



The Geriatric Cat: Complex Management with Multiple Disorders

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Common Concurrent Diseases

1. Chronic kidney disease II-III + hyperthyroidism + hypertension + arthritis
2. Diabetes mellitus + IBD + chronic kidney disease II

But first



A bit of background...

Geriatric cats

- Improved health care and nutrition, vaccination, dental care
- Average life expectancy 15 years
- 1983, 24% cats > 6 years
- 1996, 47% cats > 6 years
- 2007, 16% cats ≥ 11 years
– “Senior”: 7-12 years;
– “Geriatric”: 13 + years

That's 13,527,000 cats!



Geriatric cats

- Importance of early detection!
- Raise awareness of subtle signs of sickness
- Getting to the vet with less distress:



Help cats live longer, healthier lives by creating a culture of life-long, preventive healthcare.

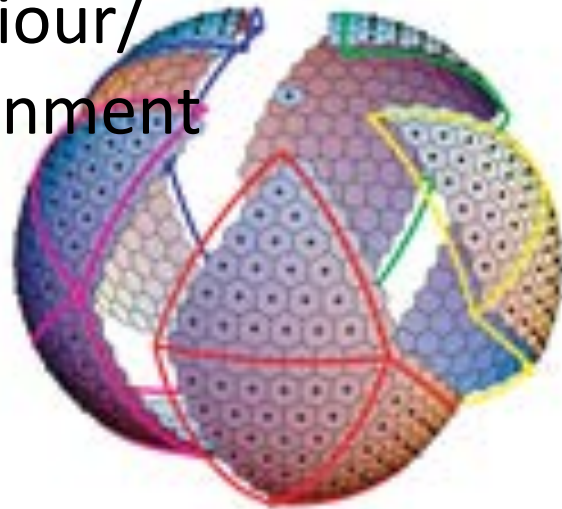
Always focus on 4 goals

1. Hydration

2. Analgesia

3. Nutrition

4. Behaviour/
environment



Cause vs. result?

- Oral health
- Arthritis
- Renal disease
- Anemia
- Hypertension
- Weakness
- Muscle loss
- Inappetence
- Weight loss
- Constipation

Constipation



Pain of Dehydration

- Lethargy
- Inappetence
- Nausea
- Headache
- Grumpy/withdrawn
- Constipation



The Skinny Aging Cat

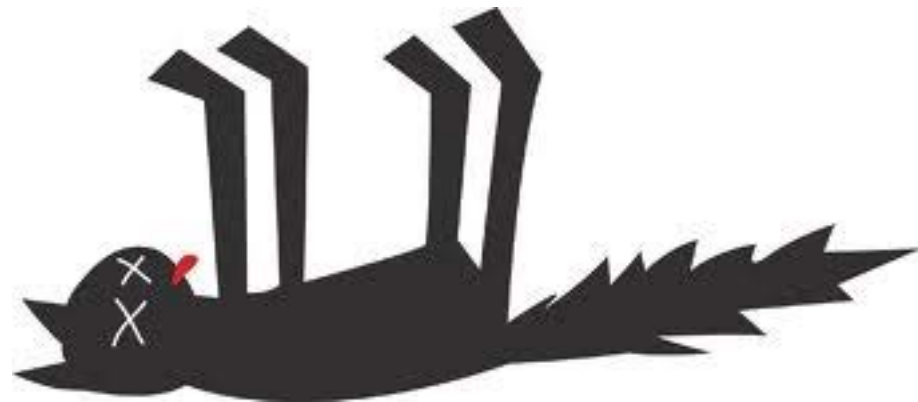
- Down-regulation of metabolic processes limited
 - Designed to eat many small meals/day
 - High protein, water, moderate fat
- Cats have a limited ability to store many nutrients
 - Potassium, sodium, B vitamins, Vitamin E and Vitamin K

Poor body condition, is a risk factor for illness & death

- **Inappetance = *urgency***
- **Anorexia = *emergency***

Effects of weight loss on longevity

- Study results:
 - Every 100g loss of weight increased the risk of death by 6.4%
 - Every 100g loss of lean body mass increased the risk of death by 20%
 - Every 100g loss of body fat increased the risk of death by 40%



Appetite Stimulants

- Cyproheptadine: 1 mg/cat PO q12h
- Mirtazapine: 2 mg/cat PO q48h
- Maropitant: 1 mg/kg SQ, PO q24h

- It isn't enough that kitty eats; must calculate and monitor amount
- Supportive feeding: syringe feeding or large bore tube feeding

When To Start Supportive Feeding?

Severely malnourished cat (20% weight loss, body condition score 1-2/9). *Example: 6 kg => 4.8 kg*

Moderately malnourished (10% weight loss, BCS 3-4/9) with catabolic disease. *Eg: 6 kg => 5.4 kg*

Normal weight and condition if catabolic disease

Start *early*

Method of feeding?

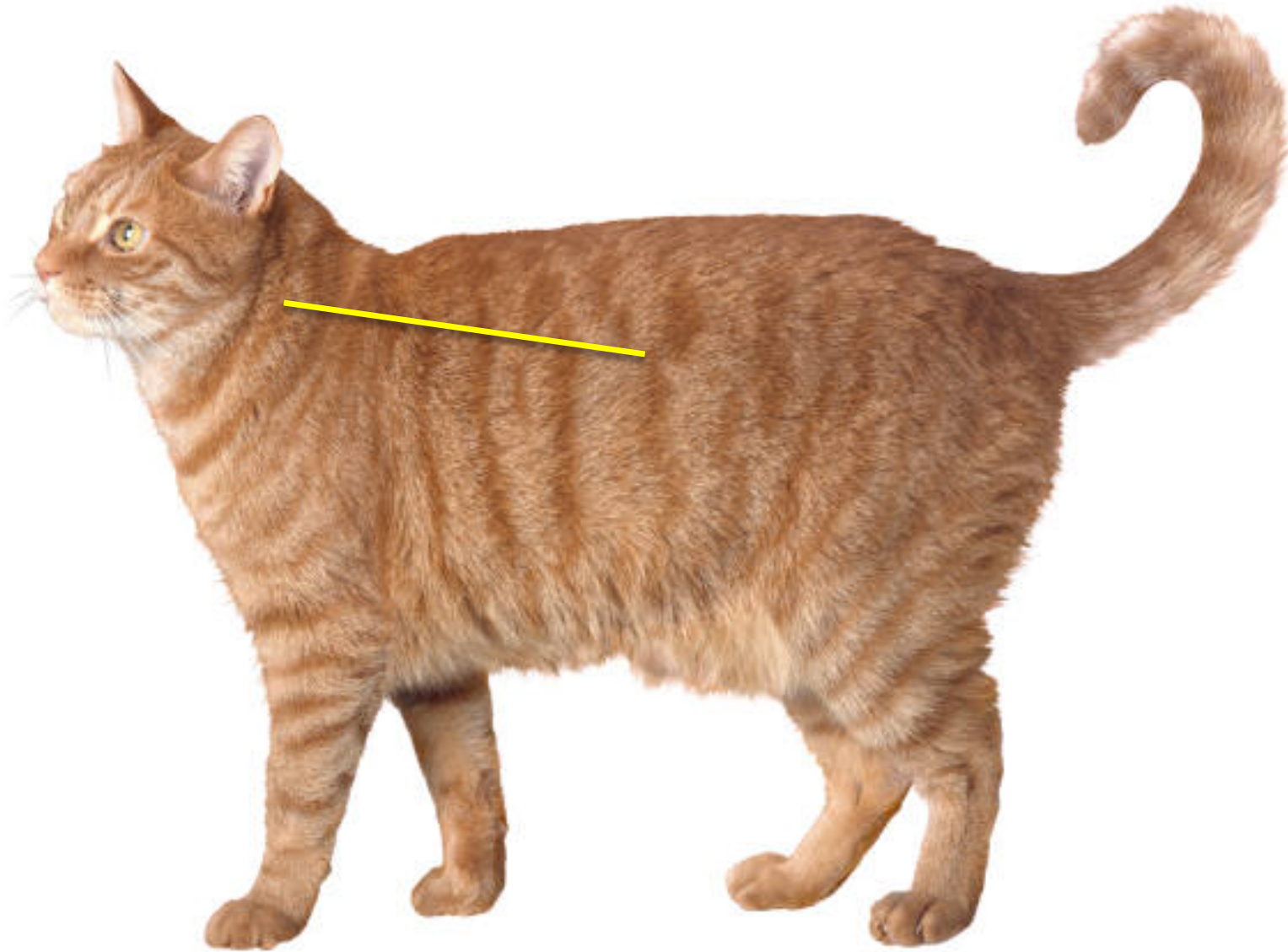
- Oral assisted vs. tubes
- Nasoesophageal
- Esophageal
- Gastrostomy
- Jejunostomy
- Advantages and disadvantages
 - +/- anaesthetic, when start using, types of foods, patient acceptance

