# 2025 CCS VETS

## PREPPING FOR PRIVATE PRACTICE

# TREATMENT PROTOCOLS

Khula

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BESPOKE VETERINARY TRAINING

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# Allergic reaction

**Presentation:**
History of sting, hives/wheals (urticaria), swelling of face/limbs (angioedema), closing airways (bronchospasm), vomiting/diarrhoea, pruritis
*BUT HEMODYNAMICALLY STABLE**

**Rx:**
New recommendation: Antihistamines are superior to steroids in the case of hypersensitivity reactions.

1. Corticosteroid: Dexamethasone @ 0.1-0.2mg/kg iv/im (For [2mg/ml]: starting dose = *1ml/20kg*); can be followed with oral Prednisone/Prednisolone @ 0.25-0.5mg/kg q24h x 2-3days if needed)
2. Antihistamine: DOGS: Mepyramine Maleate @ *1ml/10kg* sc or Diphenhydramine @ 1-2mg/kg im/sc then po q8h for 24-48hrs; CATS: Cetirizine @ *5mg/cat* or 2.5mg/tiny cat po)

# Anaphylaxis

**Presentation:**
Usually numerous stings/post-vaccination, hypotensive shock, pallor, urticaria, angioedema, stridor, bronchospasm, tachycardia, vomiting/diarrhea, urination, seizures, coma

**Rx:**

1. Ensure patent airway and provide O2: intubate and ventilate with ambu-bag
2. Adrenaline (for hypotension/bronchoconstriction): 0.01-0.02mg/kg dilute in saline & give SLOW iv (For [1:1000]: starting dose = *0.1ml/10kg*)
3. IVFT (crystalloids): rate based on response (shock bolus initially)
4. Corticosteroid: Dexamethasone @ 0.5mg/kg iv ONCE (if bronchospasm/angioedema persists)
5. Bronchodilator: Aminophylline = DOG: 5-10mg/kg; CAT = 5mg/kg NB: dilute 1:3 in sterile water and give SLOW iv

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# Addisonian Crisis

**Presentation:**
Lethargy, inappetence, weight loss, vomiting and diarrhoea – very non-specific signs that follow a waxing and waning pattern, exacerbations following stress or improvement following fluid/steroids; also GI bleeding, collapse/severe weakness and hypovolemic shock

**Dx:**
Electrolytes: *hyponatremia/hyperkalemia* – Na:K ratio <25:1
ACTH stimulation test

**Rx:**
1. Correct shock + reduce serum potassium: 0.9% Saline (INITIAL: 40-80ml/kg/24h; *low end* in cats*); reduce once hypotension/hypovolemia resolved, this also helps with hyperkalemia (dilutional effect)
2. Correct hypoglycemia + reduce serum potassium: Add dextrose to isotonic fluids to create a 1.25-5% solution (50ml of dextrose 50% into 1l bag = 2.5% solution); for *severe* hypoglycemia: iv bolus 1ml/kg dextrose 50% (diluted 1:1 with 0.9% Saline) - dextrose induces endogenous insulin release, which pushes potassium intracellularly
3. Provide a glucocorticoid: Dexamethasone (0.25 mg/kg iv) is recommended, since it does not interfere with the ACTH stim test; dexamethasone should be continued at a dose of 0.07–0.15mg/kg q12h until prednisone can be given orally, prednisone is then started @ 0.5 mg/kg q12h (but only *after* the ACTH stimulation test)
4. Provide mineralocorticoid: DOCP injections (Zycortel - Section 21 permit) @ 2.2mg/kg im/sc q25d (preferred during crisis) or Fludrocortisone (Florinef) @ 0.01mg/kg po q12h (only given once diagnosis is confirmed i.e. *after* the ACTH stimulation test); will need *adjustments* based on electrolytes assessed q1-2w

**OTHER MEASURES TO CONSIDER:**
1. Insulin can be given to drive K intracellularly (in *normoglycemic* animals): Novorapid @ 0.2iu/kg iv (dextrose should then be added to the intravenous fluids to produce a 2.5-5% solution, and blood glucose should be monitored)
2. Cardioprotection: 10% calcium gluconate @ 0.5–1.5 ml/kg is given slowly over 15-20 minutes (ONLY in cases with *severe life threatening hyperkalemia*)
3. Provide gastric protectants (for GI bleeds): Omeprazole/Pantoprazole and Sucralfate
4. Antibiotics: Use in severe gastro-intestinal disease to prevent bacterial translocation – controversial, so use judiciously (i.e. Ampicillin/Amoxicillin)

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# Diabetic Ketoacidosis (DKA)

**Presentation:**
Hyperglycemia, ketonaemia, ketonuria, acetone odour on the breath, weak/collapsed, thin, vomiting, tachypnoea, dehydrated, hypovolemic shock (hx of PU/PD and weight loss)

**Dx:**
UA, biochemistry and electrolytes
NB: hyperglycemia (average of 25 mmol/L), hypokalemia, hyponatremia, hypophosphatemia, hypomagnesemia, glucosuria/ketonuria

**Rx:**

1. Aggressive IVFT: RLS vs 0.9% NaCl - dependent on electrolyte profile - RLS is alkalinising vs NaCl to supplement sodium - clinician's decision (*NB: Insulin/PO4 cannot be given iv with RLS, only saline*)
2. Potassium supplementation: Supplement based on requirements (see appendix 1); insulin dosage may need to be *reduced by 50% or delayed* if px is hypokalemic (insulin pushes K intracellularly)
3. Insulin: begin 2-6 hours after initiating fluid therapy
    a. Ideally use short acting insulin - Novorapid @ 0.2iu/kg iv/im initially, then @ 0.1iu/kg q1-2h until glucose reaches +- 13.9mmol/L; then switch to longer acting insulin (i.e. Caninsulin - dog/Lantus - cat)
    b. For "healthy" DKA px, use short acting insulin q8h; feed 1/3 of daily caloric intake at the time of each insulin injection; adjust dose based on blood glucose readings
4. Monitor blood glucose: every 1-2 hours - supplementation of dextrose is indicated when glucose drops below 13.9mmol/L (use a 5% solution - see appendix 1)

**OTHER MEASURES TO CONSIDER:**

1. Check and supplement other electrolytes if necessary
    a. Phosphate: if serum PO4 is below 1.5mg/dL +- hemolytic anemia develops
    b. Magnesium: for persistent weakness, anorexia + refractory hypokalemia/hypocalcemia despite IVFT and insulin therapy for 24-48h
2. Monitor urine daily:
    a. Volume: to keep track of renal function (especially in hyperosmolar patients)
    b. Dipstick: to keep track of glucosuria/ketonuria (response to treatment)
3. Electrolyte monitoring q6-12h
4. PCV, blood pressure and body weight daily

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# Babesiosis: Canine

**Presentation:**
Lethargic, inappetant, weak, pale/icteric, febrile, rapid waterhammer pulse, increased respiration rate, enlarged spleen, lots of ticks on body or lack of ectoparasite control

**Dx:**

- Blood smear = Intracellular *B. canis* parasites in red blood cells (teardrop/round)
- Ht/ISA:
    - Ht below 12-15% - high risk - consider blood transfusion (base decision on *clinical appearance*)
    - ISA (1 drop blood : 6 drops saline) - will see clumping of RBCs if positive
        i. If ISA positive - IMHA confirmed
        ii. If ISA negative
            1. check blood smear for *spherocytes* = hallmark of IMHA
            2. consider Coomb's test

