



# CANINE CARDIAC DIAGNOSTIC SCHEME

## ABCDs OF CANINE CARDIOLOGY

UPDATED NOVEMBER 2017



# A

## HEART FAILURE STAGES

Dogs with no structural disease but at high risk for developing heart disease

### DIAGNOSTICS

- **Patient history**
- **Yearly auscultation**
- **Screening programs for select breeds**

### CEG RECOMMENDATIONS

- **No treatment**
- **Client education**
- **Annual re-evaluation**



**KEY:** **Red text:** High priority diagnostic procedures

**Black text:** Lower priority diagnostic procedures



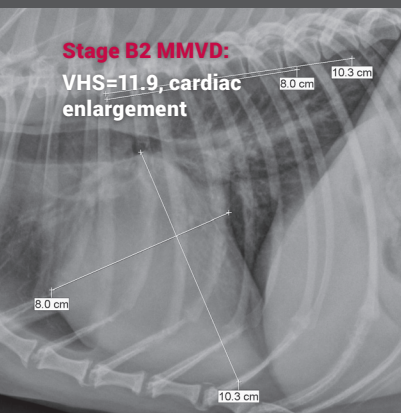
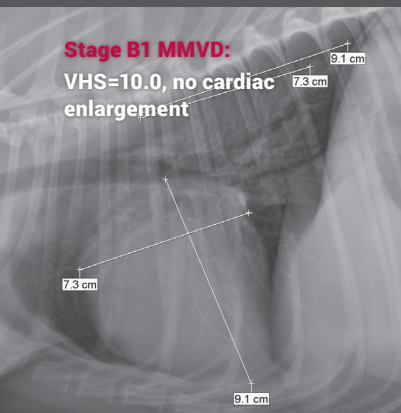
# B

## HEART FAILURE STAGES

Dogs with structural heart disease that have not yet developed clinical signs of heart failure

### DIAGNOSTICS – B1 & B2

- **Patient history**<sup>1</sup>
- **Cardiac and pulmonary auscultation**<sup>2</sup>
- **Thoracic radiographs**<sup>3,4</sup>
- **Echocardiography**<sup>5</sup>
- Blood pressure
- Electrocardiogram (ECG) when cardiac arrhythmia is evident during clinical examination
- NT-proBNP<sup>6</sup>-increases over time are associated with progression of MMVD
- 24 hour ambulatory (Holter) electrocardiogram (ECG) for evaluation of heart rhythm disturbances<sup>7</sup>
- Ambulatory event monitor electrocardiogram (ECG) for evaluation of syncope<sup>8</sup>
- Clinical lab tests: serum biochemistries, PCV/TS (or CBC) and urinalysis (prior to initiating any therapy)



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MMVD: Myxomatous Mitral Valve Disease

#### FOOTNOTES

1. The history should include: questions about exercise tolerance, resting respiratory rate, appetite, interaction with family, evident clinical signs (cough, collapse), and overall assessment of quality of life.
2. MMVD dogs – imaging is strongly recommended if murmur grade is  $\geq 3/6$ .
3. A second opinion from a radiologist or cardiologist may be helpful.
4. See [cardiaceducationgroup.org](http://cardiaceducationgroup.org) for more information about radiographs and the Vertebral Heart Size (VHS).
5. Echocardiography is needed for confirmation of Stage B2 DCM and strongly recommended prior to the initiation of pimobendan in dogs with Stage B2 MMVD and a VHS of  $>10.5$  but  $<11.5$ .
6. See [cardiaceducationgroup.org](http://cardiaceducationgroup.org) for more information regarding the use of NT-proBNP.
7. A Holter electrocardiogram is used to identify and assess severity of arrhythmias. Holter monitor results may be useful to detect arrhythmias associated with dilated cardiomyopathy (often a referral evaluation).
8. Results of event monitor electrocardiograms are especially useful for diagnosis of intermittent syncope or collapse episodes.

