

IRIS EPIDEMIOLOGICAL PROJECT

DESCRIPTIVE ANALYSIS OF POPULATION CHARACTERISTICS OF DOGS AND CATS WITH SUSPECTED CHRONIC RENAL INSUFFICIENCY

Introduction:

This study was organised as a pilot project to look at the feasibility of gathering data from across the world from dogs and cats presenting to veterinarians in practice where the suspected diagnosis was that of chronic renal failure. A request was made through Novartis Animal Health Field representatives for practitioners to submit cases to the database using the on-line facility created for the International Renal Interest Society (IRIS). This facility allowed entry of all the data that would be necessary for classification of the case according to the IRIS algorithm. This also permitted cases to be staged according to the IRIS algorithm allowing an initial examination of the value of this diagnostic classification to practitioners and allowing us to see what patterns emerged within the two species.

1. GENERAL DESCRIPTION OF THE POPULATION BY COUNTRY

Information was received 921 cats and dogs suffering from suspected chronic renal insufficiency. 79% of the cases were from England, while the remaining 21% were from Canada and various countries in Europe. Table 1.1 lists the countries that contributed information.

Table 1.1: Countries that contributed information about cats and dogs with chronic renal insufficiency

Contributing Country	Frequency	Percentage of total
Canada	5	0.5
England	728	79.0
France	33	3.6
Germany	8	0.9
Italy	5	0.5
Netherlands	1	0.1
Spain	141	15.3
Total	921	100.0

Of the 921 animals, 789 were cats (85.7%) and 132 were dogs (14.3%). However, there was a difference in the distribution of cats and dogs between the different countries (Figure 1.1). In Spain, the animals presenting with suspected renal insufficiency were predominantly dogs (71.6%), whereas in England the vast majority were cats (98.9%). France contributed relatively equal numbers of cats and dogs. Due to the small number of cases contributed by the remaining countries, they were grouped together as 'Other'.

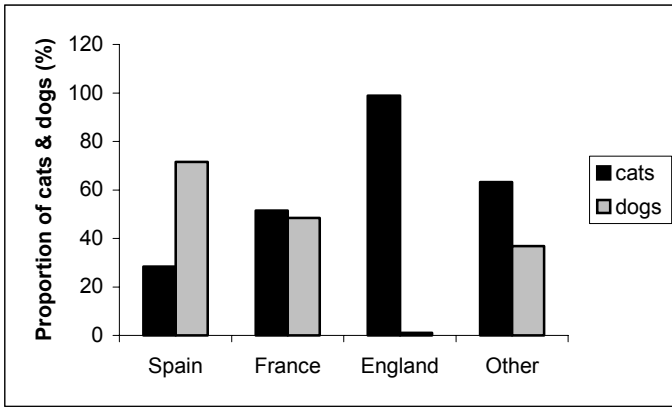


Figure 1.1: Proportion of cats and dogs presenting with suspected renal insufficiency in various countries

Suspected renal insufficiency cases were evenly distributed between male and female cats in England (49.9% and 50.1% respectively), but for cats in the remaining countries the disease was predominantly male-related (Figure 1.2a). However, circumstances differed slightly for dogs (Figure 1.2b). In Spain and France, over 60% of the animals that presented with suspected renal insufficiency were male, yet in England there was an equal number of male and female dogs, while in 'Other' countries the dogs were primarily female.

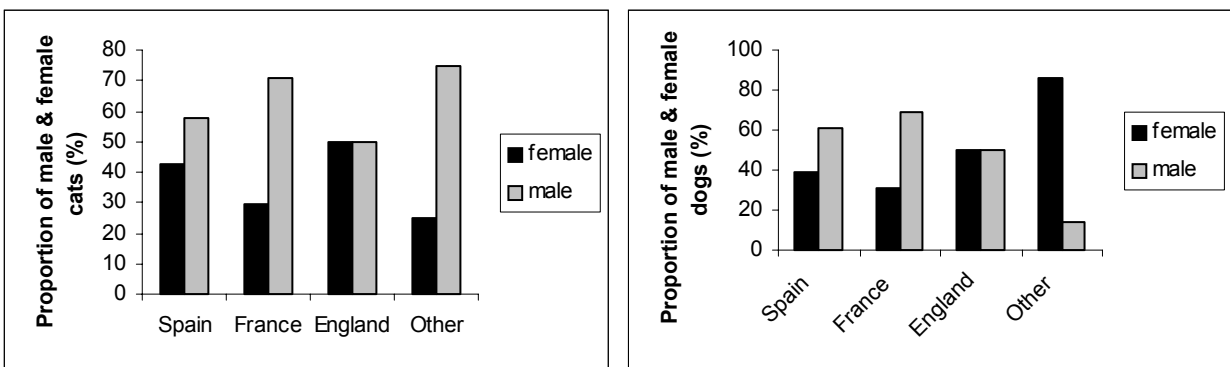


Figure 1.2: Proportion of male and female (a) cats and (b) dogs presenting with suspected renal insufficiency in various countries

More than 65% of the cats suffering from suspected renal insufficiency in Spain, France and England were neutered, yet of the 12 cats from the 'Other' countries, only one was neutered leaving the majority intact (Figure 1.3a). Dogs however displayed a different picture as over 60% of those presenting with renal insufficiency in Spain and France remained intact, yet all English dogs were neutered. 'Other' countries also had primarily neutered animals (71.4%) (Figure 1.3b).

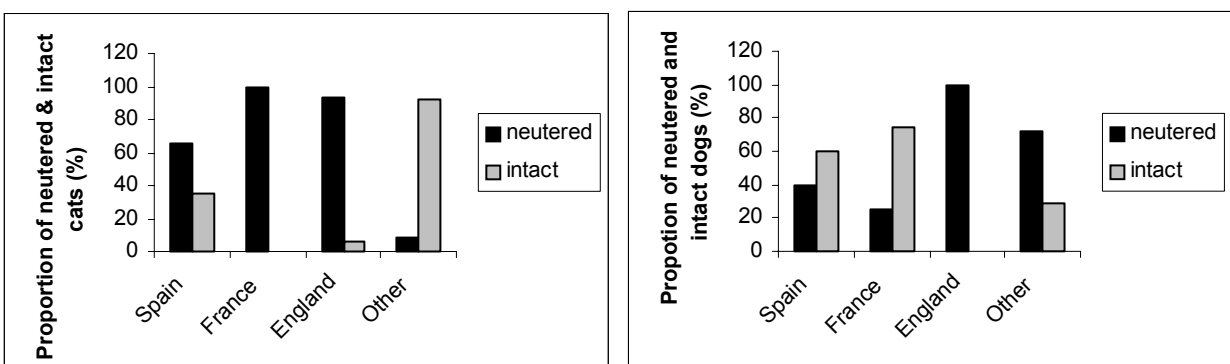


Figure 1.3: Proportion of neutered and intact (a) cats and (b) dogs presenting with suspected renal insufficiency in various countries

In all participating countries, over 64% of the suspected renal insufficiency cases occurred in cats older than six years (Figure 1.4a). The situation however, was slightly different among the canine population - over 68% of the dogs from France, England and 'Other' countries presenting with suspected renal insufficiency were over the age of six. However, in Spain only 43.2% of the dogs were over the age of six.

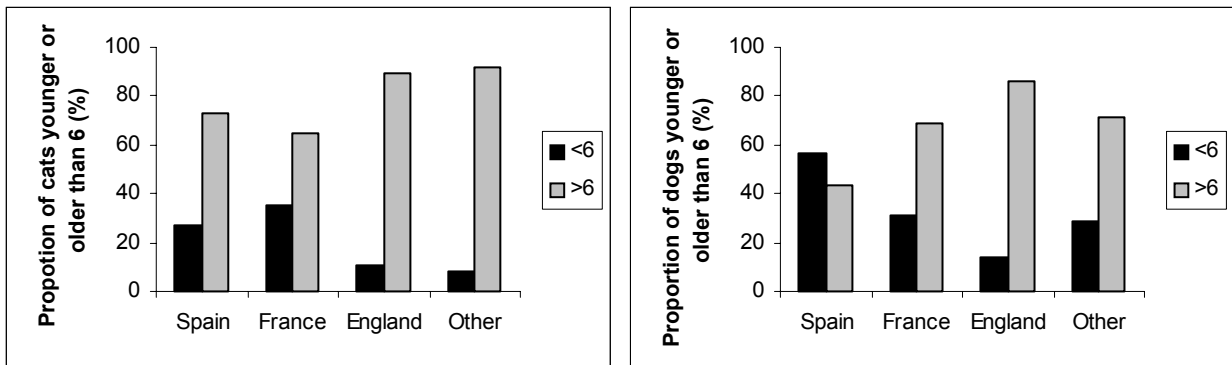


Figure 1.4: Proportion of (a) cats and (b) dogs younger or older than six years presenting with suspected renal insufficiency in various countries

2. DESCRIPTIVE ANALYSIS OF A CAT POPULATION PRESENTING WITH SUSPECTED CHRONIC RENAL INSUFFICIENCY

2.1 Gender, Age and Neutering

As a group the feline population was evenly divided between genders (51.3% males and 48.7% females). The majority of cats were neutered (91.2%) and only 8.8% remained intact. Only 11.7% of cats were six years or younger, while the majority (88.3%) were older than six.

When sub-divided according to gender, male and female cats both displayed a predominance of neutered animals and only a small proportion of intact cases (Table 2.1).

Table 2.1: Proportion of neutered and intact animals among male and female cats

	Male (n=380)	Female (n=400)
Neutered	88.5%	93.9%
Intact	11.5%	6.1%

The majority of both male and female cats were older than six years (85.2% and 91.5% respectively) (Table 2.2).

Table 2.2: Proportion of male and female cats younger or older than six years

	Male (n=371)	Female (n=355)
< 6 years	14.8%	8.5%
> 6 years	85.2%	91.5%

There was a difference in the number of neutered and intact cats between the two age groups as more than 92% of the neutered cats were over the age of six, whereas intact cats were more evenly distributed between the two age groups (Table 2.3).

