




Insights Into The Feline Heart
Understanding, Diagnosing, and Treating
Feline Cardiomyopathy

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Why are Cat Heart Sounds So Difficult to Characterize?


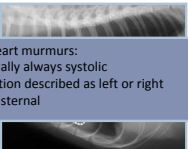
- A. Gallop heart sounds can be hard to detect.
- B. Murmurs in cats all sound the same.
- C. Cats are small; the valve areas are close together.
- D. The position of the heart in the thorax changes w/age.
- E. Most feline heart murmurs are dynamic (labile).
- F. Knowledge deficits about murmur location, prevalence.
- G. All of the Above.



Cardiac Auscultation in Cats



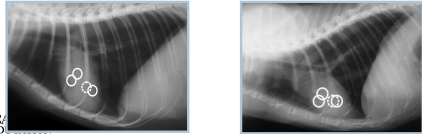
The neglected area:
ventral thorax
directly over the
sternum



Cat heart murmurs:
•Virtually always systolic
•Location described as left or right parasternal

Why are Cat Heart Sounds So Difficult to Characterize?

The position of the heart in the thorax changes w/age.

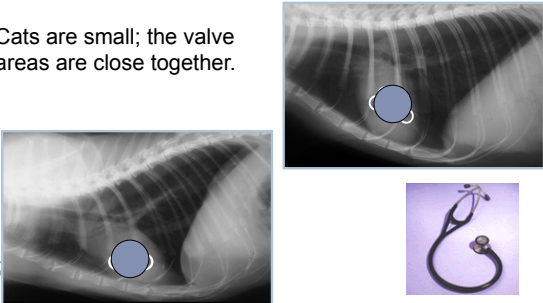


Young cat Old cat

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Why are Cat Heart Sounds So Difficult to Characterize?

Cats are small; the valve areas are close together.

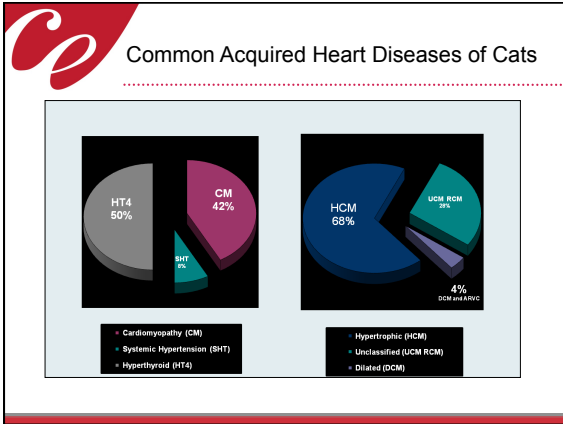


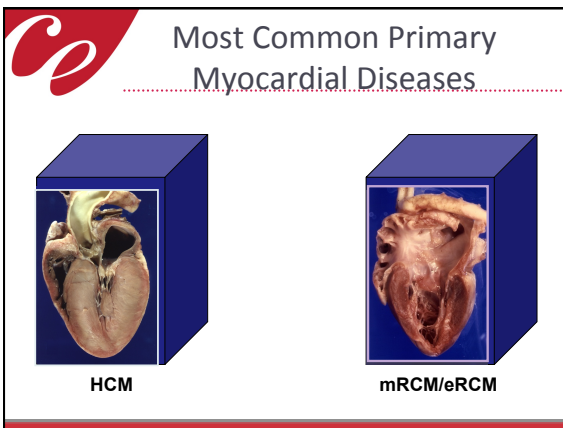
Common Acquired Heart Diseases of Cats

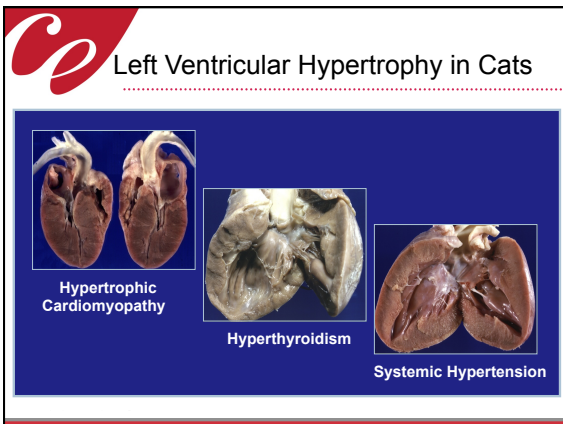
- ♥ **Cardiomyopathy**
 - Hypertrophic (HCM)
 - Restrictive (RCM) or Unclassified (UCM)
 - Less Common
 - Dilated (DCM)
 - Arrhythmogenic Right Ventricular (ARVC)
- ♥ **Systemic Hypertension (SH)**
- ♥ **Hyperthyroidism (HT4)**