**Rx:**

1. IVFT/Blood transfusion:
    a. Volume of blood = (Desired Ht – Patient Ht)/Donor Ht X 90 X Weight
    b. Aim for a Desired Ht of 20-25%
    c. Piggy-back blood on Saline (NOT Ringers), change fluids to RLS afterwards
2. Berenil: @ 3,5mg/kg (= 1ml/20kg) im (NEVER GIVE IV) – need to ensure accurate weight of px; always ensure Berenil has not been given previously as toxicity could result in death; *DO NOT REPEAT*
3. Forray 65: @ 6.6mg/kg (= 1ml/20kg) im/sc once and then 7-14 days later (USUALLY USED IN CASES OF BILIARY *RE-INFECTION/PERSISTENCE* AFTER PREVIOUS BERENIL ADMINISTRATION; not to be used simultaneously with Berenil)
4. Doxycycline: @ 10mg/kg po q24h for 28 days; used for suspected *Ehrlichiosis* – i.e. low platelets, increased/active monocytes OR pancytopenia; PCR can confirm if needed as some cases can be *refractory/chronic*
5. Prednisone: @ 1mg/kg q12h initially (if *IMHA* is suspected) - needs to be *tapered SLOWLY*, i.e. reduce dose every 2-4 weeks *if PCV remains stable*
6. Gastric protectants: if using long periods of high dose Prednisone i.e. Omeprazole @ 0.5-1.5mg/kg po q24h – give 1hr after other oral meds
7. Liver support: Heptonic
8. Monitor for complications:
    a. *12 complications* of babesiosis = acute renal failure, cerebral babesiosis, coagulopathy, icterus/hepatopathy, immune-mediated haemolytic anaemia (IMHA), peracute babesiosis, ARDS, hemoconcentration, hypotension, myocardial pathology, pancreatitis and shock

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# Babesiosis: Feline

**Presentation:**
Lethargy, anorexia, weight loss, weakness, pale/icteric mm, *NOT ASSOCIATED WITH PYREXIA* (unless concurrent infection), found in coastal regions of South Africa

**Dx:**

- Blood smear = Intracellular *B. felis* parasites in red blood cells (small signet ring)
- Ht/ISA:
  - Ht below 12-15% - high risk - consider blood transfusion (base decision on *clinical appearance*)
  - ISA (1 drop blood : 6 drops saline) - will see clumping of RBCs if positive
    i. If ISA positive - IMHA confirmed
    ii. If ISA negative
      1. check blood smear for *spherocytes* = hallmark of of IMHA (*difficult to see in cats because of morphology of feline rbcs*)
      2. consider Coomb's test

**Rx:**

1. IVFT/Blood transfusion:
   a. MUST *crossmatch/blood-type* in cats FIRST to avoid either life threatening hemolytic reaction (Type A blood to a Type B cat) or shortened survival of transfused cells (Type B blood to a Type A cat)
   b. Volume of blood (ml) = desired Ht increase (%) x BW (kg) x 2
   c. Aim for Ht of *at least* 20%
   d. Piggy-back blood on Saline (NOT Ringers), change fluids to RLS afterwards
2. Primaquin: @ 0,5mg/kg po/im (= 1 tablet/kg)
   a. 3 doses at 72 hour intervals, then 1x weekly for 3 weeks
   b. Recrudescence is common - Primaquin DOES NOT STERILISE THE INFECTION, so a chronic carrier state can persist for years; BUT it allows for *clinical cure*
   c. Doses of 1mg/kg or higher can be fatal - must weight px accurately
3. Doxycycline: @ 10mg/kg po q24h for 21 days; for concurrent *Mycoplasma hemofelis* infection
4. Prednisolone: @ 1-2mg/kg q12h initially (if IMHA is suspected) - needs to be tapered SLOWLY, i.e. reduce dose every 2-4 weeks *if PCV remains stable*
5. Gastric protectants: if using long periods of high dose Prednisolone i.e. Esomeprazole (Nexium) @ 0.5-1.5mg/kg po q24h – give 1hr after other oral meds
6. Nutritional support: High protein + high fat diet @ 70-90kcal/kg/day
7. Monitor for complications/recrudescence:
   a. Icterus/hepatopathy, immune-mediated haemolytic anaemia (IMHA), FIV, FeLV
   b. Repeat blood smears every 2-3 months for asymptomatic, parasitemic cases - cases should only receive treatment when clinical signs or anaemia develop

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# Immune-Mediated Hemolytic Anemia (IMHA)

**Presentation:**
Hx: Progressive weakness, collapse, inappetance, vomiting, discoloured urine
Cx: anemia, dyspnoea, icterus, pulmonary thrombo-embolism, heart murmur

**Subtypes:**
1. *Primary*: Idiopathic
2. *Secondary:* immunoglobulin targeting of RBC-attached antigens (neoplasms; infectious agents; parasites; evenomations; drugs)

**Dx:**
Bloodsmear - polychromasia; *spherocytes* are a hallmark finding
Hematology - Regenerative anemia; elevated WCC (band neutrophils), low platelets (concurrent IMTP)
ISA - only positive in 42-66% of cases

**Rx:**
1. IVFT/Blood transfusion:
   a. Volume of blood = (Desired Ht – Patient Ht)/Donor Ht X 90 X Weight
   b. Aim for a Desired Ht of 20-25%
   c. Piggy-back blood on Saline (NOT Ringers), change fluids to RLS afterwards
2. Corticosteroids:
   a. Prednisone/Prednisolone @ 1-2mg/kg po q12h - *DO NOT TAPER TOO QUICKLY* - some animals need to stay on therapy for *up to 8 months*
   b. Dexamethasone @ 0.15-0.25mg/kg iv q12h
3. Gastric protectants:
   a. Omeprazole @ 1mg/kg po q12h (slightly higher)
   b. Famotidine @ 0.5mg/kg iv/po q12-24h
4. Antithrombotic:
   a. Anticoagulant: Low-MW Heparin @ 150iu/kg sc q8-12h; Regular Heparin @ 150-300iu/kg q6-8h
   b. Antiplatelet: Clopidogrel @ 1-2mg/kg po q24h
5. Adjunctive immunosuppressants:
   a. Azathioprine @ 2mg/kg po q24h x10d; then q48h (dogs only)
   b. Cyclosporine @ 5mg/kg po q12h
   c. Mycophenolate @ 10mg/kg po q12h
   d. Leflunomide @ 2-4mg/kg po q24h (dogs only)

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# Congestive Heart Failure (CHF)

**Presentation:**

*Hx:* Coughing (dogs), exercise intolerance, syncopal episodes

*Cx:* Coughing (dogs), *tachypnea*, dyspnea, pale mucous membranes, extended capillary refill time, hypothermia, *heart murmur*, delayed/weak femoral pulses, arrhythmia

- LEFT SIDED FAILURE: pulmonary edema (lung crackles)
- RIGHT SIDED FAILURE: ascites; pleural effusion (however PE occurs with both *left & right* sided failure in cats)

**Dx:**

1. Radiographs:
   - *enlarged cardiac silhouette* = the average *VHS* in the dog is 9.7 v (range *8.5 - 10.5* v)
   - *pulmonary edema* = *alveolar-interstitial* infiltrate (*perihilar/R caudal* lobes usually affected)
2. Echocardiogram: usually only conducted by a skilled technician (i.e. specialist)
3. Electrocardiogram: when arrhythmias are present
4. Serum NT-Pro-BNP: if available, can distinguish primary respiratory vs cardiogenic dyspnea

