“I’ve Fallen and I Can’t Get Up”
Assessing Acute Collapse

Wendy Blount, DVM

drblount@vonallmen.net

For Presentation PowerPoint and Handouts:
http://wendyblount.com

Kinds of Shock

Anaphylactic Shock
- Acute allergic reaction
- Mast Cell Tumor Degranulation

Cardiovascular Shock
- Arrhythmia
- Left Heart Failure
- Right Heart Failure
- Pericardial Disease

Hypovolemic Shock
- Dehydration
- Hemorrhage
- Hypoproteinemia

Hypoxic Shock
- Anemia
- Hemoglobin Pathology

Obstructed airway
- Lung Disease
- Pleural air or effusion
- Forebrain and brainstem - decreased consciousness
- Spinal cord – flaccid paralysis

Neurogenic shock
- Overwhelming infection
- Traumatic Shock
- Due to pain
- Toxic Shock
- Due to inflammatory mediators, endogenous and exogenous toxins

 Collapse Other Than Shock

Inability or Unwillingness to get up

Profound Weakness
- Metabolic weakness
- Hypercalcemia
- Hypokalemia
- Hypoglycemia
- Neurotoxins
- Polynuropathy
- Junctionopathy
- Myopathy

Pain
- Spinal Cord/Nerve Pain
- Orthopedic Pain
- Muscular Pain

Ataxia
- Lack of coordination
- Vestibular ataxia
- Cerebellar ataxia
- Sensory ataxia

Paresis
- Loss of voluntary motor
- Lower Motor Neuron
- CNS Lesion at level of paresis
- Flaccid paresis
- Upper Motor Neuron
- CNS Lesion above paresis
- Spastic paresis

Assessment of Collapse

Quick Assessment
Life Saving Treatment
Physical Exam
Emergency Diagnostics
History
In House Diagnostics
Assessment of Collapse

Quick Assessment
- Airway
- Breathing
- Circulation
- Vital Signs – TPR & BP
- Diagnostic Centesis
  - thorax, abdomen

Life Saving Treatment
- Oxygen
- IV fluids and colloids
- Therapeutic centesis
  - Thorax, abdomen, pericardium
- Normalize temperature
- Emergency Surgery

Assessment of Collapse

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Physical Exam
- General Exam
- Cardiovascular Exam
- Neurologic Exam

Emergency Diagnostics
- PCV, TP, glucose, BUN, creat
- Blood gases/lytes
- ECG
- Radiographs
  - Lateral thorax
  - Lateral abdomen

Assessment of Collapse

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- General Exam
- Cardiovascular Exam
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- PCV, TP, glucose, BUN, creat
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- Life Saving Treatment
- Physical Exam
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- History
- In House Diagnostics

In House Diagnostics
- CBC, profile, UA - Get urine prior to fluid therapy
- Heartworm test in dogs
- FeLV/FIV in cats
- Coags - PT, PTT/ACT, BMBT
  - If all else fails, US abdomen

Assessment of Collapse

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- Life Saving Treatment
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Quick Assessment

Check Airway and Breathing
- Clear airway
- Intubate and begin IPPV if not breathing

Check Pulses, Heart Sounds and Pulse deficits
- Hook up ECG if pulse deficits or auscultable arrhythmia
- Begin CPR if no pulses or heartbeats
- Plan for chest x-rays if abnormal heart/lung sounds or pleural rubs

Place IV catheter

Supplement oxygen by mask, nasal or flow-by

Quick Assessment

If dyspnea and muffled heart/lung sounds, perform diagnostic/therapeutic chest tap
- If in sternal recumbency, tap right & left caudodorsal lung fields

Quick Assessment

If dyspnea and muffled heart/lung sounds, perform diagnostic/therapeutic chest tap
- If in lateral recumbency, tap the highest point on each side
- Butterfly catheter with 6-12 cc syringe first
- Attach larger syringe & 3-way stopcock if evacuation is needed
- Save fluid for analysis and possibly culture
  - EDTA tube for fluid analysis
  - Red top tube for culture