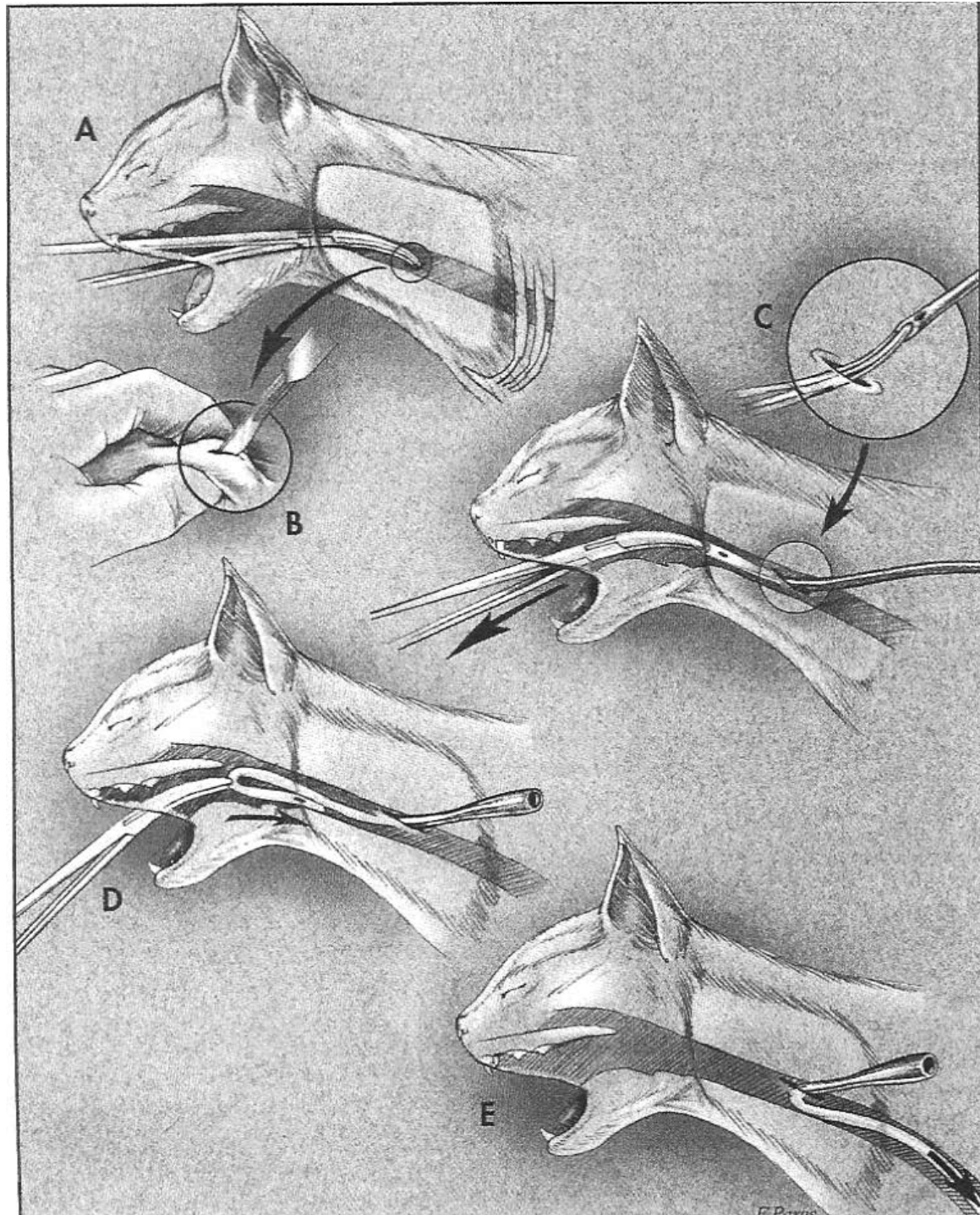


Esophagostomy Tubes

- Placement requires brief anaesthesia
- Size 14-16 Fr. red rubber feeding tube
- Carmalt forceps or long hemostats
- Injection port/prn adapter
- Bandage neck/kitty kollar (NOT an elizabethan collar)
- Clean stoma site BID for 3-5 days with warm water and disinfectant

7th -9th intercostal space

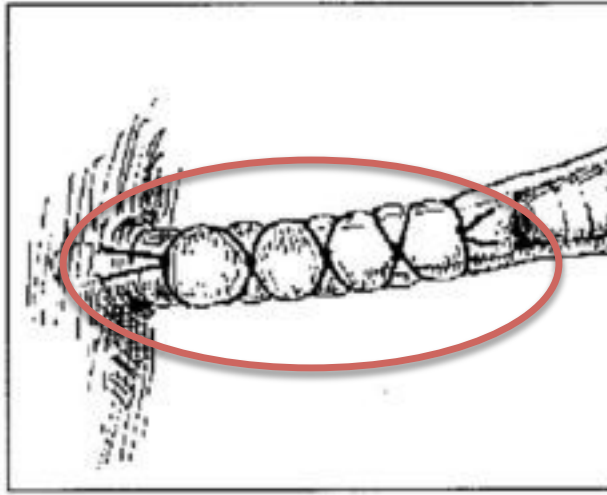
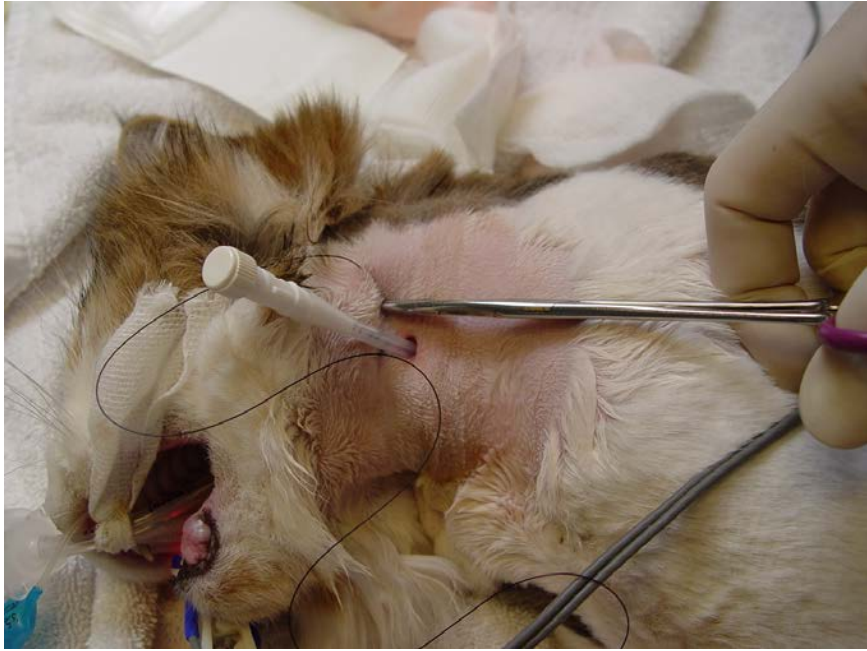




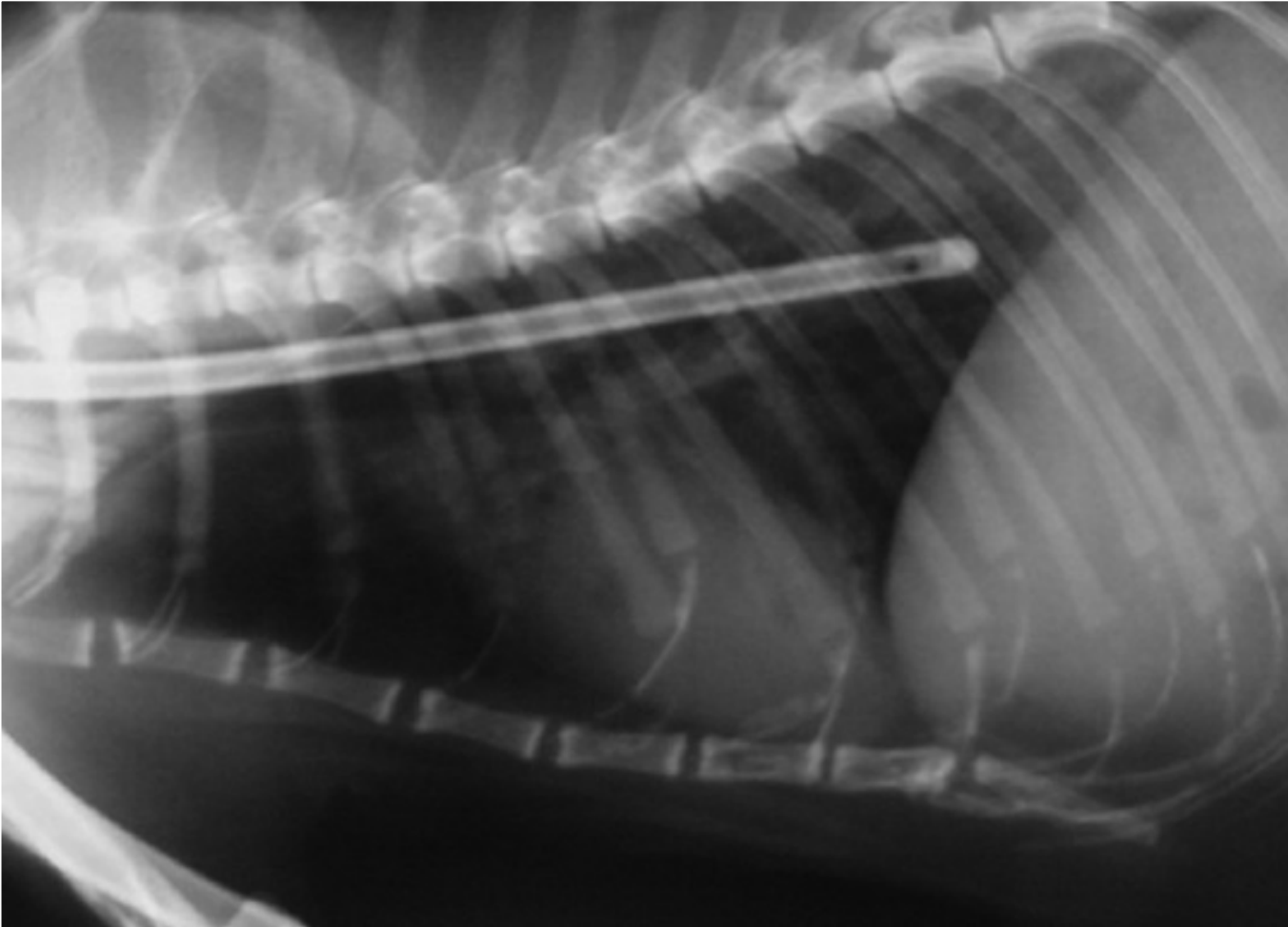


E-tube placement

Movie Susan Little



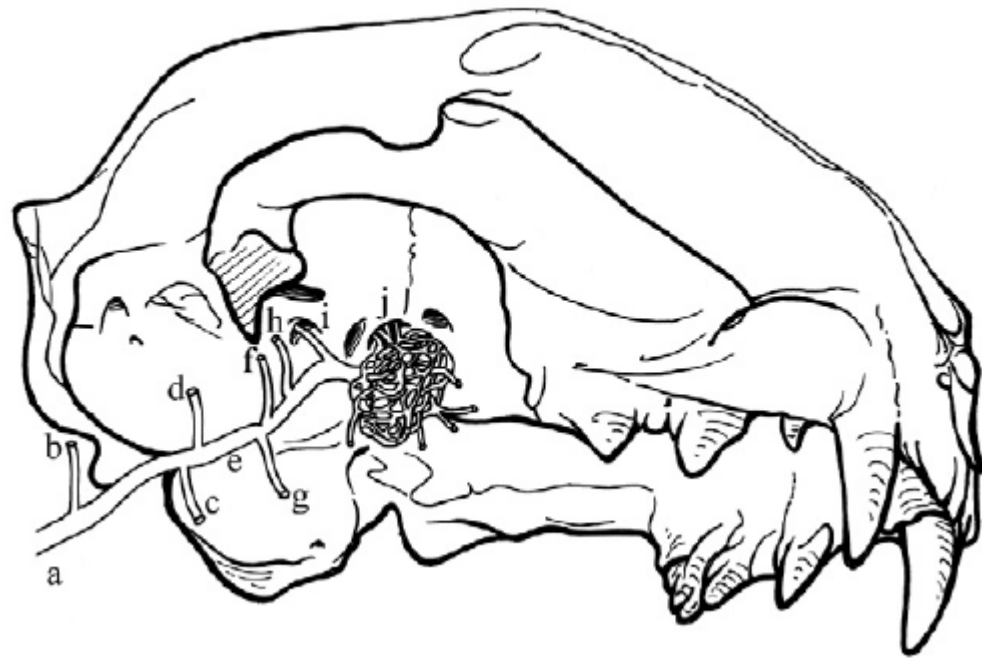
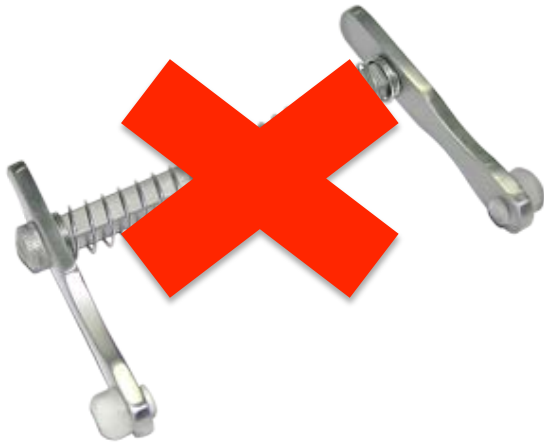


