

PEER REVIEWED

# Internal Medicine Practice Pearls

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## *The Art of Diagnosis*

- *To make the correct diagnosis, we need the right choices.*
- *To consider the right choices, we need the right information.*
- *To obtain the right information, we need to ask the right questions.*
- *Asking the right questions is the hallmark of clinical expertise.*

~ R. Kreisburg, MD

After 25 years of practice, most clinicians come to the conclusion that the practice of medicine is both an art and a science. The main objective of this article is to share some of the lessons I have learned over the years, with the hope that this knowledge will benefit the readers' patients.

For the sake of simplicity, thoughts have been categorized according to:

- **Patient evaluation and care**
- **Fluid administration and medications**
- **Diseases by organ system.**



## GENERAL CLINICAL SIGNS

### FLUID ACCUMULATION: CHEST AND ABDOMEN

Commonly indicates a serious disease, such as neoplasia, heart failure, diffuse inflammation, or hypoproteinemia

### HIGH TEMPERATURE

Temperature > 109.4°F = heat stroke; beware of disseminated intravascular coagulation

- *Fever + immune-mediated disease* = appetite can persist
- *Fever + sepsis* = anorexia

### HYPERVENTILATION

Various causes include cardiorespiratory distress, pyrexia, brain disease, Cushing's disease, metabolic acidosis, anxiety, pain, shock, and anemia

### PALLOR & ICTERUS

Pallor can be caused by hypoxia, shock, anemia, or peripheral vasoconstriction.

- *Anemic pallor + icterus* = yellow mucous membrane color
- *Pink mucous membranes + icterus* = orange mucous membrane color

### SEPTIC SHOCK

Patient typically has hypothermia, thrombocytopenia, and hypotension refractory to intravenous fluid treatment.

## PATIENT EVALUATION & MANAGEMENT

### PATIENT EVALUATION

<b>History</b>	<ul style="list-style-type: none"> <li>• It is all in the history.</li> </ul>						
<b>Physical Examination</b>	<ul style="list-style-type: none"> <li>• Skin turgor is difficult to assess with cachexia and obesity.</li> <li>• Look under the tongue for a linear foreign body in any vomiting cat or dog.</li> <li>• Palpation: “Touch but don’t squeeze the Charmin.”</li> <li>• Have you been palpating each mammary gland for early detection of mammary tumors?</li> <li>• If something “just ain’t right,” consider neurologic disorders.</li> <li>• To detect early signs of weakness, look at the rear limbs for splaying or crossing.</li> <li>• Circumlinear ulcer in frenulum: Consider linear foreign body.</li> <li>• Sudden mental depression 2 to 3 days post enterotomy: Rule out dehiscence and sepsis.</li> </ul>						
<b>Diagnostics</b>	<p><b>The big 6 preliminary tests for assessing ill animals when client funds are limited:</b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">1. Packed cell volume</td> <td style="width: 50%;">4. Glucose</td> </tr> <tr> <td>2. Total protein</td> <td>5. Urinalysis</td> </tr> <tr> <td>3. Blood urea nitrogen</td> <td>6. Chest/abdominal radiographs</td> </tr> </table>	1. Packed cell volume	4. Glucose	2. Total protein	5. Urinalysis	3. Blood urea nitrogen	6. Chest/abdominal radiographs
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2. Total protein	5. Urinalysis						
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<b>Imaging</b>	<ul style="list-style-type: none"> <li>• Every sick or trauma patient should have chest and abdominal radiographs performed on initial evaluation.</li> <li>• Performing abdominal ultrasound without abdominal radiographs will eventually lead to missed information.</li> </ul> <div style="border: 1px solid #0070C0; border-radius: 15px; padding: 10px; margin-top: 10px; text-align: center;"> <p>See <a href="#">Small Animal Thoracic Imaging</a>, September/October 2011, and <a href="#">Small Animal Abdominal Imaging</a>, November/December 2011, available at <a href="http://todaysveterinarypractice.com">todaysveterinarypractice.com</a>.</p> </div>						
<b>Advanced Diagnostics</b>	<ul style="list-style-type: none"> <li>• Don’t just look at a lump—stick it! A lump is a lump until you do so.</li> <li>• Traumatic ear flush can cause inner ear and vestibular disease.</li> </ul>						

