Acute and Chronic Management of Congestive Heart Failure in Dogs

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Lecture Objectives

- Review 4 cardiac cases
- Focus on relevant diagnostic tests
- Review ACVIM consensus statement for Chronic Valvular Disease (CVD)
- Discuss in-hospital and at home treatment of congestive heat failure
- Discuss the prognosis for dogs with CVD

Applejack: 11 yr, MN, Miniature Schnauzer



- Chief complaint
 - + Gagging, coughing, and breathing hard
 - Started a few days ago
 - $\boldsymbol{\cdot}$ Progressive and now frequent throughout day and night
 - Seems uncomfortable and is not sleeping well (restless)
- Relevant History
- Vaccines are current
- * Receiving heartworm preventative regularly



- Physical Examination
- Weight 10 kg, BCS 5/9
- Temperature: normal
- * Pulses: 154/min, regular with normal amplitude
- Respiratory Rate: 62/min
- * MM: pale pink, CRT = 2 sec
- Auscultation
 - Heart: rate 154 bpm, grade 4/6 left apical systolic murmur, which radiates well everywhere
 - Lungs: mildly increased bronchovesciular sounds over all lung fields

Applejack: 11 yr, MN, Miniature Schnauzer



Based on the available information, what is Applejack's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- 4. Stage C
- 5. Stage D
- 6. There is not enough information at this time

Classification of Heart Failure



- Stage A: apparently healthy but high risk for developing CVD
 Stage B1: asymptomatic disease with none to minimal remodeling
- secondary to CVD
 Stage B2: asymptomatic disease with significant remodeling secondary to CVD
- Heart Failure
- Stage C: past or current signs or symptoms of heart failure due to CVD
- Stage D: end stage heart failure with signs that are refractory to standard therapy



Based on the available information, what is Applejack's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1 Asymptomatic
- 3. Stage B2
- Stage C
 Stage D
- 6. There is not enough information at this time





Based on the available information, what is Applejack's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- Stage C
 Stage D
 No history of medication
- There is not enough information at this time

Applejack: 11 yr, MN, Miniature Schnauzer



Based on the available information, what is Applejack's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- 4. Stage C
- 5. Stage D
- 6. There is not enough information at this time



What is the best initial test to evaluate Applejack?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF



Applejack: 11 yr, MN, Miniature Schnauzer



What is the best initial test to evaluate Applejack?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF





Do you think Applejack has congestive heart failure?

- 1. Yes
- 2. No
- 3. Unsure, need more information











Vertebral Heart Size



Breed Specific Ranges • N = 320 dogs, right lateral

• 6 breeds (boxers, labs, GSD, Dobes, CKCS, Yorkies)

- Each with 20 normal and 19 with heart or lung disease
 Key findings Boxers, Labs, and CKCS have larger VHS
- Key findings Boxers, Labs, and CKCS have larger VH
 Use 11.5 for boxers and 11.0 for CKCS and Labs
- Females < Males













- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- 4. Stage C
- 5. Stage D





Based on the available information, what is Applejack's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- 4. Stage C
- 5. Stage D





What additional diagnostic tests would you recommend for Applejack? (pick as many as you would like)

- 1. ECG
- 2. Holter (24 hour ECG)
- 3. Echocardiography
- 4. NT-proBNP
- Chemistry Panel & CBC 5.
- 6. UA
- 7. Blood Pressure
- 8. Referral
- 9. Start treatment for CHF





What additional diagnostic tests would you

recommend for Applejack? (pick as many as you would like) 1. ECG

- 2. Holter (24 hour ECG)
- 3. Echocardiography
- 4. NT-proBNP 5. Chemistry Panel & CBC
- 6. UA
- 7. Blood Pressure
- Referral stabilize first if necessary 8.
- Start treatment for CHF 9.





