

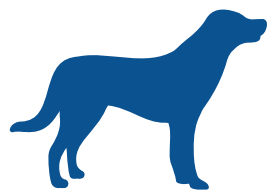
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## ACVIM CONSENSUS GUIDELINES FOR THE DIAGNOSIS AND TREATMENT OF MYXOMATOUS MITRAL VALVE DISEASE IN DOGS

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### Background

This report, issued by the ACVIM Specialty of Cardiology consensus panel, revises guidelines for the diagnosis and treatment of myxomatous mitral valve disease (MMVD, also known as endocardiosis and degenerative or chronic valvular heart disease) in dogs.



The panel adopted the following scheme, adapted from the American Heart Association to rate the strength of the recommendations in these guidelines.



**MMVD** is the most common heart disease of dogs in many parts of the world, accounting for approximately **75%** of heart disease cases seen in dogs by veterinary practices in North America.

It is estimated that approximately **10%** of dogs presented to primary care veterinary practices have heart disease.

The panel chose to use a hybrid of the American Heart Association and Veterinary Emergency Critical Care RECOVER evidence grading criteria, as outlined below.



Classes of recommendation	
CLASS I	BENEFIT>>>RISK
CLASS IIA	BENEFIT>>RISK
CLASS IIB	BENEFIT>RISK
CLASS III	BENEFIT=RISK
CLASS IV	RISK>>BENEFIT

Levels of Evidence (LOE)	
STRONG	The highest level of evidence based on high quality studies generating a clear and statistically valid result.
MODERATE	This level of evidence is based on well designed, controlled studies for interpretation by the reader.
WEAK	Based on quality studies which leave room for observation and discussion.
EXPERT OPINION	Considered the weakest LOE based on experience of the panel.



In 2009, the consensus panel adapted a staging system for heart disease and heart failure, and sought to link clinical signs to appropriate treatments at each stage.



According to this approach, patients are expected to advance from one stage to the next stage.



This new staging system for MMVD, updated from 2009, describes 4 basic stages of heart disease and heart failure	
STAGE A	Identifies dogs at high risk for developing heart disease (predisposed breeds)
STAGE B	Identifies dogs with structural heart disease
B1	Describes asymptomatic dogs that have no radiographic or echocardiographic evidence of cardiac remodeling in response to their MMVD
B2	Refers to asymptomatic dogs that have more advanced mitral valve regurgitation that meet clinical trial criteria used to identify dogs that clearly should benefit from initiating treatment to delay the onset of heart failure
STAGE C	Denotes dogs with either current or past clinical signs of heart failure caused by MMVD
STAGE D	Refers to dogs with end-stage MMVD, in which clinical signs of heart failure are refractory to standard treatment

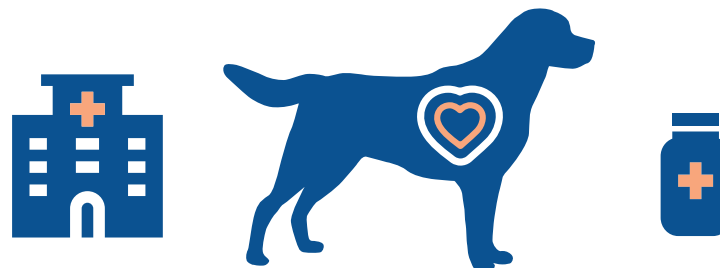
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# GUIDELINES FOR DIAGNOSIS AND TREATMENT OF MMVD







Stage A		Identifies dogs at high risk for developing heart disease (predisposed breeds)	
RECOMMENDATIONS FOR DIAGNOSES 🔍	Small breed dogs, including breeds with known predisposition to develop MMVD should undergo regular evaluations.	CLASS I	LOE: EXPERT OPINION
	Owners of breeding dogs or those at high risk may choose to participate in approved screening events.	CLASS I	LOE: EXPERT OPINION
RECOMMENDATIONS FOR TREATMENT +	If evidence of a murmur or mitral regurgitation (MR) is identified dogs should no longer be bred.	CLASS I	LOE: MODERATE
	No drug treatment. No dietary treatment.	CLASS I	LOE: EXPERT OPINION
Stage B		Identifies dogs with structural heart disease	
RECOMMENDATIONS FOR DIAGNOSES 🔍	Short axis basilar views and recently described 2-dimensional, long-axis echocardiographic ratios have proven to be effective for identifying left atrial and ventricular enlargement in dogs with MMVD.	CLASS I	LOE: STRONG
	Echocardiography is to identify the cause of the murmur, answer specific questions regarding the severity of cardiac chamber enlargement, and identify comorbidities.	CLASS I	LOE: MODERATE
	Because of marked variation in thoracic conformation, in addition to using a vertebral heart score, the use of the vertebral left atrial size (VLAS) may be beneficial.	CLASS I	LOE: EXPERT OPINION
	Having baseline radiographs at a time when the dog is asymptomatic can enhance the ability to differentiate cardiac from noncardiac causes of cough.	CLASS I	LOE: EXPERT OPINION
	Thoracic radiography in all patients at a time when the patient is asymptomatic for MMVD.	CLASS I	LOE: EXPERT OPINION
	Blood pressure measurement.	CLASS I	LOE: EXPERT OPINION
Stage B1		Describes asymptomatic dogs that have no radiographic or echocardiographic evidence of cardiac remodeling in response to their MMVD	
RECOMMENDATIONS FOR DIAGNOSES AND MONITORING 🔍 📊	Treatment is not recommended in these dogs because at this early stage of disease, progression to heart failure is uncertain. No drug or dietary treatment.	CLASS I	LOE: EXPERT OPINION
	Reevaluation by echocardiography is suggested (or radiography if echocardiography is unavailable) in 6-12 months.	CLASS I	LOE: EXPERT OPINION
Stage B2		Asymptomatic MMVD causing MR severe enough to result in cardiac remodeling, dogs in this category should meet the following criteria:	
RECOMMENDATIONS FOR DIAGNOSES 🔍	<ul style="list-style-type: none"> <li>- Murmur intensity &gt;3/6;</li> <li>- Echocardiographic LA : Ao ratio in the right-sided short axis view in early diastole &gt;1.6</li> <li>- Left ventricular internal diameter in diastole, normalized for body weight (LVIDDN) &gt;1.7</li> <li>- Breed-adjusted radiographic vertebral heart score (VHS) &gt;10.5</li> </ul> Ideally, all of these criteria should be met. However, in the absence of echocardiographic measurements, clear radiographic evidence of cardiomegaly (VHS > 11.5) or evidence of increasing interval change can be used to identify Stage B2.	CLASS I	LOE: STRONG
	VLAS values of >3 likely identify Stage B2 MMVD.	CLASS I	LOE: MODERATE
RECOMMENDATIONS FOR TREATMENT +	Pimobendan at a dosage of 0.25-0.3 mg/kg PO q12h.	CLASS I	LOE: STRONG
	Surgical intervention in advanced Stage B2 is possible and recommended by some panelists.	CLASS IIA	LOE: MODERATE
	Dietary treatment.	CLASS IIA	LOE: WEAK
	For patients in stage B2 on either initial examination, 5 (of 10) panelists recommend treatment with ACEI.	CLASS IIA	LOE: WEAK