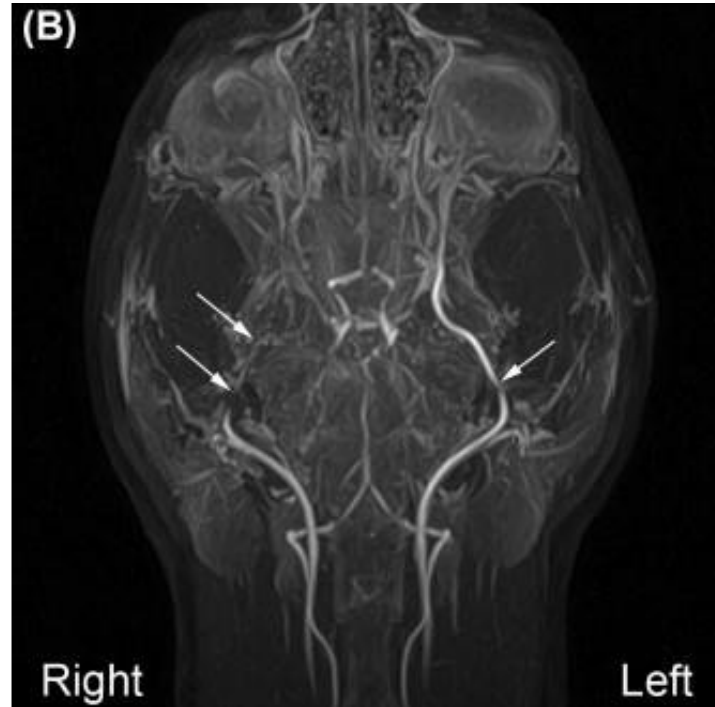


Mouth gags: a bad idea

Maxillary artery compression

- Cerebral ischemia
- Blindness





Barton-Lamb JL et al, Vet J, in press

Caloric densities

- Rebound™: 1 kcal/ml
- Clinicare™: 1 kcal/ml
- PVD CN: 1.2 kcal/ml
- Royal Canin Recovery: 1.23 kcal/ml
- Hill's a/d: 1.3 kcal/ml
- Iams Maximum Calorie™: 2.1 kcal/ml



How much to feed? Example

3.3 kg sick BCS 3/9, healthy weight 4.8 kg BCS 5/9

$4.8 \text{ kg} \times 50 \text{ kcal/kg/day} = 240 \text{ kcal}$

240 kcal = 115 ml Eukanuba Maximum Calorie

OR 200 ml of Hill's a/d or Royal Canin Recovery or PVD CN

Day 1 feed 38 ml of Max Cal or 66 ml of other diets

Day 2 feed 76 ml of Max Cal or 133 ml of other diets

Day 3 feed 115 ml Max Cal or 200 ml of other diets.

Tube care

- Post-operatively e-tube npo 1-2h
- Start with 6-10 cc of warm water only through the tube
- First feeding start with 6 cc of slurry and flush tube with 6 cc water
- After each feeding, flush
- If clogged, instill 6 cc cola for 10 minutes
 - Pancreatic enzymes, meat tenderizer



Kittykollar.com

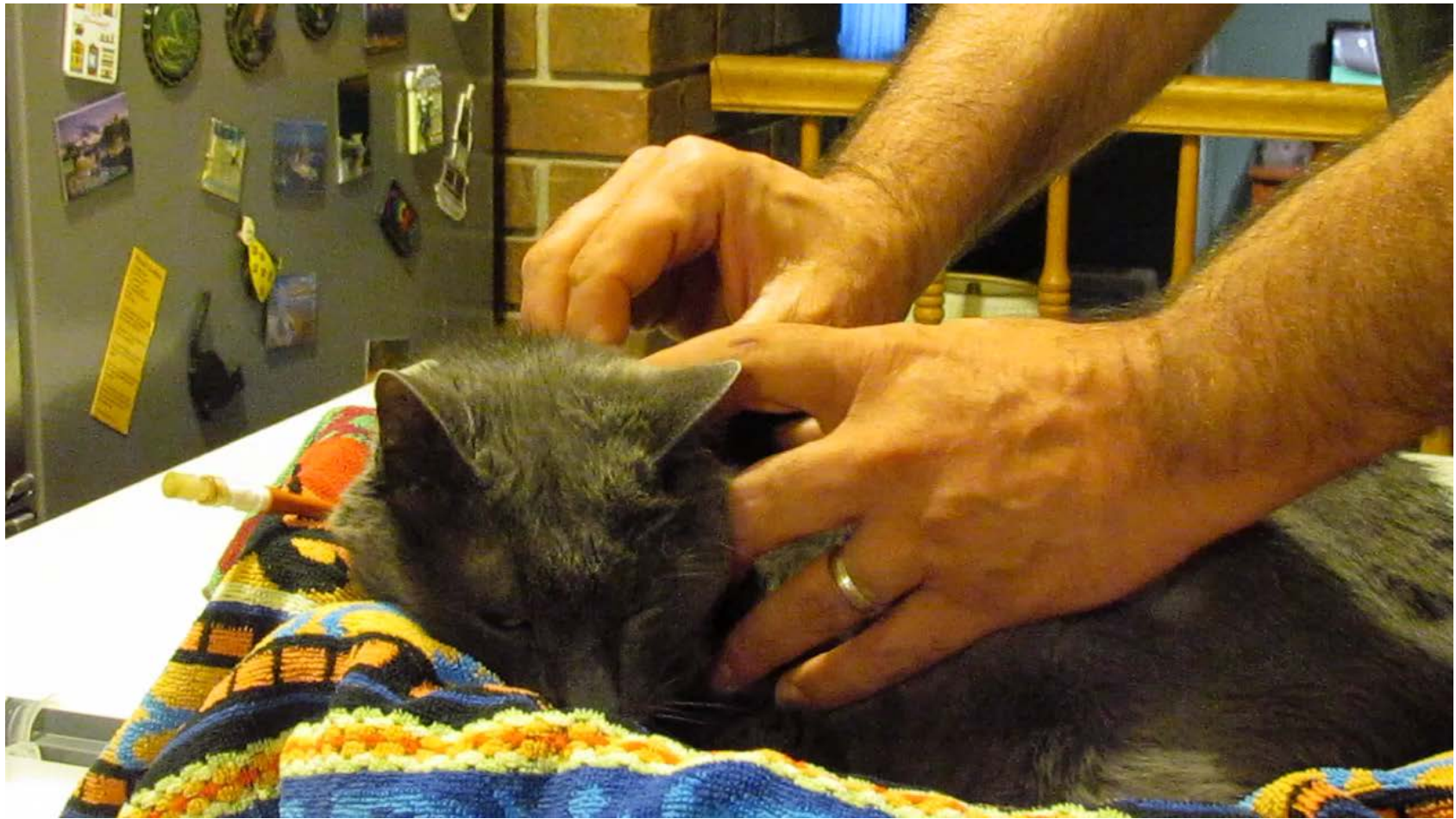
Less scary than bandage

Cats can eat with tubes in place

Website has information about:

- Living with an E-Tube
- How to change collar





Using an e-tube is easy – video for staff and clients

Movie Susan Little

How often to feed?

- Based on caloric requirements & volume tolerance
 - Example: Start with 6 ml and increase by 6 ml increments to ~ 36-48 for most cats
 - 4 kg healthy weight cat: 95 ml Max Cal vs. 154 ml of the other diets.
 - Tolerance is very variable: be patient, don't get disheartened

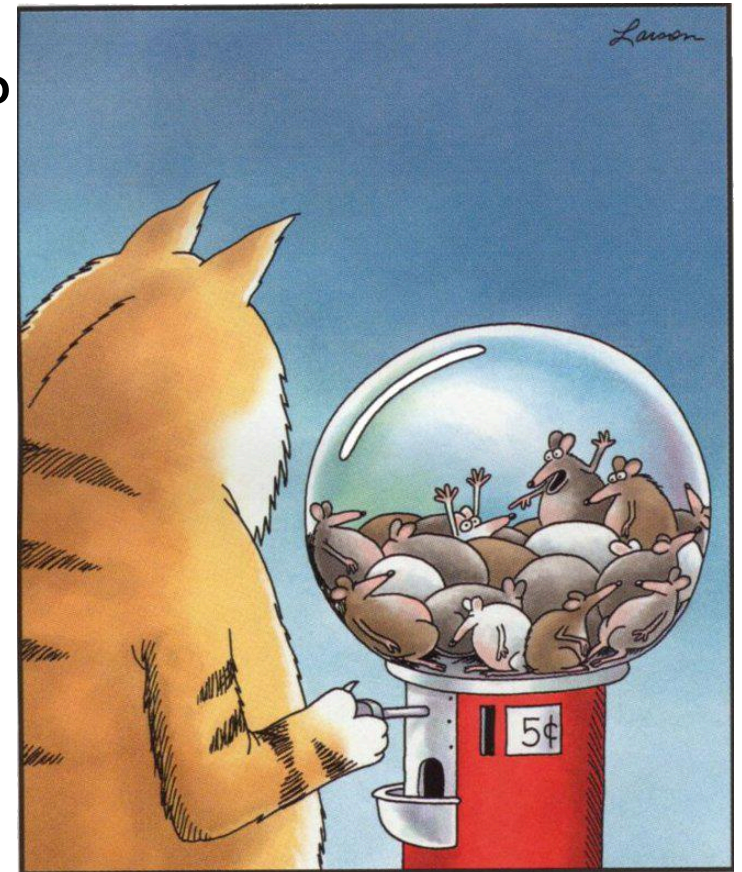
Trickle feeding

- Syringeable food
- Clean empty IV fluid bags and lines
 - 2 per day
- ½ volume into bag, fill line
- Connect via gravity drip or pump



How long to assist feed?

