### Guidelines for Diagnosis and Treatment of CVHD (Stage A and B)

<table>
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<tr>
<th>Stage</th>
<th>Description</th>
<th>Diagnosis</th>
<th>Therapy</th>
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</table>
| **A** | Dogs at high risk for HF but without apparent structural abnormality | - Regular yearly evaluations (auscultation by rDVM) for small breed dogs and breeds with known predisposition  
- Owners of high risk dogs can choose to participate in yearly screening events conducted by cardiologists (usually at shows) | - No drug therapy  
- No dietary therapy |
| **B1** | Dogs with structural abnormality indicating the presence of CVHD but have never had clinical signs of HF  
B1: hemodynamically insignificant MR | - Thoracic radiographs when asymptomatic  
- Blood pressure measurement  
- Echo **recommended in small breeds** with typical murmurs *(to answer specific questions regarding chamber enlargement if not answered adequately by auscultation and thoracic rads)* | B1 (normal LA, LV or both with normal LV systolic function, normal VHS; normotensive):  
- No drug or dietary therapy recommended  
- Re-evaluation buy radiology or echo with Doppler studies in 12 months (some recommend more frequent follow up in large dogs) |
| **B2** | B2: hemodynamically significant MR | - Echo **indicated in large breeds** *(murmur of MR more likely related to other causes i.e. DCM)*  
- Basic lab work for all patients (hct, TP, creatinine, UA) | B2 (cardiac remodeling – enlarged LA, LV or both; normotensive):  
**No consensus re: drug or dietary recommendation:** |
## Guidelines for Diagnosis and Treatment of CVHD (Stage C)

<table>
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<th>Stage C: Dogs with structural abnormality and current or previous clinical signs of HF</th>
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| - Clinical database (chest rads, echo, basic labs) | **Acute (hospital-based)**<br>- Furosemide: dosing should be related to severity of CS and response (1-4mg/kg). Repeated IV boluses or CRI indicated for poorly responsive dogs<br>- For life-threatening pulmonary edema (poor initial response to furosemide bolus in first 2 hours, expectoration of froth): furosemide administered as CI 1mg/kg/hr after initial bolus<br>- Free access to water | - [Serum NT pro-BNP]  
- Signalment and PE can be helpful  
*Ex1: obese dogs with no history of weight loss are less likely to be in HF secondary to CVH*  
*Ex2: dogs with marked sinus arrhythmia and slow HR less likely to have HF secondary to CVH*  
- CBC, Biochem, UA if therapy for CHF is anticipated |
| - CBC, Biochem, UA if therapy for CHF is anticipated | - Pimobendan 0.25-0.3mg/kg PO q12 *strongly supported by hemodynamic and experimental evidence*  
- O2 supplementation  
- Mechanical treatments: thoracocentesis or abdominocentesis for effusions sufficient to impair ventilation  
- Nursing care  
- Sedation: butorphanol + combinations  
- CRI of nitroprusside for up to 48 hours useful for life-threatening poorly responsive pulmonary edema | |

### Chronic (home-based)
- PO furosemide to effect (2mg/kg q12 usually, range 1-6mg/kg IV q8) with attention to effects on renal function and electrolyte status  
- Start (or continue) ACEI (enalapril 0.5mg/kg PO q12 or equivalent)  
- Measure creatinine and electrolytes 3-7 days after initiating ACEI  
- Continue Pimobendan (0.25-0.3mg/kg PO q12)  
- Do not start beta blocker in face of active clinical signs of HF caused by CVHD  
- Follow up to ensure body weight, appetite, resp and HR monitoring |

### Dietary
- Maintain adequate calorie intake to minimize weight loss  
- Record weight at every visit  
- Ensure adequate protein intake and avoid low protein diets designed to treat CKD unless severe concurrent renal failure is present  
- Modestly restrict sodium intake  
- Monitor serum [potassium] and supplement diet with potassium from natural or commercial sources
## Guidelines for Diagnosis and Treatment of CVHD (Stage D)

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<td>-Refractory HF</td>
<td>-Involves same diagnostic steps outlined for stage C PLUS failure to respond to treatments.</td>
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<td><strong>Acute (hospital-based)</strong></td>
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<td>-Patients are receiving maximum recommended or tolerated dosage of furosemide, ACEI, and pimobendan</td>
<td>-Chronic oral furosemide (&gt;6mg/kg q12) needed to maintain patient comfort in the face of appropriate adjunct therapy indicates disease progression to Stage D</td>
<td></td>
<td><strong>Acute (hospital-based)</strong></td>
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| | | | -Additional furosemide IV as a bolus of 2 mg/kg followed by additional bolus doses, OR furosemide CRI of 1 mg/kg/h **until respiratory distress has decreased, or for a maximum of 4 hours.**
  *Unless there is evidence of severe renal insufficiency (serum creatinine > 3mg/kg IV)*
  -Continue to allow patient free access to water |
| | | | -Fluid removal (abdominocentesis, thoracocentesis) as needed to relieve respiratory distress or discomfort |
| | | | -O2 supplementation + mechanical ventilation if necessary (allow time for meds to take effect) |
| | | | -More vigorous afterload reduction in patients that can tolerate arterial vasodilation. Sodium nitroprusside (starting at 0.5–1 mg/kg/min), hydralazine (0.5–2.0 mg/kg PO), or amlodipine (0.05–0.1 mg/kg PO)
  **Started at low dosage and titrated up hourly until clinical improvement and decrease of systolic blood pressure (5–10%).** |
| | | | -Spironolactone if not already started in stage C is indicated at this point |
| | | | -Beta blockade generally should NOT be initiated at this stage |
| | | | **Chronic (home-based)** |
| | | | -Furosemide dosage increased as needed to decrease pulmonary edema or body cavity effusions, if use is not limited by renal dysfunction (should be monitored 12-48 hours after dosage increases)
  **Specific strategy and magnitude of dosage increase varied among panelists** |
| | | | -Spironolactone if not already started in stage C is indicated at this point |
| | | | -Beta blockade generally should NOT be initiated at this stage |
| | | | **Home-based chronic dietary** |
| | | | -Dietary considerations for stage C apply |
| | | | -Attempts to further decrease dietary sodium intake should be made if it can be done without compromising appetite or renal function |