Staging is undertaken following diagnosis of Chronic Kidney Disease (CKD) in order to facilitate appropriate treatment and monitoring of the patient. There are separate but related algorithms for staging CKD in cats and dogs.

Staging is based initially on fasting blood creatinine, assessed on at least two occasions in the stable patient. The patient is then substaged based on proteinuria and blood pressure.

Based on these categories, some empirical recommendations can be made about the type of treatment it would be logical to use for these cases. In addition, predictions based on clinical experience might be made about the likely response to treatment.

### Stage Blood creatinine µmol/l mg/dl Comments

<table>
<thead>
<tr>
<th>Stage</th>
<th>Dogs</th>
<th>Cats</th>
</tr>
</thead>
<tbody>
<tr>
<td>At risk</td>
<td>&lt;125</td>
<td>&lt;140</td>
</tr>
<tr>
<td>1</td>
<td>&lt;125</td>
<td>&lt;140</td>
</tr>
<tr>
<td>2</td>
<td>125 – 180</td>
<td>140 – 250</td>
</tr>
<tr>
<td>3</td>
<td>181 – 440</td>
<td>251 – 440</td>
</tr>
<tr>
<td>4</td>
<td>&gt;440</td>
<td>&gt;440</td>
</tr>
</tbody>
</table>

Note these blood creatinine levels apply to average size dogs – those of extreme size may vary
2a. Substaging by Proteinuria

The goal is to identify renal proteinuria having ruled out post-renal and pre-renal causes.

Standard urine dipsticks can give rise to false positives therefore practitioners should consider using a more specific screening test such as the sulphosalicylic acid turbidometric test or the ERD® test.

The urine protein to creatinine (UP/C) ratio should be measured in all cases, provided there is no evidence of urinary tract inflammation or hemorrhage and the routine measurement of plasma proteins has ruled out dysproteinemias. Ideally staging should be done on the basis of at least three urine samples collected over a period of at least 2 weeks.

<table>
<thead>
<tr>
<th>UP/C value</th>
<th>Dogs</th>
<th>Cats</th>
<th>Substage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>&lt;0.2</td>
<td>Non-proteinuric</td>
</tr>
<tr>
<td>0.2 to 0.5</td>
<td>0.2</td>
<td>0.4</td>
<td>Borderline proteinuric (BP)</td>
</tr>
<tr>
<td>&gt;0.5</td>
<td>&gt;0.4</td>
<td></td>
<td>Proteinuric (P)</td>
</tr>
</tbody>
</table>

Patients with persistent proteinuria in the BP subcategory should be re-evaluated within 2 months and re-classified as appropriate.

UP/Cs in the NP or BP range may be categorized as ‘microalbuminuric’ on the ERD® test. The significance of microalbuminuria in predicting future renal health is not understood at present. IRIS recommendation is to continue to monitor this level of proteinuria.

Proteinuria may decline as renal dysfunction worsens and so may be less frequent in animals in Stages 3 and 4.

Response to any treatment given to reduce glomerular hypertension, filtration pressure, and proteinuria, should be monitored at intervals using the UP/C ratio.
IRIS Staging of CKD (modified 2013)

2b. Substaging by Arterial Blood Pressure

Patients should be acclimatized to the measurement conditions and multiple measurements taken. The final classification should rely upon multiple pressure determinations (preferably multiple patient visits to the clinic on separate days but acceptable if during the same visit with at least 2 hours separating determinations).

Patients are substaged by blood pressure according to the degree of risk of target-organ damage, and whether there is evidence of target-organ damage or complications.

