Several large scale studies of anesthetic related morbidity and mortality in small animal patients have revealed a mortality rate between 1 and 4 deaths per 1,000 anesthetic events.\(^1\) This rate is relatively low, but still much higher than reported human anesthetic related mortality rates. Furthermore, these studies only evaluated immediate peri-anesthetic events or outcomes, censoring many episodes of congestive heart failure that can develop after out-patient anesthesia.

Continued on page 2
It is paramount that we identify risk factors for adverse anesthetic events and individualize our anesthetic approach in order to optimize outcomes, and assessment of the cardiovascular system on physical exam alone has significant limitations. The American Society of Anesthesiologists (ASA) physical status assessment helps stratify patients in regarding their risk of peri-anesthetic complications and studies have shown a rapid escalation in mortality with increasing ASA status.1-3,5

<table>
<thead>
<tr>
<th></th>
<th>ASA Physical Status Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal patient with no organic disease</td>
</tr>
<tr>
<td>2</td>
<td>Patient with mild systemic disease</td>
</tr>
<tr>
<td>3</td>
<td>Patient with severe systemic disease limiting activity but not incapacitating</td>
</tr>
<tr>
<td>4</td>
<td>Patient with incapacitating systemic disease that is a constant threat to life</td>
</tr>
<tr>
<td>5</td>
<td>Moribund patient not expected to live 24 hours with or without surgery</td>
</tr>
</tbody>
</table>

A thorough history and careful physical examination are integral components to the pre-anesthetic evaluation. Clinical suspicion of systemic disease often comes from these inexpensive diagnostics and can lead to a logical plan for further workup. Most systemic diseases are readily apparent through routine blood work,9 however the identification of occult cardiovascular disease is frequently dependent on our physical exam skills. The detection of a murmur, arrhythmia, or extra heart sound requires further evaluation of the pre-anesthetic patient prior to reaching for the laryngoscope.

**Diagnoses for the Canine Cardiac Patient**

**Thoracic radiology:**
Thoracic radiographs assess cardiac silhouette size and vascular pattern and provide information regarding the hemodynamic significance of a murmur7. Radiographic interpretation of the cardiac silhouette is a subjective assessment that is influenced by patient position, radiographic technique, phase of respiration, and chest conformation. Utilization of the vertebral heart scale adds an objective measurement to aid in our assessment8 and is also affected by patient positioning and breed.9,10.

**Electrocardiogram:**
An electrocardiogram is indicated for any patient with an auscultable arrhythmia and will determine the cause and clinical relevance of the detected arrhythmia and may identify conduction abnormalities which should prompt further evaluation.
Bloodwork/NT-proBNP:

NT-proBNP is a biomarker of ventricular wall stress that has become available as a simple blood test to aid in the assessment of cardiac disease in the dog. This test is most useful to delineate between cardiac and respiratory causes of canine dyspnea. Its clinical utility in the staging of patients with valvular disease has some limitations due to day-to-day individual variability and overlap between groups of patients with or without heart enlargement, but in the small breed dog with a systolic heart murmur, a normal NT-proBNP can provide greater confidence that clinically relevant heart disease is not present, and an elevated NT-proBNP should prompt referral for further evaluation to avoid anesthetic related complications.

In large breed dogs, particularly breeds at risk for the development of dilated cardiomyopathy, NT-proBNP may prove to be a useful screening tool in the detection of occult disease. These patients frequently have more subtle abnormalities on physical exam, resulting in decreased detection and frequent underestimation of the severity of occult cardiac disease. Thus, based on signalment and physical exam findings an NT-proBNP assay may be a useful in-house diagnostic to help determine if further assessment is indicated prior to anesthesia.

Echocardiogram:

The gold standard for assessing structural cardiac disease in the canine patient is an echocardiogram performed by a board certified cardiologist such as those of CVCA. In trained hands it is a highly sensitive and specific test that provides precise assessment of the patient's cardiac dimensions, myocardial function, and hemodynamic status; including estimated pulmonary arterial and left atrial pressures which may significantly influence anesthetic recommendations and outcomes.

In patients with physical findings concerning for heart disease, cardiac evaluation prior to anesthesia is crucial. This consultation provides the owner and the veterinarian with a specific diagnosis and the ability to tailor the anesthetic protocol, fluid recommendations, and therapeutic intervention to optimize the patient's short and long term outcomes. In short it allows us to know what we are dealing with "and knowing is half the battle."

References for this newsletter available on our website www.cvcavets.com.

Works Cited Section for “Pre-Anesthetic Evaluation of the Canine Patient”

8. Buchanan JW, Bucheler J. Vertebral scale system to measure canine heart size in radiographs. JAVMA 1975;206:194

Continued on page 4
Meet Dr. Emily Olson-Westphal, CVCA's newest cardiologist!

Welcome Dr. Emily Olson-Westphal to our Richmond Location!

Emily attended Texas Christian University in Fort Worth, TX, prior to being accepted to veterinary school at Kansas State University in Manhattan, KS. After receiving her Doctorate in Veterinary Medicine, she completed a rotating small animal internship at North Carolina State University. She returned to Kansas State for a cardiology residency program and received her board certification in cardiology in 2011.

