

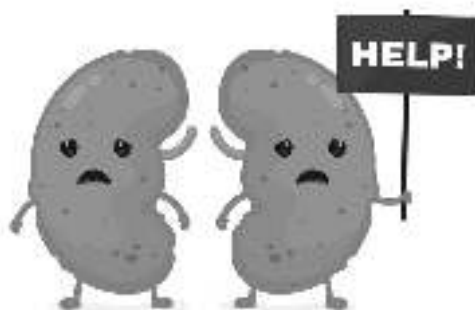


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MAPS
MAGAZINE OF ANIMAL PRACTICE

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ESVCN



Nutritional management of a (special) dog with chronic kidney disease

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Why «special»?



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SONIC

- Border Collie
- 12 y.o.
- Male, intact
- BW 23.5-25 kg
- BCS 4-5/9

Medical history

- TPLO, osteoarthritis (NSAIDs whenever needed)
- Bone marrow hypoplasia (biopsy in 2018)



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SONIC

- Always fed with commercial dry dog food (same brand, different life stages and flavours)
- fed *ad libitum*







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SONIC

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- fed *ad libitum*



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Late December 2019...



at home

Clinical signs

- Polyuria (clear water!), compensatory polydipsia
- Nocturia
- Decreased appetite, weight loss



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Late December 2019...



at the veterinary clinic

Physical examination

- Weight loss (22.5 kg)

Diagnostics

- Complete blood count
- Serum biochemical profile
- Urinalysis
- Abdominal ultrasound
- Blood pressure measurement

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Laboratory evaluation – CBC

RBC (million/ μ L):	5.201	5.74	7.84
Hgb (g/dL):	14.4	15.4	18.1
Hct (%):	42.3	45.2	51.5
MCV (fL):	72.9	84.3	72.9
MCH (pg):	24.7	23.5	24.3
MCHC (g/dL):	33.9	29	37.1
CHCM (g/dL):	34.0	31.3	37.2
MCHCV (fL):	8.99	8.94	11.1
CH (pg):	21.7	23.1	24.1
CHCM (pg):	2.85	2.81	3.27
RDW (%):	12.5	12.8	11
RDW (g/dL):	1.57	1.57	1.72
NRBC/100 WBC:	0	0	0
PLT (in platelets/ μ L):	397	84	411
MPV (fL):	9.3	10.5	12.4
PCT (%):	0.25	0.35	0.52
PDW (%):	53.1	51.2	57.6
VPC (g/dL):	33.7	37.5	45.2
PCDW (g/dL):	3.4	3.8	4.1
VPCV (pg):	308	394	418
PVPCV (pg):	0.00	0.50	0.41
Large PLT (in platelets/ μ L):	5	5	40

- No dehydration
- Low RBC count
- Low PLT count

(but bone marrow hypoplasia)

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Laboratory evaluation – serum biochemistry

Protein total (g/dL) :	6.4	6-7
Albumin (g/dL) :	2.9	2.9-3.5
Glucose (mg/dL) :	1.5	1.0-2.0
Urea Nitrogen (mg/dL) :	0.02	0.16-1.14
Cholesterol (mg/dL) :	220	140-254
Triglyceride (mg/dL) :	48	34-75
Ammonia (mM) :	1283	477-1200
Urea (mg/dL) :	64	10-140
Urea (mg/dL) :	88	11-28
Creatinine (mg/dL) :	1.74	0.6-1.1
Glucose (mg/dL) :	132	78-132
Calcium (mg/dL) :	10.2	9.4-11.0
Phosphorus (mg/dL) :	8.8	2.1-7.1
Calcium (mg/dL) :	81	214-236
Phosphorus (mg/dL) :	11.0	11.2-11.8
Alkaline Phosphatase (mg/dL) :	134	115-144
Protein (mg/dL) :	1.4	4.2-5.5
Urea Nitrogen (mg/dL) :	25.4	30.0-30.0
Cholesterol (mg/dL) :	11.4	106-112