### PATIENT MANAGEMENT

<b>Feline</b>	<ul style="list-style-type: none"> <li>• A clean cat is a happy cat.</li> <li>• Cats hate atropine eye drops, which cause marked salivation; use ointment instead.</li> <li>• Do not forget to evaluate cats for thiamine deficiency.</li> <li>• Body bandages in cats cause pseudoparalysis.</li> </ul>
<b>Pediatrics</b>	<ul style="list-style-type: none"> <li>• Don’t forget glucose for neonates.</li> <li>• A heparinized syringe may contain as much as 200 U heparin—too much for puppies and kittens (best not to exceed 150 U or 0.15 U/g).</li> </ul>
<b>Sedation</b>	<ul style="list-style-type: none"> <li>• Senior dogs and cats poorly tolerate tranquilization.</li> <li>• Avoid sedating acutely ill patients unless absolutely necessary.</li> <li>• Don’t sedate at the end of the day unless IV fluid support is provided, especially in senior patients; it is an invitation for renal failure.</li> </ul>
<b>Therapeutics</b>	<ul style="list-style-type: none"> <li>• After therapeutic paracentesis, repeat abdominal palpation so you do not pass the mass.</li> <li>• Rapid abdominocentesis is effective and safe for chronic ascites, except when ascites is caused by chronic liver disease; in these cases simultaneous IV plasma or albumin infusion is recommended.</li> <li>• A heat lamp and rubbing alcohol can ignite the patient.</li> </ul>
<b>Digestive System</b>	<ul style="list-style-type: none"> <li>• Postoperative patients or those with pelvic fractures will appreciate glycerine suppositories.</li> <li>• No Fleet enemas (fleetlabs.com) for obstipation, unless you want to treat a case of hypocalcemia.</li> </ul>
<b>Urinary System</b>	<ul style="list-style-type: none"> <li>• Manually expressing a male dog’s bladder may result in rupture.</li> <li>• Some pathologic bladders can leak after cystocentesis.</li> <li>• Ketamine (3 mg IV) can adequately restrain an ill cat with urethral obstruction.</li> </ul>
<b>End-of-Life Considerations</b>	<ul style="list-style-type: none"> <li>• Many terminal patients will show a burst of movement prior to dying.</li> <li>• Never euthanize based on cytology results because cytologic errors may be as high as 50%.</li> </ul>