**Rx:**

1. O2 supplementation: To improve hypoxia, place animal in an O2 tent
2. Diuretic:
   a. Furosemide: (first choice in acute/decompensated heart failure)
      i. Start @ 2-4mg/kg iv/im
      ii. If respiratory rate does NOT improve, repeat that dose in 45-60 minutes
      iii. If respiratory rate improves, reduce to 1-2mg/kg q1-6h (lower doses at more frequent intervals are preferred as furosemide has relatively short-lived effects)
3. Inotropes:
   a. Dobutamine: @ 2-15mcg/kg/min; for systolic dysfunction + reduced cardiac output (i.e. *persistently low BP)*
   b. Pimobendan: @ 0.25mg/kg q12h; for *valvular insufficiency* and *DCM cases* (CHRONIC)
4. Reduce stress:
   a. Environment: minimal restraint, reduce ambient noise/excitement etc.
   b. Anxiolytic:
      i. Midazolam @ 0.15mg/kg im/iv (only if needed)
      ii. Buprenorphine @ 0.01mg/kg sc/iv (if further sedation required)

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# Dyspnea

**Patterns:**

1. Obstructive: LONG respiratory cycles with increased EFFORT (inspiratory vs expiratory) - this pattern is due to narrowing of airways (*upper airway* vs *lower airway*); if there is fixed obstruction dyspnoea will be present in both phases
2. Restrictive: SHORT, SHALLOW, RAPID breaths - this pattern is due to inability of the lungs to expand (due to *pulmonary parenchymal* disease or *pleural space* disease)
3. Hypoventilation: reduced CHEST WALL movement or FISH MOUTH breathing - this pattern is seen with chest wall trauma or neuromuscular disorders

**Presentation:**

- *Nasal:* stertor, sneezing, dyspnoea improves with open mouth breathing
- *Upper airway:* stridor, hyperthermia, inspiratory wheezes
- *Obstructed airway:* gasping, dyspnoea on inspiration + expiration
- *Tracheal collapse:* honking cough, terminal retch
- *Lower airway:* cough, expiratory wheezes, abdominal effort, abducted elbows
- *Pulmonary parenchyma disease:* rapid breathing, abdominal effort, crackles, harsh lung sounds
  - Pneumonia: fever, nasal discharge, harsh lung sounds
  - Cardiogenic oedema: heart murmur, arrythmia, pulse deficitis, crackles
- *Pleural space disease:* diminished breath sounds (ventral = fluid; dorsal = air)
- *Thoracic wall disease:* paradoxical breathing, visible trauma

**Management:**

1. Secure the airway: (this must be done immediately for a severely dyspnoeic animal that is *unable to move air* +- panicking/cyanotic)
   a. Endotracheal intubation (use a smaller tube if necessary) & ventilate/oxygenate (ambu-bag)
   b. Emergency tracheostomy is indicated if intubation is not possible due to an UA obstruction
2. O2 supplementation:
   a. Pulse oximetry can help assess flow rate required
3. Sedation: *(stress must be controlled)*
   a. Butorphanol @ 0.1-0.4 mg/kg im/iv (OR Buprenorphine @ 0.01-0.02 mg/kg im/iv)
   b. Midazolam @ 0.15-0.2mg/kg im/iv (add in severely stressed animals)
4. Temperature: keep an eye on this, start cooling measures if needed
5. Investigation:
   a. Chest radiographs – always do a dorsoventral view FIRST (*sternal recumbency is the safest*) to assess type/location of pathology before deciding on appropriate lateral views
   b. Oral/pharyngeal exam - may require sedation (if FB suspected)

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# Dyspnea

**OTHER MEASURES TO CONSIDER:**

a. Upper airway - nebulise
b. Lower airway - bronchodilators, corticosteroids
c. Pulmonary parenchyma
    i. Pneumonia - antibiotics (amoxiclav + enrofloxacin)
    ii. Cardiogenic oedema - diuretics (furosemide)
d. Pleural space disease - thoracocentesis/chest tube + drain
e. Thoracic wall disease - penetrating chest wounds (cover/bandage); surgery (flail chest)

**Thoracocentesis:** (indicated for pleural effusion)

- Thoracocentesis is usually performed at the *7th or 8th intercostal space* unless radiography or ultrasonography indicates otherwise. To identify the 7th or 8th intercostal space, count cranially from the most caudal intercostal space which is the 12th.
- The site of needle insertion is:
    i. Half way up the thoracic wall if both pleural air and fluid are present
    ii. In the *ventral third* of the thorax if only pleural *fluid* is present
    iii. In the *dorsal third* of the thorax if only pleural *air* is present.
- Advance the needle slowly into the pleural space. Once the needle is through the skin, turn the 3-way stopcock to the 'on' position and apply slight negative pressure. If air or fluid enters the syringe, the needle is in the pleural space.
- As soon as the pleural space is entered, direct the tip of the needle to lie parallel to the thoracic wall to minimize the risk of pulmonary lacerations.
- Turn the 3-way stopcock to the 'on' position and drain the pleural space of fluid or air. Excessive negative pressure should be avoided. Fluid or air can be expelled from the syringe when full, after closing off the 3-way stopcock to the pleural space.
- Drainage is complete when no further fluid or air can be drained, or when the veterinary surgeon can feel the lung rubbing against the tip of the needle.

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# FLUTD (Obstructed)

**Presentation:**
Frequent attempts at urination, squatting for long periods with little or no urine produced, bladder is full, hard and inexpressible

**Dx:**
Full UA, biochemistry, electrolytes & radiographs/US (to check for uroliths/neoplasia)
NB: Post-renal azotemia, shock, hyperkalemia, hypothermia, hypocalcemia – death within 3-6 days if left untreated

**Rx:**

1. Aggressive IVFT: RLS vs 0.9% NaCl - dependent on electrolyte profile - RLS is alkalinising vs NaCl which has no K - clinician's decision (*NB: Insulin cannot be given iv with RLS, only saline*); lukewarm fluids are ideal for hypothermic patients; NOTE: Cats are less tolerant of high rates of fluids - monitor and adjust
2. Cystocentesis (if overdistended): Use a 21g needle (1.5inch) attached to intravenous extension tubing, a 3-way stop-cock and a syringe; this allows decompression without repeated puncturing of the bladder wall. Remove as much urine as possible to avoid leakage.
3. Correct hyperkalemia:
    a. *10% Calcium Gluconate*: Doesn't lower K but antagonises effects at muscle. Lasts 20 - 30min. 0.5 - 1.5 ml/kg IV at a rate of 1ml/min (slowly)
    b. *If hypoglycemic:* Add dextrose to isotonic fluids to create a 2.5-5% solution (50ml of dextrose 50% into 1l bag = 2.5% solution); for severe hypoglycemia: SLOW iv bolus 1ml/kg dextrose 50% (diluted 1:1 with 0.9% Saline) - dextrose induces endogenous insulin release, which pushes K intracellularly
    c. *If normoglycemic:* Short-acting insulin (Novorapid) @ 0.2iu/kg iv/im; dextrose should then be added to the intravenous fluids to produce a 2.5-5% solution, and blood glucose should be monitored
4. Sedation:
    a. Stable: Diazepam (0.2-0.3mg/kg iv) + Morphine (0.02mg/kg iv/sc) + Ketamine (0.5-1mg/kg iv/im)
    b. Compromised: Diazepam (0.2-0.3mg/kg iv) + Morphine (0.02mg/kg iv/sc) + Alfaxalone @ 2-5mg/kg iv + top-up boluses of 1-1.5 mg/kg q10min