Table 2.3: Proportion of neutered and intact cats younger or older than six years

	Neutered (n=662)	Intact (n=61)
< 6 years	7.6%	54.1%
> 6 years	92.4%	45.9%

Median age of the cat population was 13.00 years (interquartile range 10-15). There was hardly any difference in the median age of male (13 years) and female (13.1 years) cats (interquartile ranges 9.1-15 and 10.1-16 respectively), although median age of neutered cats was almost two and a half times that of intact cats (13.0 and 5.5 years respectively; interquartile ranges 11-15.1 and 1.1-12 respectively). Median age of cats in the six-years-or-younger age-group was 3.5 years while those in the over-six-years age-group had a median age of 13.6 years (interquartile ranges 1.5-5.6 and 11-16 respectively).

2.2 Breeds

Suspected renal insufficiency among cats did not appear to be restricted to any one breed, although some were more frequently represented than others. Those breeds that had 12 or more cases are listed in Table 2.4.

Table 2.4: Most frequently occurring cat breeds presenting with suspected renal insufficiency

Breed	Number of cats
Domestic short hair	594
Domestic long hair	80
Persian	20
Siamese	21
European	18
Burmese	12

2.3 Historical and Clinical Examination Findings

The most common signs occurring in the history of cats suspected of having renal insufficiency were polyuria/polydipsia (40.3%), weight loss (40.1%), a decreased appetite (22.8%), vomiting (22.4%), and lethargy (12%) (Figure 2.1).

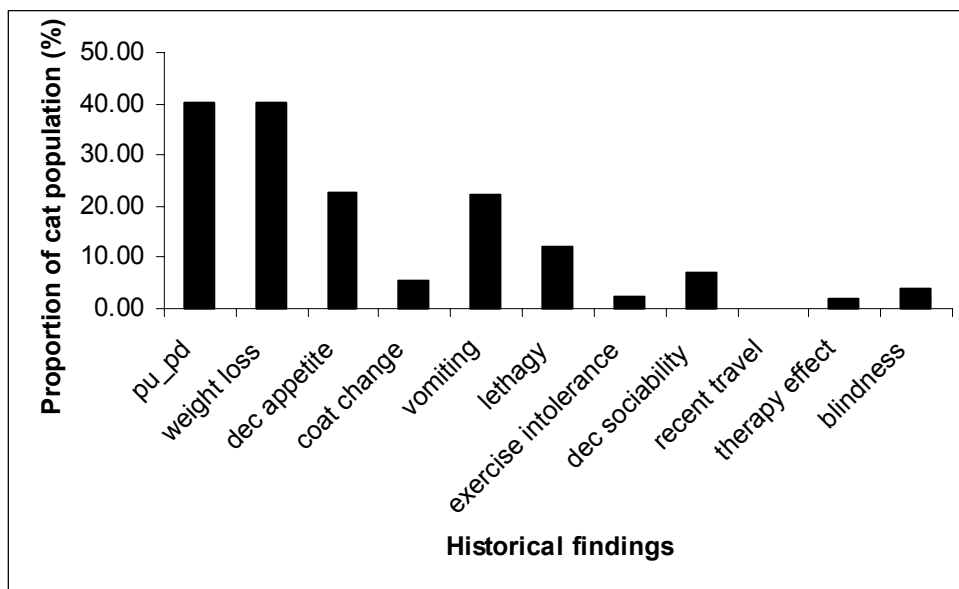


Figure 2.1: Proportion of various signs in the history of cats presenting with suspected chronic renal insufficiency

When considering the history of the animal, male cats displayed a higher prevalence than female cats for each sign except for a decrease in sociability and therapy affect. The two most common historical findings among both male and female cats were polyuria/polydipsia (44.9% and 35.9% respectively) and weight loss (43.7% and 35.9% respectively), with the third most common being a decreased appetite for males (25.6%) and vomiting for females (22.4%) (Figure 2.2).

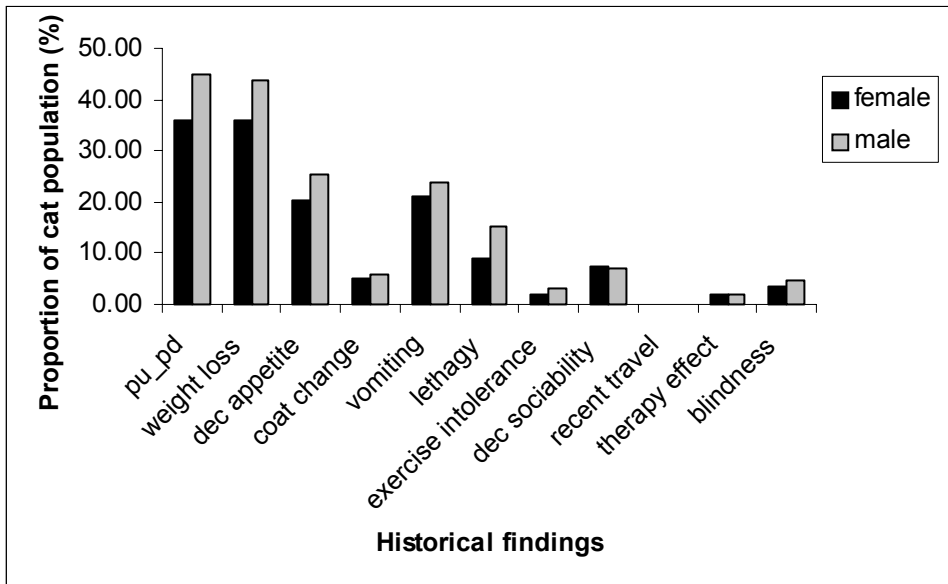


Figure 2.2: Proportion of various signs in the history of male and female cats presenting with suspected chronic renal insufficiency

The history of intact cats showed a higher prevalence of each sign than neutered cats except for polyuria/polydipsia and weight loss. The two most common signs for both intact and neutered cats were polyuria/polydipsia (37.7% and 41.1% respectively) and weight loss (37.7% and 40.1% respectively) with the third most common for intact cats being decreased appetite (34.8%) and vomiting for neutered cats (22.1%) (Figure 2.3)

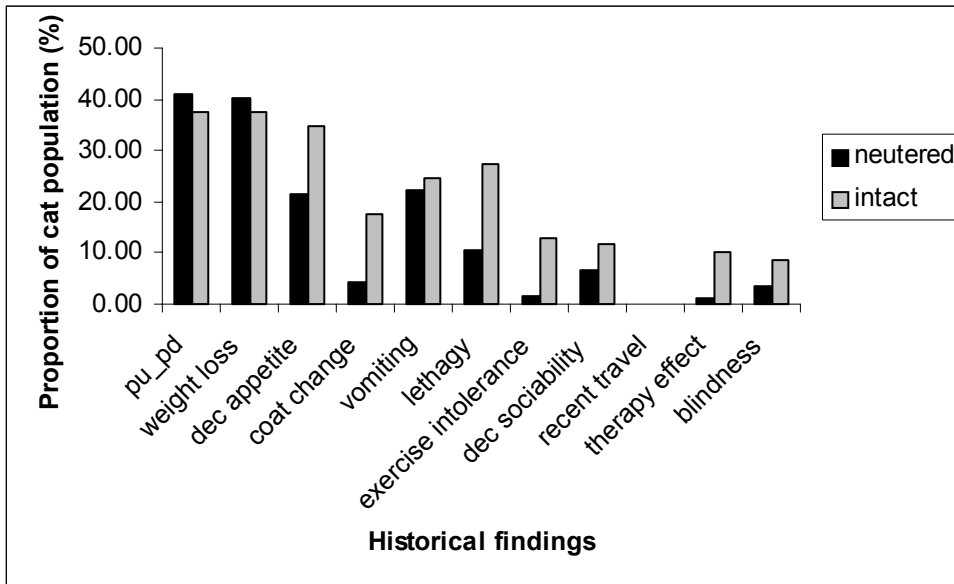


Figure 2.3: Proportion of various signs in the history of neutered and intact cats presenting with suspected chronic renal insufficiency

The history of older animals showed a higher prevalence of all signs except for decreased appetite, coat change, exercise intolerance and therapy effect (Figure 2.4). The most common signs for older cats were polyuria/polydipsia (43.7%), weight loss (42%), and vomiting (23.7%). For young cats (six years or less) the most common signs were decreased appetite (29.4%) polyuria/polydipsia (23.5%), and weight loss (22.4%).

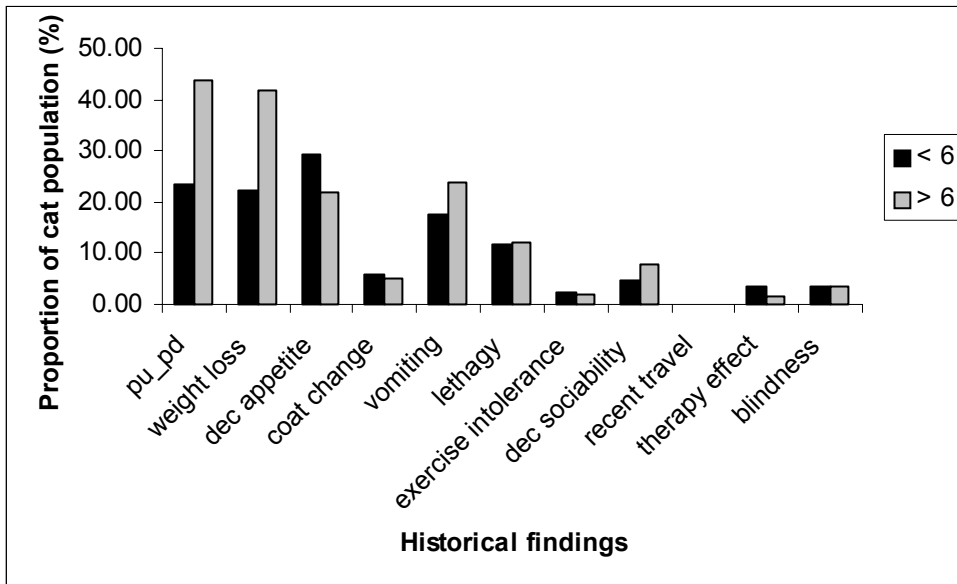


Figure 2.4: Proportion of various signs in the history of cats younger or older than six years presenting with suspected chronic renal insufficiency

The most common signs recorded during the clinical examination of cats presenting with suspected renal insufficiency were dental problems (34.5%), abnormal renal palpation (18.4%), a decrease in weight (17%), an abnormal coat (16.6%) and dehydration (10.9%) (Figure 2.5).