SC = subcutaneous; IM = intramuscular; IV = intravenous; U = units

## FLUID ADMINISTRATION & MEDICATIONS

### FLUID & ELECTROLYTES

<b>Administration</b>	<ul style="list-style-type: none"> <li>• If the patient is eating and drinking without excess fluid loss, IV fluids are not needed.</li> <li>• SC fluid administration: Isotonic, 18-gauge needle, gravity flow without positive pressure; 50 mL/site in adult cats</li> <li>• Volume load with isotonic crystalloid.</li> <li>• Rehydrate before inducing diuresis; however, check urine specific gravity first.</li> <li>• Intraosseous cannulas can be life saving.</li> </ul>
<b>Specific Recommendations</b>	<ul style="list-style-type: none"> <li>• All IV maintenance fluids should contain <b>KCl</b> (7–10 mEq/250 mL); exceptions are cases of oliguria and untreated Addison’s disease.</li> <li>• To make 2.5% dextrose solution increments, add:               <ul style="list-style-type: none"> <li>» <b>D-50-W</b> (12.5 mL) to <b>fluids</b> (LRS, NaCl; 250 mL) <i>or</i></li> <li>» <b>D-50-W</b> (50 mL) to <b>isotonic crystalloid</b> (1 L).</li> </ul> </li> <li>• Adult cats:               <ul style="list-style-type: none"> <li>» When IV administration is not an option, manage hypocalcemia by adding <b>10% calcium gluconate</b> (2.5 mL/kg) to <b>0.9% NaCl</b> (150 mL); administer SC Q 12 H</li> <li>» Avoid hypokalemia when administering SC fluids by adding <b>KCl</b> (7 mEq) to <b>LRS</b> (250 mL)</li> </ul> </li> </ul>
<p>See <a href="http://todaysveterinarypractice.com">Resuscitative Fluid Therapy for Circulatory Shock</a>, September/October 2011, available at <a href="http://todaysveterinarypractice.com">todaysveterinarypractice.com</a>.</p>	
<b>Physiologic Conditions</b>	<ul style="list-style-type: none"> <li>• <b>Metabolic alkalosis</b> (usually with hypokalemia) = <math>\text{TCO}_2 &gt; 40</math> mEq/L</li> <li>• <b>Severe metabolic acidosis</b> = <math>\text{TCO}_2 &lt; 10</math> mEq/L (usually)</li> </ul>
<b>Cautions</b>	<ul style="list-style-type: none"> <li>• Be careful with SC fluids: Dogs are not cats; they are prone to sloughing.</li> <li>• Potassium penicillin contains 1.7 mEq K+/million U; take heed when bolusing.</li> <li>• Avoid tissue edema by restricting excess fluids in cases of severe pulmonary, brain, and general trauma.</li> </ul>

D-50-W = dextrose in water (50%); GI = gastrointestinal; IV = intravenous; KCl = potassium chloride; LRS = lactated Ringer’s solution; NaCl = sodium chloride; SC = subcutaneous;  $\text{TCO}_2$  = total carbon dioxide; U = units

## “A dynamic duo: Good science and experience”

### MEDICATIONS

<b>Specific Recommendations</b>	<ul style="list-style-type: none"> <li>• <b>Aminoglycosides</b> should only be administered after rehydration.</li> <li>• <b>Doxycycline &amp; clindamycin</b> tablet administration should be followed by a syringe of water to encourage swallowing and prevent esophageal stricture in cats.</li> <li>• <b>Imipenem</b> should be considered for life threatening infections.</li> <li>• <b>Prednisone</b> will arrest the progression of craniomandibular osteopathy if caught early; extended treatment with alternate day therapy will reverse early changes and impede disease progression.</li> </ul>
<b>Adverse Effects</b>	<ul style="list-style-type: none"> <li>• Consider adverse drug effects when unexpected signs appear following treatment with a new medication.</li> <li>• Prevent anaphylactoid reactions by avoiding IV administration of:               <ul style="list-style-type: none"> <li>» <b>Thiamine</b> (administer IM)</li> <li>» <b>Vitamin K<sub>1</sub></b> (administer SC)</li> <li>» <b>Vitamin B<sub>1</sub></b> (administer SC)</li> <li>» <b>Vitamin preparations</b></li> </ul> </li> <li>• <b>Panmycin</b> (oral tetracycline) can cause fever in cats.</li> </ul>
<b>Interactions</b>	<ul style="list-style-type: none"> <li>• <b>Theophylline &amp; ciprofloxacin:</b> Use together will result in theophylline overdose.</li> <li>• <b>Cimetidine &amp; metronidazole:</b> Cimetidine, a cytochrome P450 inhibitor, enhances metronidazole-induced neurotoxicity.</li> </ul>