Quick Assessment

If abdominal fluid wave, do a diagnostic abdominal tap – 4 quadrants
- R cranial, L cranial, R caudal, L caudal
- Syringe and 18-20g needle are fine
- Put fluid in EDTA and red top tubes for analysis
- Spin down for cytology
- Save red top tube for culture if needed
- Run EDTA through CBC machine for cell counts

Fluid Analysis Handout

DDx By Fluid Analysis

Pure Transudate
- Hypoalbuminemia (<1.5 g/dl)
- Rupture of a cyst – Hepatobiliary, Pancreatic, periportal, prostatic

Modified Transudate
- Early hepatic cirrhosis
- Cavalc occlusion, HW Disease
- Right CHF
- Idiopathic pericardial effusion
- Pulmonary hypertension
- Lymphangitis
- Neoplastic effusion
- Eosinophilic effusions
- Rarely FIP

Hemorrhage
- Bleeding neoplasia

Interpret dysplastic epithelial/mesothelial cells with care

Septic Exudate
- Coagulopathy
- Vascularitis
- Idiopathic pericardial effusion
- Trauma

Non-Septic Exudate
- Neutrophilic
  - Pancreatitis, steatitis
  - Tissue necrosis
  - Neoplasia
  - Urabdomen, bile peritonitis
  - FIP
- Eosinophilic
  - Heartworm disease
  - Systemic mastocytosis
  - Hypereosinophilic syndrome
  - Eosinophilic lung disease
- Neoplasia

Bilious Effusion
- GI perforation
- Neoplasia
- Thrombosis
- Volvulus
- Intussusception
- Penetrating Wound
- Surgical Dehiscence
- Ruptured abscess
- Septicemia
- Bile peritonitis
- FIP

Culture exudative, bilious and hemorrhagic effusions
Fluid Therapy

“Shock/Replacement Fluids”
• Bolus of 10 ml/lb over 10-15 minutes, then reassess
• NO shock fluids if there is anuria or CHF (Angel)
  • Anuria - you can probably get way with one shock dose if the dog hasn’t had prior fluid therapy
  • MONITOR URINE OUTPUT AFTER THE SHOCK DOSE
• YES shock fluids if there is evidence of hypovolemia
  • Pale mucous membranes, slow CRT
  • Weak peripheral pulses

Fluid Therapy

“Shock/Replacement Fluids”
• Bolus of 10 ml/lb over 10-15 minutes, then reassess
• YES if evidence of dehydration, anaphylaxis, hemorrhage, or sepsis
• Anaphylaxis
  • Pale mucous membranes and weakness despite no dehydration, no CHF and no apparent external/internal fluid loss
  • Cats often have pulmonary edema (tachypnea/dyspnea)
  • Dogs often have abdominal pain

Fluid Therapy

“Shock/Replacement Fluids”
• Bolus of 10 ml/lb over 10-15 minutes, then reassess
• YES if confirmed pericardial effusion (PE) without CHF
• Muffled heart and lung sounds, dyspnea
• Negative diagnostic thoracocentesis
• Lateral chest x-ray raises suspicion of PE
  • Huge heart (DDx cardiomegaly, Pericardial Dz)
• Quick ultrasound of the heart confirms PE or PPDH
• If hemorrhagic PE (PCV PE = PCV blood), then bolus fluids

Fluid Therapy

“Shock/Replacement Fluids”
• Bolus of 10 ml/lb over 10-15 minutes, then reassess
• YES if confirmed pericardial effusion (PE) without CHF
• If modified transudate, RHF is possible
  • Signs of RHF on exam –
    • Peripheral edema
    • Diarrhea
    • Distended jugular veins or abnormal jugular pulses
    • Positive hepatojugular reflux

Fluid Therapy

“Shock/Replacement Fluids”
• Bolus of 10 ml/lb over 10-15 minutes, then reassess
• CAREFUL if hypoalbuminemia
  • If TP low, get albumin ASAP

Aggressive fluid therapy + hypoalbuminemia = pulmonary edema
  • Replace colloids first – hetastarch
  • Shock fluids may not be necessary, and could even lead to volume overload
Fluid Therapy

Maintenance Fluids
- 1-2 ml/lb/hr – fine tune later
- To keep the IV line open while the patient is assessed
- Most patients fall under this category

