USE OF SENTINEL PRACTICES TO OBTAIN DATA REGARDING COMMON CLINICAL CONDITIONS AND PRESENTATIONS IN SMALL ANIMAL CONSULTATIONS

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Abstract

Aim

Gathering data on the veterinary caseload will be useful in directing both future research and the veterinary curriculum. Previous studies have used clinical records to gather this data, but the validity of these methods remains unclear. Direct observation has been used to collect similar data in medicine and may be better able to capture the complexities of the consultation. The aim of the study was to determine the common patients, presentations, diagnoses and interventions during small animal veterinary consultations using direct observation.

Methods

A network of 8 sentinel practices in England and Scotland was recruited. A tool allowing collection of data during direct observation of consultations was developed and piloted. The tool was used to gather data on patient characteristics, problems discussed, diagnoses made and outcomes selected. Practice visits were conducted to feedback results and stimulate discussion.

Results

Consultations were highly complex, with discussion of multiple problems, leading to a wide range of diagnoses and outcomes. Discussion of several problems appeared to be associated with increased consultation length. Preventive medicine was a common reason for presentation, and these consultations were amongst the most complex. A definitive diagnosis was not reached for most problems, yet actions were frequently taken. Feedback from the practices involved was positive, and discussions surrounding priorities for future research echoed the findings of the study.

Conclusions

Direct observation of consultations allows caseload to be recorded in great detail, which may not be possible with other collection methods. The results are the first step in directing future research towards areas relevant to practitioners and will also be useful in guiding the veterinary curriculum. The way in which future research is conducted should take into account the realities of first opinion practice, such as the high frequency of comorbidity and polypharmacy, and low frequency of definitive diagnosis.

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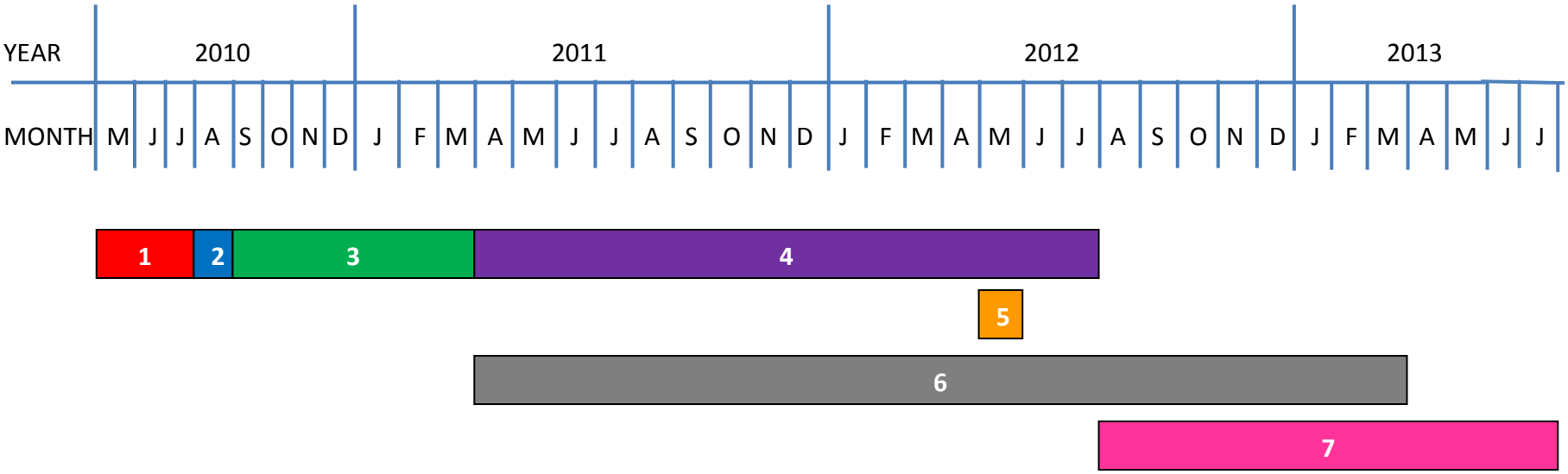
List of Abbreviations