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# FLUTD (Obstructed)

5. Catheterization:

   Extrude the penis by applying gentle pressure each side of the prepuce with two fingers. Gently introduce the catheter into the urethra. To allow safe advancement of the catheter, the prepuce and penis should be grasped and pulled in a caudal direction to straighten out the penile and membranous urethra. As soon as the catheter tip enters the urethra, flush several times with saline/lube mix + retropulse gently + slowly advance the catheter as the obstruction is passed. As soon as urine appears in the catheter hub, advance the catheter 1 cm further. Remove stylet if present. Carefully suture/tape in place. Keep catheter in to monitor urine output + sediment if re-obstruction is a risk. Only remove in 48-72 hours. (closed system = catheter + intravenous tubing [e.g. admin set] + empty drip bag)

6. Pain Management:

   Buprenorphine @ 0.02mg/kg sc q6h; (NB: NSAIDs are contraindicated in azotemic cases)

7. Nursing:

   Liz collar, empty + measure urine regularly, flush catheter; keep in hospital 24 hours post-catheter removal to ensure comfortable urination before discharge, RC blu-care crystals TGH, Hill's c/d stress diet TGH

**OTHER MEASURES TO CONSIDER:**

1. Antibiotics: only if infection present, ideally based on culture & sensitivity
   a. broad-spectrum cover: Amoxiclav @ 8.75-25 mg/kg iv q8h sc q24h
2. Calcium gluconate: for K-induced bradycardia - 10% calcium gluconate @ 0.5–1.5 ml/kg is given slowly over 15-20 minutes (only in cases with severe life threatening hyperkalemia)
3. Complications:
   a. Urethral spasm – rx: Prazosin (0.25-0.5mg/cat po q12h x 5-7 days then wean) – keep on fluids if using this drug
   b. Detrusor atony – rx: Bethanecol (2.5-5 mg/cat po q12h – start low and titrate upwards). Keep bladder as empty as possible.

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# Chronic Kidney Disease (CKD)

**Presentation:**

*Hx:* Weight loss, hypo/anorexia, vomiting, PU/PD, lethargy, halitosis

*Cx:* Dehydration, poor BCS/MCS, pallor, uremic ulcers, abnormal kidney palpation, retinal bv torsion/hemmorrhage or detachment (indicative of systemic HT)

**Dx:**

- *Confirm:*

Stage 1&2: (one or more of the following – usually no cx signs yet – incidental finding)

1. Consistent elevations in serial creatinine readings & in serial SDMA readings (but both WNR)
2. Persistently elevated SDMA (>14 ug/dL)
3. Abnormal kidney imaging (size on rads/internal appearance on US)
4. Persistent renal proteinuria (>0.5 in dogs; >0.4 in cats)

Stage 2-4: (BOTH of the following)

1. Increased SDMA and creatinine concentrations (always interpret in light of hydration status and MCS)
2. Low SG <1.030 in dogs; <1.035 in cats (USUALLY isosthenuric)

- Stage*:*
  - Check BP/UPC
  - Check IRIS (iris-kidney.com)
- *Other:*

Uremia, Hyperphosphatemia, Hypoalbuminemia, Hypokalemia, Hyperkalemia (rare), Hypercalcemia, Non-regenerative anemia, High T4 (cats), UA - pyuria/bacteriuria, RTE cells, casts

**Rx:**

1. Azotemia/Dehydration: IVFT – RLS: rate based on px presenting *FLUID DEFICIT*
2. Antinausea: Maropitant @ 1mg/kg sc q24h
3. Stomach protectants: (for suspected GI bleeds) Omeprazole @ 0.7mg/kg po q24h; Pantoprazole @ 1mg/kg iv q24h
4. Normalise potassium:
   a. Hypo – supplement according to deficit (see appendix 1)
   b. Hyper – relatively uncommon, but dextrose/insulin can push K intracellularly
5. Phosphate binders: titrate dose according to desired phosphate levels
   a. Aluminium hydroxide (Amphojel) @ 10-30mg/kg q8h (with meals)
   b. Sevelamer (Renvela) @ 30-40mg/kg q8h (1hr before or 3h after other medications)

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# Chronic Kidney Disease (CKD)

6. Antibiotics: only if infection present (i.e. pyuria/bacteriuria), ideally based on culture & sensitivity
    a. broad-spectrum, kidney-safe cover: Amoxiclav @ 8.75mg/kg iv q8h sc q24h
7. Hypertension: reduce over time; delay therapy until px is stabilised
    a. Cats: Amlodipine @ 0.625-1.25mg po q24h
    b. Dogs: Amlodipine @ 0.05-0.1mg/kg q12-24h; Benazepril @ 0.25-0.5mg/kg po q12-24h
8. Proteinuria: delay therapy until px is stabilised
    a. Cats: Telmisartan (Semintra) @ 1mg/kg po q24h (monitor K,HT,urea/creat if using *with* ACEi)
    b. Dogs: Telmisartan (Semintra/Micardis) @ 0.5-1mg/kg po q24h (monitor K,HT,urea/creat if using with ACEi)
9. Anemia:
    a. Darbopoetin (Aranesp) @ 0.25-0.5ug/kg sc q7d until Ht = 30%; then q14d until Ht = 40%; then q21d
10. Appetite stimulant:
    a. Mirtazipine: CATS - 1.88mg/dose po q48-72h; DOGS - 0.6mg/kg po q24-48h
    b. Cyproheptadine: CATS - 1-2mg/dose po q12h
11. Kidney diet: never introduce in a hospital setting – only once px is discharged; transition over a long period to ensure it is successful – the longer the transition, the less the chance of rejection (3-4 weeks if needed)
12. Periodic rehydration: Oupatient sc fluids – long term measure for end-stage patients who dehydrate easily; can teach owners to do at home

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# Gastric Dilation-Volvulus (GDV)

**Presentation:**
Large breed dog, dry dog feeds, overfeeding, rapid eating, OID feeding, retching with an inability to vomit, SEVERE abdominal distention with tympany, shock, tachyarrythmias, hyperthermia, poor peripheral perfusion

**Dx:**
Radiograph – boxing glove stomach (seldom necessary); blood glucose; electrolytes

**Rx:**

1. Aggressive IVFT:
    a. Crystalloid Fluids: place 2 large bore catheters, give RLS @ 20ml/kg as fast as possible *(before decompression)*
    b. Voluven: 5-20ml/kg over 15-30 minutes once haemodynamically stable
2. Analgesia/Sedation: use opiates/benzodiazepines
    a. Morphine @ 0.1-0.4 mg/kg iv q4h
    b. Midazolam @ 0.2-0.5 mg/kg iv once off
3. Antibiotics:
    a. Ampicillin @ 20mg/kg iv q6h or Amoxiclav @ 8.75-25mg/kg iv q8h
    b. Metronidazole @10-15mg/kg iv q12h (in severe cases of sloughing/necrosis)
4. Anaesthetize: GA - induce with Propofol @ 1-4mg/kg iv + incl. cuffed endotracheal intubation
5. Decompress:
    a. *Gastric lavage:*
        i. Mark the distance from the animal's nose to its 11th rib on the stomach tube
        ii. Insert the lubricated stomach tube into the animal's mouth, down the oesophagus and into the stomach (rotating the stomach tube gently about its long axis may aid passage through the gastro-oesophageal junction)
        iii. Smell/listen at the end of the tube for fetid-smelling gas/bubbling to ensure you are in the stomach (depending on the gas distension, you may be able to palpate the other end of the tube in the stomach)
        iv. Instill warmed water through the tube & agitate the animal's stomach manually
        v. Allow the fluid to drain out of the stomach tube, by lowering the tube and the animal's head
        vi. The procedure should be repeated until the fluid returned is relatively clear