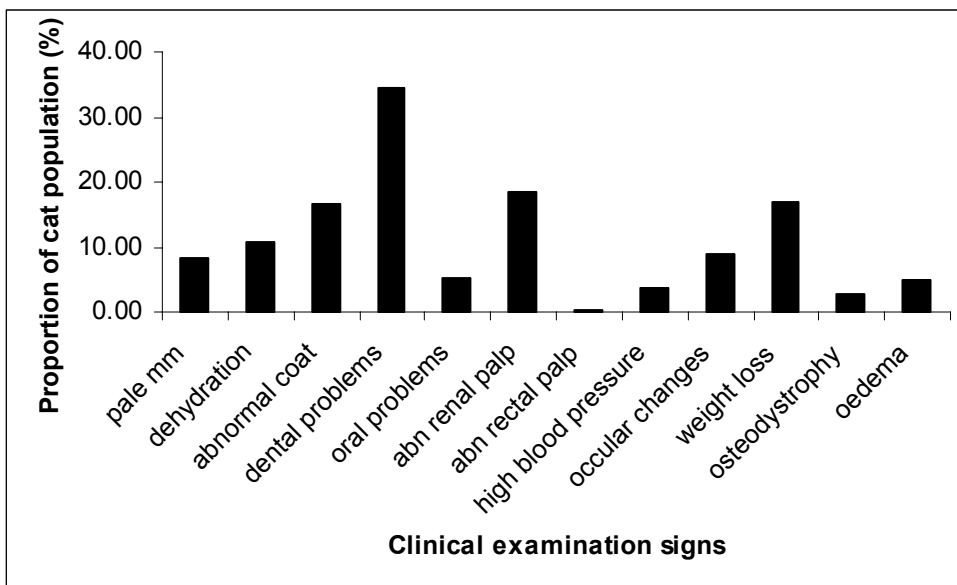


Figure 2.5: Proportion of cats exhibiting various signs during their clinical examination

During the clinical examination male cats displayed a higher prevalence than female cats for each sign except oedema. The three most common signs encountered in the clinical examination of male cats were dental problems (36%), an abnormal coat (19.4%) and an abnormal renal palpation (18.4%). The three most common signs for females were dental problems (33%), abnormal renal palpation (18.6%) and weightloss (17%). (Figure 2.6).

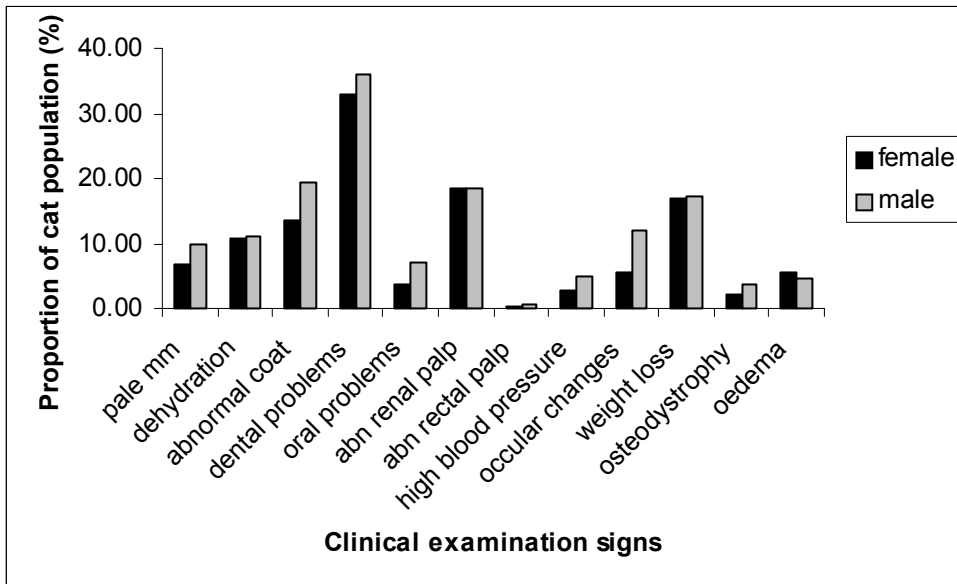


Figure 2.6: Proportion of male and female cats presenting with suspected chronic renal insufficiency exhibiting various signs in their clinical examination

During the clinical examination the three most common signs displayed by intact cats were pale mucous membranes (27.5%), dehydration (27.5%), and ocular changes (23.2%). The three most common signs displayed by neutered cats were dental problems (36.2%), abnormal renal palpation (19.4%) and weightloss (17.7%) (Figure 2.7).

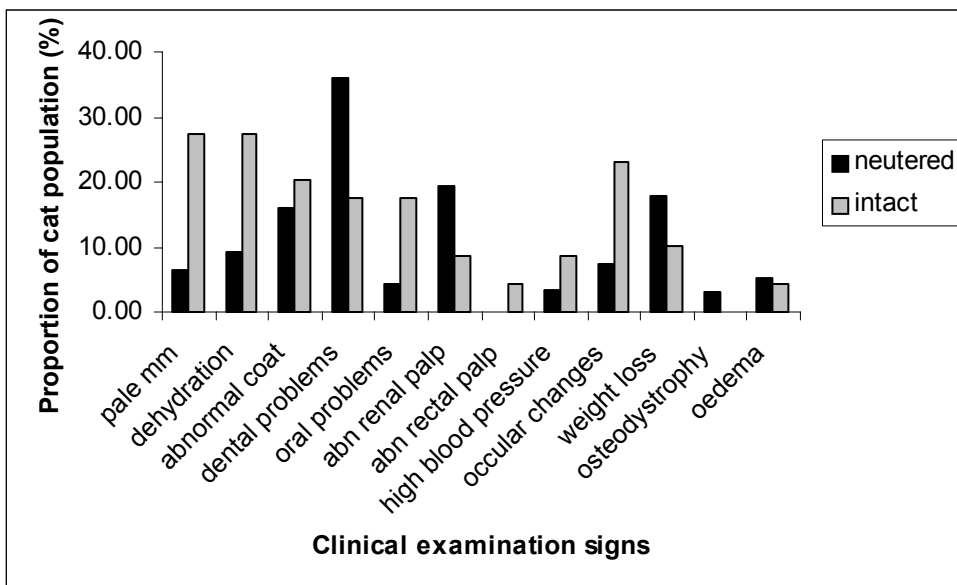


Figure 2.7: Proportion of neutered and intact cats presenting with suspected chronic renal insufficiency exhibiting various signs in their clinical examination

The most common signs in cats six years or younger were abnormal renal palpation (16.5%), dental problems (16.5%) and pale mucous membranes (14.1%). The most common signs in older cats were dental problems (36.8%), abnormal renal palpation (18.1%) and weight loss (17.5%) (Figure 2.8).

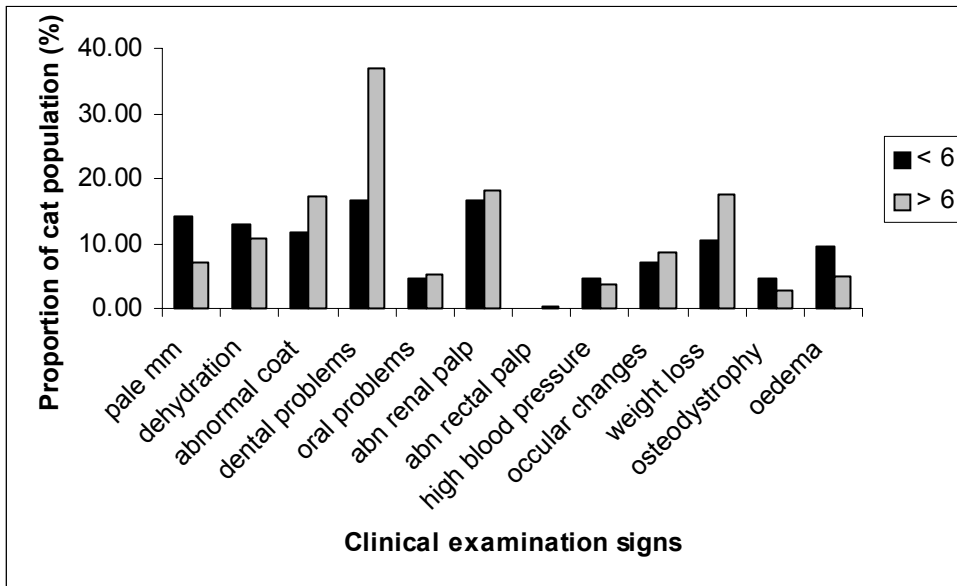


Figure 2.8: Proportion of cats younger or older than six years presenting with suspected chronic renal insufficiency exhibiting various signs in their clinical examination

2.4 Blood and Urine Variables

Median plasma and urinary variables of the cats presenting with suspected chronic renal insufficiency are listed in Table 2.5. Seventy-two percent of cats had a urine sample available for analysis

Table 2.5: Median plasma and urinary variables of cats presenting with suspected chronic renal insufficiency

	Median	Interquartile range	Number of cats
Plasma bicarbonate (mmol/l)	19.00	17 - 21	123
Plasma potassium (mmol/l)	4.14	3.8 - 4.5	738
Plasma phosphorus (mmol/l)	1.67	1.3 - 2.3	744
Plasma creatinine (umol/l)	178.00	125 - 280.5	789
Urine specific gravity (mm Hg)	1.022	1.016 – 1.035	570
Urine protein:creatinine ratio	0.311	0.158 – 0.785	61

Blood pressure readings were divided into categories and the number of cats in each group is presented in Table 2.6. Only 17% of cats had blood pressure data available, 47.8% of these were either borderline hypertensive or hypertensive according to the IRIS classification.