Which medications would you initiate in Applejack today e.g. initial onset of CHF due to CVD? (pick all that apply)

- 1. Pimobendan
- 2. Furosemide
- 3. Amiodarone
- 4. Enalapril
- 5. Spironolactone
- 6. Beta Blocker (e.g. carvedilol)
- 7. Digoxin
- 8. Other cardiac medication





Which medications would you initiate in Applejack today e.g. initial onset of CHF due to CVD? (pick all that apply)

- 1. Pimobendan
- 2. Furosemide
- 3. Amiodarone
- 4. Enalapril
- 5. Spironolactone
- 6. Beta Blocker (e.g. carvedilol)
- 7. Digoxin
- 8. Other cardiac medication



Applejack: 11 yr, MN, Miniature Schnauzer



- Initial treatment plan (10kg, 22 lbs)
 - * Consider oxygen supplementation and sedation with butorphanol
 - * Parenteral furosemide
 - \cdot 2-3 mg/kg initial IV dose, then
 - 1-2 mg/kg q 1-2 hours until RR is reduced by 50% or
 - + 0.66 mg/kg/hr CRI until RR is reduced by 50% then taper
 - * Oral Pimobendan
 - 5 mg tablet: 1/2 tablet BID (start immediately) [0.25 mg/kg]



- Discharge plan (10 kg, 22 lbs) • Medications
 - Furosemide 20 mg tablet: 1 tab BID (2 mg/kg BID)
 - Pimobendan 5 mg tablet: 1/2 tab BID (0.25 mg/kg BID)
 - Benazepril 5 mg tablet: 1/2 tab BID (0.25 mg/kg BID)
 - Spironolactone 25 mg tablet: 1/2 tab BID (1.25 mg/kg BID)
- * Additional Recommendations
- Exercise restriction
- Diet modification
- Supplements
 Posting home recting room
- Resting home resting respiratory rate
 Follow-up
- FOIIOW-UP
 Initial: 10-14 days
- Initial: 10-1





- Resting Home Respiratory Rate
 - Taken when sleeping or resting quietly over 60 seconds
 > 35/min abnormal
 - Lower values may be abnormal in some dogs when compared with baseline
 Acuity of change as well as degree of change significant (> 20% increase from baseline)
 - Stage B2
 - Daily for first week
 - Then once per week
 - Stage C or D
 - Daily







When would you tell Applejack to return for reevaluation?

- 1. q 3-4 months
- 2. q 6 months
- 3. q 10-14 days
- 4. q1 year
- 5. Only if he develops recurrent signs of CHF





When would you tell Applejack to return for reevaluation?

q 3-4 months 1.

- 2. q 6 months
- 3. q 10-14 days
- q 1 year 4.
- 5. Only if he develops recurrent signs of CHF



Acute Management



- Furosemide • Lasix CRI
 - Loading dose 1 mg/kg IV bolus
 - 0.66 mg/kg/hr
 - * Comparative Study
 - Intermittent bolus (IB) 3 mg/kg IV at 0 and 4 hours
 - CRI 0.66 mg/kg/hr over 8 hours
 - CRI resulted in more diuresis, naturesis, and kaliuresis in normal Greyhounds
 - * Clinical observation
 - More rapid improvement in respiratory rate and shorter average hospital stay Adin DB et al. IB vs CRI furosemide in normal greyhounds J Vet Intern Med. 2003;17(5):633

Acute Management



- Pimobendan
- Calcium sensitizer
 Positive inotrope
- * Phosphydiesterase III inhibitor
 - Peripheral vasodilation, mild pulmonary arterial vasodilation
- * Route of Administration
- Oral
- Dosage
 - • Canine: 0.25-0.35 mg/kg q 8-12 hours
 - Feline: 0.05-0.2 mg/kg q 12 hours





Neurohormonal Compensatory Mechanisms



- Pros
 - * Maintain $BP = CO \times SVR (CO = SV \times HR)$
- Cons
- * Clinical signs on congestion
- Long term injuriesShorten life