Dr. Olson-Westphal has over 5 years of experience in private practice referral medicine. She has a strong interest in acute and chronic management of heart disease (canine and feline), diagnosis and treatment of congenital heart defects, and arrhythmia management. She is very excited to join the CVCA team.

In her spare time, Dr. Olson-Westphal enjoys playing golf, hiking, traveling and spending time with her two dogs and cat.

# # #
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- Website: www.cvcavets.com
The Murmur
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Lunch & Learns!

Did you know CVCA offers morning or midday CE opportunities at your practice (we bring the food too!). Lectures are AAVSB RACE approved so you earn CE credits from your own hospital. Please note - For locations more than 45 minutes away a webinar may need to be considered.

- Visit our website at: www.cvcavets.com
- Go to: “For Veterinarians/Technicians"
- Click on: "Lunch and Learns"

Virginia & Maryland Locations

Kentucky Location
Do you have a Supply Request Form and Client Education Binder?

- NEW Handout: Nutritional Supplements for Cardiac Patients
- No passwords required to access information
- Online referral forms
- Supply Request Forms - order client handouts, business cards and more FREE of Charge

Log onto www.ccvavets.com and take a look around at everything we have to offer.

Questions, feel free to email CVCA at info@cccvavet.com
February 16th – 18th, 2017 — Virginia Veterinary Medical Association Conference
Where: Roanoke, VA
Hotel: The Hotel Roanoke & Conference Center
CVCA Speakers:
  ▪ Bill Tyrrell, DVM, Diplomate, ACVIM (Cardiology)
Event Information:  http://vvma.org/vvc-attendees

March 1st – 2nd — DC Academy
Where: Fairfax, VA
Hotel/Conference Center: Elks Lodge
Exhibiting: CVCA Cardiac Care for Pets
Event Information: http://www.dcavm.org/

March 17th, 18th & 19th – Super Pet Expo in Chantilly, VA
Where: Chantilly, VA
Hotel/Conference Center: Dulles Expo Center
Exhibiting: CVCA Cardiac Care for Pets
Event Information: http://www.superpetexpo.com/chantilly

March 19th – CVRC CE Conference
Where: Easton, MD
Hotel/Conference Center: Talbot Country Club
CVCA Speakers:
  ▪ Richard Cober, DVM, MS, Diplomate, ACVIM (Cardiology)
  ▪ Carrie Massey, RVT
Event Information:  http://cvrcspringconference.eventbrite.com

April 2nd - Facets
Location: Bethesda, MD - More information to come
CE Event for Veterinarians, Technicians and Practice Management
CVCA Doctors Lecturing (subject to change):
  ▪ Steven Rosenthal, DVM, Diplomate, ACVIM (Cardiology)
  ▪ Tim Cain, DVM, Diplomate, ACVIM (Cardiology)
  ▪ Michael Hickey, DVM, Diplomate, ACVIM (Cardiology)
  ▪ Jennifer Sidley, DVM, Diplomate, ACVIM (Cardiology)

April 19th — Delaware Veterinary Medical Association
Where: Delaware
Hotel/Conference Center: Modern Maturity Center in DE Exhibiting: CVCA Cardiac Care for Pets
CVCA Speaker:
  ▪ Michael Hickey, DVM, Diplomate, ACVIM (Cardiology)
Event Information:  http://www.devma.org/events/

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The Murmur
Exceptional Cardiac Care for Pets and their families since 1987.

May 2017 — CARE CE Event in Frederick, MD
More information coming soon!

May 19th – 21st — CVC East
Where: VA Beach
Hotel/Conference Center: Virginia Beach Conference Center
Exhibiting: CVCA Cardiac Care for Pets – Booth # 632
CVCA Speakers:
  • Neal Peckens, DVM, Diplomate, ACVIM (Cardiology)
  • Kristin Jacob, DVM, Diplomate, ACVIM (Cardiology)
  • Ori Scislowicz, LVT

June 8th – 10th — ACVIM Conference
Where: Gaylord National Resort and Convention Center, National Harbor in MD
Exhibiting: CVCA Cardiac Care for Pets – Booth #523

Kentucky & Indiana Area CE Events

http://www.cvcavets.com/conferences-events/

March 2nd – 5th — Indianapolis Veterinary Medical Association Annual Conference
Where: Indianapolis, IN
Hotel: Indianapolis Marriott East
Exhibiting: CVCA Cardiac Care for Pets – Booth #44
Event Information: http://invma.org/ivma-conference/

June 4th - BluePearl Specialty & Emergency Pet Hospital CE
Where: TwinSpired at Churchill Downs
4.0 hours CE credits approved by the Kentucky Board of Veterinary Examiners
Morning programs followed by lunch, cocktails and live racing!
Topics and registration details: Coming soon!

June 15th - Southwestern Indiana Veterinary Medical Association CE
Where: The Bauerhaus in Evansville, IN
CVCA Speaker:
  • Sarah Clay Bell, DVM, Diplomate, ACVIM (Cardiology)
More information to come!

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