- How long can you leave tubes in?
- When to remove?
- How do we determine success?
 - Weight gain
 - Coat quality
 - Increased energy
 - Muscle recovery
 - Client-noted improvements



"Randy's goin' down!"

Concurrent Diseases

1. Chronic kidney disease
II=III + hyperthyroidism
+ hypertension +
arthritis

2. Diabetes mellitus + IBD
+ chronic kidney
disease II



CKD + HT₄ + HT + DJD



CKD + HT₄ + HT + DJD

- Buffy: 15 year old DSH NM
- 2 years inappropriate usg
 - *What is inappropriate usg level?*
- Has been doing well, stable weight, eating geriatric/
senior dry and canned foods
- Last month, slowing down
- Last week, inappetant and less interactive
 - Vomited twice



Physical Exam

1) Attitude/Appearance <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE BCS _____ / Muscle Condition _____	2) Oral Cavity/Teeth <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE Breath odour _____	3) Mucous Membranes <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE Colour _____ CRT _____ SEC Moisture _____	4) Integumentary <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE Skin tent: Present <input type="checkbox"/> Absent <input type="checkbox"/>
5) Eyes <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	6) Ears <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	7) Cardiovascular <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	8) Respiratory <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE
9) Gastrointestinal <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	10) Musculoskeletal <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	11) Lymph Nodes <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	12) Urogenital <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE
13) Nervous System <input type="checkbox"/> N <input type="checkbox"/> A <input type="checkbox"/> NE	14) Pain <input type="checkbox"/> Y _____/10 <input type="checkbox"/> N BP _____ Cuff Size _____ Limb _____		
T _____ PR _____ HR _____ RR _____ Wt _____ % wt Δ _____			
Frequency <input type="checkbox"/> AM <input type="checkbox"/> PM <input type="checkbox"/> Free choice # _____ Meals Amount _____ Diet _____ <input type="checkbox"/> Treats <input type="checkbox"/> Supplements			
<input type="checkbox"/> Indoors <input type="checkbox"/> Outdoors <input type="checkbox"/> Contact with others _____			N = Normal A = Abnormal NE = Not Examined
Other observations/findings _____ _____			





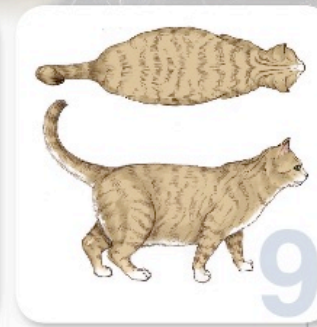
Examination findings

- Body weight = 7.2 lb (3.3 kg), previous visit 8 months ago for fleas, he weighed 10.5 lb. (4.8 kg, BCS 6/9) ↔ weight loss of 3.3 lb. (1.5 kg)
 - 31% weight loss
 - BCS 3/9
 - Muscle wasting
- Rectal temperature = 37.9 C/ 100.2F
- Blood pressure: 190, size 2, RH
- Depressed and quiet
- Subdued energy, lying quietly in client's lap

Body condition scores

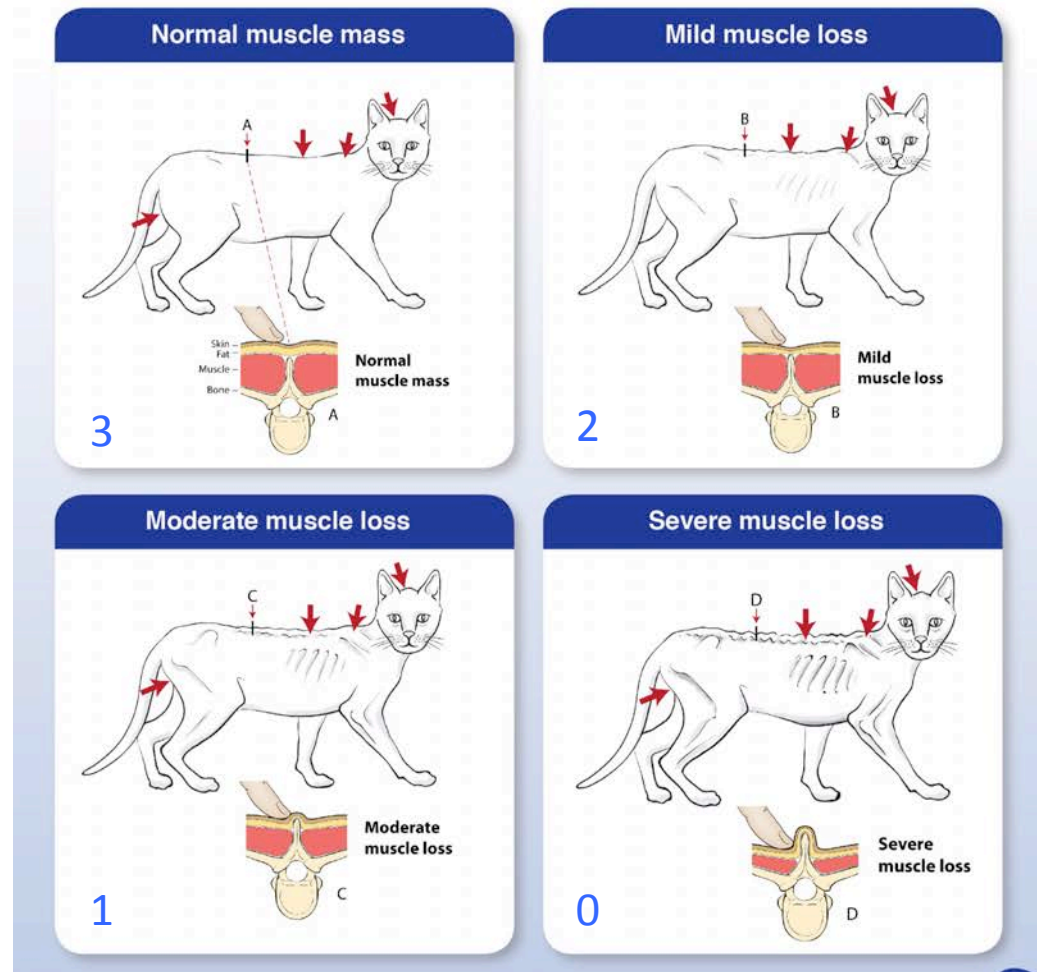
CALORIC INTAKE



 1	 3	 5	 7	 9
UNDER IDEAL <ul style="list-style-type: none">1 Ribs visible on shorthaired cats. No palpable fat. Severe abdominal tuck. Lumbar vertebrae and wings of ilia easily palpated.2 Ribs easily visible on shorthaired cats. Lumbar vertebrae obvious. Pronounced abdominal tuck. No palpable fat.3 Ribs easily palpable with minimal fat covering. Lumbar vertebrae obvious. Obvious waist behind ribs. Minimal abdominal fat.		IDEAL <ul style="list-style-type: none">4 Ribs palpable with minimal fat covering. Noticeable waist behind ribs. Slight abdominal tuck. Abdominal fat pad absent.5 Well-proportioned. Observe waist behind ribs. Ribs palpable with slight fat covering. Abdominal fat pad minimal.	OVER IDEAL <ul style="list-style-type: none">6 Ribs palpable with slight excess fat covering. Waist and abdominal fat pad distinguishable but not obvious. Abdominal tuck absent.7 Ribs not easily palpated with moderate fat covering. Waist poorly discernible. Obvious rounding of abdomen. Moderate abdominal fat pad.8 Ribs not palpable with excess fat covering. Waist absent. Obvious rounding of abdomen with prominent abdominal fat pad. Fat deposits present over lumbar area.9 Ribs not palpable under heavy fat cover. Heavy fat deposits over lumbar area, face and limbs.	