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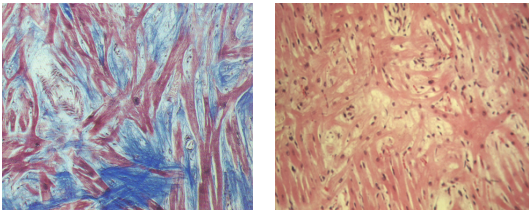






Pathology of HCM

Myocardial Fibrosis Myocardial Fiber Disarray



LV Hypertrophy

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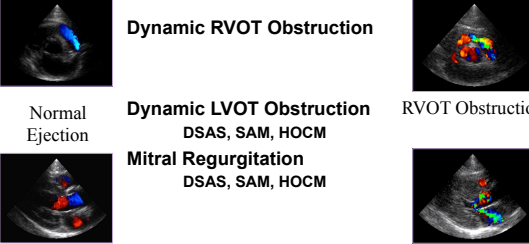
The Three Most Common Heart Murmurs of Adult Cats

Dynamic RVOT Obstruction **RVOT Obstruction**

Normal Ejection **Dynamic LVOT Obstruction** **DSAS, SAM, HOCM**

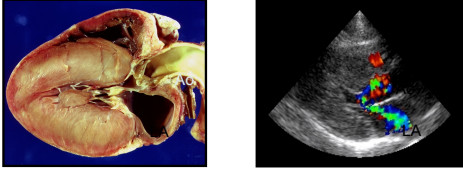
Mitral Regurgitation **DSAS, SAM, HOCM**

LVOT Obstruction



Dynamic LVOT Obstruction

♥ Systolic anterior motion (SAM) of the mitral valve



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Dynamic LVOT Obstruction

Dynamic LVOT obstruction:

- Caused by systolic anterior motion (SAM) of the mitral valve
- Creates a source of pressure overload to the left ventricle
- Pressure overload → concentric hypertrophy in an already hypertrophied HCM heart!

early systole → mid systole → late systole

Systolic Anterior Motion of the Mitral Valve

- Subsequent to concentric LVH.

Results in additional Hypertrophy!!!

Normal
SAM-mid systole
SAM-end systole

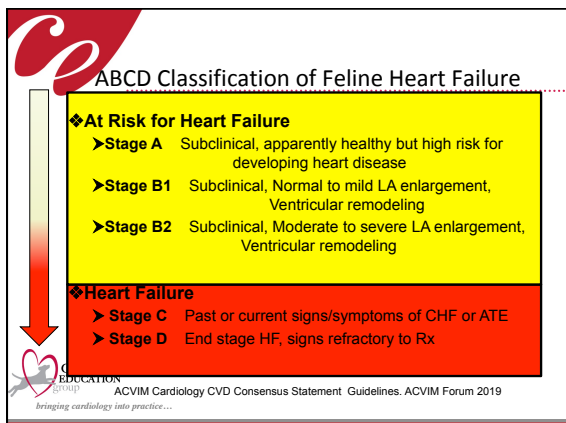
Dynamic RVOT Obstruction

Normal
DRVOT Obstruction

Condition	Percentage
Hyperthyroid	73%
Systemic Hypertension	16%
Idiopathic LVH with DSAS	11%

■ Hyperthyroid
■ Systemic Hypertension
■ Idiopathic LVH with DSAS

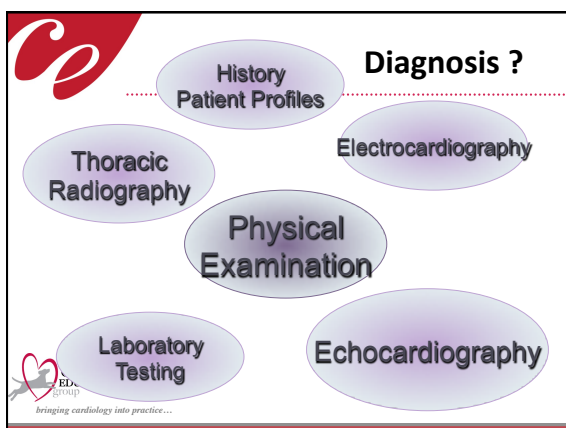
Unlike LV obstruction, RV obstruction is relatively benign and does not appear to cause overload to the heart.