No Fluids – if CHF is possible
- Auscultable arrhythmia or pulse deficits
- Undiagnosed thoracic effusion or ascites – modified transudate
- Dyspneic animal who has not had chest x-rays yet
- Be especially careful with cats
- Fluids, corticosteroids or x-rays can KILL a cat in CHF

Pneumothorax

1. Use butterfly catheter and 3-way stop cock to evacuate the air from the left and right sides
   - Continue until you get negative pressure
   - Take chest x-rays to confirm lungs expanded
   - Some cases of spontaneous pneumothorax will resolve with this treatment
   - If the patient is getting worse, or you can not get negative pressure after several minutes, continue to step 2

2. Place chest tube and evacuate air.
   - You may need to place a chest tube on each side
   - If air constantly re-enters the chest, place continuous suction on the chest tubes.
   - Slow leaks will sometimes eventually seal without surgery
   - Take chest x-rays to confirm tubes placed well and lungs expanded
   - If the patient is getting worse, and you cannot get negative pressure, continue to step 2

   - Evacuate hourly at first, then less often as needed to get negative pleural pressure.
   - Apply continuous negative pressure if necessary.
   - Offer referral to a 24-hour ICU if your clinic does not offer 24-hour care
   - An uncapped chest tube can cause death by pneumothorax within minutes.
   - Remove chest tube when no air is aspirated for 24 hours, and chest x-rays confirm resolution of pneumothorax.
   - It is normal for a chest tube to produce a small amount of serosanguinous pleural fluid as long as it is present.

Pleural Effusion

1. Use butterfly catheter and 3-way stop cock to evacuate the fluid from the left and right sides
   - Continue until you get negative pressure
   - Take chest x-rays to confirm lungs expanded
   - Some scalloping of the lungs may remain if effusion is chronic
   - Perform fluid analysis to characterize the fluid, then the indicated diagnostics to determine the specific cause.
   - If the effusion is hemorrhagic, remove only enough blood to alleviate dyspnea
     - the remaining will autotransfuse if the source of hemorrhage can be treated or is likely to resolve.

2. Indications for a chest tube.
   - Pyothorax
     - Managed by treating with antibiotics, and lavaging the chest with small amounts of sterile isotonic fluid
     - 5-10 ml/lb, sit for 5 minutes, drain
     - Lavage BID
     - Chest tube can be removed when:
       - bacteria are no longer present in the retrieved fluid (check for phagocytosed bacteria)
       - Fluid production is down to 1-1.5 ml/lb/day
     - Recheck chest x-rays one week after tubes pulled.
     - Occasionally lung lobectomy will be needed to resolve the problem.
Pleural Effusion

2. Indications for a chest tube.
   • Chylothorax
     - Until source of effusion can be treated or resolved.
   • Management of pleural effusion pending surgical therapy.

Pericardial Effusion

Pericardial tap is life saving, and not as scary as it seems
   • Clip and prep area over the heart on the right side
   • Place the animal in right lateral recumbency
   • Use an echo table for easy access
   • Or just roll them up a little to lift the sternum off the table
   • Bring their sternum to the edge of the table
   • Wear sterile gloves
   • Feel for the apical beat on the right chest wall.
   • Introduce a long IV catheter until you get free flow of fluid (runs or drips)

Pericardial Effusion

Pericardial tap is life saving, and not as scary as it seems
   • Thread catheter in and evacuate the fluid
   • Use a three-way stop cock & extension set if desired
   • As flow stops, thread the catheter in or out a little to reposition the tip
   • I am not a big fan of cutting additional side holes in the catheter to improve flow
     - Can cause the catheter to break off when removed
   • Save samples for cytology and culture
   • Give pain meds

Ascites

Transudate or Modified Transudate
   • Remove enough fluid to alleviate dyspnea, and allow comfortable chest x-rays & abdominal ultrasound
   • Bloodwork and abdominal ultrasound to determine the cause, and treat accordingly
   • If cause is congestive heart failure, remove all fluid

Hemorrhage - usually a surgical problem, unless
   • Coagulopathy is identified and treated
   • Traumatic hemorrhage resolves spontaneously

