, Landsberg GM, Milgram NW et al: Improvement of short-term memory performance in aged beagles by a nutraceutical supplement containing phosphatidylserine, *Ginkgo biloba*, vitamin E, and pyridoxine, *Can Vet J* 49:379, 2008.
2. Baldwin K, Bartges J, Buffington T et al: AAHA Nutritional assessment guidelines for dogs and cats, *J Am Anim Hosp Assoc* 46:285, 2010.
3. Bamberger M, Houpt KA: Signalment factors, comorbidity, and trends in behavior diagnoses in cats: 736 cases (1991–2001), *J Am Vet Med Assoc* 229:1602, 2006.
4. Brellou G, Vlemmas I, Lekkas S et al: Immunohistochemical investigation of amyloid beta-protein (Abeta) in the brain of aged cats, *Histol Histopathol* 20:725, 2005.
5. Brodbelt D: Feline anesthetic deaths in veterinary practice, *Top Companion Anim Med* 25:189, 2010.
6. Brodbelt DC, Blissitt KJ, Hammond RA et al: The risk of death: the confidential enquiry into perioperative small animal fatalities, *Vet Anaesth Analg* 35:365, 2008.
7. Brodbelt DC, Pfeiffer DU, Young LE et al: Risk factors for anaesthetic-related death in cats: results from the confidential enquiry into perioperative small animal fatalities (CEPSAF), *Br J Anaesth* 99:617, 2007.
8. Burger IH: Energy needs of companion animals: matching food intakes to requirements throughout the life cycle, *J Nutr* 124:2584S, 1994.
9. Campbell DJ, Rawlings JM, Koelsch S et al: Age-related differences in parameters of feline immune status, *Vet Immunol Immunopathol* 100:73, 2004.
10. Clarke SP, Bennett D: Feline osteoarthritis: a prospective study of 28 cases, *J Small Anim Pract* 47:439, 2006.

11. Crowell-Davis SL: Cognitive dysfunction in senior pets, *Comp Contin Educ Pract Vet* 30:106, 2008.
12. Cummings BJ, Satou T, Head E et al: Diffuse plaques contain C-terminal A beta 42 and not A beta 40: evidence from cats and dogs, *Neurobiol Aging* 17:653, 1996.
13. Cupp C, Perez-Camargo G, Patil A et al: Long-term food consumption and body weight changes in a controlled population of geriatric cats [abstract], *Comp Contin Educ Pract Vet* 26:60, 2004.
- 13a. Czarnecki-Maulden G, Cupp CJ, Patil AR et al: Effect of aging on blood metabolites in the cat (abstract), *Comp Contin Educ Pract Vet* 26:74, 2004.
14. Epstein M, Kuehn NF, Landsberg G et al: AAHA senior care guidelines for dogs and cats, *J Am Anim Hosp Assoc* 41:81, 2005.
15. Godfrey DR: Osteoarthritis in cats: a retrospective series of 31 cases, *J Small Anim Pract* 43:260, 2002.
16. Godfrey DR: Osteoarthritis in cats: a retrospective radiological study, *J Small Anim Pract* 46:425, 2005.
17. Gunn-Moore D, Moffat K, Christie LA et al: Cognitive dysfunction and the neurobiology of ageing in cats, *J Small Anim Pract* 48:546, 2007.
18. Gunn-Moore DA, McVee J, Bradshaw JM et al: Ageing changes in cat brains demonstrated by beta-amyloid and AT8-immunoreactive phosphorylated tau deposits, *J Feline Med Surg* 8:234, 2006.
19. Hardie EM, Roe SC, Martin FR: Radiographic evidence of degenerative joint disease in geriatric cats: 100 cases (1994-1997), *J Am Vet Med Assoc* 220:628, 2002.
20. Harper EJ: Changing perspectives on aging and energy requirements: aging and digestive function in humans, dogs and cats, *J Nutr* 128:2632S, 1998.
21. Harper EJ: Changing perspectives on aging and energy requirements: aging, body weight and body composition in humans, dogs and cats, *J Nutr* 128:2627S, 1998.
22. Head E: Combining an antioxidant-fortified diet with behavioral enrichment leads to cognitive improvement and reduced brain pathology in aging canines: strategies for healthy aging, *Ann N Y Acad Sci* 1114:398, 2007.
23. Heath SE, Barabas S, Craze PG: Nutritional supplementation in cases of canine cognitive dysfunction—a clinical trial, *Appl Anim Behav Sci* 105:284, 2007.
24. Hellyer P, Rodan I, Brunt J et al: AAHA/AAFP pain management guidelines for dogs and cats, *J Feline Med Surg* 9:466, 2007.
25. Laflamme DP: Nutrition for aging cats and dogs and the importance of body condition, *Vet Clin North Am Small Anim Pract* 35:713, 2005.