ABCD Classification of Feline Heart Failure

- ◆ **At Risk for Heart Failure**
 - ▶ **Stage A** Subclinical, apparently healthy but high risk for developing heart disease
 - ▶ **Stage B1** Subclinical, Normal to mild LA enlargement, Ventricular remodeling
 - ▶ **Stage B2** Subclinical, Moderate to severe LA enlargement, Ventricular remodeling
- ◆ **Heart Failure**
 - ▶ **Stage C** Past or current signs/symptoms of CHF or ATE
 - ▶ **Stage D** End stage HF, signs refractory to Rx

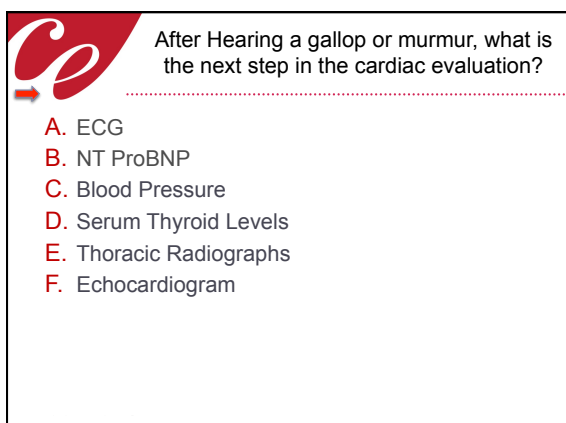
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ACVIM Cardiology CVD Consensus Statement Guidelines. ACVIM Forum 2019
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Diagnosis ?


- History Patient Profiles
- Thoracic Radiography
- Electrocardiography
- Physical Examination
- Laboratory Testing
- Echocardiography

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After Hearing a gallop or murmur, what is the next step in the cardiac evaluation?


- A. ECG
- B. NT ProBNP
- C. Blood Pressure
- D. Serum Thyroid Levels
- E. Thoracic Radiographs
- F. Echocardiogram




Diagnosis of Systemic Hypertension

SAP > 190 mmHg on 3 or more occasions

SAP > 170 mmHg + Ocular lesions
LV hypertrophy
CNS signs



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HCM: Differential Diagnoses

♥ Older Cats with LVH


- Hyperthyroidism
- Systemic hypertension

♥ Younger Cats with LVH/ DSAS

- Mitral valve dysplasia



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Routine Clinical Evaluation

♥ ECG, thoracic radiographs, NT ProBNP

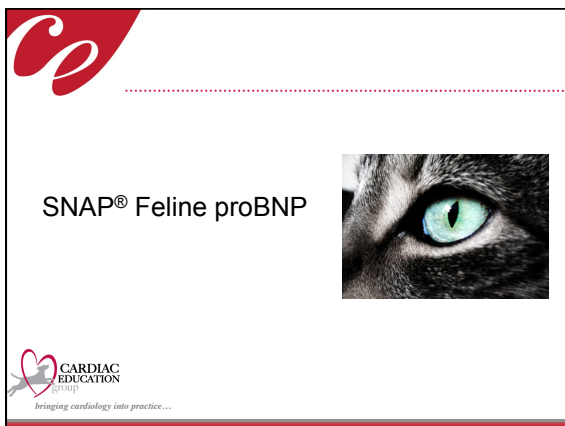
♥ Echocardiography

♥ Systemic blood pressure (Doppler)