Table 2.6: Blood pressure readings of cats presenting with suspected chronic renal insufficiency

Blood pressure	Frequency (n=134)
< 150 mmHg	52.2%
150-179 mmHg	26.2%
> 179 mmHg	21.6%

Dividing the feline population according to severity of renal failure (stages one to four) based on plasma creatinine values, revealed that 70.5% of the cats were classified as either stage 1 or stage 2 (Table 2.7).

Table 2.7: Number of cats in stages one to four of renal failure based on plasma creatinine values

Stage of renal failure	Frequency (n=786)
Stage 1 (<140umol/l)	33.3%
Stage 2 (140 – 249.9umol/l)	37.2%
Stage 3 (250 – 439.9umol/l)	15.4%
Stage 4 (>440umol/l)	14.1%

Table 2.8: Median plasma and urinary variables (with interquartile range) of cats with suspected renal insufficiency divided according to stage of renal failure (stage one to four)

	Stage 1	Stage 2	Stage 3	Stage 4
Plasma bicarbonate (mmol/l)	19.0 (16.8-20.5)	19.0 (17.3-21.0)	22.0 (17.3-24.0)	18.0 (15.0-20.0)
Plasma potassium (mmol/l)	4.08 (3.8-4.4)	4.13 (3.8-4.5)	4.22 (3.7-4.6)	4.26 (3.7-5.0)
Plasma phosphorus (mmol/l)	1.56 (1.3-1.9)	1.50 (1.2-1.9)	1.96 (1.5-2.8)	3.51 (2.3-5.5)
Plasma creatinine (umol/l)	107.0 (88.4-124.9)	182.25 (160.6-210)	306.40 (276.8-348.5)	752.9 (539.2-1202)
Urine specific gravity (mm Hg)	1.037 (1.028-1.050)	1.022 (1.017-1.032)	1.016 (1.012-1.021)	1.014 (1.010-1.018)
Urine protein:creatinine ratio	0.258 (0.137-0.49)	0.243 (0.128-0.379)	0.352 (0.131-1.044)	0.891 (0.50-1.70)

As might be predicted, plasma phosphate concentration tended to be higher in the stage 3 and 4 categories. Urine was more dilute the higher the stage and urine protein to creatinine ratio tended to be higher in the stage 3 and 4 categories. The number of proteinuric and hypertensive animals in each stage can be derived from the flow charts presented in the appendix Figures 1, 3 and 5.

Table 2.9: Results of urinary protein dipstick and urinary sediment examination of cats presenting with suspected renal insufficiency

Urinary protein dipstick evaluation (n=489)	
Negative	7.2%
+1 or less	71.4%
More than 1+	21.4%
Urinary sediment (n= 458)	
Abnormal	15.9%
Normal and/or hyaline casts	84.1%

3 DESCRIPTIVE ANALYSIS OF A DOG POPULATION PRESENTING WITH CHRONIC RENAL INSUFFICIENCY

3.1 Gender, Age and Neutering

As a group the canine population was relatively evenly divided between genders, with 59.1% males and 40.9% females. Only 43.1% of the dogs were neutered, leaving 56.9% intact. 49.2% were six years or younger, while 50.8% were over the age of six.

The number of intact and neutered female dogs was relatively even (45.3% and 54.7% respectively). However, 65.9% of male dogs remained intact (Table 3.1).

Table 3.1: Proportion of neutered and intact animals among male and female dogs

	Male (n=77)	Female (n=53)
Neutered	35.1%	54.7%
Intact	65.9%	45.3%

Of those animals over six years, 57.1% were male and only 41.7% were female. However, those animals six years or younger were predominantly female (Table 3.2).

Table 3.2: Proportion of male and female dogs younger or older than six years

	Male (n=70)	Female (n=48)
< 6 years	42.9%	58.3%
> 6 years	57.1%	41.7%

Both neutered and intact dogs were equally divided between the two age groups (Table 2.3).

Table 3.3: Proportion of neutered and intact dogs younger or older than six years

	Neutered (n=48)	Intact (n=70)
< 6 years	50%	48.6%
> 6 years	50%	51.4%

Median age of dogs presenting with suspected renal insufficiency was 7.0 years (interquartile range 4.7-9.4). Further investigation revealed that when grouped according to breed size (n=34 small, 61 medium and 31 large), there was a difference between the median age of small and medium dogs (8.3 versus 5.7 years; interquartile ranges 5.8-11.6 and 4.3-9.1 respectively), and between small and large dogs (8.2 versus 7.1 years, interquartile ranges 5.8-11.6 and 5.1-9 respectively).

The median age of female dogs (5.7 years) was different to that of male dogs (7.3 years) (interquartile ranges 4.1-9.6 and 5.1-9.4 respectively), although there was very little difference between the mean age of intact and neutered dogs (7.1 and 6.6 years respectively; interquartile ranges 4.3-11.3 and 3.3-8.8 respectively). Median age of dogs in the six-years-or-younger age-group was 4.7 years (interquartile range 3.3-5.5) while those in the over-six-years age-group had a median age of 9.3 years (interquartile range 7.9-12).

3.2 Breeds

Suspected renal insufficiency did not appear to be restricted to any one breed, although some were more frequently represented than others. Those breeds that had 5 or more cases are listed in Table 3.4

Table 3.4: Most frequently occurring dog breeds with suspected chronic renal insufficiency

Breed	Number of dogs
Mongrel	33
German shepherd	13
Boxer	13
Cocker spaniel	8
Labrador	5
Poodle	5

3.3 History and Clinical Examination Symptoms

The most common signs occurring in the history of dogs presenting with suspected renal insufficiency were a decreased appetite (83.3%), weight loss (69%), lethargy (62.1%), polyuria/polydypsia (58.3%) and vomiting (56.1%) (Figure 3.1).

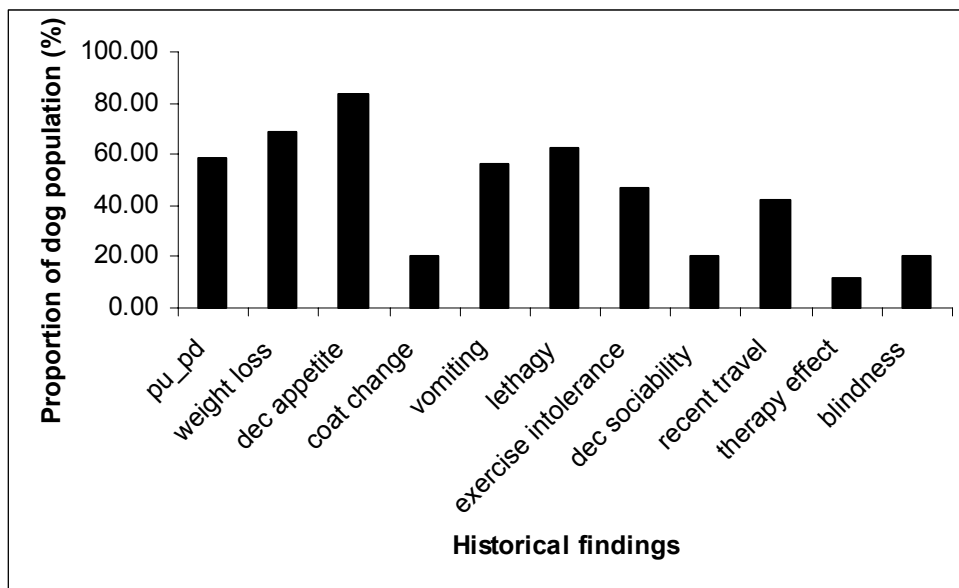


Figure 3.1: Proportion of dogs presenting with suspected chronic renal insufficiency exhibiting various signs in their history

When considering the history of the animal, male dogs displayed a higher prevalence than female dogs for most signs under consideration except for coat change, exercise intolerance, decreased sociability, therapy affect and blindness. (Figure 3.2). The three most common historical signs among both male and female dogs were a decreased appetite (85.9% and 79.6% respectively), weight loss (74.4% and 61.1% respectively) and lethargy (65.4% and 57.4% respectively).

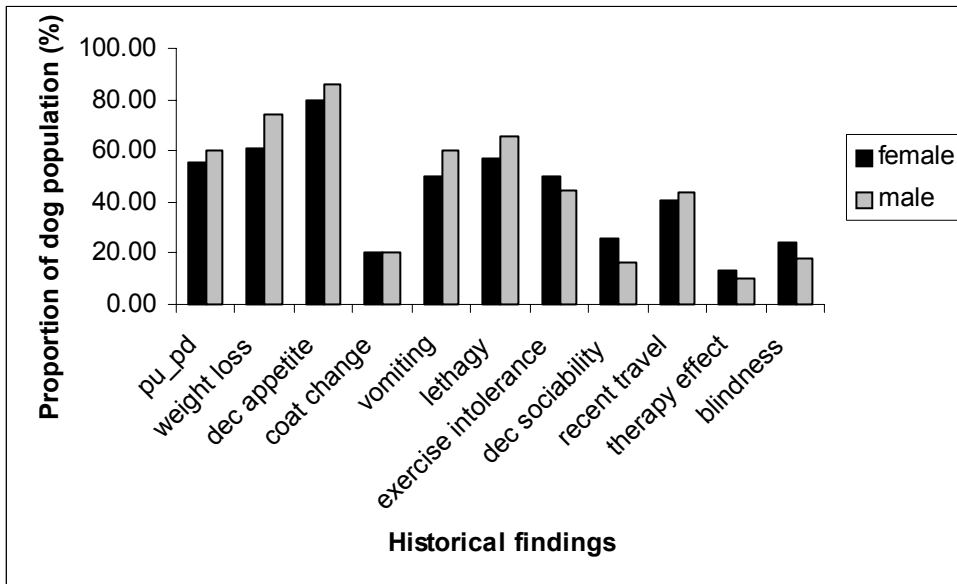


Figure 3.2: Proportion of male and female dogs presenting with suspected chronic renal insufficiency exhibiting various signs in their history

The history of neutered dogs showed a higher prevalence than intact dogs of most signs except for polyuria/polydypsia, weight loss, decreased appetite, coat change and vomiting. For both intact and neutered dogs decreased appetite (89.2% and 76.8% respectively) and weight loss (71.6% and 66.1% respectively) were the most common signs, with the next most common being vomiting (68.9%) for intact dogs and lethargy (64.3%) for neutered dogs (Figure 3.3).