- BUN: 85 mg/dl
- Crea: 1.74 mg/dl
- P: 5.0 mg/dl

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Laboratory evaluation – urinalysis

		min	max
Color:	GAUO		
Aspartate:	LIVIDA		
Glucose (mg/dL) :	8.8	1.9	1000
Pero Specific:	1011	1012	1042
pH (Unit) :	5.9	6.5	7.5
Glucose (mg/dL) :	0	0	2
Cholesterol (mg/dL) :	0	0	2
Bilirubin (mg/dL) :	0	0	0.2
Protein (mg/dL) - H1000:	POSITIVE	NEGATIVE	
Protein (mg/dL) - H1000:	33	10	50
Microprotein (mg/dL) :	27	15	84
Protein (mg/dL) - H1000:	55	0.1	0.4

- USG: 1011
- UP/C ratio: 0.6

- Struvite crystals +
- No bacteria
- No RBC, WBC, epithelial cells

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Diagnostic imaging - ultrasound



- Increased renal cortical echogenicity

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Step 1 Diagnose CKD

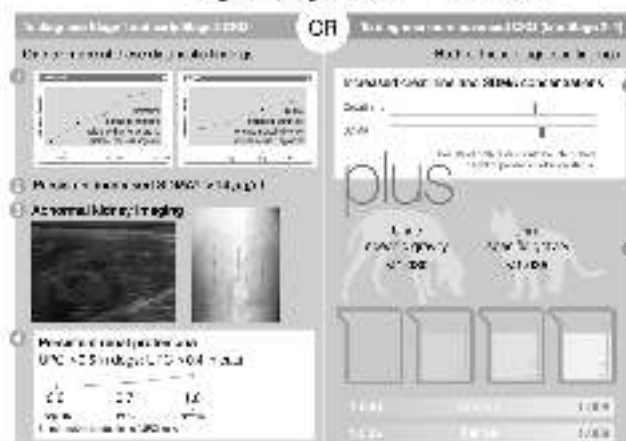
Diagnosing renal physical
renal cortex is thickened and echogenicity is increased

Clinical presentation

For example, decreased appetite, weight loss, polyuria, polydipsia, and lethargy are common clinical signs of CKD.

Physical examination findings

CKD can cause various physical findings, such as dehydration, anemia, and hypertension. These findings can help in the diagnosis of CKD.

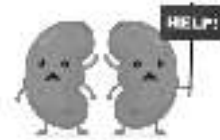


That's it!

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Chronic Kidney Disease



- = kidney damage present for at least 3 m, with or without $< \text{GFR}$ or $>50\%$ reduction in GFR persisting for at least 3 m (Polzin et al., 2005)
- Results from other systemic conditions or nephrotoxic drugs vs no apparent underlying cause
- frequent disease in older pets (decline in kidney function associated with aging)
- Traditional tests detect large decreases in GFR ($\geq 75\%$)
- Systemic consequences: hypertension, non-regenerative anemia, secondary hyperparathyroidism, hypokalemia, metabolic acidosis

(Small Animal Clinical Nutrition, 2010) ¹³

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IRIS

Diagnosing, Staging, and Treating Chronic Kidney Disease in Dogs and Cats

Chronic kidney disease (CKD) is a common condition in dogs and cats. It is characterized by a gradual loss of kidney function over time. The disease is often diagnosed through blood and urine tests. Early detection and treatment can help slow the progression of the disease and improve the quality of life for the animal.



Next...