# B

## HEART FAILURE STAGES

Dogs with structural heart disease that have not yet developed clinical signs of heart failure

### CEG RECOMMENDATIONS – B1 & B2

- No specific dietary changes or exercise restrictions at this stage
- Manage systemic hypertension if present

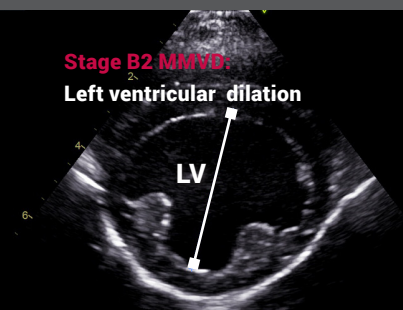
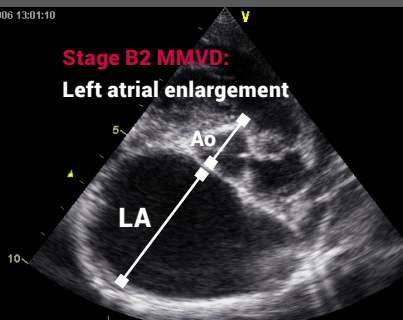
**B1:** MMVD – No treatment

DCM – Optimal therapy is uncertain; consulting a cardiologist may be useful in these patients.

**B2:** MMVD – Echocardiographic confirmation of cardiac enlargement is recommended. Pimobendan treatment should be initiated in dogs with substantial echocardiographic evidence of cardiac enlargement<sup>9</sup>, or a VHS  $\geq 11.5$ . In dogs with severe cardiac enlargement an ACEi can be added.

DCM in Doberman pinschers and Irish wolfhounds – Pimobendan with or without an ACEi in echocardiographic-confirmed cases; consult a cardiologist regarding use of other therapies.

DCM in other breeds – Consultation with a cardiologist is strongly recommended. Pimobendan with or without an ACEi in echocardiographic confirmed cases can be considered; consult a cardiologist regarding use of other therapies.



#### FOOTNOTES

9. Echocardiographic cardiac enlargement (LA:Ao $\geq 1.6$ , LVIDD $\geq 1.7$ ); review flow chart found in The EPIC Trial: Pimobendan in Preclinical Myxomatous Mitral Valve Disease recommendation article at cardiaceducationgroup.org.

MMVD: Myxomatous Mitral Valve Disease

DCM: Dilated Cardiomyopathy

ACEi: Angiotensin-Converting Enzyme Inhibitor

# C

## HEART FAILURE STAGES

Dogs with past or current clinical signs of heart failure

### DIAGNOSTICS

- **Patient history**
- **Cardiac and pulmonary auscultation**
- **Thoracic radiographs**
  - Blood pressure
  - Electrocardiogram (ECG) when cardiac arrhythmia is evident during clinical examination.
  - NT-proBNP might help discriminate between dogs with respiratory causes of clinical signs or congestive heart failure.
  - Echocardiography for definitive diagnosis of underlying structural heart disease.
  - 24 hour ambulatory (Holter) electrocardiogram (ECG) for evaluation of heart rhythm disturbances.
  - Ambulatory event monitor electrocardiogram (ECG) for evaluation of syncope.
  - Clinical lab tests: serum biochemistries, PCV/TS (or CBC) and urinalysis (prior to initiating any therapy).

### CEG RECOMMENDATIONS

- **Standard Treatment:** *Furosemide, Pimobendan, ACEi*
- Spironolactone is commonly added to long-term therapy.
- Atrial fibrillation – digoxin and/or diltiazem<sup>10</sup>
- Ventricular arrhythmias – lidocaine for emergency therapy of ventricular tachycardia
- Consider dietary changes – avoid excessive sodium intake and maintain adequate protein intake.
- Exercise as tolerated, avoid prolonged strenuous activity.

Stage C DCM:  
CHF: active

Stage C MMVD:  
CHF: active

Stage C MMVD:  
No CHF: stable on medications

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#### FOOTNOTES

10. Relative contraindications for digoxin include: impaired renal function (digoxin is eliminated by the kidneys); complicated ventricular ectopy (digoxin may worsen ventricular arrhythmias); conduction disease of the sinus node or atrioventricular node (digoxin may suppress these tissues).