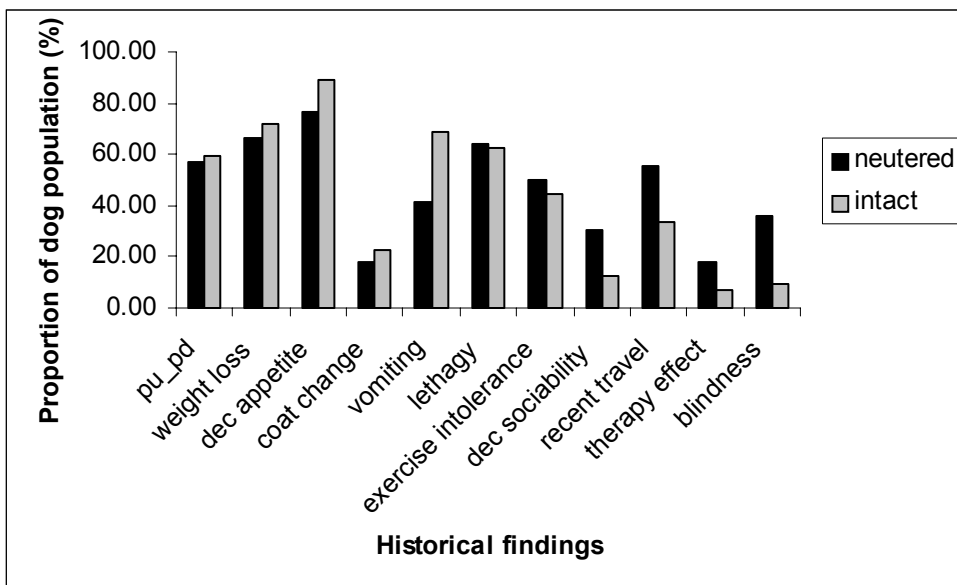


Figure 3.3: Proportion of neutered and intact dogs presenting with suspected chronic renal insufficiency exhibiting various signs in their history

The most common signs for dogs six years or younger were a decreased appetite (86.2%), weight loss (79.3%) and lethargy (70.7%). For dogs older than six years the most common signs were a decreased appetite (78.3%), polyuria/polydypsia (65%), weight loss, lethargy and vomiting (all 55%) (Figure 3.4).

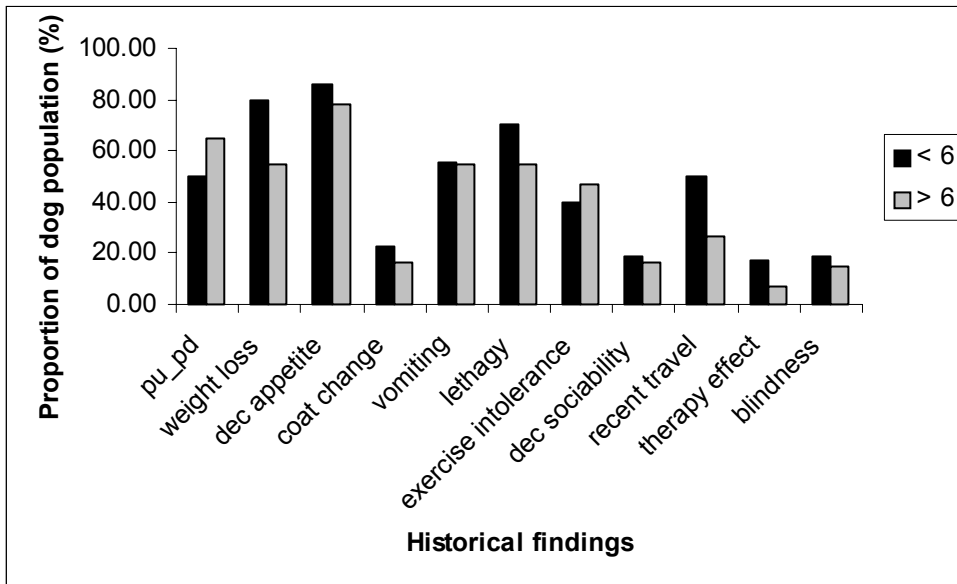


Figure 3.4: Proportion of dogs younger or older than six years exhibiting various signs in their history

The most common signs occurring in the clinical examination of dogs suspected of having renal insufficiency were pale mucous membranes (41.7%), high blood pressure (39.4%), dehydration (33.3%), ocular changes (28%) and dental problems (27.3%) (Figure 3.5).

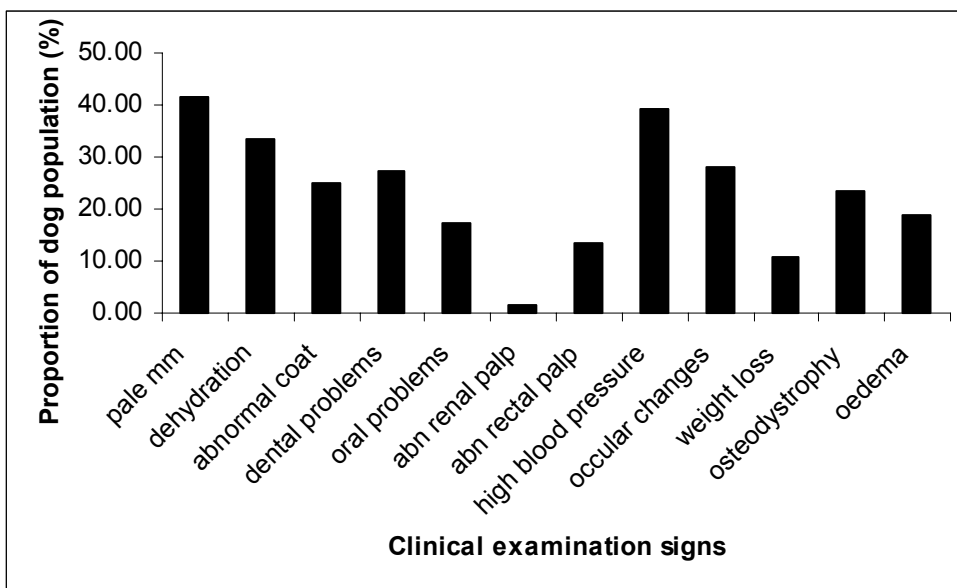


Figure 3.5: Proportion of dogs presenting with suspected chronic renal insufficiency exhibiting various signs during their clinical examination

On examination male dogs displayed a higher prevalence than female dogs of each sign, except for abnormal coat, oral problems, ocular changes and a decrease in weight. The most common signs seen in male dogs were high blood pressure (46.2%), pale mucous membranes (44.9%) and dehydration (38.5%), while the most common for female dogs were pale mucous membranes (37%), ocular changes (31.5%), and high blood pressure (29.6%) (Figure 3.6).

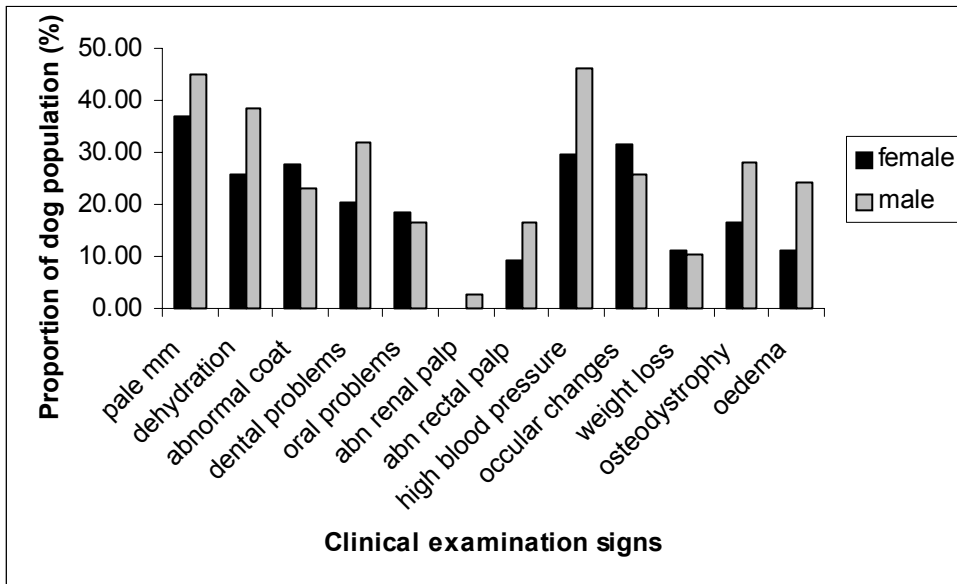


Figure 3.6: Proportion of male and female dogs presenting with suspected chronic renal insufficiency exhibiting various signs during their clinical examination

Clinical examination revealed that the most common signs for intact dogs were pale mucous membranes (48.7%), high blood pressure (46%) and dehydration (41.9%), yet for neutered dogs these were ocular changes (50%), pale mucous membranes (34%), and high blood pressure (32.1%) (Figure 3.7).