Muscle condition score

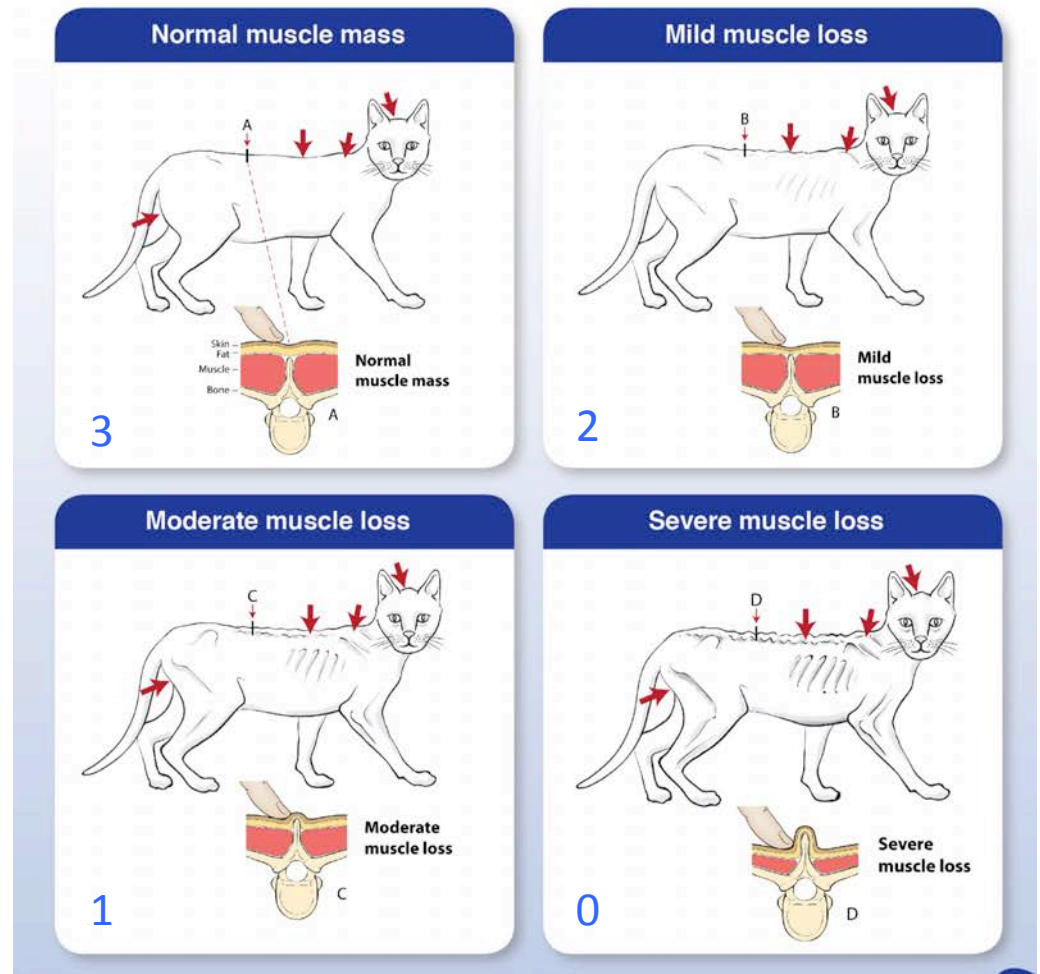
PROTEIN adequacy



Muscle condition score



Image courtesy of Mark Peterson



Sarcopenic obesity



Body & Muscle condition scores



UNDER IDEAL

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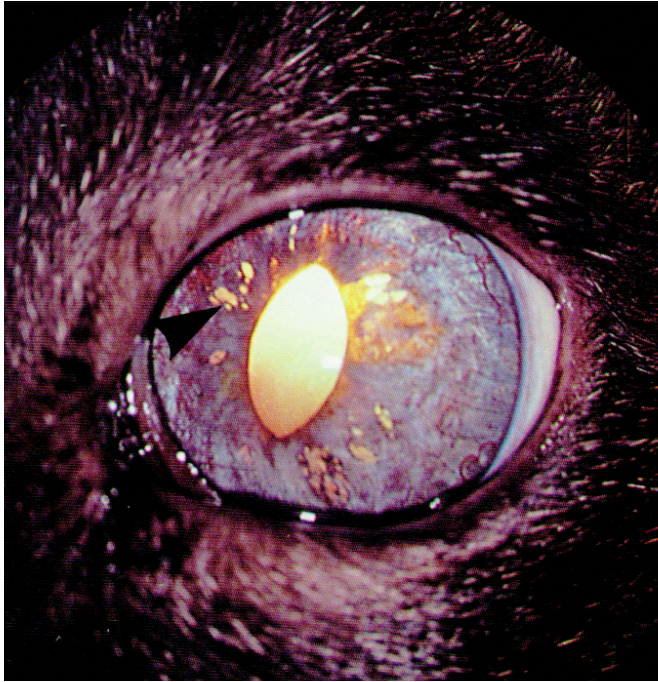


HDO (High-definition oscillometry)



PetMap





- Moderate muscle wasting of face and head, dorsal trunk and hindquarters
- Sunken eyes, slightly dull
- Iris atrophy (moderate)
- Direct ophthalmic exam: no abnormalities noted
- Otoscopic exam: superficial flaky golden waxy material, scant

- Pale pink oral mucous mbr, moist
- Capillary refill time ~1.5 seconds
- Mod dental calculus & gingivitis
- Cervical palpation: blip/bleb

- Moderate skin tent
- Dull "greasy-looking", spiky coat
- Reluctant to jump up or walk around room



Photo courtesy D Paepe

- Thoracic compressibility, decreased
- Cardiac auscultation: holosystolic murmur over sternum, not ausculted elsewhere, grade 2/6, heart rate = 196 bpm
- Femoral pulses, present and strong, pulse rate = 190 bpm, no deficit apparent

- Lungs quiet, respiratory rate = 54 pm
- Tracheal auscultation no abnormalities noted

- Abdominal palpation: "doughy"
 - Mildly thickened intestinal loops
 - Hard fecal material in descending colon
 - No apparent discomfort or abdominal masses palpated
-
- ~ 4 cm diameter urinary bladder
 - Kidneys bilaterally smooth and ~ 2 cm in length

Physical Exam

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T <u>37.9C</u> PR _____ HR <u>196</u> RR <u>54</u> Wt <u>3.3kg</u> % wt Δ <u>31% ↓</u>			
Frequency <input type="checkbox"/> AM <input type="checkbox"/> PM <input checked="" type="checkbox"/> Free choice # <u>2</u> Meals Amount <u>¼ can RC</u> Diet <u>Dry g/d</u> <u>6 Greenies</u> <input checked="" type="checkbox"/> Treats <input type="checkbox"/> Supplements			
<input checked="" type="checkbox"/> Indoors <input type="checkbox"/> Outdoors <input type="checkbox"/> Contact with others _____			N = Normal A = Abnormal NE = Not Examined
Other observations/findings <u>Cervical bleb</u>			

What are Buffy's problems?

- Vomiting
- Dehydration
- Lethargy
- Inappetance
- Weight loss: 31%
$$\frac{4.8-3.3}{4.8} = \frac{1.5}{4.8} = 0.3125 = 31\%$$
- Muscle wasting
- Hypertensive (confirm)
- Moderate dental disease
- Pale mucous membranes
- Cervical blip
- Cardiac murmur
- Decreased thoracic compressibility
- Thick intestinal loops
- Decreased mobility?

What are your differentials?

Differentials

- Chronic kidney disease
- Hyperthyroidism
- Dental disease
- Neoplasia (lymphoma)
- Pancreatitis
- Cholangitis
- IBD
- Degenerative joint disease
- Triaditis
- Cholecystitis
- Inadequate food
- Malabsorption
- Ureteroliths/
nephroliths
- Urethral obstruction
- FeLV/FIV/FIP

Is Muscle Wasting Normal In Old Cats?

- a. Yes
- b. No
- c. It depends



Mean loss of 34% LBM in cats > eight years of age

What's Normal And What's Not?



Kitten



Junior



Prime



Mature



Senior



Geriatric

Categories from AAFP Senior Care Guidelines

Normal Musculoskeletal Changes



- Bones should be slightly more palpable but have good quantity surrounding muscle mass
- Normal for joints to deteriorate

Sarcopenia

- Occurs with normal aging independent of disease
- It is “characterized by gradual, progressive, generalized loss of skeletal muscle mass and strength with a risk of adverse clinical outcomes, such as physical disability, poor quality of life and death “



“Poverty of the flesh”



Sarcopenia

- In cats: lean body mass decreases after 11 years
- Related to increased morbidity & mortality

Differentials for unhealthy muscle loss:

- Inadequate dietary protein
- Sarcopenia
- DJD
- Cachexia?



Image courtesy of Mark Peterson

Muscle Wasting: Diet



- Protein & fat digestibility ↓
- Inappropriate dietary recommendations
 - Reassess
 - Dietary trial of n=1
 - Nutritional assessment
 - Body condition score
 - Muscle condition score

Differentials

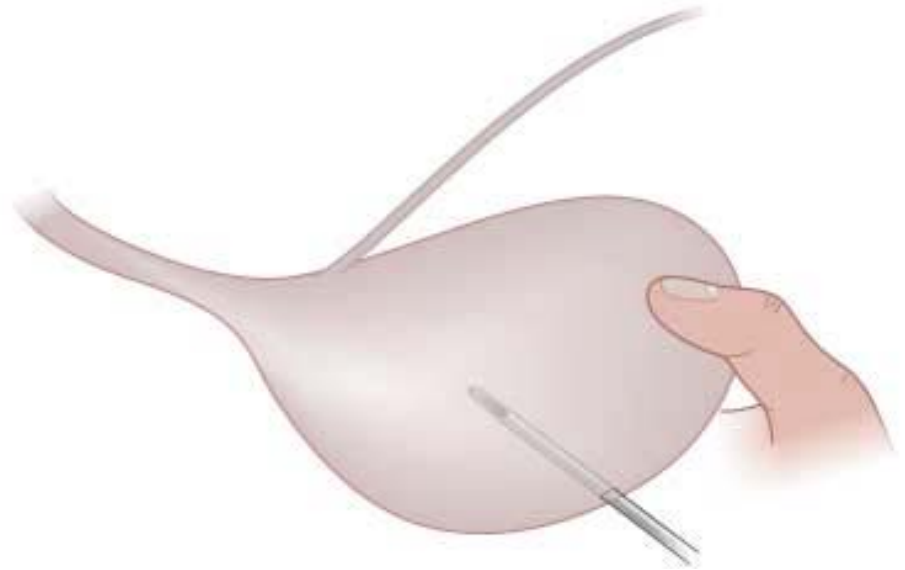
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What do you recommend?

Plan: Therapeutics & Diagnostics

1. Geriatric/senior panel
2. Agitated cystocentesis urinalysis
3. Repeat BP
4. IV fluids
 type?
 additives?
5. PCV/TS, BG
6. Well padded kennel with hiding place
7. Smorgasbord, tempt feed +/- syringe feed
 caloric intake!
8. Thoracic radiographs?

Urine sediment yield





Agitated cystocentesis

Fluids

Replacement solution with 35 mEq KCl/litre
1 cc Vit B complex

Rate: 8% deficit of 4.8 kg	= 384 ml
maintenance 60 ml/kg/day	= 288 ml
<u>ongoing losses</u>	= <u> ?</u>
	672 ml

672 ml/24 hours = 28 ml/hour

Monitor BW & PCV/TS q12-24h,

Auscult lungs q6-8h

Repeat BP = 185

Lab results

Interpretation of lab results

wbc	12.2	(5.5 - 19.0)	Basos	0
rbc	5.60	(5.00 - 10.00)	Eos	1206
Hgb	82.0	(80 - 150)	Bands	0
Hct	0.28	(0.32 - 0.45)	Polys	9434
MCV	41	(39 - 55)	Lymphs	1560
MCH	13.0	(12.0 - 18.0)	Monos	0
MCHC	305	(300 - 360)		
RDW	7.6	(7.0 - 17.0)		
Platelet count		INV		
Reticulocytes		< 1%		
				Aniso slight, poikilo slight, echino slight
				Platelets clumped, platelet estimate adequate numbers, variability in platelet size apparent
				Slight toxic change, occasional doehle bodies
				Few stimulated lymphs present

Interpretation of lab results

Glucose	3.2	(3.9– 7.0)	SAP	65	(10 - 70)
BUN	48.2	(3.5 – 13)	ALT	50	(5 - 65)
Creatinine	1002	(87.5- 177)	Chloride	116	(117 - 128)
Sodium	156	(145 - 160)	tCO ₂	10	(17 - 24)
Potassium	3.8	(3.5 - 5.8)	Calc osm	328.6	(280.0 - 305.0)
Calcium	2.69	(1.61 – 2.68)	Anion gap	35	(13 - 25)
Phosphorus	2.31	(1.61 – 2.25)	CPK	110	(10 - 100)
Total protein	88	(60 – 81)	Amylase	1206	(500 - 800)
Albumin	28	(26 – 40)	Lipase	87	(0 - 200)
Globulin	60	(26 – 51)	Gamma gt	2	(1-8)
Albumin: globulin	0.4	(0.5 - 2.0)	Chol	5.20	(1.88 - 4.38)
Bilirubin tot	0	(0 – 8.0)	T4	45.0	(19.3 – 50.2)

Sample moderately lipemic

Urinalysis

- Colour: pale clear yellow
- Spec gravity 1.012
- pH 7.5
- Protein 0.3 g/L
- Glucose neg
- Ketones pos
- Bilirubin pos
- Urobilin normal,
- Hemoglobin trace
- Wbc neg,
- Rbc 0-3/hpf,
- Bacteria neg,
- Crystals neg

Chemistries & electrolytes

- Lipemia
- Azotemia (severe) prerenal and renal
 - *IRIS Stage = ?*

Stage	I Non-azotemic renal disease	II Mild renal azotemia	III Moderate renal azotemia	IV Severe renal azotemia/ "chronic renal failure"
Creatinine: mg/dL (mmol/L)	< 1.6 mg/dl (<140 mmol/L)	1.6 – 2.8 mg/dl (140-249 mmol/L)	2.9 – 5.0 mg/dl (250-439 mmol/L)	> 5.0 mg/dl (> 440 mmol/L)
Clinical signs	None	+/- inappetance, weight loss, PU/PD	Usually inappetance, weight loss, PU/PD	Uremia, clinically ill
Progression	Stable for long periods of time	Stable for long periods of time	May progress	Fragile
Therapeutic goals	Identify and treat specific primary kidney disease (e.g., acute pyelonephritis, nephrolithiasis)	Identify and treat specific primary kidney disease (e.g., acute pyelonephritis, nephrolithiasis)	Modify progression: phosphorus restriction, omega 3 fatty acids?	Ameliorate uremic signs: protein restriction, anti-emetics, erythropoietin, fluid therapy, appetite

Important!