Non-septic exudate
   • Imaging determines whether the problem is surgical

Dyspnea

Pleural effusions & Pneumothorax discussed previously
That leaves:
   • Airway problems
   • Collapsing trachea and bronchi
   • Feline Asthma
   • COPD/Allergic Bronchitis (Joshua)
   • External ligature or foreign body
   • Lung Parenchyma Problems
     - Infectious Pneumonia – bacterial, viral, fungal, protozoan, parasitic
     - Noncardiogenic pulmonary edema
     - Pulmonary trauma
     - Eosinophilic Pneumonitis
     - Primary and metastatic neoplasia
     - Lung lobe torsion

Dyspnea

Pleural effusions & Pneumothorax discussed previously
That leaves:
   • Pericardial effusion
   • Hemorrhagic – neoplasia, idiopathic
   • Modified transudate – idiopathic, neoplasia
   • Exudative - infectious
   • Peritoneopericardial Diaphragmatic hernia
     - Pectus excavatum is a clue
     - Confirmed by ultrasound or barium series
     - Treated surgically
     - Adhesions can be vexing
     - Re-expansion pulmonary edema can complicate recovery
Dyspnea

Pleural effusions & Pneumothorax discussed previously
That leaves:

- Diaphragmatic hernia
  - Confirmed by ultrasound
  - Loops of gut in the chest on rads are the giveaway
  - Giving a little barium helps see these
  - If liver is entrapped or gut strangulated, can be an emergency

Emergency Drugs for Dyspnea

When you think you just might kill your patient with x-rays
- Bronchodilators
  - If cat has dyspnea with no murmur and harsh lung sounds, consider asthma
  - Cat can have CHF without murmur, though dogs almost never do
  - If cat is stable enough, give lasix IM and place in oxygen for 15-30 minutes.
    - If not, skip to next step
  - If no improvement, give 2-3 puffs of albuterol and wait 5-10 minutes
    - Can use AeroKat spacer for $100
    - Or a 60cc syringe case for a few bucks

If emergency drugs for dyspnea do not make your dyspneic patient better within an hour, you might have to try one quick lateral thoracic radiograph, and hope for the best.

You have to understand the problem in order to be able to treat it well.
Noncardiogenic Pulmonary Edema

Bulldog Conformation
- Redundant esophagus predisposes to chronic aspiration pneumonia
  - This can lead to chronic COPD and hypoxia
- Upper airway compromise obstruction
  - Stenotic nares
  - Elongated soft palate
  - Hypoplastic trachea
  - Everted saccules

The bottom line is there is no “respiratory reserve” to call on in case of increased oxygen demand
- Overheating
- Excitement or exercise
- Pulling on a collar while walking
- Restraint at the veterinary office
- Respiratory disease
- Cardiovascular Disease

Noncardiogenic Pulmonary Edema

The Vicious Cycle
1. Obstructive hypoventilation and respiratory stridor
2. Leads to respiratory acidosis
3. Damages pulmonary endothelium
4. Pulmonary edema results
5. Hypoxia ensues
6. More pulmonary edema, then worsening hypoxia
7. ARDS (Acute Respiratory Distress) results

Emergency treatment
- Establishing a patent airway early in the process is the most effective treatment
  - Sedate and intubate
- Tracheostomy if necessary
- Later intervention may require putting the dog on a ventilator
- Talk to bulldog owners BEFORE this happens (handout)

History

Change in Voice, Noisy Breathing
- Laryngeal paralysis
  - Isolated, or associated with LMN Disease
Regurgitation
- Megaesophagus may be isolated, or may be associated with LMN disease
- History of “vomiting” and “coughing” - think megaesophagus with aspiration pneumonia

History

Acute collapse over seconds
- Seizures - stiff
  - Pre-ictal signs, abnormal behavior
  - Preceded by twitching or other partial seizure activity
  - Post-ictal signs, abnormal behavior
  - Syncope - flaccid or stiff if hypoxia is severe enough
  - Recovery is usually quick

History

Acute collapse over minutes
- Anaphylaxis
  - After insect bite, snake bite
  - After heartworm prevention in untested dog
  - After going outside
  - Acute spinal cord injury
    - Immediately after crying out
    - No loss of consciousness
**History**

