



CHRONIC KIDNEY FAILURE

What is Chronic Kidney Failure?

“Uremia” is the medical term for excessive levels of urea and other nitrogenous waste products in the blood (it is also known as “azotemia”)

Sudden (acute) uremia is a clinical syndrome characterized by sudden onset of kidney failure; urea and other nitrogenous waste products build up, leading to clinical signs

It is potentially reversible, if diagnosed quickly and treated aggressively

The kidney filters the blood and removes various waste products from the body as it produces urine; the kidney is involved in maintaining the normal fluid volume of the body; each kidney is composed of thousands of nephrons (the functional units of the kidney, each consisting of the glomerulus [a tuft of blood capillaries—the “blood filter”] and a series of tubes and ducts, through which the filtered fluid flows, as urine is produced)

Mean Age Range

- Peak incidence in dogs and cats—6-8 years of age
- Older pets at greater risk

Clinical Signs

- Sudden onset of lack of appetite (known as “anorexia”); listlessness; depression; vomiting (with or without the presence of blood); diarrhoea (with or without the presence of blood); bad breath (known as “halitosis”); wobbly, in coordinated or “drunken” appearing gait or movement (known as “ataxia”); seizures; and production of only small amounts of urine (known as “oliguria”)/or no urine (known as “anuria”) or increased volume of urine (known as “polyuria”)
- Observed poison or drug exposure; recent medical or surgical conditions
- Normal body condition and hair coat; dehydration (or over hydration due to administration of fluids); ulcers in the mouth; inflammation of the tongue (known as “glossitis”) and death of tissues of the tongue; low body temperature (known as “hypothermia”) or fever; rapid breathing (known as “tachypnea”); slow heart rate (known as “bradycardia”); inability to feel the urinary bladder during physical examination; and enlarged, painful, firm kidneys

What causes Kidney Failure

Causes Related to Abnormal Circulation to the Kidneys

Shock; trauma; blood clots (known as “thromboembolism”); heat stroke; excessive narrowing of the blood vessels (known as “vasoconstriction,” such as following the administration of nonsteroidal anti-inflammatory drugs [NSAIDs]); adrenal gland insufficiency; excessive enlargement or dilation of blood vessels (known as “vasodilation,” such as following the administration of angiotensin-converting enzyme [ACE] Inhibitors or medications to decrease blood pressure [known as “antihypertensive drugs”]); prolonged anaesthesia; heart failure

Compounds/Medications That Are Toxic to the Kidneys

Ethylene glycol (found in antifreeze); antibiotics (aminoglycosides); antifungal medications (amphotericin B); chemotherapeutic agents (such as cisplatin and doxorubicin); nonsteroidal anti-inflammatory drugs; radiographic contrast agents; heavy metals (such as lead, mercury, arsenic, thallium); insect or snake venom; calcium; grape or raisin ingestion (dogs); and lily ingestion (cats)

Generalized Disease Affecting the Kidneys

- Infectious disease (such as leptospirosis or Lyme disease); immune-mediated disease (such as inflammation and accompanying dysfunction of glomeruli [plural of glomerulus] of the kidney [known as “glomerulonephritis”] and inflammation of the arteries [known as “arteritis”]); inflammation of the pancreas (known as “pancreatitis”); generalized disease caused by the spread of bacteria in the blood (known as “septicaemia” or “blood poisoning”); blood-clotting disorder (known as “disseminated intravascular coagulopathy” or DIC); liver failure; heat stroke; blood transfusion reactions; bacterial inflammation/infection of the lining of the heart (known as “bacterial endocarditis”); bacterial infection/inflammation of the kidney (known as “pyelonephritis”); and cancer (such as lymphoma; “lymphoma” is a type of cancer that develops from lymphoid tissue, including lymphocytes, a type of white blood cell formed in lymphatic tissues throughout the body)
- Blockage or obstruction of one or both ureters (the tubes running from the kidneys to the bladder) in cats

Risk Factors

Pre-existing long-term (chronic) kidney disease; dehydration; generalized bacterial infection (known as “sepsis”); low blood volume (known as “hypovolemia”); low blood pressure (known as “hypotension”); advanced age; coexistent disease; low levels of sodium in the blood (known as “hyponatremia”); low levels of potassium in the blood (known as “hypokalaemia”); low levels of calcium in the blood (known as “hypocalcaemia”); and acidosis (a condition in which levels of acid are increased in the blood)

Medications (such as the diuretic, furosemide; nonsteroidal anti-inflammatory drugs; angiotensin-converting enzyme [ACE] inhibitors; antibiotics [aminoglycosides]); prolonged anaesthesia; acidifying diets; trauma; multiple organ disease; and high environmental temperature