- ONE CAN'T STAGE
or PROGNOSTICATE
UNTIL CAT IS
REHYDRATED!



Chemistries & electrolytes

- Lipemia
- Azotemia (severe) prerenal and renal
- Hypoglycemia
- Hypokalemia
- Hypercalcemia
- Hyperglobulinemia
- Hypochloremia
- Hyperamylasemia
- Metabolic acidosis
- Pay attention to T4 (euthyroid sick?) and bilirubin

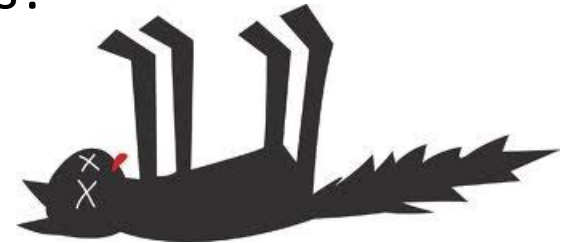
Therapeutic implications?

Revised treatment plan

1. Culture urine???
2. Reassess daily
3. Continue IV fluids + KCl, recalculate dose daily based on PCV and **TS**
4. K gluconate 2 mEq PO BID
5. Feed/syringe high quality, calorically dense diet
 - Restrict protein? Phosphorus?
 - Place tube?

Questions about protein

1. What is optimal amount of protein for cat with renal disease? How much restriction is necessary?
2. Do different types of kidney disease require different dietary therapies?
3. At what point in disease progression should protein restriction be implemented?
4. Does the type of protein fed make a difference?
5. Does every meal have to be restricted?
6. Will a cat in > stage 2 benefit if phosphorus is restricted by other means?
7. Might some cats with advanced disease benefit from increased protein levels?



Protein restriction?

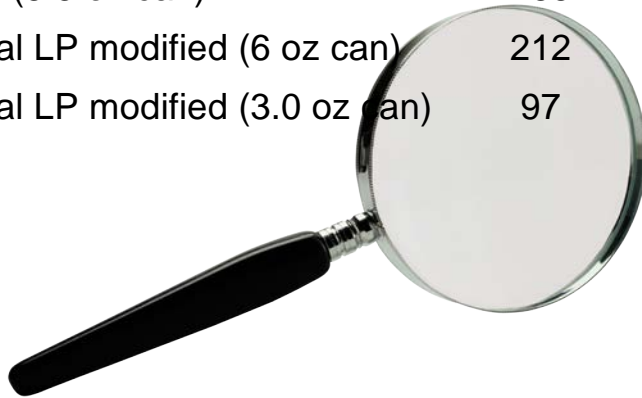
- Monitor for **protein: calorie malnutrition**
 - Weight loss
 - Hypoalbuminemia
 - Poor hair coat quality
 - Muscle wasting
- Growth or convalescent diets



Feline reduced protein and phosphorus diets; non-acidifying

Nutrients of Concern (/100 kcal)

	kcal/can or cup	Protein (g)	PO4 (mg)	Na (mg)	K (mg)	Fat (g)
Hill's j/d (5.5 oz can)	152	9.3	195	102	205	4.6
Hill's y/d (5.5 oz can)	188	8.2	141	58	207	6.2
Hill's g/d (5.5 oz can)	165	8.2	123	76	171	4.6
Purina NF (5.5 oz can)	193	7.7	110	50	180	5.6
Iams renal plus (6 oz can)	199	6.8	128	82	217	5.8
Hill's l/d (5.5 oz can)	183	6.7	145	43	196	4.9
Hill's k/d chicken (5.5 oz can)	183	6.5	85	68	264	6.1
Royal Canin renal LP modified (6 oz can)	212	5.5	80	50	200	7.1
Royal Canin renal LP modified (3.0 oz can)	97	5.6	90	60	210	7.0



As at December 2012

Diet composition for endocrine disease

	Protein	Carbohydrates
Diabetes Mellitus	>40% calories; > 55% dry matter	<10% calories; < 15% dry matter
Hyperthyroidism	40% calories; > 55% dry matter < 250 mg phos/100 kcal	<15% calories; < 20% dry matter

Peterson, Vet Clin N Am 2014

Williams JVIM 2010 Association of iatrogenic hypothyroidism with azotemia and decreased survival time in cats treated for hyperthyroidism

6. Amlodipine 0.625 mg PO SID
7. Amphojel 90 mg/kg PO TID with food?
8. Appetite stimulant
 - Cyproheptadine 1 mg PO BID
 - Mirtazapine 2 mg po q48h
 - 50 kcal/kg ideal weight/day
 - $50 \times 4.8 = 240$ kcal/day
9. Consider calcitriol?
10. Repeat CBC, chemistry, T4 after 3 days

Progress:

Days 1-3:

- Buffy started to eat enthusiastically after 36 hrs of fluids and syringe feeding!
- Much brighter
- Cardiac murmur resolved
- Urinating voluminously
- BM day 3 dry and small
- Day 3 gallop rhythm appeared loudest over sternum, but also ausculted over mitral valve grade 3/6
- BP 185 mm Hg size 2 RH

Day 3 lab results

wbc	13.6	(5.5 - 19.0)	Slight toxic change, occasional doehle bodies
rbc	4.80	(5.00 - 10.00)	
Hgb	75.0	(80 - 150)	Few stimulated lymphs present
Hct	0.20	(0.24 - 0.45)	
Reticulocytes	< 1%		

Interpretation of lab results

BUN	21.6	(3.5 – 13)	Amylase	1251	(500 - 800)
Creatinine	276	(87.5- 177)	Gamma gt	5	(1-8)
Potassium	4.1	(3.5 - 5.8)	Cholesterol	5.67	(1.88 - 4.38)
Albumin	24	(26 – 40)	T4	53.0	(19.3 – 50.2)
Albumin: globulin	0.44	(0.5 - 2.0)			
Bilirubin total	11.97	(0 – 8.0)			

Chemistries & electrolytes

- IRIS Stage = ?
- Hyperthyroid

Stage	I Non-azotemic renal disease	II Mild renal azotemia	III Moderate renal azotemia	IV Severe renal azotemia/ "chronic renal failure"
Creatinine: mg/dL (mmol/L)	< 1.6 mg/dl (<140 mmol/L)	1.6 – 2.8 mg/dl (140-249 mmol/L)	2.9 – 5.0 mg/dl (250-439 mmol/L)	> 5.0 mg/dl (> 440 mmol/L)
Clinical signs	None	+/- inappetance, weight loss, PU/PD	Usually inappetance, weight loss, PU/PD	Uremia, clinically ill
Progression	Stable for long periods of time	Stable for long periods of time	May progress	Fragile
Therapeutic goals	Identify and treat specific primary kidney disease (e.g., acute pyelonephritis, nephrolithiasis)	Identify and treat specific primary kidney disease (e.g., acute pyelonephritis, nephrolithiasis)	Modify progression: phosphorus restriction, omega 3 fatty acids?	Ameliorate uremic signs: protein restriction, anti-emetics, erythropoietin, fluid therapy, appetite stimulation, dialysis, etc.
Proteinuria	classify	classify	classify	classify

Stage 1

- $U_{sg} \leq 1.035$ while dehydrated prior to inc Cr
- $U_{sg} > 1.040$ but has
 - Pyelonephritis,
 - Abnormal shape or size
 - Painful kidney(s)
 - Abnormalities on renal imaging,
 - Persistent renal
 - Abnormal renal biopsy results

Stages 2-4

- Based on inc Cr levels in HYDRATED cat
- Stage 2: Cr may be high “normal” because is insensitive screening test
- Cr is affected by:
 - Muscle mass
 - Renal blood flow:
 - Dehydration
 - Uncontrolled hyperthyroidism

Hypertension

- 60% of cats with CKD have hypertension (Kobayashi) (Stiles)
- Using higher cut-off value, a study of 103 cats with CKD, 20 (19.4%) were found to have systolic BPs in excess of 175 mm Hg. (Syme 2002)
 - May promote progression?
(glomerular injury)



- Treat when systolic pressure is consistently > 160mm Hg
 - Earlier if hypertensive complications are present

Management of CKD: systolic BP

- ACVIM Panel on Hypertension (Consensus statement 2007 – www.acvim.org)
- Believe increases > 160 mm Hg

Systolic BP mm Hg	Risk of target organ damage
< 150	Minimal
150-159	Low
160-179	Moderate
> 180	High

- Target organs = brain, eye, kidneys, heart

Treating hyperT4 may exacerbate CKD

1. By reducing cardiac output, GFR is reduced (as much as 50%)
 - a) Revealing CKD
 - b) Worsening previously recognized CKD
2. Should see these changes by 4 weeks of euthyroidism
3. Cannot predict
4. Initial treatment of choice is methimazole

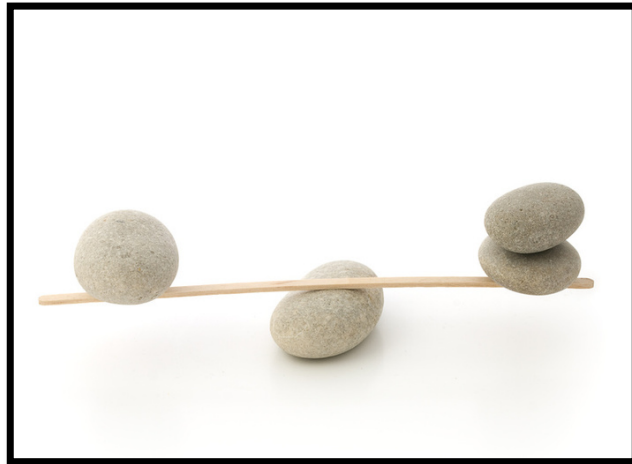
Assess renal function beforehand

- usg low initially?
- In one study, if GFR > 2.25ml/kg/min: won't develop renal insufficiency after ¹³¹I
 - Not confirmed in another study
- Consider: treat initially with methimazole and assess renal function once euthyroid status achieved