SC = subcutaneous; IM = intramuscular; IV = intravenous

## DISEASE BY ORGAN SYSTEM

## CARDIORESPIRATORY DISEASE

<b>Clinical Signs &amp; Disease Identification</b>	<ul style="list-style-type: none"> <li>• Watch for the exaggerated abdominal component of respiration.</li> <li>• <b>Cardiac arrhythmias:</b> Consider digoxin intoxication</li> <li>• <b>Cough in cats:</b> Consider allergic bronchitis, tracheobronchial disorders, flukes, lung worms, heartworms, hair or foreign body in trachea, tumors</li> <li>• <b>Diffuse muffling:</b> Usually caused by chest fluid</li> <li>• <b>Dorsal muffling:</b> Caused by air or mass in chest</li> <li>• <b>Lack of coughing in dyspneic cats:</b> Usually indicates heart disease</li> <li>• <b>Muffled chest sounds:</b> Causes include fluid, air, or mass in chest; obesity; deep-chested conformation; and even the clinician's plugged ears</li> <li>• Many patients die without ever showing open-mouth breathing.</li> </ul> <p style="text-align: center;">See <b>Feline Rhinitis &amp; Upper Respiratory Disease</b>, July/August 2012, available at <a href="http://todaysveterinarypractice.com">todaysveterinarypractice.com</a>.</p>
<b>Diagnostics</b>	<ul style="list-style-type: none"> <li>• <b>Electrocardiography:</b> <ul style="list-style-type: none"> <li>» Cardiomegaly does not always cause tall ECG complexes.</li> <li>» A standing lead 2 ECG is satisfactory for rate, rhythm, and interval measurements.</li> </ul> </li> <li>• <b>Echocardiography:</b> Can be used to diagnose vegetative endocarditis</li> <li>• <b>Imaging:</b> <ul style="list-style-type: none"> <li>» For dyspneic patients, keep the unaffected side "up" (away from the table) when taking radiographs.</li> <li>» Ketamine (3–5 mg IV, total dose) can allow "survival" radiographs in a dyspneic cat.</li> <li>» Minimal radiographic infiltrates: Consider bacterial pneumonia + leukopenia (myelosuppression)</li> <li>» Sudden-onset diffuse pulmonary infiltrates: Consider ARDS</li> </ul> </li> </ul>
<b>Therapeutics</b>	<ul style="list-style-type: none"> <li>• Dispense <b>prednisone</b> and <b>furosemide</b> for the earliest signs of pulmonary thromboembolism in dogs treated for heartworms.</li> <li>• <b>H<sub>2</sub>-blockers</b> alter stomach microbial population, which worsens aspiration pneumonia.</li> <li>• Do not use <b>beta blockers</b> until pulmonary edema resolves.</li> </ul>

ARDS = acute respiratory distress syndrome; ECG = electrocardiography

*"Take the patient out of the cage and look at it!"*



## NEOPLASIA

<b>Clinical Signs &amp; Disease Identification</b>	<ul style="list-style-type: none"> <li>• Bloody, suppurative, mucoid nasal discharge: Produced by nasal cancer</li> <li>• Copious mucoid nasal discharge: Consider nasal adenocarcinoma.</li> <li>• Firm mammary nodule: Assume carcinoma until proven otherwise.</li> <li>• Massive generalized lymphadenopathy: Usually indicates lymphoma.</li> <li>• Cutaneous mast cell tumors can mimic any type of skin growth.</li> <li>• Don't miss lymphangitic inflammatory mammary carcinoma.</li> </ul> <p style="text-align: center;">See <b>What's New in Lymphoma: Cats &amp; Dogs</b>, November/December 2011, available at <a href="http://todaysveterinarypractice.com">todaysveterinarypractice.com</a>.</p>
<b>Diagnostics</b>	<ul style="list-style-type: none"> <li>• Cancer can cause elevated total WBC count and fever.</li> <li>• Mammary tumors: Don't stick them; remove them.</li> <li>• Try gastric biopsy forceps for nasal biopsy.</li> <li>• Closed-mouth nasal cavity radiographs are useless.</li> </ul>

