

## Cardiology ER Protocols AVMA 2020

### Left-sided congestive heart failure secondary to DVD (degenerative valve disease)

1. Thoracic radiographs and chemistry panel, PCV/TS if stable. Consider initial IV or IM dosage of furosemide at 3-4 mg/kg if very unstable.
2. Oxygen support if needed
3. Get initial respiratory rate after diagnostics when settled, and then monitor RR q 1 hr.
4. Intravenous catheter if at possible, then furosemide 2-4 mg/kg IV initial bolus repeated hourly until resting respiratory rate drops by 25 to 50%. Then give furosemide 2 mg/kg IV q 2-6 hrs as needed (but at least every 6 hours). Alternatively, a furosemide CRI can be utilized at 0.1-1.0 mg/kg/hr IV (usually start in the middle 0.5 mg/kg/hr IV – unless ancient or azotemic, then consider 0.25-0.35 mg/kg/hr IV). To calculate CRI and give minimal amounts of fluids, can calculate the total mg of furosemide needed for 24 hours then calculate the mls needed (F ml) for 24 hours. Take 24 ml of 0.9 NaCl – (F ml) = amount of 0.9 NaCl needed in syringe pump. Run NaCl/furosemide (F mL) syringe of 24 ml at 1 ml/hr to last for one day. Intermittent furosemide boluses may be indicated at 2 mg/kg IV q 4 hrs with the CRI if respiratory rate too high.
5. Positive inotropic support – Oral pimobendan at 0.2-0.4 mg/kg PO q 8-12 hrs
6. If not vastly improving in 4-6 hours or worsening, consider dobutamine CRI IV at 2.5-7.5 mcg/kg/min. If dobutamine is chosen, continuous ECG monitoring should be utilized and the patient should be watched for arrhythmias. If ventricular arrhythmias develop, stop the CRI. A second catheter is indicated for dobutamine as it is not compatible with IV furosemide.
7. Monitor for urination
8. Free choice water always

### Left-sided congestive heart failure secondary to DCM or DVD in a large breed dog

1. Thoracic radiographs and chemistry panel, PCV/TS if stable. Consider initial IV or IM dosage of furosemide at 3-4 mg/kg if very unstable.
2. Oxygen support if needed
3. Get initial respiratory rate after diagnostics when settled, and then monitor RR q 1 hr.
4. Intravenous catheter if at possible, then furosemide 2-4 mg/kg IV initial bolus repeated hourly until resting respiratory rate drops by 25 to 50%. Then give furosemide 2 mg/kg IV q 2-6 hrs as needed (but at least every 6 hours). Alternatively, a furosemide CRI can be utilized at 0.1-1.0 mg/kg/hr IV (usually start in the middle 0.5 mg/kg/hr IV – unless ancient or azotemic, then consider 0.25-0.35 mg/kg/hr IV). To calculate CRI and give minimal amounts of fluids, can calculate the total mg of furosemide needed for 24 hours then calculate the mls needed (F ml) for 24 hours. Take 24 ml of 0.9 NaCl – (F ml) = amount of 0.9 NaCl needed in syringe pump. Run NaCl/furosemide (F mL) syringe of 24 ml at 1 ml/hr to last for one day. Intermittent furosemide boluses may be indicated at 2 mg/kg IV q 4 hrs with the CRI if respiratory rate too high.
5. Positive inotropic support – Oral pimobendan at 0.2-0.4 mg/kg PO q 8-12 hrs and dobutamine CRI IV at 2.5-7.5 mcg/kg/min. If dobutamine is chosen, continuous ECG monitoring should be utilized and the patient should be watched for arrhythmias. If ventricular arrhythmias develop, stop the CRI. A second catheter is indicated for dobutamine as it is not compatible with IV furosemide.
6. Monitor for urination
7. Free choice water always



### **Left-sided congestive heart failure secondary to HCM, RCM or UCM in a cat**

1. Thoracic radiographs and chemistry panel, PCV/TS if stable. Consider initial IV or IM dosage of furosemide at 1-2 mg/kg if very unstable.
2. Thoracocentesis before anything else if muffled heart and/or lung sounds.
3. Oxygen support if needed
4. Get initial respiratory rate after diagnostics when settled, and then monitor RR q 1 hr.
5. Intravenous catheter if at possible, then furosemide 0.5-2 mg/kg IV every 6-12 hours or furosemide CRI IV at 0.15-0.5 mg/kg/hr. Use lowest possible doses.
6. Consider oral pimobendan 0.2-0.4 mg/kg PO q 12 hrs if able to pill and NO loud heart murmur. OK if soft heart murmur as LVOTO (left ventricular outflow tract obstruction) LESS LIKELY.
7. Monitor for urination
8. Free choice water always
9. NIBP if feasible
10. Potential heat support (hypothermic, hypotensive, bradycardic signs not uncommon)

### **Right-sided congestive heart failure secondary to DVD**

1. Thoracic radiographs and chemistry panel, PCV/TS if stable.
2. Get initial respiratory rate after diagnostics when settled, and then monitor RR q 1 hr.
3. Abdominocentesis – remove as much fluid as possible – you are better than furosemide at that moment!
4. Oral, Subcutaneous or IM Furosemide at 2 mg/kg q 12 hrs.
5. Positive inotropic support – oral pimobendan at 0.2-0.4 mg/kg PO q 12 hrs
6. Monitor for urination
7. Free choice water always
8. Be mindful for arrhythmias such as atrial fibrillation and treat if present.
9. Consider echo as soon as possible for assessment of pulmonary hypertension.

