



**Ettinger: Textbook of Veterinary Internal
Medicine, 7th Edition
Chronic Kidney Disease
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What is chronic kidney disease or failure?

Kidney disease means that something is abnormal about the structure or function of one or both kidneys. Most often, kidney disease is recognized when kidney function has declined sufficiently to be detectable by routine blood and urine tests.

The functions of the kidneys are the following:

- Eliminate waste products
- Maintain water and electrolyte balance
- Produce a variety of hormones

In the past, the term *kidney (or renal) failure* was used to describe advanced forms of kidney disease. Kidney disease occurs in acute or chronic forms. Acute kidney disease happens over just days and is potentially reversible. In contrast, chronic kidney disease has been present for months to years and is irreversible. Dogs and cats with chronic kidney disease cannot be cured, but their symptoms can often be managed successfully.

Kidneys are composed of many small functional units called *nephrons* (approximately 190,000 in cats and 400,000 in dogs). Dogs, cats, and humans are normally born with such an abundance of nephrons that loss of more than two thirds of these nephrons can occur before symptoms of kidney disease become apparent. Because of this fact, it is possible to safely donate one kidney for transplantation without adverse effect. On the other hand, surplus nephrons make it difficult to diagnose kidney disease before substantial numbers of nephrons have been lost. As a consequence, kidney disease can be an insidious condition that remains unrecognized either until blood and urine tests are performed or the patient becomes ill. Chronic kidney disease tends to progress over time.

An important goal of managing patients with chronic kidney disease is to recognize the condition while it is still mild and attempt to slow or stop progression to more severe disease. Because chronic kidney disease is completely advanced when it is diagnosed, it is often impossible to determine the original cause for the kidney damage. Although it is most commonly diagnosed in older dogs and cats, chronic kidney failure is not simply a result of aging.

What are the symptoms of chronic kidney disease?

Dogs and cats with mild kidney disease may appear healthy. However, dogs and cats with marked loss of kidney function can become very ill. The earliest symptoms of chronic kidney disease are as follows:

1. Increased thirst (polydipsia)
2. Increased urine volume (polyuria)

These symptoms result from impairment of the kidneys' ability to produce concentrated urine. Other common problems include the following:

- Weight loss
- Poor hair coat
- Increasingly selective appetite

Further decline in kidney function results in progressive inability to eliminate waste products, leading to retention of toxic wastes in blood and tissue in the body. This condition is called *uremia* (literally, urine in the blood).

Prominent symptoms of uremia include the following:

- Loss of appetite
- Vomiting
- Ulcers in the mouth
- "Uremic" (foul ammonia-smelling) breath
- Weakness
- Lethargy

Other important effects of declining kidney function include anemia (caused by inability of the kidneys to form erythropoietin, the hormone responsible for making red blood cells) and high blood pressure (hypertension). Anemia worsens the weakness, lethargy, and loss of appetite of dogs and cats with advanced chronic kidney disease. High blood pressure may cause sudden blindness, stroke-like signs (such as mental dullness, sudden behavioral changes, coma, or seizures), or injury to the kidneys and heart.

What tests are needed?

Diagnosis of chronic kidney disease is confirmed by laboratory evaluation of your pet's blood and urine:

- Urinalysis can help determine whether the kidneys can form concentrated urine and provide evidence of other urinary tract problems such as urinary tract infection.
- Blood tests used to evaluate kidney function include the blood urea nitrogen (BUN) and creatinine concentrations. Because only the kidneys eliminate urea and creatinine from the body, increased urea and creatinine concentrations indicate decreased kidney function. These tests are usually performed together

because they provide different information. The serum creatinine concentration is the more specific test of kidney function, whereas BUN may reflect the effect of treatment and other factors. In addition to measuring kidney function, other tests are used to evaluate your pet for anemia, electrolyte and acid-base abnormalities, and nutrition.

- Measuring blood pressure and the amount of protein in urine is often performed because, left untreated, high blood pressure and too much protein in urine (proteinuria) can be associated with worsening of kidney function.
- Ultrasound and x-rays may also be used to evaluate kidney disease.

What treatment is available?

Fortunately, most dogs and cats with chronic kidney disease can be treated, providing a good quality of life for months or years. Treatment is tailored to the unique requirements of each pet but may include a "kidney-friendly" diet; hydration therapy; and medications designed to control symptoms (such as vomiting or poor appetite), acid-base and electrolyte complications, anemia, proteinuria, and hypertension.

Consumption of excess protein may make some pets ill because the waste products of protein metabolism are excreted by the kidneys and retained when kidney function is reduced. Dogs and cats with chronic kidney disease have been shown to live longer when fed "kidney-friendly" diets. Dehydration is a special threat to pets with kidney disease. Kidney function may decline further and clinical signs appear if episodes of vomiting, diarrhea, or inadequate water intake are not responded to promptly. Water should never be withheld from dogs and cats with chronic kidney disease.

Regular follow-up examinations are important for successful treatment of dogs and cats with chronic kidney disease. Most pets should be examined on a regular schedule to evaluate for changes in kidney function and treatment needs. The frequency of these visits depends on the severity and type of kidney disease and the medications being used.

In humans, chronic kidney disease is commonly managed using hemodialysis, peritoneal dialysis, and/or kidney transplantation. Although dialysis is generally not appropriate for long-term management of chronic kidney disease in dogs and cats, it is useful for treating acute uremia in dogs and cats. Kidney transplantation is becoming more available and has proven to be a viable option for some pets with chronic kidney disease. At present, it is more successful in cats than dogs. A long-term commitment to administering medication and follow-up examinations is essential for transplantation to succeed.