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# Gastric Dilation-Volvulus (GDV)

b. *Trocharisation* (if tube is not able to pass): Use a 14-16g needle at the point on the *right abdominal wall* where the most tympany is heard (after percussion); the procedure should produce a hissing sound associated with a release of fetid-smelling gas through the needle

6. Gastropexy: surgery should be done as soon as possible to de-rotate stomach and affix it in the normal position (ideally within 1-2 hours of presentation)
7. Perioperative considerations:
   a. Hypokalemia – check level and supplement (see appendix 1)
   b. Hypoglycaemia – check level and supplement (see appendix 1)
   c. Hypomagnesemia – for persistent weakness, anorexia + refractory hypokalemia/hypocalcemia
   d. Tachyarrhythmia – Lidocaine @ 2mg/kg iv bolus then CRI @ 0.025-0.1mg/kg/min
   e. Gastric ulceration – Pantoprazole @ 0.7mg/kg iv q24h; Omeprazole @ 0.7mg/kg po q24h
   f. Recurrent bloating – Metoclopramide CRI @ 1-2mg/kg/day
   g. Offer food (in a slurry) approx. 12 hours post-op (if not vomiting)

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# Gastrointestinal Obstruction

**Presentation:**

*Hx:* vomiting, anorexia, depression

*Cx:* abdominal pain, palpation of the object/mass, dehydration, shock, endotoxemia, perforation, gut necrosis, peritonitis

**DDx:**

Foreign object, mass, linear foreign body, intussuseption, volvulus/torsion, trichobezoar

**Dx:**

- Radiographs (with/without contrast) - small-bowel lumen should not exceed the diameter of *twice the width of a rib* or be greater than *1.6 times the height of the fifth lumbar vertebra*
- U/S - intestinal diameter enlargement of the *jejunum* > *1.5 cm* suggests an obstruction
- Chemistry + Electrolytes - hypoglycemia, hypokalemia, hyponatremia, hypochloremia, hypoalbuminemia

**Management:**

1. Fluid & Electrolyte replacement: according to deficit (see appendix 1)
2. Endoscopy: May be an option if location of obstruction is proximal and equipment is available
3. Exploratory Laparotomy:
    a. Pre-medication/Induction:
        i. Midazolam @ 0.2mg/kg iv/im + Buprenorphine @ 0.01-0.02mg/kg iv/sc (avoid NSAIDs until hydration/shock is resolved); induce with Propofol @ 1-4mg/kg iv
    b. Gastrotomy:
        i. Make the gastric incision in a *hypovascular* area of the ventral aspect of the stomach
        ii. Close the stomach with *4-0 or 3-0 absorbable* suture material
        iii. Close the stomach with a *two-layer inverting* seromuscular suture pattern
    c. Enterotomy:
        i. Make the incision into the intestinal lumen on the *antimesenteric* border, in the healthy-appearing tissue *distal* to the foreign body
        ii. To close, use a *monofilament, absorbable* (e.g. Maczyn) suture material *4-0 or 3-0* with a swaged-on round *taperpoint* needle
        iii. To close, place *simple-interrupted* sutures through *all layers* of the intestinal wall, 2 mm from the edge and 2 to 3 mm apart with extraluminal knots

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# Gastrointestinal Obstruction

d. Enterectomy:
    i. Recommended for removing ischemic, necrotic, neoplastic or fungal-infected segments
    ii. In animals with peritonitis, consider using a more *slowly* absorbable monofilament suture
    iii. After suture placement, inspect the anastomosis and check for leakage with saline
e. Biopsies:
    i. Always obtain gastric, small-intestine (duodenum, ileum, jejenum), liver and lymph node biopsies even if they appear normal
    ii. Obtain biopsies of any other organ that looks grossly abnormal
f. General:
    i. Omentum or serosal patch may be placed to reinforce suture line
    ii. Change gloves and surgical instruments before abdominal lavage and closure to minimize contamination

4. Post-op care:
    a. NPO: 6-12h post enterotomy; 12h post enterectomy
    b. Antibiotics (prophylatic - in severe cases/spillage): Ampicillin 10-20mg/kg iv q6-q8h OR Amoxiclav @ 8.75-25mg/kg iv q8h
    c. Gastric protectantants: Pantoprazole @ 0.7mg/kg iv q24h or Omeprazole 1mg/kg BID
    d. Antiemetics: Maropitant @ 1mg/kg sc q24h; Metaclopramide @ 0.2-0.4mg/kg iv/sc q6h (prokinetic)
    e. Consider a feeding tube in severely debilitated patients (low albumin is a risk factor for dehiscence)
    f. Monitor for signs of dehiscence/peritonitis @ 3-5d post-op (temperature, vomiting, intra-abdominal fluid, pain etc.)
    g. Monitor for ileus (inappetance, vomiting, no stool)

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# Gastroenteritis

## Vomiting

**CAUSES:** Diet, parasites, infection, toxins, drugs, liver, kidney, pancreas, bloat, FB, intussusception

**Rx:**

1.ACUTE: Systemically well case
   a.Cerenia @ 1mg/kg sc q24h
   b.Deworm (Drontal)
   c.Small bland meals fed frequently (Hill's i/d or RC Gastrointestinal)
2.CHRONIC: Full work up
   a.IVFT
   b.Anti-emetics (Cerenia, add Clopamon @ 1-2mg/kg/day CRI once FB ruled out)
   c.Abx (pyrexia, left shift neutrophilia) – Ampicillin 10-20mg/kg iv q6-q8h OR Amoxiclav @ 8.75-25mg/kg iv q8h or sc q24h
   d.Sucralfate @ 500mg/dog (<20kg) or 1-2g/dog (>20kg) po q6-8h; 250mg/cat po q8-12h – for reflux oesophagitis  or Omeprazole 1 - 2mg/kg BID
   e.Treat underlying cause

## Diarrhoea

**CAUSES:** Worms, dietary indiscretions, drug-induced, toxins, infections, metabolic disorders, intestinal obstructions (acute); malassimilation syndrome, PLE, IBD, Addisons (chronic)

**Rx:** (acute)

1.Small bland meals fed frequently (Hill's i/d or RC Gastrointestinal)
2.Oralade/Prolyte if outpatient (IVFT if severe fluid loss)
3.Pre/probiotic/anti-diarrheal paste – Diomec po q12h
4.Deworm (Drontal)
5.Abx (pyrexia, left shift neutrophilia) – Ampicillin @ 10-20mg/kg q6-q8h OR Amoxiclav @ 8.75-25mg/kg iv q8h or sc q24h