♥ T₄, CBC, chemistry, UA

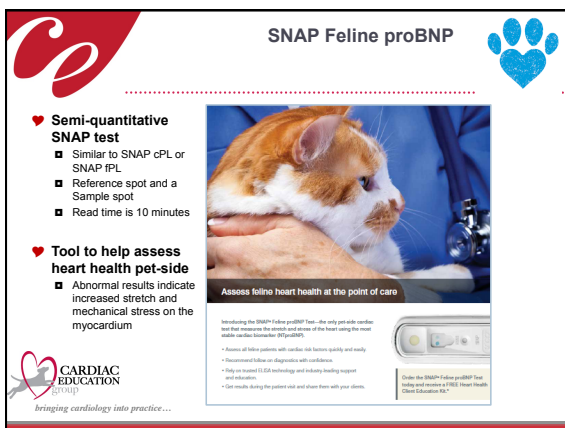


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SNAP® Feline proBNP

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SNAP Feline proBNP

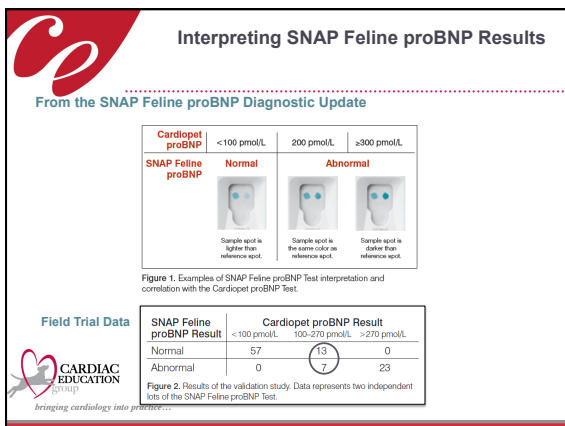
- Semi-quantitative SNAP test**
 - Similar to SNAP cPL or SNAP fPL
 - Reference spot and a Sample spot
 - Read time is 10 minutes
- Tool to help assess heart health pet-side**
 - Abnormal results indicate increased stretch and mechanical stress on the myocardium

Assess feline heart health at the point of care

Introducing the SNAP Feline proBNP Test, the only pet-side cardiac test that measures the stretch and stress of the heart using the most stable and accurate technology (ELISA).

- Assess at home patients with cardiac risk factors quickly and easily
- Documented follow-up diagnostics with confidence
- Only use trusted ELISA technology and industry leading support and resources
- Get results during the patient visit and share them with your clients

Order the SNAP Feline proBNP Test today and receive a FREE Street Health Client Education Kit!



Interpreting SNAP Feline proBNP Results

From the SNAP Feline proBNP Diagnostic Update





Cardiopet proBNP	<100 pmol/L	200 pmol/L	≥300 pmol/L
SNAP Feline proBNP	Normal	Abnormal	
			
	Sample spot is lighter than reference spot.	Sample spot is the same color as reference spot.	Sample spot is darker than reference spot.

Figure 1. Examples of SNAP Feline proBNP Test interpretation and correlation with the Cardiopet proBNP Test.


SNAP Feline proBNP Result	<100 pmol/L	100-270 pmol/L	>270 pmol/L
Normal	57	15	0
Abnormal	0	7	23

Figure 2. Results of the validation study. Data represents two independent lots of the SNAP Feline proBNP Test.



Potential Uses for NT-proBNP in Cats

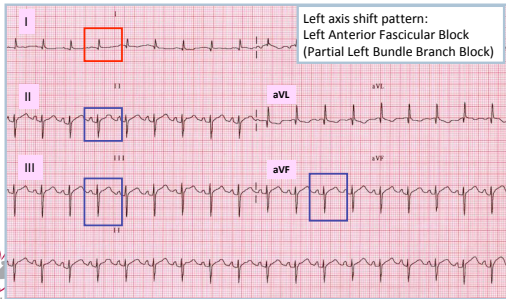
- ♥ Detection of heart disease in an asymptomatic cat
- ♥ Differentiating causes of dyspnea:
 - Cardiac vs. Respiratory
 - Help interpret radiographs
- ♥ The big question is, "Where do we place the cutoff value to avoid false positives and false negatives."



Interpreting NT-proBNP in Cats

♥ Feline NT-proBNP pmol/L


	0 - 50	50 - 100	100 - 200	200 - 500
No Symptoms	Heart Disease Unlikely Recheck in 6-12 months	Heart Disease Possible -Echo Indicated	Heart Disease Probable -Echo Indicated	Heart disease Probable Echo Indicated Chest Radiographs +/-
Cat Dyspneic	Chest Radiographs -Heart Failure Unlikely	Chest Radiographs -Heart Failure Unlikely -Echo +/-	Chest Radiographs -Heart Failure Possible -Echo Indicated	Chest Radiographs -Heart Failure Probable -Echo Indicated

