Introduction

The key to the wellness exam in all patients but especially the geriatric patient is to provide an early diagnosis, enable close monitoring, and initiate treatment as necessary for pathological conditions that develop. Conditions including kidney disease, osteoarthritis, and periodontal disease are examples of common geriatric disease that have shown that an early diagnosis and intervention can slow disease progression.1-3 Many published foundation guidelines based on scientific evidence and expert opinion are available and encompass consensus statements regarding vaccinations, nutrition, dental care, heartworm and parasite control, pain management, and patient care based on life stages. However the specific plan for each individual patient is ultimately left to practitioner based on the each patient’s needs.

Outlined below is a recommended framework in which to develop a rationale approach to wellness evaluations in geriatric canine and feline patients. Information provided is based on the integration of clinical experience and recently published guidelines.4-6

Geriatric Canines

History: Individuals and body systems age differently and this is especially true in dogs due to significant size differences and the varying aging rates among breeds. The classification of middle-aged, senior or geriatric in dogs is somewhat arbitrary as published guidelines are not evidence based. The general guidelines used is that dogs 7 to 8 years of age are classified as middle-aged with the exception of large breed dogs which are considered middle-aged at 5 to 6 years.5 The senior classification is estimated at 9 to 12 years and geriatric at > 12 years. In most publications senior/geriatric wellness evaluations are recommended when a dog is in the last 25% of their predicted life span. For example a small breed dog with a life span of between 12-15 years of age, senior/geriatric wellness should begin at 10-11 years, a medium sized breed at 8-9 years (estimated life span 10-13 years), and large/giant breeds at 6 years (estimated life span 7-8 years).5

The recommended consensus for evaluation frequency in well older dogs is every 6 months. By beginning to monitor dogs more closely once they fall into the middle-age to senior age group their baseline status can be documented for comparison, knowing the likelihood for developing an acute or chronic illness increases with age. The 6 month interval for monitoring focuses on changes in the patient’s history and physical exam, with diagnostics pursued as indicated. A minimum database is recommended at least annually.

Physical examination: The purpose of the physical exam is to detect physical changes in patients that go undetected by the owner and are not pick up by diagnostic testing. In geriatric patients it is often the trends in objective parameters that become important to detect early disease. For example the changes in body weight, heart rate, kidney values (BUN, creatinine, urine specific gravity) and liver values (ALT, ALP, albumin).
Minimum database: The minimum database recommended annually in older dogs is CBC, biochemistry panel, and urinalysis. Routine monitoring of blood pressure is recommended in dogs known to have a predisposing cause for hypertension (i.e. proteinuria, hyperadrenocorticism, diabetes mellitus, or chronic kidney disease). The interpretation of results obtained through diagnostic testing needs to be done in conjunction with clinical assessment and again the changes in trends may be more important than the results from a single sample.

Preventative medicine: Preventative medicine remains very much applicable to older dogs including weight management, vaccination status, parasite prevention, and dental hygiene. Controlling obesity is a lifelong goal. Overweight dogs are at increased risk in developing a variety of chronic diseases including osteoarthritis, diabetes mellitus, and early mortality. Alternatively in a geriatric dog the loss of lean body mass occurs with aging but weight loss can be a clinical indication of an underlying chronic disease that requires further investigation.

The need for preventative care including vaccines, intestinal deworming, and flea and tick preventative is going to be significantly impacted by the dog’s lifestyle, risk of exposure, and the presence of any underlying chronic diseases. Vaccine recommendations should be appropriate for lifestyle and health status of the patient and influenced by geographic region and local jurisdiction.

Chronic disease monitoring: The level of monitoring needed will vary based on the organ system affected, the type and severity of dysfunction, and the individual patient. Summarized below are recommendations for some of the more common chronic diseases encountered in geriatric canine medicine.

Chronic kidney disease (CKD) - The detection of early kidney disease can be difficult using a single serum creatinine concentration due to poor sensitivity serum creatinine has in predicting kidney function. The International Renal Interest Society (IRIS) classification of kidney disease in dogs is a serum creatinine concentration > 1.4 mg/dL and a urine specific gravity < 1.030. In addition, common clinical signs of reduced kidney reserve are polyuria and polydipsia, which can be easily missed by owners especially dogs living in a multi-dog household or outdoor dogs. Other less commonly appreciated clinical signs that can have a slow insidious onset include poor appetite, weight loss, muscle wasting, and nausea. Overall early detection of CKD requires a high level of suspicion and remains a clinical challenge.