<table>
<thead>
<tr>
<th>Systolic BP mm Hg</th>
<th>Diastolic BP mm Hg</th>
<th>Adaptation when breed-specific reference range is available*</th>
<th>Arterial Pressure Substage (AP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;150</td>
<td>&lt;95</td>
<td>&lt;10 mm Hg above reference range</td>
<td>0 Minimal Risk</td>
</tr>
<tr>
<td>150 – 159</td>
<td>95 – 99</td>
<td>10 – 20 mm Hg above reference range</td>
<td>1 Low Risk</td>
</tr>
<tr>
<td>160 – 179</td>
<td>100 – 119</td>
<td>20 – 40 mm Hg above reference range</td>
<td>2 Moderate Risk</td>
</tr>
<tr>
<td>≥ 180</td>
<td>≥ 120</td>
<td>≥40 mm Hg above reference range</td>
<td>3 High Risk</td>
</tr>
</tbody>
</table>

No evidence of target-organ damage/complications

Evidence of target-organ damage/complications

Blood pressure not measured

Treated

As with proteinuria, in the absence of evidence of target-organ damage, demonstration of persistence of blood pressure readings within a particular category is important.

‘Persistence’ of elevation should be judged on multiple blood pressure measurements made over the following timescales:

- 2 months (if at moderate risk – 160 to 179 mm Hg systolic BP)
- 1 to 2 weeks (if at severe risk – ≥180 mm Hg).

*If available, it is preferable to use breed specific ranges for normal values and compare the measurement to the upper limit of the normal range for the breed being evaluated. Sight hounds, in particular, have a higher reference range than most breeds of dog.
3. Therapy Effect

If antihypertensive/antiproteinuric therapy is instigated, subsequent staging of hypertension/proteinuria should be based on the current values for blood pressure and UP/C.

Example:

Cat A before treatment
Creatine 260 µmol/l
UP/C 0.3
Systolic blood pressure 200 mm Hg
IRIS CKD Stage 3-BP-AP3

Cat A after antihypertensive treatment
Creatine 300 µmol/l
UP/C 0.3
Systolic blood pressure 155 mm Hg
IRIS CKD Stage 3-BP-AP1 (T)

Dog B before treatment
Creatine 160 µmol/l
UP/C 0.8
Systolic blood pressure 155 mm Hg
IRIS CKD Stage 2-P-AP1

Dog B after antiproteinuric treatment
Creatine 170 µmol/l
UP/C 0.4
Systolic blood pressure 155 mm Hg
IRIS CKD Stage 2-BP (T)-AP1
Algorithm for Staging of Chronic Kidney Disease in Dogs

History and/or physical examination suggest chronic kidney disease (CKD)

Measure blood creatinine

Creatinine
- <125 µmol/l <1.4 mg/dl
- 125 – 180 µmol/l 1.4 – 2.0 mg/dl
- >180 µmol/l >2.0 mg/dl

Measure urine specific gravity

Firm evidence of CKD present

Stage 1
Substage by UP/C & BP

Radiographs and ultrasound, UP/C, BP and urine culture

Institute management plan for Stage 1 patients

Firm evidence of CKD absent

<1.030

Radiographs and ultrasound, UP/C, BP and urine culture

Normal: re-evaluate within 2 months
Abnormal: Stage 2
Substage by UP/C & BP

Institute treatment

≥1.030

Clinical evaluation

If underlying systemic abnormalities, correct and re-evaluate within 6 months

Renal azotaemia

Stage 3 or 4
Substage by UP/C & BP

Pre- or post-renal azotaemia

Correct underlying abnormalities and re-evaluate immediately

Normal: re-evaluate within 2 months
Abnormal: Stage 2
Substage by UP/C & BP

Institute treatment

Re-evaluate in 2-3 months, then every 3 months if creatinine rising; every 3-6 months if creatinine stable
Algorithm for Staging of Chronic Kidney Disease in Cats