WBC = white blood cell

## DISEASE BY ORGAN SYSTEM

### ENDOCRINE DISEASE

<b>General</b>	<ul style="list-style-type: none"> <li>• The hypocalcemic cat may not exhibit early signs of tetany; it may simply be dazed and weak.</li> <li>• Keep an eye out for the atypical Addisonian patient.</li> </ul>
<b>Diagnostics</b>	<ul style="list-style-type: none"> <li>• <b>Blood glucose meters:</b> Not very accurate at the high/low ends of scale</li> <li>• <b>Tears:</b> May help detect hyperglycemia</li> <li>• Soiled litter: Can be used to detect glycosuria</li> <li>• Assess toy/miniature breed dogs with eclampsia for hypoglycemia.</li> </ul>
<b>Laboratory Analysis</b>	<ul style="list-style-type: none"> <li>• <b>Glycosuria:</b> Can occur with diabetes, Fanconi's syndrome, proximal renal tubular disease, stress, and IV dextrose</li> <li>• <b>Hypercholesterolemia + elevated CK:</b> Can occur with hypothyroidism</li> <li>• <b>Hypocholesterolemia:</b> Can occur in some patients with Addison's disease</li> <li>• <b>Marked hyperglycemia:</b> Present in oliguric diabetics</li> <li>• <b>Marked hyperglycemia + minimal glycosuria:</b> Consider oliguria/anuria</li> <li>• <b>Morning marked glycosuria + afternoon diminished glycosuria:</b> Typifies transient insulin response (requires split dose)</li> </ul>
<b>Therapeutics</b>	<ul style="list-style-type: none"> <li>• U-100 syringe (or TB syringe) must be used for U-100 insulin.</li> <li>• When treating diabetic ketoacidosis, do not forget adequate <b>K+</b>.</li> <li>• If patient initially hypokalemic, delay insulin for several hours, but begin <b>crystalloid supplemented with potassium</b>.</li> <li>• During the correction of hypokalemia, <b>IV fluids</b> alone can lower blood glucose by as much as 50% to 60%.</li> <li>• For severe hypoglycemic encephalopathy, try <b>mannitol</b>.</li> <li>• When fludrocortisone (Florinef, pfizer.com/kingpharmaceuticals) is not effective, use <b>DOCP</b> (Percorten-V, norvartis.us) and <b>prednisone</b>.</li> <li>• If you have a dog with Cushing's disease and diabetes that becomes weak and depressed and is receiving both insulin and opDDD, remember:             <ul style="list-style-type: none"> <li>» If dog is <i>opDDD toxic</i>, its appetite will be absent that day and vomiting may have occurred.</li> <li>» If dog has been <i>overdosed with insulin</i>, it very likely will have eaten that morning; coma and seizures may be present.</li> <li>» If dog has both <i>hypoglycemia and opDDD toxicity</i>, any combination of the above can occur. In this situation, treat for the treatable if laboratory tests are unavailable, which would indicate <b>dextrose and glucocorticoid</b> administration.</li> </ul> </li> </ul>

See **Fundamentals for Insulin Therapy**, September/October 2011, available at [todaysveterinarypractice.com](http://todaysveterinarypractice.com).

CK = creatine kinase; DOCP = desoxycorticosterone; IV = intravenous; K+ = potassium ion; opDDD = 1,1-dichloro-2-(o-chlorophenyl)-2-(p-chlorophenyl) ethane; TB = tuberculin

### TOXICITIES

<b>Clinical Signs &amp; Disease Identification</b>	<ul style="list-style-type: none"> <li>• <b>Newly acquired bleeding:</b> Consider anticoagulant rodenticide intoxication.</li> <li>• <b>Sudden facial hemorrhagic lymphedema, hemorrhagic oral mucosa, subdued mentation:</b> Consider Eastern diamondback rattlesnake envenomation.</li> </ul>
<b>Diagnostics</b>	<ul style="list-style-type: none"> <li>• If identified early, ethylene glycol in urine sometimes fluoresces under a Wood's lamp.</li> <li>• Unexplainable radiodense particles in bowel: Consider lead.</li> </ul>
<b>Therapeutics</b>	<ul style="list-style-type: none"> <li>• DMSA: An oral chelator for lead poisoning</li> <li>• 4-methylpyrazole: Use for antifreeze intoxication; avoids grogginess (currently unavailable).</li> <li>• Vodka does work for ethylene glycol intoxication when ethanol is unavailable.</li> <li>• Oral vitamin K<sub>1</sub> (4–6 weeks): Use for newer anticoagulant rodenticides</li> </ul>

See **Rodenticide Poisoning: What to Do After Exposure**, March/April 2012, available at [todaysveterinarypractice.com](http://todaysveterinarypractice.com).