Dietary management (protein, phosphorus, and sodium restriction) of CKD is the considered the corner stone of therapy used to reduce uremia, decrease phosphorus retention, minimizes muscle catabolism, and increase survival time. Routine monitoring of dogs with CKD includes monitoring and controlling blood pressure and proteinuria. In dogs with CKD the treatment of hypertension is recommended when the systolic pressure is > 160 mmHg. Other parameters of interest that require monitoring and at some point intervention to slow the progression of disease is serum phosphorus concentrations. The ideal phosphorus (PO₄⁻⁻) level is dependent on the stage of kidney disease (stage 2 - PO₄⁻⁻ < 4.5 mg/dL; stage 3 - PO₄⁻⁻ < 5 mg/dL; stage 4 - PO₄⁻⁻ < 6 mg/dL). Persistent proteinuria, in the presence of a negative urine culture, can cause progressive renal tubular damage therefore treatment with an ACE-inhibitor is recommended when the urine protein/creatinine ratio is > 0.5 in dogs with stage 2, 3, or 4 CKD or a urine protein/creatinine ratio is > 2 in a dog with stage 1 CKD. Intermittent routine urine
cultures are recommended in the absence of clinical signs in dogs with CKD. Long-term routine monitoring is recommended every 3-6 months once kidney disease is stabilized.

**Liver disease** – Liver disease can progress to cirrhosis which is associated with end-stage liver disease. Monitoring clinical signs including neurological status, abdominal girth, liver enzyme, and markers of liver function (albumin, cholesterol, BUN, glucose, and total bilirubin) are recommended, although the frequency of monitoring is dictated by the patient’s clinical status. In patients with progressive disease monitoring focuses on controlling signs of hepatic encephalopathy and the management of ascites associated with progressive hypoalbuminemia and portal hypertension. The stable patient would likely benefit from monitoring every 3 to 6 months.

**Cardiovascular disease** – Dogs with underlying cardiovascular disease and a history of heart failure are commonly the geriatric patient on multiple concurrent medications (furosemide, enalapril, pimobendan or digoxin). Close monitoring for dehydration, hypokalemia, and digoxin toxicity is required. For example, low potassium concentrations (secondary to furosemide administration) can increase the risk of digoxin toxicity and decrease the efficacy of the antiarrhythmic lidocaine. Therapeutic drug monitoring is recommended for patient treated with digoxin. Serum concentrations are determined 4-6 hours post dosing. Digoxin is primarily eliminated by renal excretion therefore the risk of toxicity is higher in patients with underlying renal dysfunction.

**Hypothyroidism** – Once a dog is diagnosed as hypothyroid, therapy with levothyroxine is lifelong and will require at least annual monitoring. The blood sample needed to analyze thyroid levels is a serum sample collected 4 to 6 hours post dosing. The goal of therapy is resolution of clinical signs and serum thyroid concentration at the high end of the therapeutic range.

**Hyperadrenocorticism** – The monitoring of therapy for the successful management of dogs with hyperadrenocorticism is essential. Either drug, mitotane or trilostane, used to medically treat hyperadrenocorticism significantly impacts systemic steroid hormone concentrations and carries the risk of inducing hypoadrenocorticism. Historical information from the owner is essential in determining the dog’s clinical response to therapy and monitoring the dog’s adrenal reserve with an ACTH stimulation test following induction therapy and as indicated. In dogs with clinical signs of hypoadrenocorticism the monitoring of serum electrolytes becomes important. Because the dosing requirements often change with chronic therapy, dose changes are not uncommon for either mitotane or trilostane, further emphasizing the need for close clinical monitoring of these dogs.

**Osteoarthritis** - NSAIDs are generally the drug of choice in the treatment of osteoarthritis, although their beneficial effects do not come without the risk of adverse effects. Monitoring for adequate pain control and NSAIDs side effects is essential in all patients but the geriatric dog is population at greatest risk for adverse effects. Dogs chronically treated with NSAIDs need to be closely and routinely monitored for signs of gastrointestinal bleeding and/or ulceration, acute kidney injury, and hepatotoxicity. Monitoring these patients clinically as well as using periodic biochemistry and PCV/TP evaluations is recommended. Also, as dogs on NSAIDs develop other
chronic organ dysfunctions (ex. CKD) consideration for alternative means of pain control for their osteoarthritis may be necessary.