**Acute ascending paralysis over a few hours**
- Coral snake bite

**Acute ascending paralysis over 12-24 hours**
- Botulism
- Coonhound paralysis (bite wounds 7-10 days ago)
- Tick paralysis (female *Dermacentor*)
  - Improvement begins after the tick is removed

**Collapse With Exercise**
- Myasthenia gravis
- Exercise induced collapse of Labrador Retrievers
  - Paralysis is often ascending, with recovery within 15-20 minutes

**Eating carrion or garbage**
- Botulism – flaccid paralysis
- Roquefortine toxin – seizures and twitching
- HGE – hemorrhagic gastroenteritis

**Physical Exam**

**Temperature**
- Hyperthermia
  - Fever – save urine for possible culture
- Heat stroke
- Seizures
- Exercise induced collapse of Retrievers
- Hypothermia
- Shock
- Exposure

**Heart Rate**
- Sinus Bradycardia
  - Impending death
- Hypothyroidism – myxedema coma
- Increased vagal tone –
  - Increased CSF pressure
  - Abdominal disease
  - Tracheal trauma
  - Increased IOP
  - Retching
  - Give atropine or glycopyrrolate and recheck

- Sinus Tachycardia
  - Pain or anxiety
  - Give pain meds
  - Hypovolemic shock
  - Increase the fluid rate
  - Heart failure
  - Pericardial tamponade
  - Tap and give IV fluid bolus

**Heart Sounds**
- Muffled heart sounds – take chest x-rays
  - Pneumothorax
  - Pleural effusion, pericardial effusion
  - Obesity
- Chaotic heart sounds (audio)
  - Like tennis shoes in a dryer
  - Many VPCs
  - Atrial fibrillation
  - Get an ECG ASAP
Physical Exam

Heart Murmurs
- Holosystolic murmur loudest at the cardiac apex (audio)
- Anemia
- Hypoproteinemia
- Physiologic in puppies (often musical)
- Mitral regurgitation (left), Tricuspid regurgitation (right)
- To and Fro murmur (audio)
- HS - Chronic weight loss and fever, then left heart failure
- Aortic endocarditis
- Gallop rhythm
  - Check chest x-rays for enlarge heart and heart failure

Physical Exam

Mucous Membrane Color
- Cyanosis
  - Respiratory failure – airway obstruction, alveolar disease or pleural/pericardial disease (air/fluid/organs)
  - Congestive heart failure
  - Pulmonary hypertension
  - Differential cyanosis
    - Pink in front, blue in back (Reverse PDA or FATE)
    - Muddy Brown mucous membranes in a cat
    - Acetaminophen toxicity
    - Brick red mucous membranes
    - Sepsis - do CBC, and albumin
    - HGE (hemorrhagic gastroenteritis in dogs)

Physical Exam

Mucous Membrane Color
- Icterus
  - Check CBC first to rule out hemolysis
  - If anemic, check for autoagglutination
  - Very small drop of blood + large amt of saline on a slide
  - Coverslip and look at 40x-100x
  - Should be dilute enough to see space between RBC
  - "Poker Chip Stacks" is OK – rouleaux
  - "Poker Chip Winnings Pile" – autoagglutination
  - Don’t rely on observation with naked eye
  - If not anemic, you are left with hepatic or bile obstruction
  - No point doing bile acids if bilirubin is high
  - Abdominal US more helpful

Physical Exam

Respirations
- Minimal chest excursions can indicate LMN paralysis
- Exaggerated chest excursions already discussed under Emergency Treatment for Dyspnea

Physical Exam

Lung Auscultation
- Respiratory crackles (audio)
  - Moisture in the small airways
  - Pulmonary edema
  - Chronic airway disease
  - Alveolar pneumonia
- Harsh lung sounds with no murmur in a cat
  - Think asthma
  - But cats can have CHF without a murmur
- Pleural rubs – tap the chest (audio)
Physical Exam

Pulses

- Jugular pulses
  - Hepatogenous reflux
    - apply pressure to the liver for 10-15 seconds
    - Filling of the jugular veins indicates right heart failure or pericardial disease
  - Peripheral Pulses
    - Weak pulses
      - CHF
        - Pericardial disease
      - Shock of any kind, especially hypovolemic
      - Hypertension