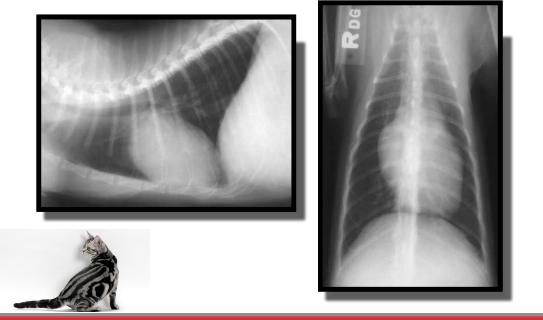



HCM - Electrocardiography

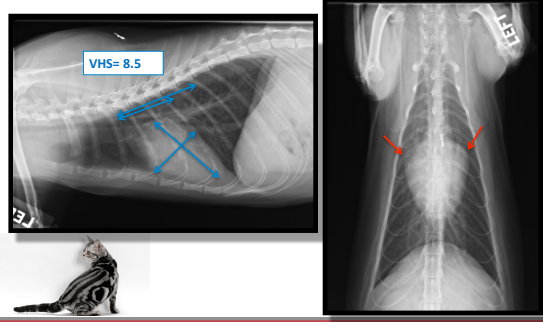
Left axis shift pattern:
Left Anterior Fascicular Block
(Partial Left Bundle Branch Block)


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 Thoracic Radiography in Cats




 Thoracic Radiography in Cats




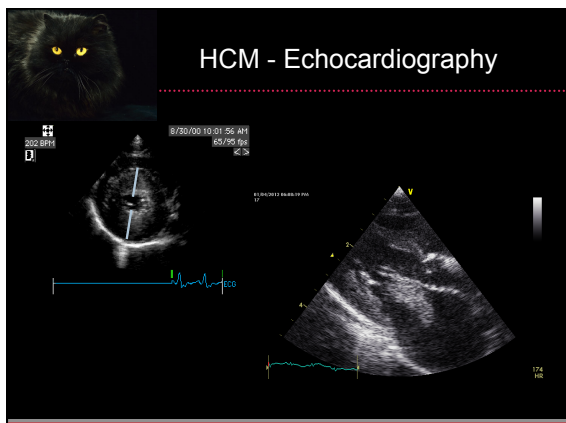
 Vertebral Heart Scale

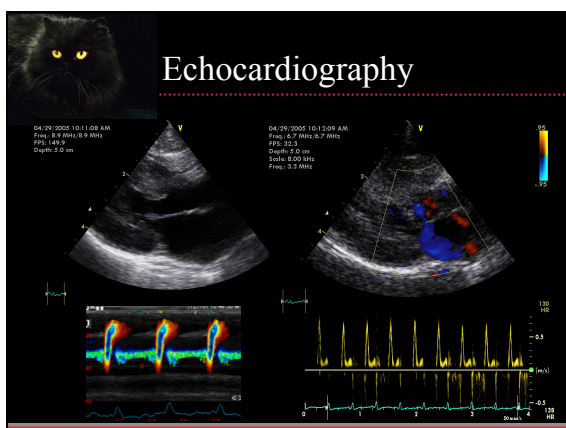
Normal Values
Dogs: 8.5 – 10.5 vertebra
Cats: 6.9 – 8.1 vertebra


Valid over a wide range of breeds, chest conformations,
and ages in both dogs and cats






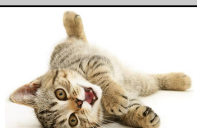







HCM - Echocardiography

- ♥ Concentric LV hypertrophy
 - Asymmetric septal hypertrophy
 - Regional hypertrophy
- ♥ Dilated LA as disease worsens
- ♥ Small LV chamber
- ♥ Intracardiac thrombi (usually in the left atrium)





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Case 1: Henry

- ♥ 9-yr old, 10lb, MN Persian presents to your hospital with a complaint of acute onset, short, rapid breathing.
- ♥ Current medications: monthly heartworm preventative
- ♥ No murmur
- ♥ Mild crackle in the right cranial lung field
- ♥ Normal femoral pulses



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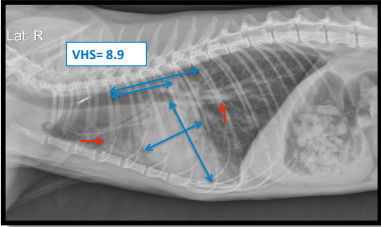
Henry's Radiographs