Treatment

Health Care

- Inpatient management; eliminate inciting causes; discontinue kidney toxic drugs; establish and maintain circulation and blood flow; treat life-threatening fluid imbalances, biochemical abnormalities, and uremic toxicities
- If a poison is the likely cause of sudden (acute) uraemia and kidney failure, follow appropriate treatment for the specific poison (treatment may include inducing vomiting, flushing of the stomach [known as “gastric lavage”], and administering activated charcoal and specific antidotes); early haemodialysis (procedure to remove waste products from the blood) can eliminate poisons
- Low blood volume (hypovolemia) or dehydration—correct estimated fluid deficits with normal (0.9%) saline or balanced fluids within 2–4 hours; blood losses may be replaced by blood transfusion; once the pet is hydrated, ongoing fluid requirements are provided; avoid over hydration
- High blood volume (known as “hypervolemia”) or over hydration—stop fluid administration and eliminate excess fluid by treatment with medications to remove excess fluid from the body (known as “diuretics”) or dialysis (procedure to remove waste products from the body)

Diet

- Restrict intake of food and water by mouth until vomiting subsides
- Fat and protein stores will be consumed by the body while pet is not eating (anorexia); resting energy requirements must be provided by 3–5 days, using moderately protein-restricted diets or feeding special solutions formulated to control excessive levels of urea and other nitrogenous waste products in the blood (uraemia or azotaemia) and supply caloric requirements
- Nutrition may be provided by intravenous feeding (known as “parenteral nutrition”) in vomiting pets

- Tube feeding may be provided for pets that are not eating (anorexia) and are not vomiting—caloric and protein requirements may be supplied by using kidney diets that have been liquefied in a kitchen-type blender, special liquid diets, or formulated diets

Surgery

- Surgery may be required for sudden (acute) blockage or obstruction of one or more ureters (the tubes running from the kidneys to the bladder) in cats
- Kidney transplant may provide long-term survival for cats with severe, sudden (acute) kidney injury

What Medications are available?

Inadequate Urine Production

- Ensure the pet has normal blood volume
- Administer medications to remove excess fluid from the body (diuretics), such as mannitol or furosemide (alternative or subsequent to mannitol)
- If diuretic treatments fail to induce increased production of urine within 4–6 hours, consider dialysis (procedure to remove waste products from the body)

Acid–Base Disorders

- Bicarbonate

Vomiting

- No food or water (nothing by mouth) until vomiting subsides
- Reduce stomach-acid production—famotidine or ranitidine or omeprazole
- Medication to protect the lining of the stomach (known as a “mucosal protectant”)—sucralfate
- Medications to control nausea and/or vomiting (known as “antiemetic’s”)—metoclopramide, ondansetron, or dolasetron

Peritoneal Dialysis or Hemodialysis

- “Peritoneal dialysis” is a type of dialysis in which fluids are put into the abdomen and the lining of the abdomen (known as the “peritoneum”) acts as a filter to remove waste products from the blood—after a certain amount of time, the fluids and waste products are removed from the abdomen; “haemodialysis” is a procedure to remove waste products from the blood
- Dialysis can stabilize the pet until kidney function is restored or until corrective surgery is performed; without dialysis, most pets that produce only small amounts of urine (oliguria) die before kidney repair can occur

Possible Complications

Seizures; coma; irregular heartbeats (known as “cardiac arrhythmias”); increased blood pressure (hypertension); congestive heart failure; fluid build-up in the lungs (known as “pulmonary oedema”); inflammation of the lungs due to the presence of urea and other nitrogenous waste products (known as “uremic pneumonitis”); aspiration pneumonia; bleeding in the gastrointestinal tract; shock due to low blood volume; generalized bacterial infection (sepsis); stopping of the heart and breathing (known as “cardiopulmonary arrest”); and death

Preventions and Avoidance

- Anticipate the potential for sudden (acute) kidney injury in aged pets or those with generalized (systemic) disease, generalized bacterial infection (sepsis), trauma, receiving kidney toxic drugs, multiple organ failure, or those undergoing prolonged anaesthesia
- Maintenance of hydration, mild saline volume expansion, and administration of mannitol may be preventive
- Monitor urine production and increased levels of urea and other nitrogenous waste products (azotaemia) in high-risk pets

Follow Up Care & Expected Prognosis

Patient Monitoring: Fluid, electrolyte, and acid-base balances; body weight; blood pressure; urine output; and clinical status—monitor daily.

Expected Prognosis: Prognosis depends on cause, extent of damage, coexistent diseases, and multiple organ involvement.

Infectious and obstructive causes have a better prognosis for recovery than toxic causes

Overview

- Poor prognosis for complete recovery
- Potential for complications of treatment (such as fluid overload, generalized bacterial infection [sepsis], and multiple organ failure)
- Prolonged hospitalization and treatment is expensive
- Alternatives to conventional medical management are available; they include peritoneal dialysis or haemodialysis (procedures to remove waste products from the blood) and kidney transplantation
- Leptospirosis has zoonotic potential; “zoonoses” are diseases that can be passed from animals to people