Chronic Management



ACE Inhibitors

- Benazepril vs. Enalapril: considered equivalent at RAAS blockade
 Benazepril has greater billiary clearance and the ability for once a day dosing
- Both increase survival and improve clinical signs of heart failure: • LIVE, COVE, IMPROVE, and BENCH studies
- Spironolactone
- + Competitively binds to aldosterone receptors
- Weak diuretic
- * Decrease myocardial fibrosis associated with aldosterone signaling
- RALES Study. Aldosterone Escape, Sequential Nephron Blockade, Mitigate Distal Nephron Hypertrophy





enazep BENCH N = 162 Mediar CHF) v	oril 4 Study 2 (MR a 1 surviv vas 2.7	and DCM) and time (c times lon) leath or ger	worsen	ing		10.15
Table 3 - Sur	vival analyses	of dogs reaching th	e "worsening en	dpoint" (deterio	pration in class o	f heart failu	re or death
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Sprionolactone

* RALES Study (human) Decreased mortality by 40%



- \cdot Decreased frequency of hospitalization by 35%
- * Veterinary Studies
 - Bernay et al. Efficacy of spironolactone on survival in dogs with naturally occurring mitral regurgitation caused by myxomatous mitral valve disease. J Vet Intern Med. 2010;24(2):331-41
 - Decreased risk of reaching the endpoint (death, euthanasia, severe
 - Study flaws: patient categorization, definition of CHF, discrepancy of MR severity within groups, and relatively high withdrawal rates
 - deMadron et al. Survival and echocardiographs data in dogs with CHF
 - caused by mitral valve disease treated by multiple drugs. Can Vet J. 2011;52(11):1219-25

 - Longer survival for dogs receiving a combination of furosemide, ACEi, pimobendan, spironolactone, and amlodipine
 Retrospective study, no placebo, no standardization





Prognosis



- Median time alive with CHF
- * 9 months (~ 267 days)
- $_{*}$ In QUEST $\sim45\%$ of dogs were still living at one year
- * All causes of mortality or treatment failure
- Factors affecting progression of CVD
 - * Multiple factors based on multivariate analysis
 - Presence of arrhythmias (Atrial Fibrillation)
 - * Presence of pulmonary hypertension

Haggstrom et al. JVIM 2008;22:1124-35







- Chief complaint
 - * Apparently Healthy
 Presenting for cardiac evaluation of a murmur
- Relevant History
 - * Diagnosed Stage B1 CVD 4 years prior
 - * Receiving heartworm preventative regularly
 - * Current on all vaccines



- Physical Examination
 - * Weight 11 kg, BCS 5/9
 - * Temperature: 101.3
 - * Pulses: 120/min, regular with normal amplitude and a regularly irregular rhythm
 - * Respiratory Rate: panting
 - MM: pale pink, CRT = 1.5 sec
 - Auscultation
 - Heart: grade 5/6 left apical systolic murmur, which radiates to the right
 - $\boldsymbol{\cdot}$ Lungs: normal lung sounds





• At Risk for Heart Failure

- + Stage A: apparently healthy but high risk for developing CVD
- * Stage B1: asymptomatic disease with none to minimal
- remodeling secondary to CVD
- * Stage B2: asymptomatic disease with significant remodeling secondary to CVD

Heart Failure

- * Stage C: past or current signs or symptoms of heart failure due to CVD
- * Stage D: end stage heart failure with signs that are refractory to standard therapy

ACVIM Cardiology CVD Consensus Statement. J Vet Intern Med. 2009;23:1143

Wake: 14 yr, MN, Beagle

What is the best initial test to evaluate Wake?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF



Wake: 14 yr, MN, Beagle



What is the best initial test to evaluate Wake?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF







In addition to thoracic radiographs what tests should be recommended for a dog with Stage $B2 \; CVD?$ (pick all that apply)

- 1. Blood pressure
- 2. Echocardiogram
- 3. ECG
- Chemistry panel, CBC, UA 4.
- 5. NT-proBNP
- 6. **Referral consultation**
- 7. All of the above

Wake: 14 yr, MN, Beagle In addition to thoracic radiographs what tests should be recommended for a dog with Stage $B2 \; CVD?$ (pick all that apply) 1. Blood pressure 2. Echocardiogram - if newly diagnosed 3. ECG 4. Chemistry panel, CBC, UA NT-proBNP 5. 6. Referral consultation - as needed 7. All of the above





What is the recommended plan for Wake as a normotensive Stage B2 CVD? (pick all that apply)

