



Guidelines for Referral to the Nephrology & Extracorporeal Therapies Service at CASE

What is Hemodialysis?

- Hemodialysis is a method of blood purification that removes blood from the body through a catheter and filters it through a dialyzer (artificial kidney). Hemodialysis is used to purify the blood by eliminating toxic metabolites, balancing electrolytes, and removing excess water that builds up when the kidneys are unable to excrete it. This is most commonly performed in the acute setting (acute kidney injury) for animals but may also be elected for patients with chronic kidney dysfunction.
- While acute kidney injury is the most common reason for performing hemodialysis, it can also be used to treat acute intoxications to enhance elimination of a toxin.

Indications for Hemodialysis

Acute Kidney Injury

- This is the most common indication for hemodialysis. This procedure should be considered when clinical uremia, hyperkalemia, acid/base disturbances, and fluid overload cannot be managed with conventional medical therapy.
- The best time to start hemodialysis is still unknown (even in human medicine), but typically starting treatment sooner means fewer side effects from uremia are typically appreciated. Thus, hemodialysis should be considered sooner rather than later.
- When hemodialysis is performed, pet owners should be prepared both emotionally and financially for at least 10-14 days of hospitalization and treatment. With acute kidney injury, typically the kidneys will start to

regain some function within this time period, but lack of response does not mean the kidneys will never recover. There are instances where it may take up to 4 weeks to become dialysis independent. Patients are typically transitioned after the 10-14 days to outpatient treatments to continue to provide time for the kidneys to recover. These outpatient treatments allow families to play an active role in facilitating recovery.

Frequently Asked Questions:

What are the indications for hemodialysis in patients with acute kidney injury?

- Oliguria/anuria → low urine output in combination with an increase in body weight
- Fluid overload → plays a large role in patient morbidity, mortality, and cost of treatment
- Elevated potassium → high potassium concentrations can lead to cardiac arrhythmias
- Acidemia → hemodialysis is able to correct acid/base disturbances much more safely than with the administration of sodium bicarbonate
- Azotemia → there are no defined cutoffs for BUN and creatinine concentrations to start hemodialysis, thus each case is treated on an individual basis. Typically, azotemia not improving with medical therapy is an indication to start treatment

How many treatments of hemodialysis are necessary?

- Patients in the early stages of disease are typically treated every 24 hours. These treatments are then extended to every 72 hours until improvement in kidney function is observed (via serial creatinine measurements). The average number of treatments

for acute kidney injury is 4 to 6, but could be more depending on kidney function. As mentioned previously, typically there is improvement in kidney function within the first 10-14 days, but hemodialysis may be necessary for up to 4 weeks in some cases.

What to expect as an owner with a patient receiving hemodialysis?

- Owners should expect a financial and emotional investment for up to 2 weeks in the hospital. These two weeks of treatment will provide a clearer picture on the kidneys ability to recover function. Depending on the patient's condition and response, animals that require further treatment can be seen on an outpatient basis, requiring visits every 48-72 hours for treatment.

Chronic kidney disease

- Hemodialysis can be performed on patients with end-stage renal disease that is refractory to medical therapy. The treatment goals are different than with acute kidney injury. The goal is to provide the patient with improved quality of life. This is accomplished by performing regular treatments, three times per week. Chronic dialysis is feasible, yet it takes a financial and emotional investment from owners to maintain quality of life. CASE can provide chronic dialysis under limited circumstances.

Indications for Extracorporeal Therapies

Immune-mediated diseases

- Diseases in which the body's immune system is attacking itself is an indication for a treatment called therapeutic plasma exchange (TPE). During TPE, the pathologic antibodies and immune complexes that form are removed with the patient's plasma. The machine that is used separates the plasma from the patient's red blood cells and discards the "dirty" plasma. Healthy donor plasma is used as a replacement. Typical immune mediated diseases that can be treated are immune-mediated hemolytic anemia (IMHA), immune-mediated thrombocytopenia (ITP), myasthenia gravis, glomerulonephritis (Lyme nephritis), and polyradiculoneuritis (Coonhound paralysis). This treatment allows for rapid elimination of antibodies, allowing time for the immunosuppressive medications to take effect. This treatment is successful in cases refractory to medical management, with response rates around 80-90% in patients with IMHA.

Intoxications

- Hemodialysis is one modality used to remove toxins that are small in size and unbound to protein in the blood. Other modalities, such a charcoal hemoperfusion and TPE, can be utilized in patients that ingest toxins that are larger in size and highly protein bound. Typically, these

patients will receive one treatment to help increase the elimination of the toxin. These therapies have been used to treat a number of intoxications, including (but not limited to):

- Non-steroidal anti-inflammatory drugs (NSAIDs) → most common toxin removed
- Alcohol
- Caffeine
- Phenobarbital
- Ethylene glycol (antifreeze)
- Baclofen
- Chemotherapeutic overdoses
- When exposure to a large intoxication is documented or suspected, please contact CASE to determine if extracorporeal therapies are indicated to prevent the manifestation of the toxin exposure.
- It should be noted that various veterinary poison hotlines are not aware of the benefits of extracorporeal therapies for treatment of toxin exposure. Consultation with the CASE team may provide additional treatment options.

General Referral Guidelines

- Consult the CASE Nephrology & Extracorporeal Therapies service soon after diagnosis and/or early in the course of disease. Early consultation after review of patient's history, bloodwork, and clinical condition will allow for assessment of the patient's candidacy, as well as provide general prognosis and complications.
- **AVOID USING THE JUGULAR VEINS IN ANY POTENTIAL CANDIDATE FOR EXTRACORPOREAL THERAPIES.** Due to the size of our patients in veterinary medicine, the jugular veins are used for vascular access and must be protected to optimize conditions for catheter placement.
- Dan Gordon, DVM, DACVECC is readily available to speak with referring veterinarians on prospective cases.
- To discuss any potential case, please reach out to the **CASE Nephrology & Extracorporeal Therapies Service at (303) 545-2273.**