**Drug monitoring:** Older dogs are often receiving chronic medications and in many cases have been prescribed multiple medications. During each semi-annual evaluation a thorough drug history is essential including not only the drug given but also the doses. Each patient should be evaluated for the common side effects associated with each medication and consideration should be given to potential drug-drug interactions. A short list of some of the common medications prescribed to geriatric dogs that require close routine monitoring include NSAIDs, phenobarbital, potassium bromide, glucocorticoids, immunosuppressive therapies (ex. cyclosporine or azathioprine), levothyroxine, ACE-inhibitors, furosemide, phenylpropanolamine, and nutraceuticals. Drug in which specific therapeutic drug monitoring is recommended with chronic therapy include phenobarbital, potassium bromide, levothyroxine, and digoxin.

**Geriatric Felines**

Individuals and body systems age differently and at varying rates, therefore mature cats have be subdivided into 3 groups: middle-aged (7-10 years), senior (11-14 years), and geriatric (15+ years). In most publications senior/geriatric wellness evaluations begin between 7 to 11 years of age. The recommended consensus for the frequency for evaluation of a well older cat is every 6 months. The 6 month interval of monitoring focuses on changes in history and physical exam findings, with diagnostics pursued as indicated. A minimum database is recommended at least annually.

**History:** A comprehensive history enables the identification of subtle clinical changes, including behavior changes (i.e. changes in litter box habits, vocalization, or activity patterns). Cats are very good at hiding significant underlying pathology and clinical signs can be relatively non-specific. For example, ill cats often present for an evaluation by veterinarian for urinating outside the box, which more often than not is associated with an underlying systemic disease rather than primary urinary tract disease.

**Physical examination:** The purpose of the physical exam is to detect physical changes in patients that go undetected by the owner and are not pick up by diagnostic testing. In geriatric patients it is often the trends in objective parameter that become important to detect early disease. For example the changes in body weight, heart rate, kidney values (BUN, creatinine, specific gravity) and liver values (ALT, ALP, albumin).

**Minimum database:** The minimum database recommended annually in older cats is CBC, biochemistry panel, urinalysis, and thyroxine level. Blood pressure evaluations are recommended but it is well recognized that stressed older cats may be difficult patients to achieve an accurate blood pressure measurement and testing is reserved to those cats known to have a predisposing cause for hypertension (ex. hyperthyroidism, chronic kidney disease). Interpretation of results needs to be done in conjunction with clinical assessment and again the changes in trends may be more important than a single sample.

**Preventative medicine:** Preventative medicine remains very much applicable to older cats and includes weight management, retrovirus status, vaccination status, parasite prevention, and dental hygiene.

Controlling obesity is a lifelong goal. Overweight cats are at increased risk in developing a variety of chronic diseases including diabetes mellitus, osteoarthritis, lower urinary tract disease, and early mortality. Alternatively in a geriatric cat the loss of lean body mass occurs
with aging but weight loss can be a clinical indication of an underlying chronic disease that requires further investigation.

The need for preventative care including vaccines, intestinal deworming, and flea control is going to be significantly impacted by the cat’s lifestyle, risk of exposure, and the presence of any underlying chronic diseases. Vaccine recommendations should be appropriate for lifestyle and health status of the patient and influenced by geographic region and local jurisdiction.5

**Chronic disease monitoring:** The level of monitoring needed is going to vary based on the organ system affected, the type and severity of dysfunction, and the individual patient. Summarized below are recommendations for some of the more common chronic diseases encountered in geriatric feline medicine.

**Chronic kidney disease (CKD)** - The detection of early kidney disease can be difficult using a single serum creatinine concentration due to poor sensitivity. Serum creatinine has in predicting kidney function in older cats that are concurrently losing lean muscle mass. For example, a cat with a serum creatinine concentration within the reference interval may still have significant kidney dysfunction, and it is the trend in creatinine that becomes important to monitor. The International Renal Interest Society (IRIS) classification of kidney disease in cats is a serum creatinine concentration > 1.6 mg/dL and a urine specific gravity < 1.030.7 In addition, common clinical signs of reduced kidney reserve are polyuria and polydipsia, which can be easily missed by owners. Other less commonly appreciated clinical signs that can have a slow insidious onset include poor appetite, weight loss, muscle wasting, nausea, and constipation. Overall early detection of CKD requires a high level of suspicion and remains a clinical challenge.