- 1. Follow up only: no medication
- 2. Blood work and start Pimobendan
- 3. Blood work and start ACEi
- 4. Blood work and start beta blocker
- 5. Blood work and start Spironolactone
- $6. \quad Diet \ modification: severe \ Na^{\scriptscriptstyle +} \ restriction \\$
- 7. Exercise restriction
- 8. Home resting respiratory rate

Wake: 14 yr, MN, Beagle

* Chronic Valvular Disease

• Plan

- (Stage B2, normotensive) • Client education (home resting respiratory rate)
- Medications
 - Currently no medications have been shown to delay the onset of congestive heart failure
 - \cdot Dietary changes (early cardiac / EC Waltham diet)
- * Follow-up
 - + 6-8 months or sooner if signs of heart failure develop

Diet

- If no alternative dietary needs (atopy, etc.)
- Moderately reduced sodium diet
 Too severe will + RAAS
 - For severe will + RAAS
 Envised with ontionidant
- Enriched with antioxidants, n-3 fatty acids, taurine, carnitine, and arginine * Freeman et al. Effects of dietary modification



JVIM 2006;20(5):1116-26 • Randomized to early cardiac diet or placebo Descensed LA and LVIDd in desc fed diet

in dogs with early chronic valvular disease.

- * Decreased LA and LVIDd in dogs fed diet (run-in with low Na+ diet)
- Increased circulating n-3 fatty acid levels



Clinical Studies for CVD Stage B2



- Enalapril
 - \bigstar SVEP no delay in the onset of congestive heart failure
 - $\star \ VetProof \text{-} \ may \ delay \ CHF \ but \ not \ statistically \ significant$
- Beta Blockers
- + Hector no delay in the onset of congestive heart failure
- * Gordon et al improved LV function but did not delay onset of CHF
- Pimobendan
 - ✤ EPIC just finished enrolling, ongoing study













Clinical Studies for CVD Stage B2



 Median time to the onset of CHF QUEST 27 months (~ 825 days), VetProof 895 days 25% of dogs will progress more quickly and 25% more slowly

80% of dogs progress to Stage C (20% remain in Stage B2)

 Factors affecting progression of CVD Multiple factors based on univariate analysis One factor holds up under multivariate analysis (LA:Ao) Some overlap with prognosis for CHF











Chief complaint

Apparently Healthy
Annual evaluation

Relevant History

- * Vaccines are current
- * Receiving heartworm preventative regularly

Fluffy: 8 yr, FS, Toy Poodle



Physical Examination

- * Weight 8 kg, BCS 7/9
- Temperature: 100.3
 Dulace: 00 (min_negulary)
- Pulses: 90/min, regular with normal amplitude and a regularly irregular rhythm
- Respiratory Rate: 16/bpm
- * MM: pale pink, CRT = 1.5 sec
- * Severe dental tartar, calculus, and gingivitis
- * Auscultation
 - \cdot Heart: grade 4/6 left apical systolic murmur
- Lungs: normal lung sounds



Based on the available information, what is Fluffy's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- 4. Stage C
- 5. Stage D
- 6. There is not enough information at this time

Fluffy: 8 yr, FS, Toy Poodle



- At Risk for Heart Failure
- * Stage A: apparently healthy but high risk for developing CVD
- * Stage B1: asymptomatic disease with none to minimal
- remodeling secondary to CVD
- * Stage B2: asymptomatic disease with significant remodeling secondary to CVD

Heart Failure

- * Stage C: past or current signs or symptoms of heart failure due to CVD
- Stage D: end stage heart failure with signs that are refractory to standard therapy Cardiology CVD Consensus Statement. J Vet Intern Med. 2009;23:1143

Fluffy: 8 yr, FS, Toy Poodle



What is the recommended initial test(s) for Stage B CVD?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF



What is the recommended initial test(s) for Stage B CVD?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF



Fluffy: 8 yr, FS, Toy Poodle



In addition to thoracic radiographs what tests should be recommended for a dog with Stage B1 CVD? (pick all that apply)

- 1. Blood pressure
- 2. Echocardiogram
- 3. ECG
- 4. Chemistry panel, CBC, UA
- 5. NT-proBNP
- 6. Referral consultation
- 7. All of the above



In addition to thoracic radiographs what tests should be recommended for a dog with Stage B1 CVD? (pick all that apply)

1. Blood pressure

- 2. Echocardiogram
- 3. ECG
- 4. Chemistry panel, CBC, UA
- 5. NT-proBNP
- 6. Referral consultation
- 7. All of the above

Fluffy: 8 yr, FS, Toy Poodle

What is the recommended plan for Fluffy as a normotensive Stage B1 CVD?