BARK	Banfield Applied Research and Knowledge
BestBET	Best Evidence Topic
BRC	British Rabbit Council
BSAVA	British Small Animal Veterinary Association
BVA	British Veterinary Association
CASP	Critical Appraisal Skills Program
CAT	Critically Appraised Topic
CEBD	Centre for Evidence-based Dermatology
CEBM	Centre for Evidence-based Medicine
CEVM	Centre for Evidence-based Veterinary Medicine
CICADA	Computer-based Investigation of Companion Animal Diseases Awareness
CPD	Continuing Professional Development
CPRD	Clinical Practice Research Datalink
DACTARI	Dog and Cat Travel and Risk Information
DEFRA	Department of Environment, Food and Rural Affairs
EVM	Evidence-based Veterinary Medicine
ICD	International Classification of Diseases
iFLUTD	Idiopathic Feline Lower Urinary Tract Disease
GCCF	Governing Council of the Cat Fancy
JLA	James Lind Alliance
MB	Dr Marnie Brennan
MeSH	Medical Subject Heading
N/A	Not Applicable
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NR	Natalie Robinson
PAW report	PDSA Animal Wellbeing Report
PDSA	People’s Dispensary for Sick Animals

PETS	Pet Travel Scheme
RCVS	Royal College of Veterinary Surgeons
RD	Dr Rachel Dean
SARSS	Suspected Adverse Reactions Surveillance Scheme
SAVSNET	Small Animal Veterinary Surveillance Network
SNOMED	Systematized Nomenclature of Medicine Clinical Terms
UK DCTN	UK Dermatology Clinical Trials Network
UK DUETS	UK Database of Uncertainties surrounding the Effects of Treatments
US NLM	US National Library of Medicine
VeNom	Veterinary Nomenclature
VetCompass	Veterinary Companion Animal Surveillance System
VMD	Veterinary Medicines Directorate
VMDB	Veterinary Medical Database
WHO	World Health Organisation
WReN	Wisconsin Research Network

Timeline



1 Initial development of the data collection tool
2 Pre-test of the data collection tool
3 Piloting of the data collection tool
4 Main data collection
5 Validation of the data collection tool
6 Analysis of data gathered from the pilot and main studies
7 Writing up

Figure 1. Timeline of the study

Chapter 1. Literature review

1.1 Introduction to veterinary practice

In the United Kingdom (UK), around three quarters of veterinary surgeons work in private practice (Nielsen et al., in press). The nature of private practice means the majority of veterinary surgeons are general practitioners working in first opinion practice (similar to primary care in medicine) rather than referral practice (similar to secondary care in medicine). Most veterinary surgeons therefore deal with a variety of different species on a daily basis (Nielsen et al., in press) as well as carrying out a wide range of medical and surgical procedures which results in a diverse and varied caseload. Staying up-to-date with the current best evidence for such a broad range of subject areas therefore presents a considerable challenge for practicing veterinary surgeons.

1.2 Evidence-based practice

Evidence-based Medicine has been described as 'the conscientious, explicit and judicious use of current best evidence in making decisions about the individual patient' (Sackett et al., 1996). It therefore focuses on providing the best care for the individual using a combination of the evidence available, the expertise of the practitioner and the values and circumstances of the patient. When adapting this principle for use in *evidence-based veterinary medicine*, it is vital to take into account the circumstances of not only the patient but also the circumstances and values of the owner (CEVM, 2014).

In order to follow the evidence-based approach, there are 5 steps which can be used as a guide (Heneghan and Badenoch, 2006):

1.2.1 Formulating an answerable clinical question

Ensuring the question of interest is well formulated and relevant to clinical practice is vital to ensuring time and resources are used to best effect. If due care is not taken at this first step to ensure the question is appropriate and relevant, then subsequent steps cannot be carried out with precision and focus. To create a well structured and focused question, a 'PICO' format is often used (Heneghan and Badenoch, 2006), the components of which are:

P Patient
I Intervention
C Comparison
O Outcome

For example, if the question of interest related to whether it was worthwhile treating pre-clinical Mitral Valve Degeneration with pimobendan or not, the PICO questioned could be as follows:

P In dogs with preclinical Mitral Valve Degeneration...
I ...does administration of pimobendan...
C ...versus no treatment...
O …delay the onset of clinical signs?