**Rx:** (chronic = lasting more than 2/3 weeks)

Characterise phenotype– large vs small bowel and start appropriate work up

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# Gastroenteritis

## Acute Hemorrhagic Diarrhoea Syndrome (AHDS)
### Previously Haemorrhagic Gastroenteritis (HGE)

**Presenting:**
Toy breeds, strawberry jam diarrhoea, sometimes vomiting (with/without blood)

**Dx:**
Ht usually above 60%, but dx usually based on clinical exam

**Rx:**
1.Fluid replacement = high rates initially = RLS @ 1.5-2x Maintenance or fluid boluses
2.Address hypokalemia/hypoglycemia
3.Antibiotics (if signs of sepsis i.e. pyrexia/left shift neutrophilia/anorexia)
    a.Ampicillin 30mg/kg iv q8h; Amoxiclav @ 8.75-25mg/kg iv q8h or sc q24h
    b.Enrofloxacin 10mg/kg iv q24 (dilute and give slowly)
4.Anti-emetics
    a.Cerenia @ 1mg/kg sc q24h
    b.Clopamon @ 1-2mg/kg/day CRI
5.Pre/probiotic/anti-diarrhoeal paste: Diomec po q12h
6. Diet: Hill's i/d or RC Gastrointestinal
7. With recurrent AHDS always rule out Addisons and worms.

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# Parvoviral Enteritis

**Presentation:**

Hx: puppies (under 1 year old); usually unvaccinated, incomplete vaccinations OR large gaps in vaccinations

Cx: lethargic, anorexic, vomiting, diarrhea (bloody or otherwise)

**Dx:**

IDEXX/Rapid CPV snap test

Blood smear, fecal float - on admission

Ht, TP, blood glucose, electrolytes - *monitor daily*

**Rx:**

ISOLATION:

1. IVFT: Crystalloids (RLS) + Voluven/Plasma in hypovolemic/hypoalbuminemic cases (base rate on fluid deficit at presentation + ongoing losses)
2. Supplementation: add dextrose and potassium to drip based on deficit,(NB: check magnesium levels if potassium doesn't return to normal)
3. Antibiotics:
   a. Ampicillin @ 22mg/kg iv q8h; Amoxiclav @ 8.75-25mg/kg iv q8h
   b. Metronidazole @ 10-15mg/kg SLOW iv q12h (can be added for profuse hemorrhagic diarrhea). Continue for 2 days post resolution.
4. Anti-emetics
   a. Metaclopramide @ 1-2mg/kg/day – work out the CRI; use a drip pump (also pro-kinetic)
   b. Maropitant (Cerenia) @ 1mg/kg (= 1ml/10kg) sc q24h
   c. Ondansetron @ 0.3-0.5mg/kg iv q8h (for refractory nausea)
5. Analgesia:
   a. Buprenorphine @ 0.02mg/kg iv q6h
   b. Paracetamol (Perfalgan) @ 10mg/kg iv q12h
6. Antiparasitic:
   a. Panacur @ 1ml/kg po q24h x 5 days (Quantel/Drontal if larger dog).
   b. Can add Baycox for coccidia @1ml/5kg
7. Antidiarrheal: Diomec po q12h
8. Gut protectant: Pantoprazole @ 0.7-1mg/kg iv q12h (for melena/hematemesis) or Omeprazole @ 1mg/kg BID
9. Nutrition:
   a. Microenteral feeding (place nasogastric tube): Oralade/Nutribound/RC liquid diets/Hill's a/d
   b. Tube/syringe feeding: feed small amounts frequently of high energy soft food (i.e. Hill's a/d OR RC Recovery tins)
10. Nursing: Keep px clean, warm and comfortable; monitor abdomen for signs of intussuseption; biosecurity - bath in F10 shampoo before discharge

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# Pesticide Poisoning (organophosphate/carbamate)

**Presentation:**

Hx: ingestion of black granules

Cx: *SLUDDE* - salivation, lacrimation, urination, diarrhea, dyspnea, emesis

ALSO: miosis, bradycardia, muscle tremors, seizures, bronchial secretions (carbamate), death due to respiratory failure

**Rx:**

1. Atropine (parasympatholytic): to reverse *muscarinic* effects (SLUDDE/miosis/bradycardia)
    a. 0.1 – 0.5 mg/kg to effect (give quarter dose iv, give the rest sc/im)
2. Pralidoxime chloride: to control *nicotinic* signs (tremors/weakness/paralysis) - only use in OPP toxicity as it would not be beneficial in carbamate toxicity
    a. 20mg/kg im/sc/SLOW iv q12h, if no improvement after 3 doses – discontinue
3. Seizure control:
    a. Diazepam @ 1-2mg/kg iv (repeat up to 3x as needed) = 2-4ml/10kg
    b. Phenobarbital @ 2-5mg/kg iv bolus; repeat 20 mins later if needed
    c. Methocarbamol (for tremors) @ 20-45mg/kg po q8h
4. Respiratory assistance (if needed):
    a. O2 supplementation
    b. Mechanical ventilation (endotracheal intubation + ambu-bag)
5. Decontamination: (only attempt once life threatening hemodynamic, neurologic or respiratory abnormalities have been addressed)
    a. Induce emesis (in asymptomatic animals with confirmed ingestion)
        i. Dogs: Apomorphine 0.03mg/kg iv or crush 1/4 -1 tablet, place in a syringe (without a needle), dissolve with a few drops of saline, and administer into the conjunctival sac (reverse with naloxone 0.04mg/kg iv if needed)
        ii. Cats: Xylazine 0.44mg/kg im (reverse with yohimbine 0.1-0.25mg/kg slow iv after vomiting is complete)
    b. Gastric lavage (for ingestion of a large amount of poison OR when emesis is contra-indicated, i.e. animal not fully conscious)
    c. Dermal exposure: Wash with dishwashing liquid, rinse thoroughly and dry
    d. Activated charcoal: 1-2g/kg initially, repeat in 8 hours (half the dose), continue for 8 treatments in total.
6. Supportive: Fluid therapy (RLS)
7. Nursing: Tube/syringe feeding (if needed), thermoregulation

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# Rodenticide Toxicosis (anticoagulant)

**Presentation:**

Animals usually present *asymptomatically* after owners witness ingestion of the toxin, however, if not treated; they will present within 4-7 days of ingestion with generalized hemorrhage, pale mucous membranes, hematomas, anorexia, lethargy, swollen joints, melena/hematochezia, tachycardia, dyspnea, weakness or sudden death

**Management:**

A. NO OVERT CLINICAL SIGNS

1. Decontamination (recent ingestion):
    a. Induce emesis
        i. Dogs: Apomorphine 0.03mg/kg iv or crush 1/4 -1 tablet, place in a syringe (without a needle), dissolve with a few drops of saline, and administer into the conjunctival sac (reverse with naloxone 0.04mg/kg iv if needed)
        ii. Cats: Xylazine 0.44mg/kg im (reverse with yohimbine 0.1-0.25mg/kg slow iv after vomiting is complete)
    b. Activated charcoal @ 1-2g/kg po + Lactulose @ 0.5-1ml/kg po
2. Assess PT/PTT: (PT increases first and is more sensitive than PTT)
    a. Do baseline and @ 48 and 72 hours
    b. If normal @ 72 hours - no further rx necessary
    c. If elevated - follow Vitamin K1 protocol specific to type of rodenticide (see below)
3. Vitamin K1: (give with high fat food)