Lat: R


VHS= 8.9

Evaluate:

1. Heart size
2. Heart shape
3. Lung fields
4. Pulmonary vessels




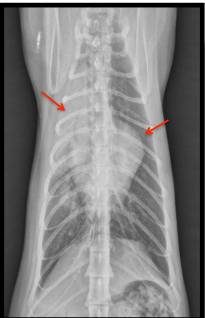
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Henry's Radiographs

Evaluate:

1. Heart size
2. Heart shape
3. Lung fields
4. Pulmonary vessels




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Henry: Radiographs

♥ Radiographic diagnosis:


- Moderate enlargement of the left atrium suspected.
- Distended and indistinct pulmonary veins/vasculature.
- There is an alveolar pattern in the right cranial lung field.
- Rule outs include pneumonia or congestive heart failure.






Additional Diagnostics?

How do I decide?
What else can I do?

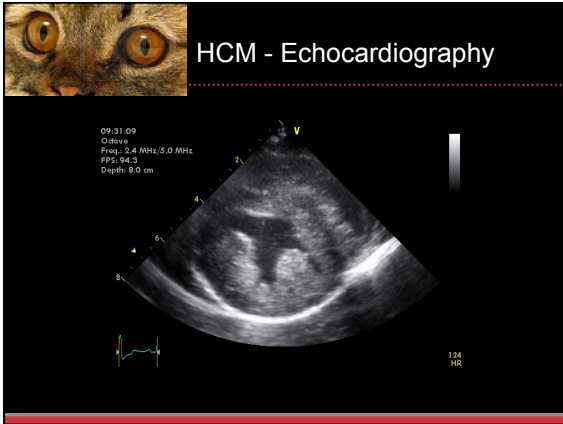


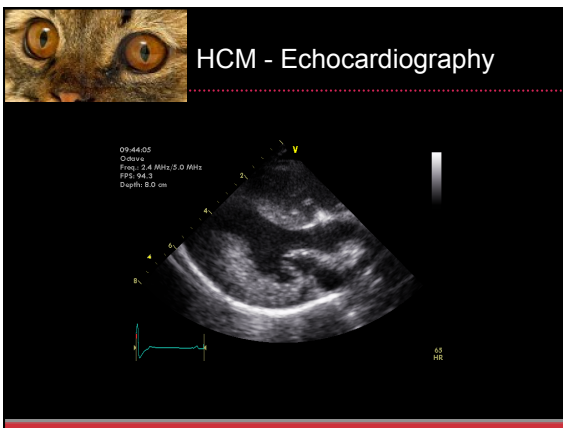


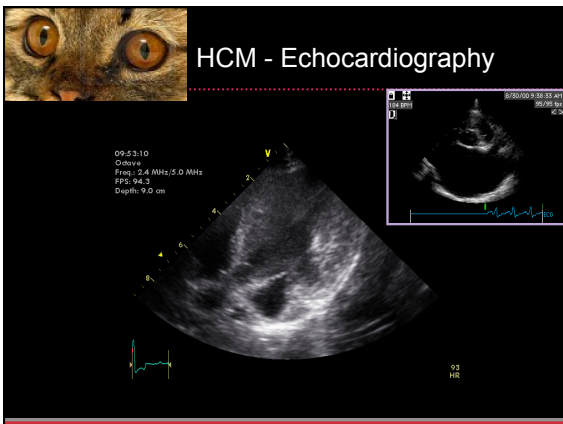
Perform an NT-proBNP?

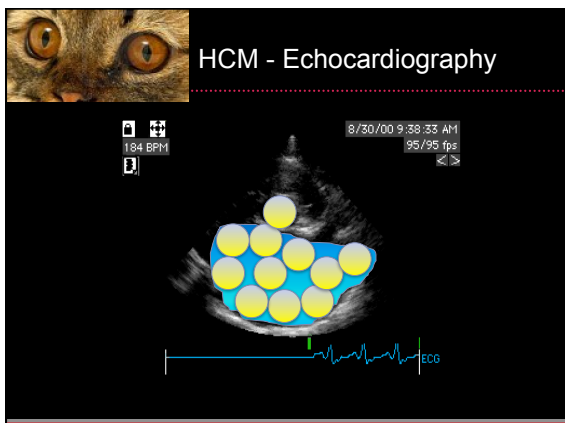
♥ 260 pmol/L (Positive on the SNAP)


	50	100	200	
No Symptoms	Heart Disease Unlikely -Recheck in 6-12 months	Heart Disease Possible -Echo Indicated	Heart Disease Probable -Echo Indicated	Heart disease Probable -Echo Indicated -Chest Radiographs +/-
Cat Dyspneic	Chest Radiographs Unlikely -Heart Failure	Chest Radiographs Unlikely -Heart Failure -Echo +/-	Chest Radiographs Possible -Heart Failure -Echo Indicated	Chest Radiographs -Heart Failure Probable -Echo Indicated












Henry's Diagnosis!