DMSA = dimercaptosuccinic acid

## DISEASE BY ORGAN SYSTEM

## GASTROINTESTINAL DISEASE

## Clinical Signs &amp; Disease Identification

- **Acute excruciating abdominal pain:** Consider bowel infarction or intestinal volvulus.
- **Bile in vomitus:** Signifies pyloric patency
- **Black stools:** Consider upper GI bleed, thrombocytopenia, blood in mouth, bismuth subsalicylate ("Pepto"), or iron or charcoal ingestion.
- **Co-existing vomiting/diarrhea:** Rarely associated with GI obstructions
- **Coffee ground vomitus:** Consider gastric ulcers (primary/secondary) or uremic gastritis.
- **Melena:** Consider upper GI lesions or thrombocytopenia.
- **Occult blood loss:** Consider GI disease, especially if accompanied by hypoproteinemia and anemia.
- **Vomiting:** Main sign of GI obstruction; the lower the obstruction, the more feculent the vomitus

## Diagnostics



- **Physical examination:**
  - » Melena detection: "Let your finger do the walking"
- **Laboratory analysis:**
  - » Bilirubinuria in cats: Signifies liver disease
  - » Elevated BUN + normal creatinine: Consider upper GI bleed, especially if kidney can concentrate urine
  - » Metabolic alkalosis + hypokalemia: Common with upper GI obstructions
- **Imaging:**
  - » Right kidney easily visible on radiograph: Consider acute pancreatitis (**Figure 1**).
  - » Cholangiostasis: Consider sepsis.
  - » Diffuse inflammatory bowel disease: Can often be diagnosed with distal colon biopsy
  - » Gas in the gall bladder is a surgical **emergency**.

**Figure 1.** Ventrals dorsal abdominal radiograph of a dog with acute pancreatitis; note the visibility of the right kidney

## Therapeutics

- **0.9% NaCl + KCl** is best for upper GI obstructions.
- Never let the sun set on a linear foreign body intestinal obstruction.
- J-tube feeding: Beneficial for the prolonged period of NPO in patients with pancreatitis

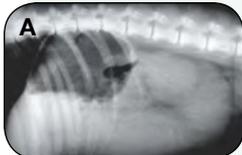
BUN = blood urea nitrogen; GI = gastrointestinal; KCl = potassium chloride; NaCl = sodium chloride; NPO = nil per os (no oral food or fluids)

## HEMATOLOGIC DISEASE

## Clinical Signs &amp; Disease Identification

- **Newly acquired bleeding:** Consider anticoagulant rodenticide intoxication
- **Lumbosacral petechia ("lots of it"):** Consider fleas + thrombocytopenia
- **Pale petechia:** Consider thrombocytopenia + anemia
- Bone marrow derived leukopenic animals don't produce pus.

## Diagnostics



- **Blood Analysis:**
  - » Unclotted blood in clot tube: Consider coagulopathy.
  - » Low WBCs, low RBCs, low platelets: Rule out bone marrow suppression.
  - » Fulminant hemolysis: Results in anemia, hemoglobinemia, hemoglobinuria, weakness, depression, +/- vomiting; then icterus
  - » Observe for autoagglutination and spherocytes in IMHA.
  - » A normal bleeding time assures that there is adequate platelet hemostasis; a normal platelet count does not.
- **Imaging:**
  - » Massive splenomegaly (**Figure 2**): Consider splenic torsion, hypersplenism, lymphoma, and myeloproliferative or mast cell splenic neoplastic infiltrate.
- Owners can use urine dipsticks to detect hemeprotein, an early sign of recurrent hemolysis.