    *No proof that injectable superior to oral so can go straight to oral.*

    a. Known *1st generation* coumarin (warfarin) toxicity: initially 2.5mg/kg sc in several sites, then 1–2.5mg/kg po q8–12h for 5–7 days
    b. Known *2nd generation* coumarin (brodifacoum) toxicity: initially 5mg/kg sc in several sites, then 2.5mg/kg po q12h for 3 weeks, then re-evaluate coagulation status. If PT is elevated 48 hours after last dose, resume vitamin K1 treatment for 1 more week, and then remeasure PT 48 hours after last dose. The patient's activity should be restricted for 1 week following treatment. Evaluate the coagulation status 3 weeks after cessation of treatment
    c. Known *inandione* (diphacinone) or *unknown* anticoagulant toxicity: initially 2.5–5mg/kg sc over several sites, then 2.5mg/kg po divided q8–12h for 3–4 weeks. Re-evaluate PT 48 hours after stopping therapy. If PT is elevated, continue therapy for 2 additional weeks. If not elevated, repeat PT in 2 days. If normal, the animal should be rested for 1 week, then retested; if abnormal then continue therapy for an additional week and re-evaluate PT as before

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# Rodenticide Toxicosis (anticoagulant)

B. HEMORRHAGING PATIENTS

1. IVFT/Blood transfusion/FFP: (to replace *red blood cells* AND *clotting factors*)
    a. Volume of blood = (Desired Ht – Patient Ht)/Donor Ht X 90 X Weight
    b. Aim for a Desired Ht of 20-25%
    c. Piggy-back blood on Saline (NOT Ringers), change fluids to RLS afterwards
2. Vitamin K1: (see above)
3. Thoracocentesis: Hemothorax patients may need fluid drained out of the chest to assist with restrictive respiration, this blood volume will need to be replaced via transfusion
4. O2 therapy: for dyspneic patients
5. Nursing: Thermoregulation, confinement/cage-rest to avoid trauma

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# Seizures

**Presentation:**

1. Grand mal: Loss of consciousness, diffuse uncontrollable tremoring
2. Partial: No loss of consciousness, involves localized parts of the body (e.g. chewing gum seizures)
3. Status Epilepticus: Grand mal seizure activity lasting 5 min or longer OR repeated grand mal seizure activity with no return of normal function in between.
4. Cluster: 2 or more seizures within a 24 hour period

**Management:**

1. *Anti-epileptics*
    a. Benzodiazepines are used for emergency management of seizures; repeat up to 3 times if necessary
        - Midazolam @ 0.1-0.3mg/kg iv or 0.2-0.5mg/kg im
        - Diazepam @ 0.5-1mg/kg iv/intranasal/per rectum = *1-2ml/10kg*
    b. Follow up with a 2nd tier anti-epileptic (longer acting)
        - Phenobarbital @ 4-6mg/kg iv/po (repeated q30-120mins until a loading dose of 16-24mg/kg is achieved)
        - Keppra (Levetiracetam) should be used for cluster seizure episodes @ 30mg/kg po q6-8hr for the duration of the cluster (usually 48-72hrs)
    c. If seizures are refractory, anaesthetic agents will need to be considered:
        - Propofol should be used first: Bolus @ 1-4mg/kg; then CRI of 0.1-0.6mg/kg/min
        - Pentobarbital @ 3-15mg/kg iv; then CRI of 0.5-4mg/kg/hr
        - Ketamine @ 5mg/kg iv; then CRI of 5mg/kg/hr
2. Take the *temperature* and start passive cooling techniques if temp is over 40 degrees (stop once 39 degrees is reached)
3. Check *blood glucose* + *electrolytes* and supplement if necessary
    a. Hypoglycemic: 50% dextrose @ 0.5g/kg = *1ml/kg* (bolus diluted 1:1 with 0.9% saline given SLOW iv or as an infusion)
    b. Hypocalcemic: 10% calcium gluconate @ 0.5-1.5ml/kg SLOW iv (over 20-30 minutes)
4. Once seizures are under control – extracranial causes should be ruled out, i.e. a *seizure profile* should be run: This includes a Chem 10, NH3, Ca, Ht and UA; always perform a blood smear to check for blood parasites as well and confirm vaccination status and screen for worms.

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# Seizures

5. If extracranial causes are eliminated, we are left with intracranial causes:
    a. *Idiopathic epilepsy* (diagnosis of exclusion: age of onset 6m-6yrs; consistent, intermittent seizure activity)
        - If idiopathic epilepsy is suspected the dog should be started on a loading dose of Phenobarbitone (16-24mg/kg once off) then maintained at 2,5mg/kg BID until bloodwork monitoring (phenobarbitone levels) is done 3 weeks later; then titrate accordingly
        - Pexion (Imepitoin) @ 10 - 30mg/kg BID. More expensive but less follow up blood tests required. It should be considered in animals with severe (sedative) side effects to Phenobarbitone OR with severe liver compromise
        - Adjuncts include Potassium Bromide, Levetiracetam, Zonisamide, Mysoline, etc. but these are added based on clinical requirement
    b. *Structural brain abnormalities* (rule out with MRI)
        i. Usually in older patients (neoplasia) or very young animals (congenital causes)
        ii. Mannitol 0.5-1g/kg or hypertonic saline (7.5% = 4ml/kg; 3% = 5.3ml/kg) administered iv over 15-20 minutes if concerned about increased intracranial pressure
    c. *Meningitis*
        i. Diagnose with MRI and CSF tap
        ii. Treatment dependent on cause - infectious vs steroid responsive etc.

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# Snake Bites

## Puff Adder (Cytotoxic)

**Presentation:**
Swelling and bruising, bite marks

**Rx:**

1. Start IVFT
2. Check baseline Ht/platelet count/ISA
3. Antivenom – polyvalent (administer SLOW iv) – 4/5 vials are usually sufficient
4. Analgesia – Morphine @ 0.1-0.4mg/kg iv q4h or Buprenorphine @ 0.02mg/kg iv/sc q6h
5. Antibiotics if infection/necrosis present or in critically ill px – Amoxiclav @ 8.75-25mg/kg iv q8h or sc q24h
6. Cyclokapron (for platelet consumption/bleeding) @ 15mg/kg iv/po q12h
7. Shave bruised area – warm & cool packing for swelling
8. Monitor urine output (especially around day 3 - renal compromise)
9. Give a blood transfusion if px is deteriorating (check Ht daily)
10. Place tracheostomy tube if upper airway becomes obstructed (due to swelling)

**Night Adder:** IVFT, analgesia and wound management is usually sufficient - NB identification

## Cobra/Mamba (Neurotoxic)

**Presentation:**
Progressive weakness, paralysis, respiratory arrest

**Rx:**

1. Start IVFT
2. Antivenom – polyvalent (administer SLOW iv) the more, the better – ideally up to 8 vials
3. Propofol CRI @ 0.1-0.4mg/kg/min, intubate & start mechanical ventilation (on a respirator)
4. Check eyes: if venom spat into eyes, flush out with saline then apply the following drops (for pain/chemosis/oedema/ulceration): a. Atropine q24h x 5d b. Exocin q4h c. Acular q6h; check fluorescein uptake 48-72h later
5. Tape eyes closed
6. Analgesia – Morphine @ 0.1-0.4mg/kg iv q4h or Buprenorphine @ 0.02mg/kg iv/sc q6h
7. Antibiotics if infection/necrosis present or in critically ill px – Amoxiclav @ 8.75-25mg/kg iv q8h or sc q24h
8. Nursing: turn patient, bladder expression/catheterisation, regularly suction fluid from the ET tube, keep the head down
9. Attempt to wean off propofol CRI after 24 hours if signs improve