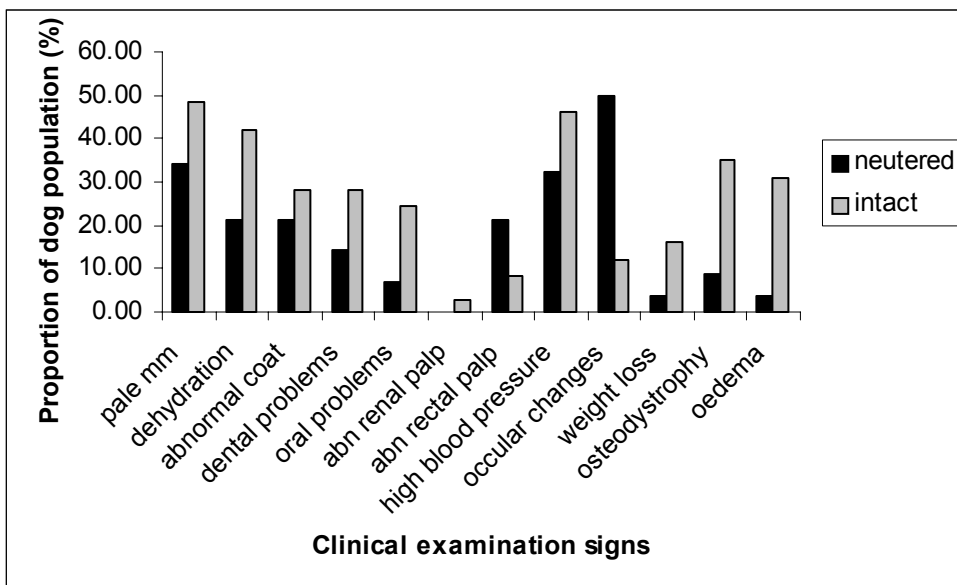


Figure 3.7: Proportion of neutered and intact dogs presenting with suspected chronic renal insufficiency exhibiting various signs during their clinical examination

Clinical examination of dogs six years or younger revealed the most common signs to be pale mucous membranes (48.3%), high blood pressure (46.6%) and dehydration (34.5%), while in older dogs the most common signs were dental problems (40%), pale mucous membranes (36.7%) and dehydration (33.3%) (Figure 3.8).

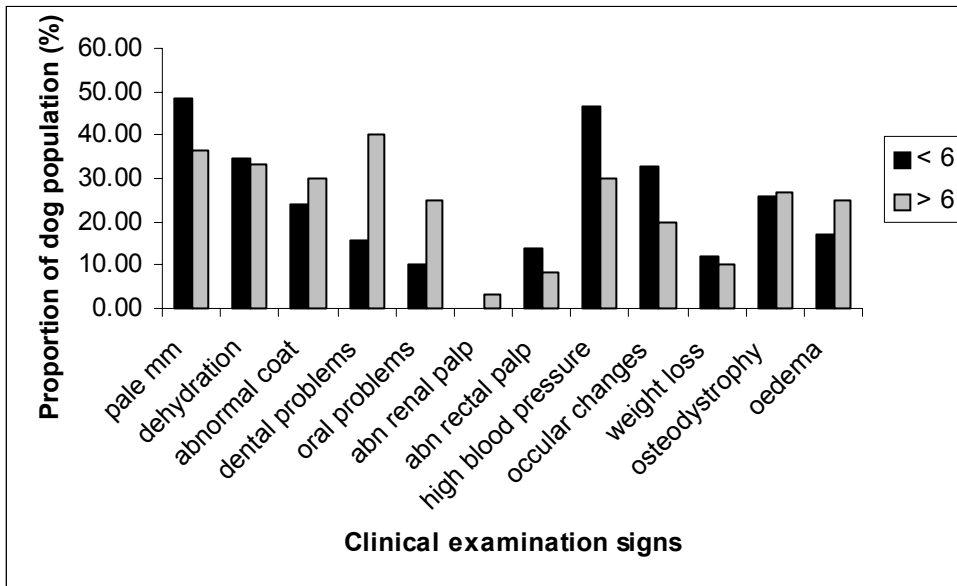


Figure 3:8. Proportion of dogs younger or older than six years presenting with suspected chronic renal insufficiency exhibiting various signs during their clinical examination

3.4 Blood and Urine Variables

Median plasma and urinary variables for the dogs presenting with suspected chronic renal insufficiency are listed in Table 3.5.

Table 3.5: Median plasma and urinary variables of dogs presenting with suspected chronic renal insufficiency

	Median	Interquartile range	Number of dogs
Plasma bicarbonate (mmol/l)	22.00	19 - 25	15
Plasma potassium (mmol/l)	4.60	4 – 5.3	83
Plasma phosphorus (mmol/l)	3.07	1.7 – 5.0	112
Plasma creatinine (umol/l)	282.88	203.3-614.4	127
Urine specific gravity (mmHg)	1.017	1.012 – 1.022	127
Urine protein:creatinine ratio	3.50	1.76 – 5.49	79

Blood pressure readings were divided into categories and the number of dogs in each group is presented in Table 3.6. Blood pressure readings were available for 76.5% of the dogs evaluated. Seventy-two percent of these dogs were classified as borderline hypertensive or hypertensive.

Table 3.6: Blood pressure readings of dogs presenting with suspected chronic renal insufficiency

Blood pressure	Frequency (n=101)
< 150 mmHg	27.7%
150-179 mmHg	25.7%
> 179 mmHg	46.5%

Dividing the canine population according to severity of renal failure (stages one to four), based on plasma creatinine values, revealed that 81.1% of the dogs were classified as either stage 3 or stage 4 (Table 3.7).

Table 3.7: Number of dogs in stages one to four of renal failure based on plasma creatinine values

Stage of renal failure	Frequency (n=127)
Stage 1 (<125umol/l)	7.1%
Stage 2 (125 – 179.9umol/l)	11.8%
Stage 3 (180 – 439.9umol/l)	46.5%
Stage 4 (>440umol/l)	34.6%

Table 3.8: Median plasma and urinary variables (with interquartile range) of dogs with suspected renal insufficiency divided according to stage of renal failure

	Stage 1	Stage 2	Stage 3	Stage 4
Plasma bicarbonate (mmol/l)	—	15.65 (4.5-15.7)	23.0 (22-28.5)	19.0 (16.8-20.5)
Plasma potassium (mmol/l)	4.20 (3.1-5.0)	4.30 (4.1-5.3)	4.80 (3.9-5.2)	4.55 (4.0-5.3)
Plasma phosphorus (mmol/l)	1.60 (1.4-4.3)	1.70 (1.6-2.8)	2.42 (1.8-4.0)	4.81 (2.7-4.0)
Plasma creatinine (umol/l)	79.56 (44.2-96.4)	150.28 (141.4-159.1)	256.36 (214-318.2)	796.93 (592.5-954.3)
Urine specific gravity (mm Hg)	1.032 (1.018-1.040)	1.020 (1.014-1.024)	1.016 (1.012-1.022)	1.015 (1.013-1.022)
Urine protein:creatinine ratio	3.13 (2.0-4.3)	4.72 (2.1-5.3)	2.95 (1.6-5.1)	4.0 (2.0-7.5)

As for the cats, plasma phosphate concentration tended to be increase with the stage and the urine specific gravity tended to decrease. Urine samples were available from 95% of dogs and urine protein to creatinine ratios had been measured in 74% of these cases. The median UPC value was in the proteinuric range for all stages although there was a wide spread of values at each stage. The number of proteinuric and hypertensive animals in each stage can be derived from the flow charts presented in the appendix Figures 2, 4 and 6. Over 50% of all cases where urine samples were available had UPC values of 3.5 or above and so were highly significantly proteinuric.

Table 3.9: Results of the urinary protein dipstick and urinary sediment examination of dogs presenting with suspected renal insufficiency

Urinary protein dipstick evaluation (n=125)	
Negative	12%
+1 or less	16%
More than 1+	72%
Urinary sediment (n= 119)	
Abnormal	19.3%
Normal and/or hyaline casts	80.7%

4.0 Conclusions

The cases submitted for this pilot study were not, as hoped, from a random selection of veterinary practices throughout the world. There was a heavy bias towards feline cases submitted from the UK and canine cases submitted from Spain. Other countries contributed cases but in smaller numbers. It is not, therefore possible to draw any conclusions about differences in the presentation of renal disease in cats and dogs in different parts of the world from the present study. There are many possible observations that can be made from this study. A few have been selected below for discussion. This is by no means a comprehensive discussion, but given the selection bias of the data, any observations can only be preliminary and tentative at best.

One observation that can be made from these data is that a higher proportion of cats that were suspected of renal disease had plasma creatinine concentrations within the Stage 1 classification than did dogs. This may stem from the fact that cats suffer from other diseases that give rise to clinical signs that mimic renal disease, most notably hyperthyroidism. Data from T₄ analyses have not been included in the present study but should be in future studies of this type. This finding might also be attributed to the more common practice of screening older cats for renal disease because of the perceived higher incidence of this condition in this species. One might speculate that dogs are identified in the higher stages of the classification system (stages 3 and 4) either because they show little in the way of clinical signs when at an earlier stage, or because they progress rapidly to the higher stages or a combination of these two factors. The value of categorising cases in the way proposed by the IRIS classification scheme requires prospective epidemiological studies to determine the prognostic information offered by this scheme. It does seem, however, all categories of the scheme are represented in the populations studied here and thus the arbitrary divisions between the categories proposed by the IRIS group are sensible ones.

It seems that proteinuria is a highly significant feature of canine renal disease with more than 50% of cases submitted having urine protein to creatinine ratios greater than 3.5 for the 79 samples where the algorithm suggested UPC ratio should be measured (see Appendix Fig 4.). Indeed, at each stage of renal disease according to the IRIS classification, at least 75% of dogs had UPC values of 1.6 or above (see Table 3.8). This contrasts with the cat data where the median value of UPC ratio was 0.311 for the 61 samples where the algorithm suggested UPC ratio should be measured (see Appendix Figure 3). This could well be influenced by geographical factors, however, with a higher incidence of certain infectious diseases leading to proteinuria in the countries submitting dog data (e.g. Leishmaniasis in Spain). In future studies it would be useful to collect data on suspected underlying cause (if known).