**Figure 2.** Radiograph (A) and surgical specimen (B) depicting splenomegaly caused by splenic torsion

## Therapeutics

- Keep IMHA and ITP patients on maintenance prednisone (Q 2 D) for 9 to 12 months to avoid relapse.
- Try danazol, azathioprine, or cyclosporine with prednisone for refractory IMHA and ITP.

IMHA = immune-mediated hemolytic anemia; ITP = idiopathic thrombocytopenic purpura; RBC = red blood cell; WBC = white blood cell

## DISEASE BY ORGAN SYSTEM

### NEUROLOGIC DISEASE

**Clinical Signs & Disease Identification**



- **Rapid onset LMN paralysis:** Consider tick-borne disease, organophosphate or metronidazole toxicity, botulism, polyradiculoneuropathy, and coral snake bite.
- **Dilated pupils and blank stare (cats) (Figure 3):** Consider thiamine deficiency.
- **Ventral cervical flexion with fixed dilated pupils:** Consider thiamine deficiency.
- **Coma:** Consider diffuse cerebral and brainstem damage, metabolic abnormalities, and adverse drug effects.

**Figure 3.** Cat with thiamine deficiency; note dilated pupils that are fixed and nonresponsive to light

LMN = lower motor neuron

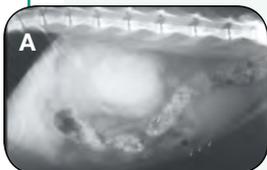
### UROGENITAL DISEASE

**Clinical Signs & Disease Identification**

- **Cessation of PU in ill patient:** Consider oliguria/anuria, which are bad signs.
- **Hematuria without stranguria:** Consider coagulopathy or primary renal bleed.
- **Ill, intact female:** Rule out pyometra.
- **Murky urine:** Can be caused by pus, chyle, crystals
- **Nasal crustiness, scleral injection, “muddy” mucous membranes:** May indicate uremia
- **Passive penile bleed, normal urination, normal dog:** Consider BPH.
- **Prostate inflammation** → “prostatic shuffle” (gait characterized by short shuffling steps)
- **Stranguria accompanying hematuria:** Consider recent renal bleed + clots in the bladder in addition to more common disorders, such as cystitis.

**Diagnostics**

- **Physical Examination:**
  - » Prostate trends: Carcinoma—asymmetrical, hard, mid- or caudal pelvis; BPH—symmetrical, firm, anterior displacement
  - » Urethral pathology (female dog): Perform rectal examination
  - » Scottish terriers have very large BPH.
- **Laboratory Analysis:**
  - » Emphysematous cystitis (**Figure 4**): Rule out diabetes mellitus.
  - » Hyperkalemia: Common in oliguric renal failure
  - » Normo- or hypokalemia: Common in high-output chronic renal failure
  - » PD + PU + isosthenuria: Consider chronic renal disease, even if normal BUN/creatinine, but watch out for Cushing’s disease.
- **Imaging:**
  - » Bilateral renomegaly (**Figure 5**) means very serious disease: Lymphoma, hydronephrosis, pyonephrosis, granuloma, inflammation, subcapsular edema, polycystic kidneys
  - » Cats with 1 big kidney + 1 small kidney: May equal 1 fibrotic kidney + 1 compensatory hypertrophic kidney that is also fibrotic
  - » Male dog + stranguria: Examine immediately and radiograph to rule out obstructive uropathy
- **Cystocentesis:** Be careful with pyometra patients—look before you stick



**Figure 4.** Lateral abdominal radiograph depicting emphysematous cystitis in a diabetic dog

**Figure 5.** Abdominal radiographs of a cat with renal lymphosarcoma; note bilateral renomegaly (A and B)

**Therapeutics**

- Never let the sun set on a sick pyometra patient.
- Empty urine line: Consider anuria, recent emptying, obstruction.
- Fluid therapy: Always assess urine specific gravity first.
- Oliguria: Try administering dopamine (3–5 mcg/kg/min) before administering more fluids, furosemide, or mannitol.

BPH = benign prostatic hyperplasia; BUN = blood urea nitrogen; PD = polydipsia; PU = polyuria



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