### **When current cardiac patient comes in with CHF – how to treat and adjust medications**

1. If moderate to severe CHF, hospitalize and treat as noted above for L-sided CHF. You do NOT need to administer ACE inhibitor or spironolactone concurrently unless a cavalier king Charles spaniel or chronic, recurrent hospitalized patient with tolerable kidney values. Do administer pimobendan if already administered at home and increase to q 8 hr dosing.
2. If Mild L-CHF or R-sided CHF (remove the fluid from abdomen if present). Consider injection of furosemide (2 mg/kg IV) and then increase oral diuretic for go home as noted in #3.
3. INCREASE ORAL DIURETIC FOR GO HOME. If taking furosemide already, add 1-2 mg/kg PO q 12 hours to the regimen. If you do not increase, they will come back with CHF. Continue all other medications as previously prescribed unless severe kidney issues, then serious concerns for prognosis. If furosemide daily dose is > 12 mg/kg PO, and azotemia is mild, consider switching to torsemide (give current furosemide daily dose and divide mg by 10 and split into twice daily dosing. For example if taking 50 mg PO daily of furosemide, give 2.5 mg PO q 12 hrs of torsemide).
4. If not already taking spironolactone and only mildly azotemic, add spironolactone (1-2 mg/kg PO q 12-24 hrs).
5. Maximize ACE inhibitor (again if only mildly azotemic) to 0.5 mg/kg PO q 12 hrs.



### Ventricular tachycardia

1. ECG rhythm strip (wide bizarre QRS complexes, fast regular rhythm, absence of P waves or no association between P waves and QRS complexes)
2. Intravenous catheter and rescue drugs calculated.
3. Thoracic radiographs
4. CBC, Chemistry – esp. to look for electrolyte disturbances
5. If VT sustained and fast and/or causing hemodynamic consequences, give IV lidocaine bolus at 1-2 mg/kg while ECG attached. If sinus rhythm achieved or ventricular ectopy reduced, start Lidocaine CRI at 25-50 mcg/kg/min IV. If no change in ECG, repeat bolus up to three times (up to 8 mg/kg IV total). Monitor for neurological side effects (seizure).
6. If VT does not break, consider procainamide 2-5 mg/kg IV up to 20 mg/kg IV total; each dose over 5 minutes. If all else fails, can try oral sotalol 1-2 mg/kg PO q 12 hr (will usually work).
7. Consider oral sotalol while administered lidocaine CRI to help for weaning lidocaine later if VT is fast and will likely require treatment long term (ie, boxer with ARVC, substantial underlying cardiac disease). Be mindful of negative inotropic properties of sotalol. If significant cardiomegaly without CHF and not currently taking furosemide, there is a risk for decreased pump function and CHF with sotalol. In this scenario, begin instead mexiletine (3-7 mg/kg PO q 8 hrs WITH FOOD). If already taking furosemide and only mildly azotemic, increase furosemide as you begin sotalol contemporaneously.
8. Continuous ECG monitoring

### Supraventricular tachycardia

1. ECG rhythm strip (narrow QRS complexes [can be wide if bundle branch block present, LV dilation, etc.], fast regular rhythm, may or may not see P waves). Will be irregularly irregular with atrial fibrillation (treated with oral medications rather than IV).
2. Intravenous catheter and rescue drugs calculated
3. Thoracic radiographs
4. CBC, Chemistry – esp. to look for electrolyte disturbances
5. If SVT sustained and fast and/or causing hemodynamic consequences, give IV incremental doses of 0.05-0.1 mg/kg IV esmolol every 5 minutes to a maximum dose of 0.5 mg/kg IV esmolol. If no success, wait 10 minutes and then give diltiazem boluses at 0.05-0.15 mg/kg slowly IV. If no change in ECG, repeat bolus every 5 minutes to effect or until a total dose of 0.1-0.3 mg/kg IV while ECG attached.
6. If sinus rhythm achieved or supraventricular ectopy reduced or slowed in rate then you have good options/choices:
  - a. Start esmolol at a constant rate IV infusion of 25-200 mcg/kg/minute (if response to esmolol originally noted)
  - b. OR diltiazem CRI at 0.12 - 0.24 mg/kg/hr IV
  - c. OR diltiazem 0.5-1.5 mg/kg PO q 8 hours
  - d. OR diltiazem ER 2-3 mg/kg PO q 12 hr, Diltiazem Extended Release (Dilacor XR) 240 mg capsules: Each capsule contains four internal 60 mg tablets. Open the capsule and give \*\*\* internal tablet (\*\*\*) mg by mouth every 12 hours.
  - e. DO NOT give both Beta-blocker and calcium channel blocker at the same time!
7. Can also consider procainamide 2-5 mg/kg IV up to 20 mg/kg IV total; each dose over 5 minutes.
8. If all else fails, can try oral sotalol 1-2 mg/kg PO q 12 hrs



9. All SVTs should be slowed down with calcium channel blockers (will not necessarily break). Goal is to slow rhythm (breaking rhythm is not required). If administered diltiazem CRI and likely to require it long term, consider transition to oral therapy in hospital by decreasing CRI by half and giving dose of diltiazem PO and then stopping CRI 2 hours later.
10. Continuous ECG monitoring
11. Atrial fibrillation should be treated with oral diltiazem doses noted above in 6 c and d.