Dietary management (protein, phosphorus, and sodium restriction) of CKD is considered the corner stone of therapy used to reduce uremia, decrease phosphorus retention, minimizes muscle catabolism, and increase survival time. Routine monitoring of cat with CKD includes monitoring and controlling blood pressure and proteinuria. In cats with CKD the treatment of hypertension is recommended when the systolic pressure is > 160 mm Hg.11 Other parameters of interest that require monitoring and at some point intervention to slow the progression of disease including electrolytes, potassium and phosphorus. Hypokalemia and potassium depletion is common in cats with CKD. The goal is to maintain serum potassium concentrations > 4 mEq/dL. The ideal phosphorus (PO₄⁻) level is dependent on the stage of kidney disease (stage 2 - PO₄⁻ < 4.5 mg/dL; stage 3 < 5 mg/dL; stage 4 < 6 mg/dL).8 Proteinuria is a negative prognostic indicator for survival in cats with CKD.12 Treatment recommendations for proteinuria in cats are when the urine protein/creatinine ratio > 0.4 in the presence of a negative urine culture. Intermittent yet routine urine cultures are recommended in absence of clinical signs cats with CKD and in cats with a history of obstructive ureterolithiasis. Cats with a history of obstructive ureterolithiasis may benefit from serial abdominal radiographs and repeated imaging is recommended during episodes of uremic crisis. Long-term routine monitoring is recommended every 3-6 months once kidney disease is stabilized.

**Hyperthyroidism** – The diagnosis and treatment of hyperthyroidism in most cases is a straightforward but monitoring and treating hypertension and tachycardia is often forgotten. In addition the assessment of kidney function can present a clinical challenge in hyperthyroid cats.
Once the diagnosis of hyperthyroidism is established an accurate blood pressure and heart rate needs to be established. A systolic blood pressure over 180 mmHg and/or a heart rate > 200 bpm warrants treatment. A calcium channel blocker is the treatment of choice for hypertension in a cat and the beta-blocker, atenolol, is used commonly to treat tachycardia in a cat. Once euthyroidism is established following I-131 therapy long term therapy for hypertension or tachycardia is not generally necessary.

Kidney function should be evaluated at the time hyperthyroidism is diagnosed using serum BUN and creatinine as well as urine specific gravity. The hyperthyroid state can effectively mask the degree of kidney compromise therefore once euthyroidism is established kidney function needs to be re-assessed.

**Diabetes mellitus** – Many cats are diagnosed as diabetics once they hit middle-age and obese male represent the classic signalment. In cats the insulin of choice is glargine; the challenge in cats is performing and accurately interpreting a glucose curve due to the significant component of stress associated with hospitalization and frequent blood collection. One option for some cats and owners is the use of home glucose monitoring.13

Following the introduction of glargine after a period of adjustment to diet and insulin (~ 2 weeks), a glucose curve allows an initial assessment of the action of current insulin type and dose in that patient; parameters of particular interest is time to peak action, duration of action, and quantification of the blood glucose nadir. The insulin dose may need to be adjusted up or down based on the patient’s clinical response and results of blood glucose curve. Once the patient is stabilized long term monitoring (every 3 to 6 months) can include clinical signs, spot glucose measurement at the anticipated time of nadir, and fructosamine levels. In a previously well controlled diabetic patient that redevelops clinical signs further evaluation for causes of insulin resistance is warranted; rule out concurrent diseases like pancreatitis, urinary tract infection, and concurrent corticosteroid administration.

**Inflammatory bowel disease** – Once the diagnosis is established either presumptively or based on biopsy results, therapy is focused on starting at higher doses of glucocorticoids and tapering to the lowest dose that will control the cat’s clinical signs. Monitoring focuses on resolution of clinical signs, tapering therapy slowly to the lowest glucocorticoid dose that controls their disease, and monitoring for drug side effects. Frequent monitoring early on is important, every 2-4 weeks, but the frequency can be tapered based on the cat’s response. Some cats initially respond well to therapy but then become refractory, at which point re-evaluation is recommended.

**Drug monitoring:** Older cats are often receiving chronic medications and in many cases have been prescribed multiple medications. During each semi-annual evaluation a thorough drug history is essential including not only the drug given but also the doses. Each patient should be evaluated for the common side effects associated with each medication and consideration should be given to potential drug-drug interactions. Some common medications prescribed to geriatric cats that require close routine monitoring include NSAIDs, methimazole, phenobarbital, insulin, glucocorticoids, immunosuppressive therapies (ex. cyclosporine or chlorambucil), and nutraceuticals.
References