- Peripheral Pulses
  - Bounding pulses - Big difference in pressure between systole and diastole
  - Fever/Sepsis (vasodilation makes diastolic pressure lower)
  - PDA (back flow during systole)
  - Aortic endocarditis (black flow during systole)
  - Extreme bradycardia (volume overload)
  - Anemia (low blood viscosity)
  - Pulsus paradoxus – absent during peak inspiration
  - Pericardial effusion or hernia
  - No pulses in only one area
    - Thromboembolic disease

Skin

- Attached tick – tick paralysis
- Coral snake bites cause minimal reaction and can be very hard to find
- Crotalid snake bite - swelling, bite wound
- Hemorrhages might indicate coagulopathy – do coags
  - Ecchymoses and petechiae
- Peripheral edema
  - Right heart failure
  - Vasculitis, venous or lymphatic obstruction
  - Hypoalbuminemia
  - Infiltrative tumor such as myxosarcoma can look like edema

Abdominal Palpation

- Distension
  - Obesity, pendulous abdomen
  - Pregnancy, pyometra - ultrasound
  - Balotte fluid wave – tap
  - Palpate organomegaly – ultrasound
    - Relieve urinary obstruction or express if bladder
  - Abdominal mass – ultrasound
    - If cystic masses, may not be safe to aspirate
    - Can aspirate solid masses later
    - Aspirate homogeneous enlarged spleen (MCT, Lymphoma)
  - Gut distended with gas – radiograph
    - Pass stomach tube if gastric

Musculoskeletal

- Rule out unwillingness to get up due to orthopedic pain
  - Bilateral cruciate disease
    - Bilateral cranial drawer signs
  - Dog often supports weight on the front limbs
  - Polyarthritis
    - Joints warm to the touch
    - Synovial effusion
    - Joint taps for cytology and culture are warranted for FUO, even if no outward signs of polyarthritis
Physical Exam

Neurologic Exam
• Mentation
  • Level of consciousness (0-4) – regulated by cerebrum & brainstem, as well as acid-base status
  • Excited (3-4)
    • Alert – Normal (2)
    • Depressed/obtunded – drowsy but arousable (1)
    • Stuporous – sleeps if left alone, arousable (1)
    • Comatose – no response to pain (0)
  • Quality of Consciousness
    • Normal
    • Demented – responds inappropriately (cerebral lesion)

Physical Exam

Neurologic Exam
• Sensation
  • Muscle pain
    • Polymyositis - check CPK
    • Immune mediated, Toxoplasma, Hepatozoon
    • Hypoglycemic myopathy
  • If LMN paralysis (all reflexes suppressed)
    • Normal sensation – Coonhound, tick paralysis, botulism
    • Decreased sensation – coral snake bite
    • Hyperesthesia – Coonhound paralysis

Physical Exam

Neurologic Exam
• Posture (lateral recumbency)
  • Schiff-Sherrington
    • Extension of thoracic limbs
  • Pelvic limbs drawn under
    • T2-L2 lesion (border cells)
  • Decerebrate rigidity
    • Extension of all limbs, sometimes opsithotonus
    • Often stupor or coma
    • Severe brainstem lesion

Physical Exam

Neurologic Exam
• Attitude
  (position of head relative to body)
  • Head tilt – vestibular disease or cranial neck pain
    • Examine the ears
    • Nystagmus, no CP deficits, falling to one side, head tilt to same side, no other CN deficiencies
    • Unilateral Peripheral Vestibular disease
  • Ventroflexion of the neck in cats
    • Indicates weakness or neck pain
    • If weakness, think hypokalemia or LMN Disease