Summary of CKD + HT4:

- Is the increase in BUN and SC significant?
- Cat may do better with compensated renal disease than in hyperthyroid state
- Treat each case individually
- Inform client of risk of unmasking pre-existing renal disease
- Treat the CKD

- If renal insufficiency becomes apparent:
 - L-thyroxine or
 - Reduce methimazole dose
 - Balance thyroid and renal function



Day 3 recommendations:

Therapeutic impact:

- Switch to SQ fluids, daily at home
 - 60 ml/kg ideal/day (288 ml/day)
- Start Tapazole
- Cosequin/Cartophen/Adequan
- Continue amlodipine
- A canned, calorically dense diet: 261 kcal/d
- Recheck after 10-14 days (weight, BP, exam)
 - +/- schedule echocardiogram
 - +/- erythropoetin
 - +/- NSAID

50 kcal/kg ideal weight/day

50 X 4.8 = 240 kcal/day

for Ideal Body Weight

		RER*
	Body weight (kg)	Kcal/day
1	0.45	39
2	0.91	65
3	1.36	88
4	1.82	110
5	2.27	130
6	2.73	149
7	3.18	167
8	3.64	184
9	4.09	201
10	4.55	218
15	6.82	295
20	9.09	366
25	11.36	433

$$\text{RER} = [\text{BW}(\text{kg})^{0.75} * 70]$$

Growth DER (Kcal/day): Growing kittens = 2.5 X RER

Maintenance DER (Kcal/day):

Normal, neutered adult = 1.2 X RER

Intact adult = 1.4 X RER

Obese prone = 1.0 X RER

For weight loss = 0.8 X RER



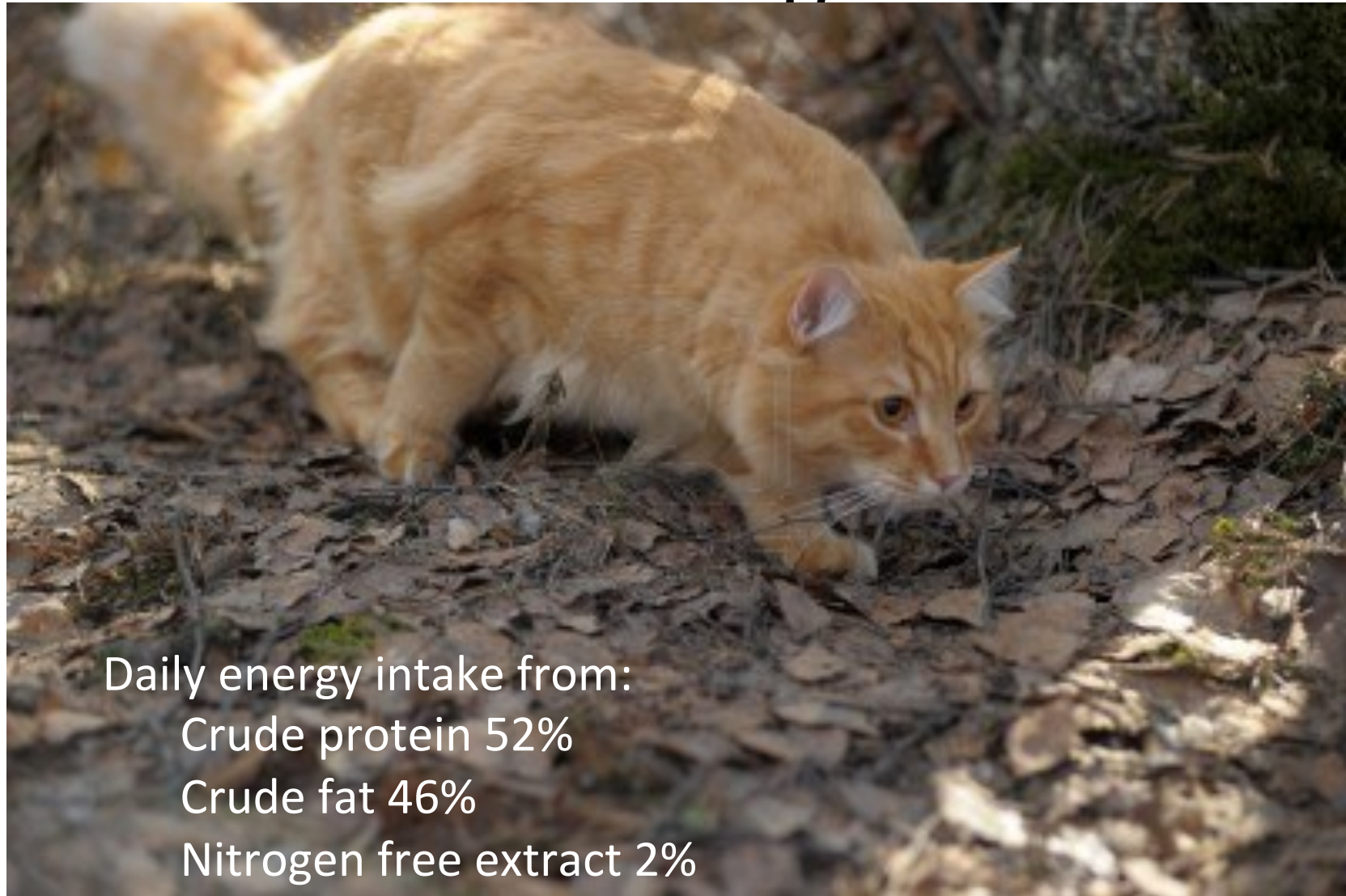
50 kcal/kg ideal weight/day

50 X 4.8 = 240 kcal/day

1.2 X 218 = 261.6 kcal/day

Reassess!!!

What are cats designed to eat?



Daily energy intake from:
Crude protein 52%
Crude fat 46%
Nitrogen free extract 2%

Plantinga: Dietary nutrient profile of free-roaming feral cats, 2011 Br J Nutrition

Protein Requirements of Aging Cats Based on Preservation of LBM

- Study in adult cats showed that cats need $>5\text{g/kg}$ body weight to maintain LBM
 - Young cats, 2 months, Laflamme JFMS 2013



Discrepancy between use of lean body mass or nitrogen balance to determine protein requirements for adult cats

Journal of Feline Medicine and Surgery
0(0) 1–7

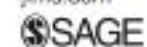
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DOI: 10.1177/1098612X12474448

jfms.com



Abstract

This study was undertaken to contrast the minimum protein intake needed to maintain nitrogen balance or lean body mass (LBM) in adult cats using a prospective evaluation of 24 adult, neutered male cats fed one to three different diets. Following a 1-month baseline period during which all cats consumed a 34% protein diet, cats were fed a 20% (LO), 26% (MOD) or 34% (HI) protein diet for 2 months. During the baseline period and following the 2-month feeding period, nitrogen balance was assessed using a 96-h complete collection of urine and feces, and LBM was assessed using dual energy X-ray absorptiometry. Weight loss increased in a linear manner with decreasing protein intake ($P < 0.01$), despite no significant difference in calorie intake. Linear regression of the data indicated that approximately 1.5 g protein/kg ($2.1 \text{ g/kg}^{0.75}$) body weight is needed to maintain nitrogen balance, while 5.2 g protein/kg ($7.8 \text{ g/kg}^{0.75}$) body weight is needed to maintain LBM. This study provides evidence that nitrogen balance studies are inadequate for determining optimum protein requirements. Animals, including cats, can adapt to low protein intake and maintain nitrogen balance while depleting LBM. Loss of LBM and an associated reduction in protein turnover can result in compromised immune function and increased morbidity. Current Association of American Feed Control Officials (AAFCO) and National Research Council (NRC) standards for protein adequacy may not provide adequate protein to support LBM. The minimum daily protein requirement for adult cats appears to be at least 5.2 g/kg ($7.8 \text{ g/kg}^{0.75}$) body weight, well in excess of current AAFCO and NRC recommendations. Further research is needed to determine the effect, if any, of body condition, age and gender on protein requirements.

Protein Requirements of Aging Cats Based on Preservation of LBM

- Determine the apparent protein requirements of aging cats based on the amount needed to maintain LBM
 - Geriatric cats, 6 month study
- At the end of 3 months (n = 39), linear regression of protein intake on LBM indicated a mean daily intake of 4.8g protein/kg body weight was needed to maintain LBM. At 6 months (n = 38), the regression indicated **5.4g protein/kg body weight was needed to maintain LBM.**
 - Laflamme poster ACVIM 2013

Phosphorus

- Hyperphosphatemia reflects decreased GFR
- In dogs, believed that phosphorus restriction may be renoprotective
- Restriction in moderate azotemia (stage 2-4) affects detrimental effects (soft tissue mineralization)
- Difficult to have diet replete in protein and restricted adequately in phosphorus



New

- Renal secondary hyperparathyroidism is more prevalent than hyperphosphatemia!
- FGF-23 (fibroblast growth factor-23)
 - A phosphatonin
 - Increases in response to decreased renal phosphate clearance
 - => inhibits calcitriol and increases phosphate FE_p
- **Consider measuring PTH** to ensure that phosphorus restriction is adequate even when serum phosphorus within IRIS recommended range

Phosphorus targets

- Increase GFR and decrease absorbed phosphorus
- Reducing phosphorus intake to maintain serum phos between
 - 1.29-1.61 mmol/L (4.0-5.0 mg/dL) protects functional nephrons, improves survival

IRIS Stage	Target Phosphate
Stage 1	Any phos restriction?
Stage 2	0.81 -1.45 mmol/L (2.5-4.5 mg/dl)
Stage 3	0.81 -1.61 mmol/L (2.5-5.0 mg/dl)
Stage 4	0.81 -1.94 mmol/L (2.5-6.0 mg/dl)

Phosphorus

- Restriction in moderate azotemia (stage 2-4) reduces risk for renal secondary hyperparathyroidism
- Intestinal phosphate binders
 - Within 2 hours of meal
 - Amphogel, Renalgel, sucralfate
 - Epakitin, Renalzin, Pronefra

↓ Phos, ↑ Protein?



Chicken meat

Food

Chicken is the most common type of poultry in the world, and is prepared as food in a wide variety of ways, varying by region and culture.