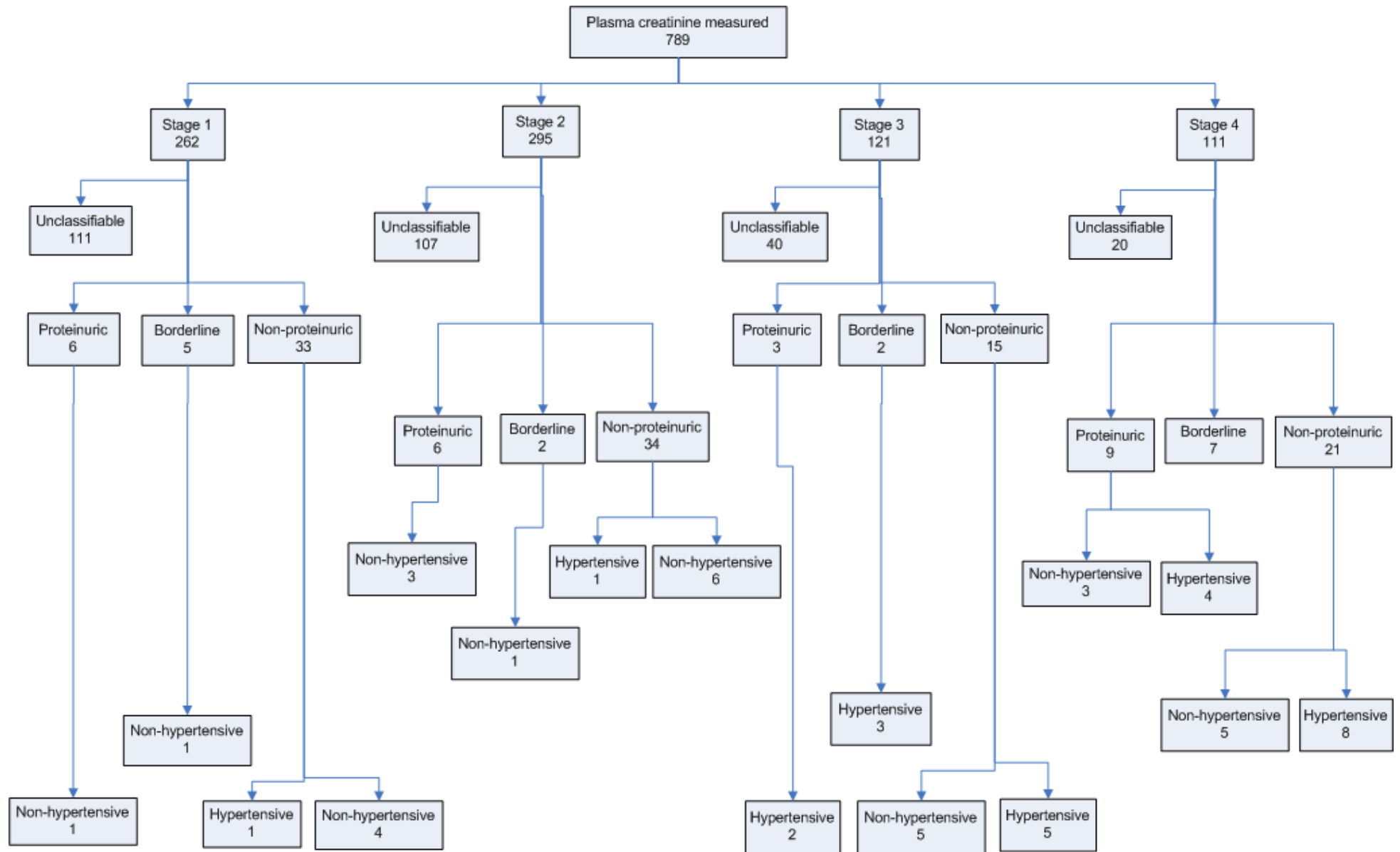
The age distribution of cases differed between the two species with dogs having renal disease at a younger age (on average) than cats (median ages 7.0 vs. 13.0). There was a population of young cats (<6 yo) with renal disease but these represented only 8% of the total cat population whereas 58 of the 118 dogs where age was known were <6 yo. Some of this difference may represent a difference in longevity between the two species but other explanations include a higher prevalence of inherited renal disease in dogs and a higher incidence of infectious causes leading to renal damage at an earlier age. This might be influenced again by geographical factors as discussed above for proteinuria.

The data on blood pressure are interesting. We do not have information on the technique used to measure blood pressure in each case, which could influence the data. However, dogs appear to have a higher prevalence (72%) of elevated pressure (borderline hypertension or hypertension) than do cats (47.8%). The high prevalence of hypertension in dogs with renal disease is in agreement with other published data on small numbers of cases but disagrees with one larger study from the UK where over 100 dogs with renal disease were assessed and a prevalence of <10% was

reported. It is interesting to note that most of the dogs had blood pressure data supplied (101/134) whereas a much smaller proportion of cats had blood pressure data supplied (134/789). Further dissection of the data on blood pressure according to severity of proteinuria, breed of dog, age of animal and so on could be undertaken but probably would require larger populations of animals where all this information is available. Appendix Figure 2 would suggest that 61% of the proteinuric dogs (UPC>1.0) had blood pressure >179 mmHg compared to 46.5% of the total population. One would expect systemic hypertension to exacerbate proteinuria in both species when occurring in animals with compromised renal function.

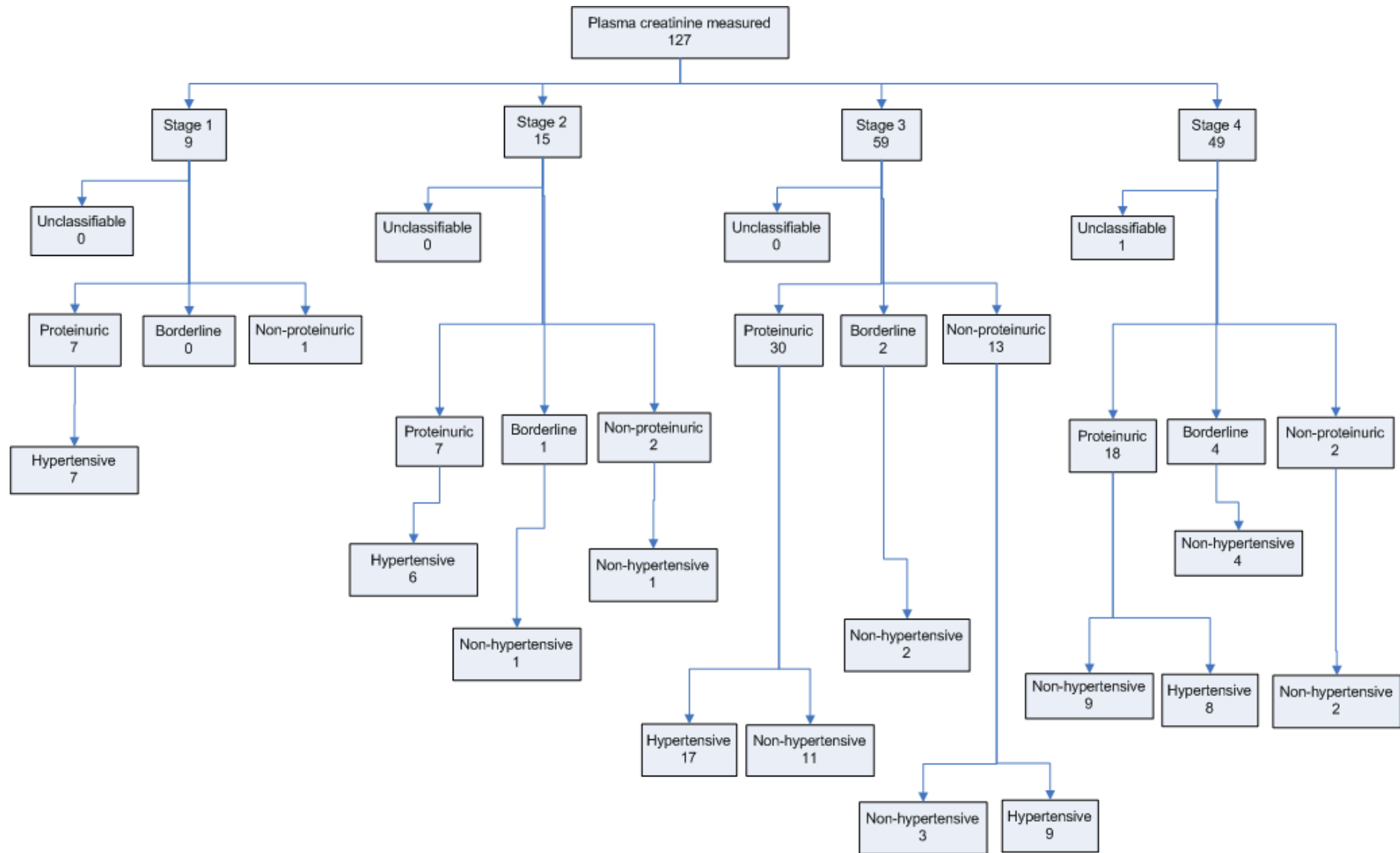
In conclusion, this pilot study has demonstrated that it is difficult to collect representative data from across the world using the electronic form provided for the purpose. It would be useful to have feedback from Novartis Field representatives as to why practitioners were reluctant to submit data. If problems in encouraging data submission can be sorted out, then this system could be used to gather and analyse data from a much larger cohort of animals. It is likely then that true disease patterns throughout the world could be analysed and provide the opportunity to develop interesting hypotheses regarding renal disease in dogs and cats. Publication of this report might demonstrate the value of such a study to practitioners world-wide and encourage their participation.

Figure 1: Full classification of feline renal insufficiency based on plasma creatinine, proteinuria* and hypertension*



*The number of cases unclassifiable on the basis of proteinuria relates to those where no dipstick data were available. Definitive classification is only given if a UPC ratio was available. Further details on classification of proteinuria are presented in Figure 3. Further information on sub-classification based on blood pressure is presented in Figure 5.

Figure 2: Full classification of canine renal insufficiency based on plasma creatinine, proteinuria* and hypertension



* The number of cases unclassifiable on the basis of proteinuria relates to those where no dipstick data were available. Definitive classification is only given if a UPC ratio was available. Further details on classification of proteinuria are presented in Figure 4. Further information on sub-classification based on blood pressure is presented in Figure 6.