Physical Exam

Neurologic Exam
• Mentation
  • Depressed or abnormal with forebrain and brainstem lesions
    • Forebrain = cerebrum and diencephalon
    • Diencephalon = thalamus and hypothalamus
  • Depressed with any cause of shock, or severe metabolic disease
    • Normal with most LMN Disease
    • Except coral snake – seems mildly sedated
Neurologic Exam
- Cranial Nerve Reflexes
  - Vision
    - If responsive, do they track a falling cotton ball?
    - Menace will be absent with cerebellar disease
    - No menace also in puppies and kittens < 12 weeks
  - Anisocoria
    - Forebrain or brain stem lesion
    - FeLV (hippus)
    - Horner's Syndrome
    - Miosis (small pupil)
    - Ptosis (droopy eyelid)
    - Enophthalmos (sunken eye)
    - Prolapsed third eyelid
- PLR – indirect and direct R and L (absent or slow)
  - Unconscious
  - Forebrain or cranial brainstem lesion
  - Optic nerve, chiasm, tract lesion
  - Retinal blindness
  - Iris atrophy
  - If PLR negative, Try Dazzle Reflex
    - Shine a bright light into the eye
      - The eye should squint as long as the light is held there
      - Apparent blindness with intact PLR & Dazzle = cortical blindness
- Palpebral response – medial and lateral L and R
  - Fatigue can indicate myasthenia gravis
  - Unilateral deficit can indicate trigeminal nerve deficits and/or facial nerve paralysis
- Facial Symmetry
  - Paralysis or spasm of the facial muscles?
  - Puckering of the skin indicates spasm
  - Flaccid muscle tone indicates paralysis
  - Peripheral nerve or brain stem disease
  - Combined with other nearby CN deficits, think brain stem
  - Peripheral disease can be bilateral
- Nystagmus
  - Normal Siamese nystagmus has equal time left and right
  - Pathologic nystagmus has fast & slow phases (fast away)
  - Positional nystagmus (only in dorsal recumbency) indicates vestibular disease
Physical Exam

Neurologic Exam
• Spinal Nerve Reflexes
  • LMN reflexes – flaccid, suppressed
    • Lesion in CNS where nerves originate from
  • Things that can mimic LMN reflexes
    • Severe muscle or joint rigidity
    • Metabolic disease causing weakness
      • Hypokalemia, acidosis, hypercalcemia
    • Spinal Shock
      • Reflex suppression causal to acute SC injury
      • Reflexes return within 30-60 minutes

  • UMN reflexes – stiff, exaggerated
    • Lesion in the CNS above where nerves originate from
  • Things that can Mimic UMN reflexes
    • Extreme excitement
    • Pseudohyperreflexia
      • Patellar reflex is exaggerated
      • But reflexes caudal to that are suppressed
    • Caudal muscle thigh tone normally dampens the patellar reflex
    • Lack of tone to the caudal thigh muscles allows seemingly exaggerated patellar reflex

  • Withdrawal (flexor) reflex
    • Remember this is a spinal reflex that can occur below a severed spinal cord
    • When assessing perception of deep pain which required connection to the brain:
      • Look for conscious acknowledgement of pain, not just pulling the foot back
      • Pet may look at you, whine, or snap
      • Pupils may dilate

  • All reflexes decreased – weakness or LMN disease
  • Suppressed (LMN) CN reflexes – brain stem disease
  • Normal mentation and CN
    • UMN all 4 limbs – cervical lesion
    • LMN front, UMN back – C4-T2
    • Normal front, UMN back – T2-L2
    • Pseudohyperreflexia, flaccid bladder, poor anal tone – LS
    • Flaccid tail, bladder, anal – S-Cd

LMN Disease

- Congenital Myasthenia gravis
- Exercise Induced Collapse of Retrievers

Immune Mediated
- Acquired Myasthenia gravis
- Coonhound paralysis

Infectious
- Botulism

Metabolic
- Hypothyroidism
- Hypoadrenocorticism

Toxic
- Botulism
- Neurotoxic snake bites
- Tick paralysis

Multifocal CNS Disease

Dogs and Cats

Degenerative
- End stage CNS atrophy of advanced age

Anomalous
- Dandy Walker Syndrome
- Neoplastic
- Metastatic neoplasia

Nutritional
- Thiamine deficiency

Immune Mediated
- GME – granulomatous meningioencephalitis
- Eosinophilic meningioencephalitis

Infectious
- Bacterial meningioencephalitis
- Fungal meningioencephalitis
- Toxoplasma gondii
- Aberrant adult heartworm
- Visceral Larval Migrants – Bayliscaris procyonis
- Prototheca spp.