# D

## HEART FAILURE STAGES

Dogs with end-stage disease with clinical signs of heart failure refractory to standard therapy

### DIAGNOSTICS

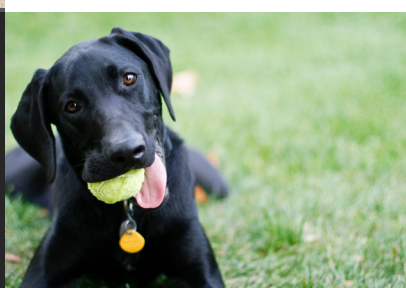
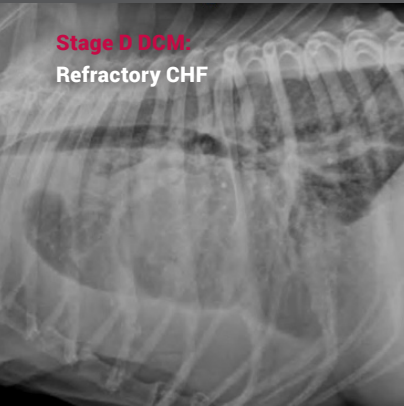
- **Patient history**
- **Cardiac and pulmonary auscultation**
- **Thoracic radiographs**
  - Blood pressure
  - Electrocardiogram (ECG) when cardiac arrhythmia is evident during clinical examination.
  - NT-proBNP increases over time are associated with progression of MMVD.
  - Echocardiography for definitive diagnosis of underlying structural heart disease, or complications (e.g. ruptured chordae tendineae or left atrial rupture).
  - 24 hour ambulatory (Holter) electrocardiogram (ECG) for evaluation of heart rhythm disturbances.
  - Ambulatory event monitor electrocardiogram (ECG) for evaluation of syncope.
  - Clinical lab tests: serum biochemistries, PCV/TS (or CBC) and urinalysis (prior to initiating any therapy).

### CEG RECOMMENDATIONS

- **Standard Treatment:** *Furosemide, Pimobendan, ACEi & Spironolactone*
- Digoxin if not contraindicated
- Atrial fibrillation – digoxin and/or diltiazem
- Ventricular arrhythmias – lidocaine for emergency therapy of ventricular tachycardia
- Other therapies may be helpful; consultation with a cardiologist is strongly recommended.
- Dietary changes – avoid excessive sodium intake and maintain adequate protein and caloric intake.
- Exercise as tolerated, avoid prolonged strenuous activity.

**Red text:** High priority diagnostic procedures

**Black text:** Lower priority diagnostic procedures





## THE CEG PROMOTES AND FACILITATES:

- Educational activities to increase veterinarians' skills and confidence in diagnosing, treating and managing heart disease and heart failure.
- Tools and resources to help veterinarians detect and diagnose heart disease earlier and with greater accuracy.
- Recommendations to ensure dogs and cats with heart disease or heart failure receive optimal care and treatments to promote longevity and quality of life.
- On-line resources for veterinarians.
- Collaboration among pet owners and veterinarians pertaining to canine and feline heart health.

## INITIAL TREATMENT OF LIFE THREATENING CONGESTIVE HEART FAILURE (CHF)

Initial treatment of acute CHF should include injectable furosemide, oxygen and butorphanol sedation if needed. Administer pimobendan if the patient can tolerate oral medication. These patients require 24-hour care and may benefit from specialty referral and additional individualized therapy. Stabilize the patient before transport is considered.

## COMPLICATING AIRWAY DISEASE

The presence of some respiratory conditions may complicate classification of dogs with heart disease.

This is especially problematic in distinguishing stage B2 from stage C dogs. Collapsing trachea, mainstem bronchial compression due to left atrial enlargement, chronic bronchitis or pulmonary hypertension may cause symptoms similar to those of congestive heart failure. These include coughing, tachypnea or symptoms related to airway obstruction. These patients might benefit from additional diagnostic testing, referral to a specialist or therapeutic trials.

See [cardiaceducationgroup.org](http://cardiaceducationgroup.org) for additional details.



## ABOUT THE CARDIAC EDUCATION GROUP (CEG)

Founded in 2009, the Cardiac Education Group is a registered not-for-profit organization of board-certified veterinary cardiologists from both academia and private practice that offers independent recommendations for the evaluation and treatment of canine and feline heart disease. The group is committed to providing resources and information on the diagnosis, treatment and management of heart disease and heart failure in dogs and cats in order to promote detection, diagnosis, and therapy with greater accuracy and confidence.

## THE CEG MISSION

The CEG offers educational recommendations and resources that will help veterinarians diagnose, treat and manage heart disease and heart failure in dogs and cats, improving the lives of companion animals with heart disease.



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[cardiaeducationgroup.org](http://cardiaeducationgroup.org).