Figure 3: Classification of proteinuric versus non-proteinuric renal disease in cats

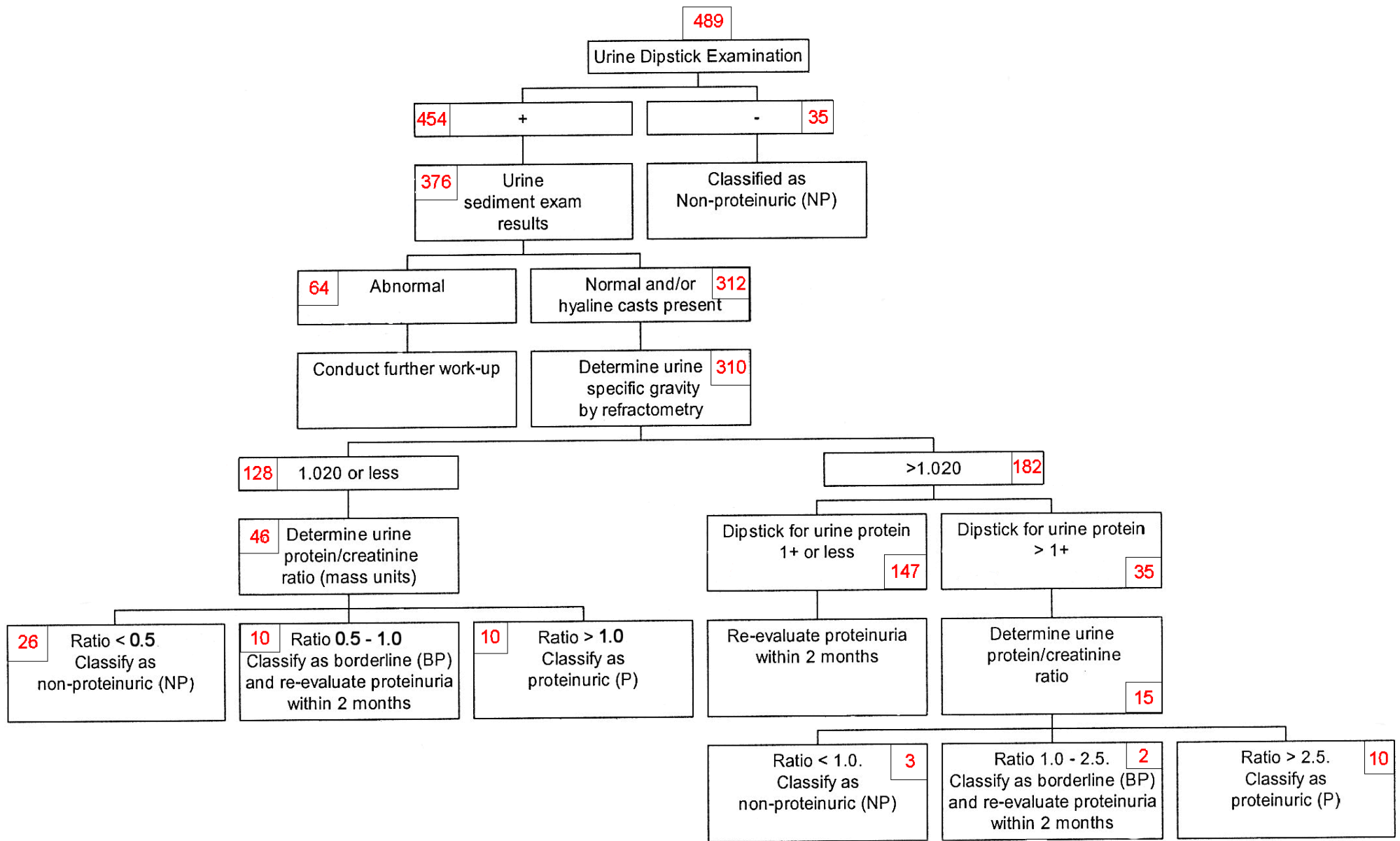


Figure 4: Classification of proteinuric versus non-proteinuric renal disease in dogs

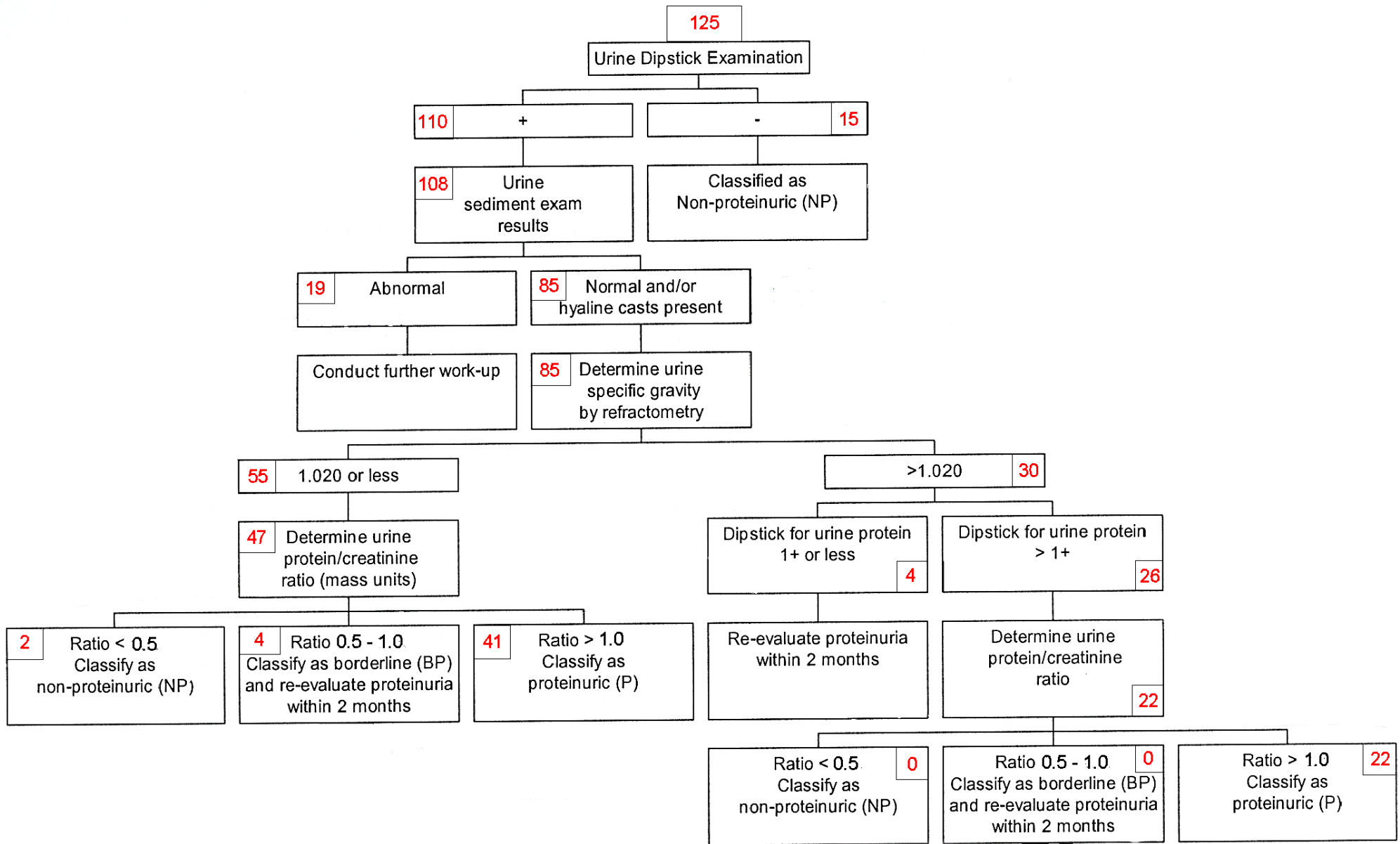


Figure 5: Classification of hypertensive versus non-hypertensive renal disease in cats

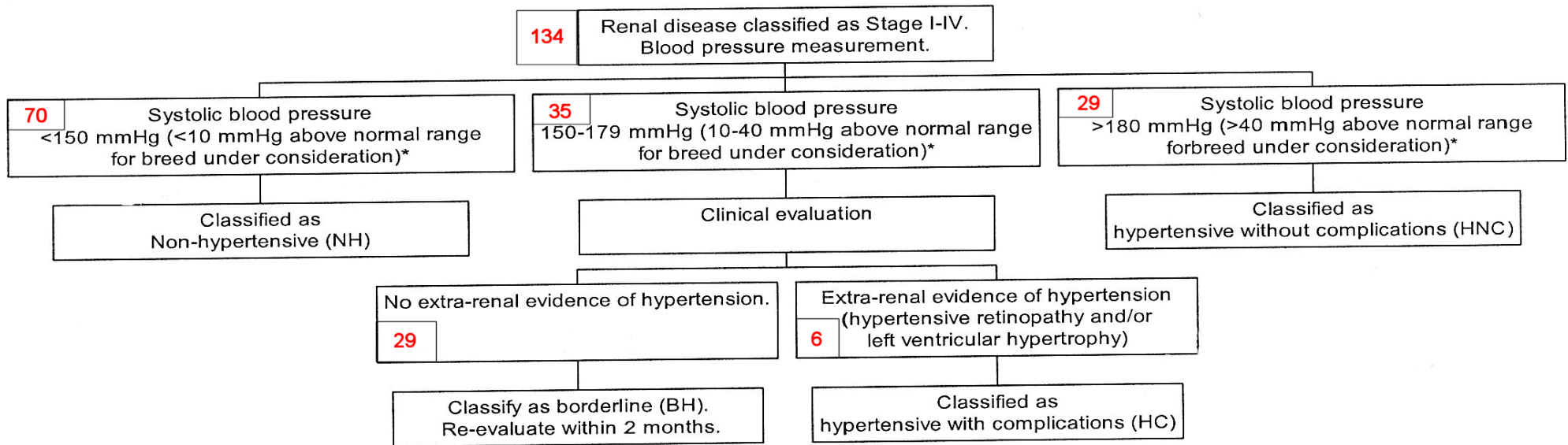


Figure 6: Classification of hypertensive versus non-hypertensive renal disease in dogs