Wikipedia



Nutrition Facts

Chicken, breast ▾

Amount Per 100 grams ▾

Calories 172

	% Daily Value*
Total fat 9 g	13%
Saturated fat 2.7 g	13%
Polyunsaturated fat 2 g	
Monounsaturated fat 3.8 g	
Trans fat 0.1 g	
Cholesterol 64 mg	21%
Sodium 63 mg	2%
Potassium 220 mg	6%
Total Carbohydrate 0 g	0%
Dietary fiber 0 g	0%
Sugar 0 g	
Protein 21 g	42%
Vitamin A	1%
Calcium	1%
Vitamin B-6	25%
Magnesium	6%
Vitamin C	0%
Iron	3%
Vitamin B-12	5%

*Per cent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Diet choice will depend on

- Phosphorus levels
- Potassium levels
- Uremic or not?
- Proteinuric or not?
- Need to individualize and reassess
- Protein restriction? Every meal?



Photos: Bayer AG

2 month recheck

- Doing very well; clients notice not jumping as well and less active



How do we detect pain?

- Normalization of behaviours after analgesics given = pain was present
 - Re-evaluate often!

ISFM AND AAFP CONSENSUS GUIDELINES

Long-term use of NSAIDs in cats

ISFM and AAFP
Consensus Guidelines

Long-term use of **NSAIDs** in cats



- Andy Sparkes
- Rediun Heine
- Duncan Lascelles
- Richard Malik
- Sheilah Robertson
- Llibertat Real Sampietro
- Margie Scherk
- Polly Taylor

www.icatcare.org/vets/guidelines

www.catvets.com/professionals/guidelines/publications/



A preprint from the
Journal of Feline Medicine and Surgery
Volume 12, July 2010



Pain medication (NSAIDs) and your cat

A 'painkiller' known as a 'non-steroidal anti-inflammatory drug' (or NSAID) has been prescribed for your cat. These drugs are commonly used in humans and animals to help relieve pain, fever and inflammation – most commonly associated with degenerative joint disease. Controlling your cat's pain is crucial for its welfare. Many cats greatly benefit from these drugs, having better mobility, less pain, increased appetite and an improved quality of life.

Degenerative joint disease (DJD) in cats

Degenerative joint disease (including osteoarthritis) is common, especially in older cats. As with other conditions, cats may mask the signs of this disease.

Problems and behaviour changes in cats with DJD include:

- ➔ **Decreased activity** – eg, sleeping more, not moving around as much, playing or hunting less
- ➔ **Decreased mobility** – eg, reduced willingness to jump, not jumping as high, difficulty using the litter tray, stiffness, and sometimes obvious lameness
- ➔ **Decreased grooming** – reduced time or difficulty grooming, a poor coat, overgrown claws
- ➔ **Altered personality** – less keen to interact with people or pets, seeking solitude, 'grumpier'
- ➔ **Other signs** – may include aggression or vocalisation when touched and loss of appetite

Understanding these changes helps alert you and your vet to the possible existence of pain and DJD, and will help you monitor whether therapy is helpful or not.

Are NSAIDs safe in cats?

NSAIDs play a vital role in therapy for many cats, but differences between cats and other animals mean you should **only ever** use a drug that has been specifically prescribed for **your cat by your veterinarian**. Many human drugs such as aspirin, ibuprofen and paracetamol/acetaminophen can be highly toxic to cats – administering these is life-threatening.

Adverse effects can be seen with NSAIDs, just as with all drugs. Some patients may be at increased risk of adverse effects (eg, older cats and cats with certain other diseases). Your veterinarian may then recommend **increased monitoring** and careful **adjustment of therapy** to find the **lowest effective dose** of the drug for your cat.



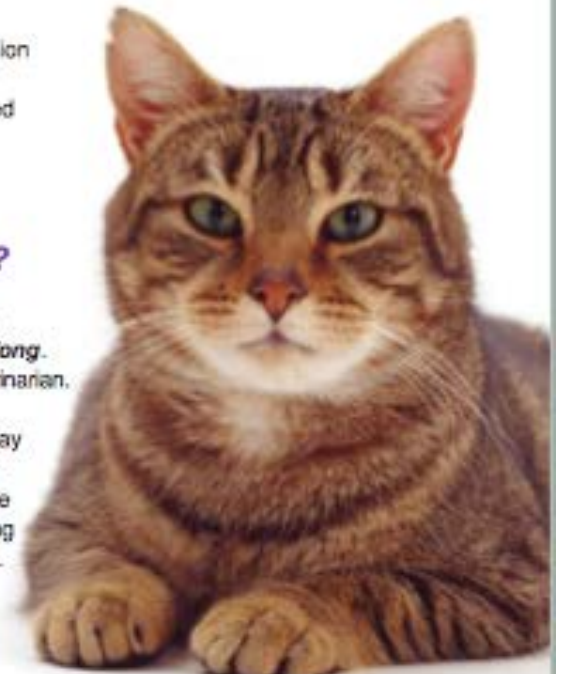
What adverse effects should I look out for?

Licensed NSAIDs have been shown to be safe for use in cats. However, adverse effects can still occur. Most are mild, but some can be serious – as in other species they may involve the gastrointestinal tract, kidneys, cardiovascular system or liver. Adverse effects may lead to a number of signs including:

- ➔ Loss of appetite
- ➔ Nausea or vomiting
- ➔ Lethargy and dullness/depression
- ➔ Altered thirst and/or urination
- ➔ Diarrhoea and/or black-coloured faeces
- ➔ Yellowing of the skin, gums, or whites of the eyes

What do I need to know?

- ✓ Make sure you understand **how much** of the drug to give, **how frequently**, and for **how long**. If you are unsure, ask your veterinarian.
- ✓ **Always give** the medication **with or after food**. Your vet may suggest feeding canned rather than dry food to help encourage good fluid intake, as maintaining a good fluid intake is important.
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www.catvets.com

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www.catvets.com/professionals/guidelines/publications

Meloxicam Safety & Efficacy: Evidence

Long-term safety, efficacy and palatability of oral meloxicam at 0.01–0.03 mg/kg for treatment of osteoarthritic pain in cats

Marcus N Gunew BVSc, BSc(Vet), MACVSc*, Victor H Menrath BAgr, BVSc, FACVSc, Rhett D Marshall BVSc, MACVSc

J Feline
Med Surg,
2008

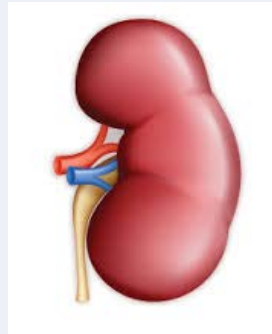
- Safe, efficacious and palatable for OA pain at 0.01-0.03 mg/kg PO q24h
- Mean treatment duration of 5.8 months
- No deleterious effect on renal function was detected in cats studied.
- Gastrointestinal upset in 4% of cats was the only adverse effect noted.

Meloxicam Safety & Efficacy: Evidence

- Gowan R: *Retrospective Analysis Of Long-term Use Of Meloxicam In Aged Cats With Musculoskeletal Disorders And The Effect On Renal Function.*
JFMS October, 2011
- Cats over seven years of age treated for a minimum of 6 months with a daily maintenance dose of 0.02 mg/kg meloxicam and concluded that this dose *does not hasten progression of renal disease in aged cats or aged cats with pre-existent stable IRIS stage 1-3 renal disease.*

Progression of CKD

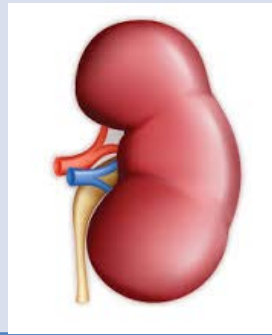
Cats w DJD and CKD +
meloxicam



Cats w DJD + meloxicam



Cats w CKD



Age-matched cats

Metabolism and excretion

	Metabolites	Unchanged meloxicam	Total
Urine	19%	2%	21%
Feces	30%	49%	79%

- Major route of excretion of meloxicam in the cat = fecal
- The main pathway of biotransformation is oxidation
- No conjugated metabolites were detected

Grude' P et al. J.Vet Pharmacol Therap. 2010

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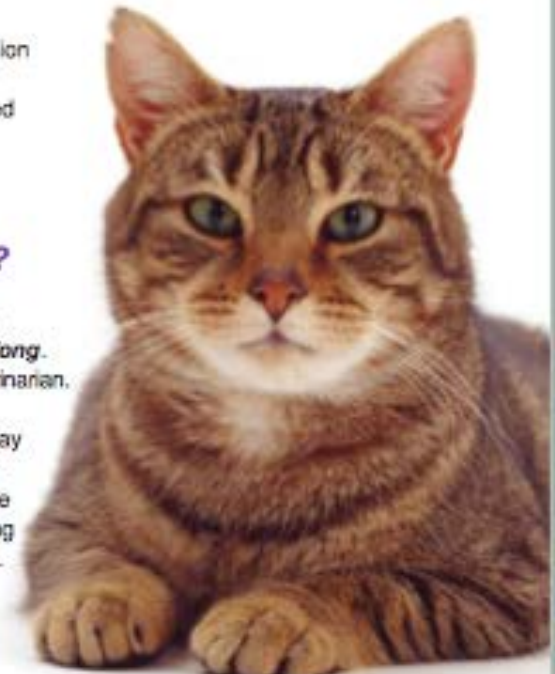
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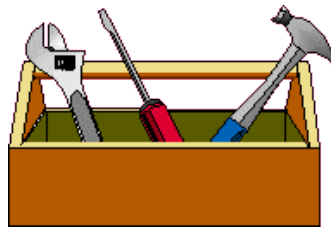
www.catvets.com

www.isfm.net/toolbox

www.catvets.com/professionals/guidelines/publications

Meloxicam use?

- Use lowest effective dose
 - Titrate: But *not above* label dose
 - Re-evaluate your patient!
- Use cautiously or not at all in cats with moderate-severe (IRIS stages 3, 4) renal disease
 - Ensure/optimize hydration
- Avoid in patients with known bleeding disorders or pre-existing GI bleeding
- *Multimodal therapy*



Meloxicam doses for feline arthritis

- 0.1 mg/kg PO on day 1, then 0.05 mg/kg PO q24h



- All doses are based on lean, hydrated weight.
- Monitor & reassess frequently



Robenacoxib doses for feline arthritis

- 1 mg/kg PO SID (with a range of 1-2.4 mg/kg); once daily for a maximum of 6 days.
- All doses are based on lean, hydrated weight.
- Monitor & reassess frequently





Clinical safety of robenacoxib in feline osteoarthritis: results of a randomized, blinded, placebo-controlled clinical trial

Journal of Feline Medicine and Surgery
1–11

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DOI: 10.1177/1098612X15590870

jfms.com



King et al, 2015

Conclusions and relevance

Robenacoxib was well tolerated when administered daily for 1 month in cats with osteoarthritis, including cats with evidence of concurrent CKD (IRIS 1-4). There was no clinical indication of damage to the gastrointestinal tract, kidney or liver.

Protocol for Musculoskeletal Pain

- NSAID +/- opioid + /- gabapentin
- Environmental modifications





Simon's
Cat



Thank you for your participation!



hypurr@aol.com