Step 2: Stage CKD

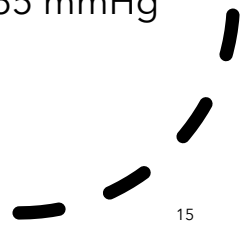
		Stage 1 GFR ≥ 90 (Creatinine ≤ 1.3 mg/dL)	Stage 2 GFR $60-89$ (Creatinine $1.3-2.8$ mg/dL)	Stage 3 GFR $30-59$ (Creatinine $2.8-5.3$ mg/dL)	Stage 4 GFR < 30 (Creatinine > 5.3 mg/dL)
Urea nitrogen (BUN)		≤ 27 mg/dL	$28-36$ mg/dL	$37-54$ mg/dL	≥ 55 mg/dL
Urea nitrogen (BUN)	Gender	Male: ≤ 27 mg/dL Female: ≤ 28 mg/dL	Male: $28-36$ mg/dL Female: $29-37$ mg/dL	Male: $37-54$ mg/dL Female: $38-55$ mg/dL	Male: ≥ 55 mg/dL Female: ≥ 56 mg/dL
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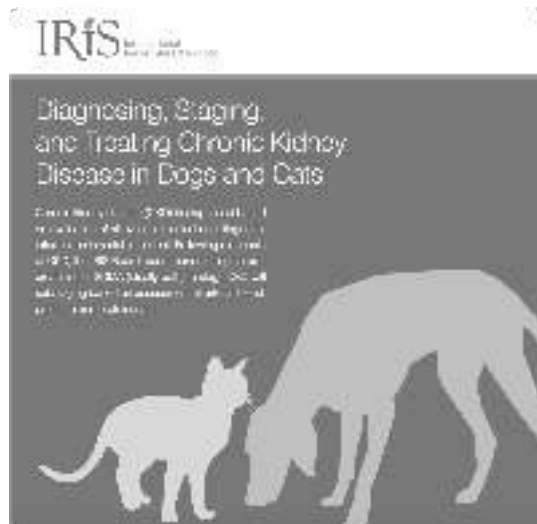
IRIS staging system

- Blood creatinine: 1.74 mg/dl
→ **stage II** (mild renal azotemia)
- UP/C value: 0.6
→ proteinuric
- Systolic Blood Pressure: 165 mmHg
→ hypertensive

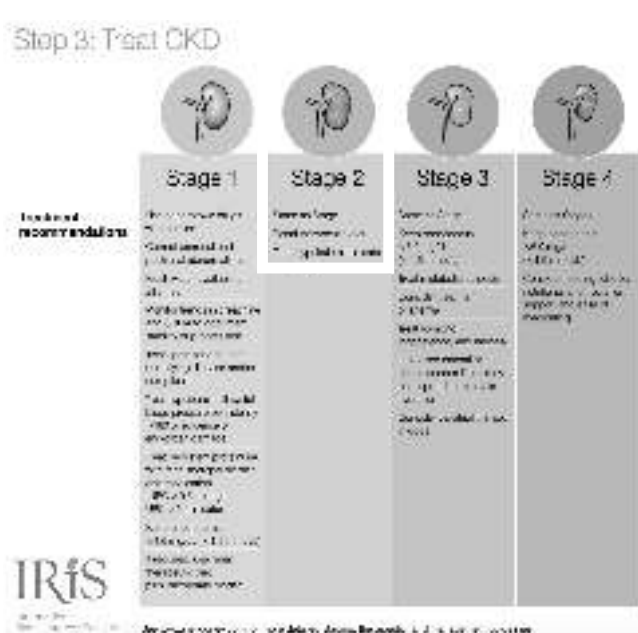


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Now...



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Feeding plan – aims

1. Control clinical signs of uremia
 2. Support adequate nutrition (and maintain BCS and MCS)
 3. Minimize fluid/electrolyte/acid-base imbalances
 4. Slow progression to later stages (Polzin et al., 2005)
- The use of commercial renal diets is the only treatment that has been shown to prolong survival time and improve QOL in pets with CKD (Jacob et al., 2002 and 2004; Ross et al., 2006; Polzin et al., 2009; Roudebush et al., 2009)

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Feeding plan – key nutritional factors

1. > Water: to reduce the amount of osmotic work to concentrate urine
2. < Protein: to reduce the amount of urea to be excreted and proteinuria
3. Phosphorus: to limit P retention
4. Sodium and chloride: to avoid retention and not worsen hypertension
5. Omega-3 FAs: renoprotective effects
6. Antioxidants: to fight renal oxidative stress

(Small Animal Clinical Nutrition, 2010)