- 1. Follow up only: no medication
- 2. Blood work and start Pimobendan
- 3. Blood work and start ACEi
- 4. Blood work and start beta blocker
- 5. Blood work and start Spironolactone
- $6. \quad Diet \ modification: \ severe \ Na^{\scriptscriptstyle +} \ restriction$
- 7. Exercise restriction
- 8. Home resting respiratory rate

Fluffy: 8 yr, FS, Toy Poodle



- Plan
- Chronic Valvular Disease (Stage B1, normotensive)
 Client education (home resting respiratory rate)
- Medications
- No medications are recommended
- * Obesity
- · Additional work-up may be indicated
- Periodontal disease
 - $\boldsymbol{\cdot}$ Dental prophylaxis
- Follow-up
- 12 months or sooner if signs of heart failure develop

Toby: 10 yr, MN, Mixed Breed

Chief complaint

- Difficulty breathing, coughing
- Decreased appetite
- Abdominal swelling
- Relevant history
- * History of CHF (CVD Stage C) and pulmonary hypertension diagnosed 12 months prior
- Current medications:
 - 1. Furosemide: 3 mg/kg PO q 8 hours
 - 2. Benazepril: 0.5 mg/kg PO q 12 hours
 - 3. Pimobendan: 0.3 mg/kg PO q 8 hours
 - 4. Spironolactone: 1.25 mg/kg PO q 12 hours
 - 5. Sildenafil: 3 mg/kg PO q 12 hours
 - 6. Hydrochlorothiazide: 0.36 mg/kg PO q 12 hours

Toby: 10 yr, MN, Mixed Breed

- Physical Examination
- * Weight 15 kg, BCS 3/9
- * Temperature: 100.3
- * Pulses: 190/min, irregular with decreased amplitude and deficits
- * Respiratory Rate: 80/bpm
- * MM: pale pink, CRT = 2 sec
- Severe muscle atrophy
- * Palpable fluid wave in abdomen and jugular pulses
- * Auscultation
 - Heart: grade 5/6 left apical systolic murmur with a thrill
 Lungs: increased bronchovesicular lung sounds

Toby: 10 yr, MN, Mixed Breed

Based on the available information, what is Toby's ACVIM heart failure stage?

- 1. Stage A
- 2. Stage B1
- 3. Stage B2
- 4. Stage C
- 5. Stage D
- 6. There is not enough information at this time

Toby: 10 yr, MN, Mixed Breed

• At Risk for Heart Failure

- \ast Stage A: apparently healthy but high risk for developing CVD
- * Stage B1: asymptomatic disease with none to minimal remodeling secondary to CVD
- * Stage B2: asymptomatic disease with significant remodeling secondary to CVD

Heart Failure

 Stage C: past or current signs or symptoms of heart failure due to CVD

 Stage D: end stage heart failure with signs that are refractory to standard therapy

Cardiology CVD Consensus Statement. J Vet Intern Med. 2009;23:1143

Toby: 10 yr, MN, Mixed Breed

What is the recommended initial test(s) for Stage C/D CVD?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF

Toby: 10 yr, MN, Mixed Breed

What is the recommended initial test(s) for Stage C/D CVD?