**Stage C** Denotes dogs with either current or past clinical signs of heart failure caused by MMVD.

<b>RECOMMENDATIONS FOR DIAGNOSES</b> 	Analyze serum NT-proBNP concentration.		CLASS I	LOE: MODERATE
	Obtain basic laboratory tests.		CLASS I	LOE: EXPERT OPINION
	Most symptomatic dogs with MMVD are middle-aged or older, and it is prudent to complete the clinical database.		CLASS I	LOE: EXPERT OPINION
	Complete clinical database (including thoracic radiographs and ideally echocardiogram).		CLASS I	LOE: EXPERT OPINION
<b>RECOMMENDATIONS FOR TREATMENT</b> 	<b>HOSPITAL BASED</b> 	Torsemide at approximately 5% to 10% of the furosemide dosage (0.1-0.3 mg/kg q24h7).	CLASS I	LOE: MODERATE
		Pimobendan, 0.25-0.3 mg/kg administered PO q12h.	CLASS I	LOE: WEAK
		ACEI (0.5 mg/kg PO q12h).	CLASS IIB	LOE: WEAK
		Furosemide 2 mg/kg IV (or IM) followed by 2 mg/kg IV (or IM) hourly until patients respiratory signs are substantially improved.	CLASS I	LOE: EXPERT OPINION
		Oxygen supplementation, if needed, can be administered.	CLASS I	LOE: EXPERT OPINION
		Furosemide CRI (0.66-1 mg/kg/hour) for life-threatening pulmonary edema.	CLASS IIA	LOE: EXPERT OPINION
	<b>CHRONIC (HOME BASED)</b> 	Continue pimobendan, 0.25-0.3 mg/kg PO q12h.	CLASS I	LOE: STRONG
		Continue PO furosemide (2mg/kg q12h).	CLASS I	LOE: MODERATE
		Spironolactone (2.0 mg/kg PO q12 - 24 h).	CLASS I	LOE: MODERATE
		Diltiazem (often combined with digoxin) in cases of complicated atrial fibrillation.	CLASS I	LOE: MODERATE
		Dietary recommendations: - Ensure adequate protein intake - Modestly restrict sodium intake - Omega-3-fatty acids	CLASS I	LOE: MODERATE
		In centers with low complication rates, patients benefit from surgical intervention to repair their mitral valve apparatus.	CLASS I	LOE: MODERATE
		Continue or start ACEI (0.5 mg/kg PO q12h).	CLASS IIB	LOE: WEAK
		None of the panelists routinely use nitroglycerin.	CLASS III	LOE: EXPERT OPINION

**Stage D** Refers to dogs with end-stage MMVD, in which clinical signs of heart failure are refractory to standard treatment

<b>RECOMMENDATIONS FOR DIAGNOSES</b> 	CHF involves the same diagnostic steps outlined for Stage C plus the finding of failure to respond to treatments outlined in the Stage C guidelines. Chronic PO furosemide dosages -8 mg/kg q24h in any dosing regimen to maintain patient comfort in the face of appropriate dosages of pimobendan, an ACEI, and spironolactone indicate disease progression to Stage D.			
<b>RECOMMENDATIONS FOR TREATMENT</b> 	<b>HOSPITAL BASED</b> 	Pimobendan dosage may be increased (off-label use) to include a third 0.3 mg/kg daily PO dose.	CLASS IIA	LOE: EXPERT OPINION
	<b>CHRONIC HOME-BASED TREATMENT</b> 	Torsemide, a potent and longer-acting loop diuretic, may be used to treat dogs no longer adequately responsive to furosemide.	CLASS I	LOE: MODERATE
		Furosemide (or torsemide) dosage should be increased as needed to decrease the accumulation of pulmonary edema or body cavity effusions.	CLASS IIA	LOE: EXPERT OPINION
		Pimobendan dosage is increased by some panelists to include a third 0.3 mg/kg daily dose.	CLASS IIA	LOE: EXPERT OPINION
		Beta blockers generally should not be initiated at this stage.	CLASS IV	LOE: EXPERT OPINION
Dietary requirements: All of the dietary considerations for Stage C (above) apply.				