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Feeding plan – diet type

Home-cooked diet

- Palatability
 - Water +
 - Customizable and easily modifiable
 - Fun (?)
- Organic vs Inorganic P?
(in cats; Colthered et al., 2018)



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Feeding plan – diet formulation

+10% one month later

- DER: $110 \text{ kcal} \times \text{ideal BW}^{0.75}$ (Fediaf, 2019)
- PRT: restriction to 40 g/Mcal
(based on $110 \times \text{BW}^{0.75}$) (NRC, 2006; Fediaf, 2019)
- FAT: 44 g/Mcal
- EPA+DHA: at least 140 mg/kg^{0.75} (Bauer, 2011)

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Feeding plan – diet formulation

Then switched
to psyllium fiber



No P included, low Na, + antioxidants

Ingredient	Daily amount
Chicken breast	110 g
Egg	1
Pasta	150 g
Vegetables	150 g
Sunflower oil	20 ml
Butter	20 g
Salmon oil	8 ml
Min&Vit supplement	12.5 g



	gram / ml	2.88	g/Mcal	2.88
Chicken breast	110 g	110 g	40.0 g	14.0 g
Egg	1 g	1 g	0.0 g	0.0 g
Pasta	150 g	150 g	53.3 g	19.0 g
Vegetables	150 g	150 g	53.3 g	19.0 g
Sunflower oil	20 ml	20 ml	7.1 g	2.6 g
Butter	20 g	20 g	7.1 g	2.6 g
Salmon oil	8 ml	8 ml	2.8 g	1.0 g
Min&Vit supplement	12.5 g	12.5 g	4.4 g	1.6 g

MINERAL		VITAMIN	
Calcium	1.0 g	Vitamin A	1000 IU
Phosphorus	0.5 g	Vitamin B1	10 mg
Potassium	0.5 g	Vitamin B2	10 mg
Sodium	0.1 g	Vitamin B3	10 mg
Magnesium	0.5 g	Vitamin B6	10 mg
Zinc	0.1 g	Vitamin B12	10 mcg
Copper	0.01 g	Vitamin E	100 IU
Manganese	0.01 g	Vitamin K	100 IU
Iron	0.01 g		
Chromium	0.01 g		
Selenium	0.01 g		

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Four months later (April 2020)...

Reassessment #1

- Polyuria and polydipsia significantly reduced
- Increased appetite, weight gain (24 kg, +1.5)

• BUN: 85 mg/dl → 53



• Crea: 1.74 mg/dl → 1.61



• P: 5.0 mg/dl → 4.4



• USG: 1011 → 1022



• UPC ratio: 0.6 → 0.7



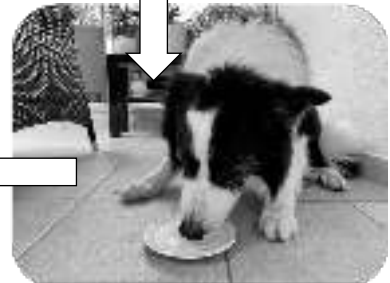
• No more struvite crystals!



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Inconveniencies...



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Four months later (August 2020)...

Reassessment #2

- Polyuria and polydipsia significantly reduced
- Weight gain (25 kg, +1)
- BUN: 53 mg/dl → 58 🙄
- Crea: 1.61 mg/dl → 1.78 🙄
- P: 4.4 mg/dl → 3.8 😊
- USG: 1022 → 1023 😊
- UPC ratio: 0.7 → 1.4 🙄
- Blood pressure: 180 mmHg 🙄

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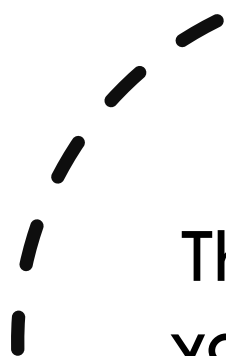
What's next?



- Antihypertensive medication (enalapril starting with 0,5 mg/kg bid)
- Re-check every 2 m max
- Worsening of clinical signs (e.g. uremic gastroenteritis; there is no cure for CKD!)

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**Thank you for
your attention!**

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