- 1. ECG
- 2. Echocardiography
- 3. Thoracic Radiographs
- 4. NT-proBNP
- 5. Chemistry Panel
- 6. Blood Pressure
- 7. Just start treatment for CHF







Abdominal Untrasound

Toby: 10 yr, MN, Mixed Breed

• Heart Failure

- * Stage D: end stage heart failure with signs that are refractory to standard therapy
 - Current medication:
 - 1. Furosemide: 3 mg/kg PO q 8 hours
 - 2. Benazepril: 0.5 mg/kg PO q 12 hours
 - 3. Pimobendan: 0.3 mg/kg PO q 8 hours
 - 4. Spironolactone: 1.25 mg/kg PO q 12 hours
 - 5. Sildenafil: 3 mg/kg PO q 12 hours
 - 6. Hydrochlorothiazide: 0.36 mg/kg PO q 12 hours

Toby: 10 yr, MN, Mixed Breed

In addition to thoracic radiographs what tests should be recommended for a dog with Stage D CVD? (pick all that apply)

- 1. Blood pressure
- 2. Echocardiogram
- 3. ECG
- 4. Chemistry panel, CBC, UA
- 5. Referral consultation
- 6. All of the above

Toby: 10 yr, MN, Mixed Breed

In addition to thoracic radiographs what tests should be recommended for a dog with Stage D CVD? (pick all that apply)

- 1. Blood pressure
- 2. Echocardiogram
- 3. ECG
- 4. Chemistry panel, CBC, UA
- 5. Referral consultation
- 6. All of the above

Toby: 10 yr, MN, Mixed Breed

- Additional diagnostic
 - * Blood pressure
 - 110 mmHg systolic
 - ✤ ECG
 - Sinus tachycardia with frequent single atrial premature complexes
 - Echocardiogram
 - Severe pulmonary hypertension, scant pericardial effusion
 Chemistry and CBC
 - Creatinine increased 0.2 units about normal
 - BUN 1.5 times normal

Toby: 10 yr, MN, Mixed Breed

If stabilization is possible, what options do you have for medically managing Toby's Stage D heart failure?

- 1. Increase Pimobendan
- 2. Increase Furosemide
- 3. Increase Spironolactone
- 4. Increase Benazepril
- 5. Increase Hydrochlorothiazide
- 6. Increase Sildenafil
- 7. Initiate Diltiazem
- 8. Initiate Beta Blocker (e.g. carvedilol)
- 9. Initiate Digoxin
- 10. Initiate Torsemide

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- 1. Increase Pimobendan
- 2. Increase Furosemide
- 3. Increase Spironolactone
- 4. Increase Benazepril
- 5. Increase Hydrochlorothiazide
- 6. Increase Sildenafil 3 mg/kg PO TID
- 7. Initiate Diltiazem
- 8. Initiate Beta Blocker (e.g. carvedilol)
- 9. Initiate Digoxin
- 10. Initiate Torsemide



Pulmonary Hypertension

- Sildenafil (Viagra)
- Direct vasodilatorPhosphodiesterase 5 inhibitor
- Prevents breakdown of cGMP
- * Dosage 1-3 mg/kg PO BID-TID
- * Brown et al. Clinical efficacy of sildenafil in treatment of pulmonary artery hypertension in dogs. JVIM 2010;24(4):850-5
- Decreases systolic PA pressure and is associated with increased exercise capacity and quality of life when compared with placebo
- L arginine 250-500 mg PO TID
- + Nitric oxide precursor

Stage D Management

- Torsemide
- * Loop diuretic with Cl channel blocking properties and intrinsic aldosterone antagonism
- * Duration of action approximately twice as long as furosemide
- * Increased oral bioavailability compared to furosemide
- * More potent diuretic compared to furosemide
- Dosage
 - Discontinue furosemide and replace with torsemide at 1/10 the daily of the previous furosemide
 - Example: Toby was receiving 30 mg PO q 8 hours (90 mg/day), torsemide would be started at 5 mg PO q 12 hours (10 mg/day)

Stage D Management

Torsemide

- Clinical Studies
 - 3 cases (Stage D)
- Apparent resolution of CHF for long periods of time
- Side effects: severe azotemia
- Clinical observation
- · A viable option for rescuing Stage D patients

Oyama M et al. Use of torsemide in three dogs with advanced heart failure. J Vet Card 2011;17:287 Peddle G et al. Effect of torsemide and fursosemide on clinical, laboratory, radiographic, and quality of life variables in dogs with heart failure. J Vet Card 2012;14:253

Questions?