**History and/or physical examination suggest chronic kidney disease (CKD)**

- **Measure blood creatinine**
  - **Creatinine**
    - <140 µmol/l
    - <1.6 mg/dl
    - Firm evidence of CKD present
    - **Stage 1**
      - Substage by UP/C & BP
      - Radiographs and ultrasound, UP/C, BP and urine culture
      - Institute management plan for Stage 1 patients
      - Re-evaluate in 2-3 months, then every 3 months if creatinine rising; every 3-6 months if creatinine stable
    - ≥140 µmol/l
    - ≥1.6 mg/dl
    - Measure urine specific gravity
    - <1.035
    - Pre- or post-renal azotaemia
    - Correct underlying abnormalities and re-evaluate immediately
    - ≥1.035
    - Renal azotaemia
    - Substage by UP/C & BP
    - Institute treatment
  - **Creatinine**
    - 140 – 250 µmol/l
    - 1.6 - 2.8 mg/dl
    - Measure urine specific gravity
    - Firm evidence of CKD present
    - **Stage 1**
      - Substage by UP/C & BP
      - Radiographs and ultrasound, UP/C, BP and urine culture
      - Institute management plan for Stage 1 patients
      - Re-evaluate in 2-3 months, then every 3 months if creatinine rising; every 3-6 months if creatinine stable
    - ≥250 µmol/l
    - ≥2.8 mg/dl
    - Measure urine specific gravity
    - Firm evidence of CKD absent
    - Re-evaluate in 2-3 months, then every 3 months if creatinine rising; every 3-6 months if creatinine stable
Algorithm for Substaging by Proteinuria

CKD diagnosed & staged 1-4
Urine dipstick examination

+ Questionable proteinuria;
Urinalysis with sediment examination

- Non-proteinuric (NP)

Sediment abnormal/‘active’

Conduct further work-up (eg rule out lower urinary tract disease)

Sediment ‘inactive’/unremarkable/hyaline casts

Determine UP/C

Cat

UP/C <0.2
Non-proteinuric (NP)

UP/C >0.4*
Proteinuric (P)

UP/C 0.2 – 0.4*
Borderline proteinuric (BP)
Re-evaluate within 2 months

Dog

UP/C >0.5*
Proteinuric (P)

UP/C <0.2
Non-proteinuric (NP)

UP/C 0.2 – 0.5*
Borderline proteinuric (BP)
Re-evaluate within 2 months

*demonstrate persistence by re-evaluating:
if Borderline Proteinuric, in 2 weeks to 2 months
if Proteinuric, in 2-4 weeks
if UP/C>2, no need to demonstrate persistence prior to initiating therapy (severe proteinuria)
Algorithm for Substaging by Blood Pressure
(risk of target-organ damage from hypertension)

CKD diagnosed & staged 1-4
Measure blood pressure (BP)

- **Systolic BP < 150 mm Hg** (or <10 mm Hg above reference range for breed)
  - **Minimal Risk of target-organ damage** (AP0)
    - No extra-renal evidence of hypertension
      - **Low to Moderate Risk of target-organ damage** (AP1nc/AP2nc)
        - Re-evaluate within 2 months
    - **Extra-renal evidence of hypertension** (retinopathy and/or left ventricular hypertrophy)
      - **Low to Moderate Risk of target-organ damage** (AP1c/AP2c)

- **Systolic BP 150-179 mm Hg** (or 10-40 mm Hg above reference range for breed)
  - **Clinical evaluation**
    - **No extra-renal evidence of hypertension**
      - **Low to Moderate Risk of target-organ damage** (AP1nc/AP2nc)
        - Re-evaluate within 2 months
    - **Extra-renal evidence of hypertension** (retinopathy and/or left ventricular hypertrophy)
      - **Low to Moderate Risk of target-organ damage** (AP1c/AP2c)

- **Systolic BP ≥ 180 mm Hg** (or >40 mm Hg above reference range for breed)
  - **Clinical evaluation**
    - **No extra-renal evidence of hypertension**
      - **High Risk of target-organ damage** (AP3nc)
        - Re-evaluate within 7 days
    - **Extra-renal evidence of hypertension** (retinopathy and/or left ventricular hypertrophy)
      - **High Risk of target-organ damage with complications** (AP3c)