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# Intervertebral Disc Disease (IVDD)

**Presentation:**

*Hx*: Acute onset pain, weakness, reluctance to move/jump para/tetra- paresis/paralysis
*Cx*: weakness, ataxia knuckling over on limbs

- Cervical disc: neck pain, carrying head low - guarding, tetraparesis
- Thoracolumbar disc: spinal pain, referred 'abdominal' pain, arched back, reluctance to walk, paraparesis

**Dx:**

1. Neurological exam: (do a *full neuro*, but focus on the following)
    a. Conscious Proprioception - delayed/absent (superficial spinal cord penetration)
    b. Superficial/Deep pain - delayed/absent (deeper spinal cord penetration - prognosis guarded/poor)
    c. Panniculus reflex - loss of reflex = 2 vertebral spaces caudal to the lesion
    d. Bladder/Bowel function - ability to urinate/defecate (hx from O)
    e. Anal/Tail tone
2. Radiographs: (not the best modality to localise IVDD)
    a. Narrowed disc spaces may be seen
    b. Used mainly to rule out fractures, luxations and neoplasia DDs
3. CT/Myelogram/MRI:
    a. Diagnostic, but require referral to specialist facility ($)

**Rx:**

1. Surgery: (refer to a specialist to perform)
    a. Px presenting with *moderate-severe neurological deficits*
        i. non-ambulatory paraparesis
        ii. loss of motor function
        iii. loss of nociception (deep/superficial pain)
    b. Px who have been treated medically but have:
        i. recurrent signs of neurological dysfunction
        ii. persistent spinal pain despite appropriate medical management
        iii. deteriorating neurological signs despite appropriate medical management

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# Intervertebral Disc Disease (IVDD)

2. Medical:
    a. STRICT cage rest for 4-6 weeks despite perceived improvement
    b. Anti-inflammatory (NSAID > Cortisone): Meloxicam @ 0.1mg/kg sc/po q24h (halve the dose in cats)
    c. Analgesia:
        i. Opioids:
            1. Buprenorphine @ 0.02mg/kg sc/iv q6h (for moderate-severe pain)
            2. Morphine @ 0.1-0.4 mg/kg iv q4h (for severe pain)
        ii. Neuropathic pain:
            1. Ketamine @ 0.5mg/kg sc/im q12-24h (initially, for hyperaesthesia/wind-up pain) (Contraindicated in patients with hx of seizures)
            2. Pregabalin (Lyrica) DOGS: @ 4mg/kg po q12h; CATS: @ 1-2mg/kg po q12h or Gabapentin @ 5 - 25mg/kg BID
    d. Muscle relaxant: Methocarbamol @ 15-20mg/kg po q8h (for muscle spasm)
    e. Stomach protectant: e.g. Omeprazole @ 0.7mg/kg po q24h (spinal cord damage can inhibit the autonomic function that normally protects the stomach lining)
    f. IVFT: to maintain spinal cord perfusion
    g. Nursing: bladder expression/catherisation; soft bedding; frequent turning; cleaning
3. Physiotherapy/Alternative:
    a. Tissue massage/stretching/PROM
    b. Hydrotherapy
    c. Underwater treadmill
    d. Infrared light therapy (Photizo Vetcare)
    e. Dry needling

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# Trauma

**Presentation:**
Bite wounds, MVA, fall from heights

**Rx:**

1. Assess = check vitals if dog is stable upon arrival (TPR, mm, CRT, chest auscultation, abdominal palpation)
2. Oxygenate if necessary
3. Stop excessive bleeding (pressure bandages, ligate/suture if necessary)
4. Shock treatment
    a. Dogs SHOCK rates:
        i. RLS = 90ml/kg total dosage - Bolus in increments of 10 - 20ml/kg every 20minutes then reassess and repeat if necessary.
        ii. Voluven = 5-20ml/kg (start at 5ml/kg SLOW iv and then re-assess) - *Only in euvolaemic patients
    b. Cats SHOCK rates:
        i. RLS = 50-60ml/kg total dosage - bolus in increments of 5 - 10ml/kg every 20 minutes then reassess and repeat if necessary.
        ii. Voluven = 5-15ml/kg (start at 5ml/kg SLOW iv and then re-assess) *Only in euvolaemic patients
    c. Monitor temp AND fluids while rewarming – normothermic animals may become fluid overloaded if fluid given while hypothermic
5. Analgesia
    a. Opioids (Buprenorphine @ 0.02mg/kg iv/sc q6h or Morphine @ 0.1-0.4mg/kg iv q4h)
    b. Paracetamol @ 10mg/kg iv/po q12h (NB - NEVER IN CATS)
    c. Ketamine @ 1mg/kg sc/im q12-24h (contraindicated in patients with hx of seizures)
    d. NSAIDs (various; do not use if in px is in shock/dehydrated)
6. Antibiotics if necessary
    a. Amoxiclav @ 8.75-25mg/kg iv q8h or sc q24h then 12.5-25mg/kg po q8-12h (broad spectrum cover). +- Metronidazole/Enrofloxacin depending on source and severity of wounds)
7. Further dx/rx once stabilised (radiographs/ultrasound/wound care/fracture stabilisation etc.)

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# Annex 1: CALCULATIONS

## Potassium supplementation

1. What is the patients potassium?
2. How many vials does the table indicate to spike the drip?
3. Remember a bag of RLS already contains 5meq/L
4. Remember maximum potassium allowed is *0.5meq/kg/hr*

| Serum potassium mEq/L | Potassium supplement/1L (mmol KCl = mEq K) | Max fluid rate in ml/kg |
|---|---|---|
| 3.5 – 5.5 (N) | 20mEq K (1 vial KCl 15% = 20mmol) | 25 |
| 3.0 – 3.4 | 30 mEq K | 18 |
| 2.5 – 2.9 | 40 mEq K | 12 |
| 2.0 – 2.4 | 60 mEq K | 8 |
| <2.0 | 80 mEq K | 6 |

## Glucose supplementation

| Amount of fluid | Amount of 50% dextrose to add: For a 2.5% solution | Amount of 50% dextrose to add: For a 5% solution |
|---|---|---|
| 250ml | 12.5ml | 25ml |
| 500ml | 25ml | 50ml |
| 1000ml | 50ml | 100ml |

## How to calculate a CRI

EXAMPLE: Clopamon CRI Dose = 2mg/kg/24hrs

*Step 1:*

Work out the dose for the animal in mg/24hrs

e.g. For a 20kg dog = 40mg/24hrs

*Step 2:*

Convert that to mg/hr

e.g. 40÷24 = 1,66667mg/ml

*Step 3:*

Choose your fluid rate for a 20kg dog based on the table

e.g. 45ml/hr = maintenance rate

*Step 4:*

Divide mg/hr by ml/hr to get mg/ml

e.g. 1,66667 ÷ 45 = 0,037037mg/ml

*Step 5:*

Multiply by 1000 to get mg/L (1L = 1000ml)

e.g. 0.037037 x 1000 = 37mg/L

*Step 6:*

Divide that by the concentration of the drug (i.e. 5mg/ml for clopamon injectable) to get the amount needed in a 1L RLS bag

e.g. 37÷5 = 7,4ml

**ANSWER = 7,4ml of clopamon into a 1L RLS bag**

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