Hypertrophic Cardiomyopathy
Congestive Heart Failure
No Outflow Obstruction

Recommended Medications:

- L**asix (~2mg/kg/day)
- ACE **I**nhibitor (Benazepril 0.5mg/kg BID)

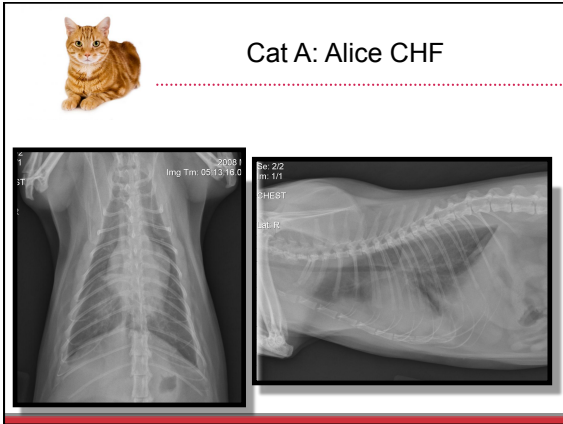
Secondary Treatments: Consider Aspirin or Plavix to prevent thrombosis formation, For refractory pulmonary edema or pleural effusion: **S**pironolactone 2mg/kg q 24hrs or possibly **V**etmedin (Pimobendan 0.25mg/kg BID)

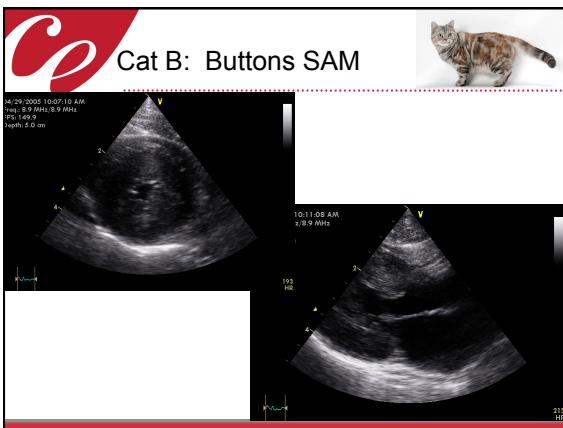


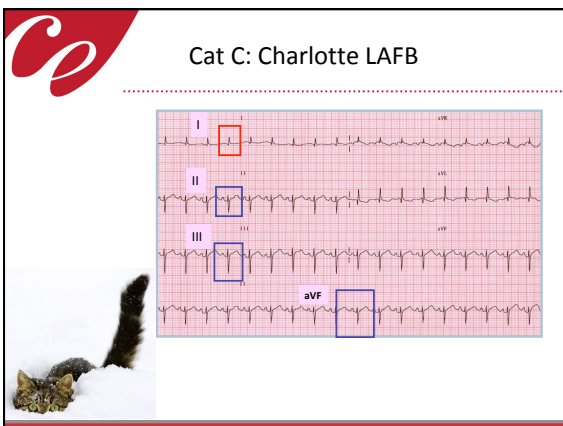
Who Needs Atenolol Therapy?



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 **Who Needs Atenolol Therapy?**

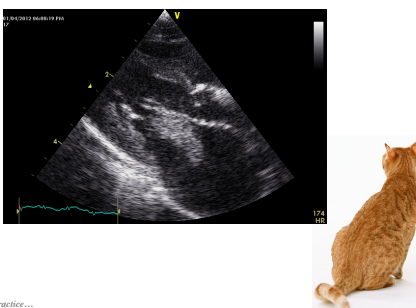
→ A. Alice


B. Buttons: Atenolol can reduce the SAM induced LVOT Obstruction and reduce the left ventricular hypertrophy secondary to the obstruction.

C. Charlotte



 **Questions?**



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