26. Laflamme DP, Ballam JM: Effect of age on maintenance energy requirements of adult cats, *Comp Contin Educ Pract Vet* 24:82, 2002.
27. Landsberg G: Therapeutic options for cognitive decline in senior pets, *J Am Anim Hosp Assoc* 42:407, 2006.
28. Landsberg G, Araujo JA: Behavior problems in geriatric pets, *Vet Clin North Am Small Anim Pract* 35:675, 2005.
29. Landsberg GM, Denenberg S, Araujo JA: Cognitive dysfunction in cats: a syndrome we used to dismiss as “old age,” *J Feline Med Surg* 12:837, 2010.
30. Levine MS, Lloyd RL, Fisher RS et al: Sensory, motor and cognitive alterations in aged cats, *Neurobiol Aging* 8:253, 1987.
31. Mansfield K, Burr P, Snodgrass D et al: Factors affecting the serological response of dogs and cats to rabies vaccination, *Vet Rec* 154:423, 2004.
32. McCune S, Stevenson J, Fretwell L et al: Ageing does not significantly affect performance in a spatial learning task in the domestic cat (*Felis silvestris catus*), *Appl Anim Behav Sci* 112:345, 2008.
33. Michel KE, Anderson WI, Cupp C et al: Validation of a subjective muscle mass scoring system for cats, *J Anim Physiol Anim Nutr (Berl)* 93:806, 2009.
34. Milgram NW: Neuropsychological function and aging in cats. 15th Annual Conference on Canine Cognition and Aging, Laguna Beach, CA, November 2010.
35. Milgram NW, Head E, Zicker SC et al: Long-term treatment with antioxidants and a program of behavioral enrichment reduces age-dependent impairment in discrimination and reversal learning in beagle dogs, *Exp Gerontol* 39:753, 2004.
36. Munday HS, Earle KE, Anderson P: Changes in the body composition of the domestic shorthaired cat during growth and development, *J Nutr* 124:2622S, 1994.
37. Osella MC, Re G, Odore R et al: Canine cognitive dysfunction syndrome: prevalence, clinical signs and treatment with a neuroprotective nutraceutical, *Appl Anim Behav Sci* 105:297, 2007.
38. Pan Y, Larson B, Araujo JA et al: Dietary supplementation with medium-chain TAG has long-lasting cognition-enhancing effects in aged dogs, *Br J Nutr* 103:1746, 2010.
39. Perez-Camargo G: Cat nutrition: what is new in the old? *Comp Contin Educ Pract Vet* 26:5, 2004.
40. Perrin T: The Business Of Urban Animals Survey: the facts and statistics on companion animals in Canada, *Can Vet J* 50:48, 2009.
41. Reme CA, Dramard V, Kern L et al: Effect of S-adenosylmethionine tablets on the reduction of age-related mental decline in dogs: a double-blinded, placebo-controlled trial, *Vet Ther* 9:69, 2008.
42. Richards JR, Elston TH, Ford RB et al: The 2006 American Association of Feline Practitioners Feline Vaccine Advisory Panel report, *J Am Vet Med Assoc* 229:1405, 2006.
43. Scarlett JM, Donoghue S, Saidla J et al: Overweight cats: prevalence and risk factors, *Int J Obes Relat Metab Disord* 18 Suppl 1:S22, 1994.
44. Shepherd AJ: Results of the 2006 AVMA survey of companion animal ownership in US pet-owning households, *J Am Vet Med Assoc* 232:695, 2008.
45. Sparkes AH, Heiene R, Lascelles BDX et al: ISFM and AAFP consensus guidelines: long-term use of NSAIDs in cats, *J Feline Med Surg* 12:521, 2010.
- 45a. Stella JL, Lord LK, Buffington CAT: Sickness behaviors in response to unusual external events in healthy cats and cats with feline interstitial cystitis, *J Am Vet Med Assoc* 238:67, 2011.
46. Taylor EJ, Adams C, Neville R: Some nutritional aspects of ageing in dogs and cats, *Proc Nutr Soc* 54:645, 1995.
47. Thayer V, Monroe P, Smith R et al: AAFP position statement: veterinary hospice care for cats, *J Feline Med Surg* 12:728, 2010.
48. Vogt AH, Rodan I, Brown M et al: AAFP-AAHA: feline life stage guidelines, *J Feline Med Surg* 12:43, 2010.
49. Zhang C, Hua T, Zhu Z et al: Age-related changes of structures in cerebellar cortex of cat, *J Biosci* 31:55, 2006.
50. Zhang JH, Sampogna S, Morales FR et al: Age-related changes in cholinergic neurons in the laterodorsal and the pedunculo-pontine tegmental nuclei of cats: a combined light and electron microscopic study, *Brain Res* 1052:47, 2005.