Vascular
- Ischemic encephalopathy
Multifocal CNS Disease

Dogs
- Degenerative
  - Leukodystrophy
  - Neuronal Vacuolation of Rottweilers
  - Abiotrophy of Cocker Spaniels

Infectious
- Canine Distemper Virus
- Neospora caninum
- Ehrlichia canis
- Rocky Mountain Spotted Fever
- Lyme Disease

Cats
- Infectious
  - Feline Infectious Peritonitis
  - Borna Disease
  - Cuterebera spp.
  - Taenia serialis - cystic coenurus

Emergency Diagnostics

ECG
- Identify whether the animal has a normal rhythm
  - P wave, QRS and T for every beat
  - No abnormal beats (VPC, fibrillation)

ECG Tips

- Always in right lateral recumbency
- Patient on a towel or rubber mat
- Metal tables are more problematic
- Limbs perpendicular to body
- Place leads at the elbow and knee
- No one moves while the ECG is being recorded
- Enhance lead contact with gel or alcohol

  Alcohol is FLAMMABLE!!

Which lead goes where?
- "Snow and Grass are on the ground"
  - White and green leads are on the bottom (R)
- "Christmas comes at the end of the year"
  - Red and green are on the back legs
- "Read the newspaper with your hands"
  - White and black are on front legs
- If all else fails, label the leads with stickers
  - White – RF
  - Green – RR (ground)
  - Black – LF
  - Red – LR

ECG Tips

At 25 mm/sec, 150mm = 6 sec
- "Bic Pen Times Ten"
- Accurate within 10 beats per minute

At 50 mm/sec, 300mm = 6 sec
- Bic Pen times Twenty
- Accurate within 20 beats per minute

Normals
- Giant dogs 60-140
- Toy dogs 80-180
- Cats 100-240
- Med-Lg dogs 70-160
- Puppies 70-220
- (Arrhythmia handout)

In House Diagnostics

Emergency Bloodwork
- CBC with platelets
- General health profile – include P, Ca++, albumin and triglycerides
- Electrolytes and blood gases
- Urinalysis – specific gravity prior to fluid is crucial to interpreting azotemia
  - Use a 5F infant feeding tube to catheterize male dog > 75 pounds
  - Use US guidance if needed for cystocentesis of small bladder
In House Diagnostics

Potassium
• Hypokalemia causing profound weakness
• Renal tubular acidosis
• Diabetic ketoacidosis
• Hyperkalemia
• Hypoadrenocorticism
• Urinary obstruction (post-renal azotemia)
• Acute oliguric/anuric renal failure
• whipworms

In House Diagnostics

Coags
• Buccal Mucosal Bleeding Time
  • Triplett, Surgicutt, Simplate
• ACT cartridges available for iSTAT
  • Or get gray top kaolin tubes (http://www.haemtech.com/ACT.htm)
  • Invert once every 30 seconds, until first sign of clot
• PT and PTT
  • Idexx has in house coags now
  • SCA2000 is another option (handout)

Tips for Thoracic Radiographs

Great Vessels
• Normal
• Enlarged pulmonary veins
• Interstitial or miliary pattern
• Masses of various sizes

Lung Fields
• Normal
• Pleural effusion
• Interstitial pattern
• Normal

Tips for Thoracic Radiographs - Heart Disease

Cardiac Silhouette
• Lateral
• Enlarged LA
• Enlarged LV
• Dorsal
• Enlarged RA
• Enlarged RV
Both views
• Large and round

Tips for Thoracic Radiographs - Respiratory Disease

Lung Fields
• Normal
• Interstitial pattern
• Normal

Pulmonary Vessels
• Normal
• Enlarged pulmonary arteries

Airways
• Normal
• Narrowed trachea

Tips for Thoracic Radiographs - Emergency Seizure

NTproBMP ELISA
N-terminal pro-B type Natriuretic Peptide
• In clinic test to distinguish cardiac from respiratory dyspnea
• Validated in dogs JACVIM January 2008
• <210 pmol/L – more likely respiratory disease
• >210 pmol/L – more likely cardiac disease
• Falsely elevated by increased creatinine
• Helpful in distinguishing cardiac from respiratory dyspnea when creatinine is not elevated

Emergency Seizure Protocol Handout