This PICO question can be made more or less specific depending upon the question of interest, which will ultimately affect the outcome of the literature search. These PICO questions can also be adapted to focus on other areas of interest e.g. diagnostic tests.

1.2.2 Searching for relevant evidence

The PICO question can then be turned into a search strategy by considering all possible terms which could apply to patient (P), intervention (I) and comparison (C) and outcome (O) (Heneghan and Badenoch, 2006). These

search terms can be used as keywords during searching, but can also help identify MeSH (Medical Subject Headings) terms which act as a vocabulary thesaurus to ensure the search is comprehensive (US National Library of Medicine, 2014). When searching, it is important to consider the most appropriate place to search, in order to maximise the number of relevant results. Grindlay et al. (2012) found that coverage of veterinary journals varied widely across the bibliographic databases, with CAB Abstracts providing the greatest coverage.

1.2.3 Critically appraising the evidence

Relevant studies can then be critically appraised to assess internal and external validity, reliability, bias, confounding and statistical methods amongst other things (Heneghan and Badenoch, 2006). The key aspects to consider during appraisal vary depending upon the study type. For example CASP (Critical Appraisal Skills Program) provides resources to support critical appraisal skills for health practitioners in the United Kingdom (UK), and has produced 8 critical appraisals tools covering systematic reviews, randomised controlled trials and other study types (CASP, 2014).

1.2.4 Making a decision

Evidence-based decision making involves combining the results of the critical appraisal, the expertise of the practitioner, and the circumstances/values of the patient/owner. Consideration should be given to whether the patients in the relevant studies are similar to the practitioners own patient(s), whether the intervention is appropriate or realistic in the practice setting and whether the outcome(s) measured are appropriate/relevant to the patient/owner (Heneghan and Badenoch, 2006). Once a decision has been made, acting upon it to ensure the appropriate changes are implemented is the next step.

1.2.5 Evaluating performance

With any evidence-based change or alteration that is made, performance should be evaluated to assess improvements or problems encountered as a result of the change (Heneghan and Badenoch, 2006). This can be in terms of both the outcome of cases for which decisions have been made, and in terms of evaluating the evidence-based approach itself to see how it could be done more effectively/efficiently in the future.

Whilst these 5 steps of evidence-based practice are usually applied by practitioners seeking current evidence in order to make a decision regarding a case, these steps can equally be applied to researchers formulating research questions. Formulating an appropriate clinical question for future research is vital to ensure that evidence generated by future research is likely to be of maximum benefit to practitioners. Addressing low priority research questions, not addressing important outcomes and failing to involve clinicians or patients in setting research agenda have all been cited as ways in which the wrong research questions can be answered, resulting in research waste (Chalmers and Glasziou, 2009). Whilst research priorities may reflect the special interests and expertise of the researcher, there may be a disconnect between this and the interests/needs of the research's end-user, the veterinary practitioner. Answering questions which come directly from veterinary practice, rather than from the researcher, may help to bridge the gap between practice and research, by generating questions directly relevant to practitioners and their patients (Cockcroft and Holmes, 2003). Additionally, evaluating the current evidence base will help to identify areas where evidence is either lacking, insufficient or of poor quality.

1.3 Prioritising research questions

In order to follow the principles of evidence-based veterinary medicine, veterinary researchers must strive to generate high-quality, clinically relevant evidence in a form which can be easily used by practitioners. In order to do

this, it is important to decide on areas in which such research should be focused by formulating appropriate PICO questions which are of interest to veterinary practitioners. To establish an appropriate method to conduct this task, it is important to first look at how research is prioritised within medicine. Evidence-based medicine is an older discipline than Evidence-based Veterinary Medicine (EVM) and so much of what the veterinary profession has learned regarding the evidence-based approach has originated from medicine.

1.3.1 Evidence-based medicine resources

One organisation in particular within medicine produces a list of uncertainties surrounding the effects of treatments, and from this formulates a list of research priorities (JLA, 2014). The James Lind Alliance (JLA) is a non-profit making initiative set up to identify and prioritise the top 10 unanswered questions about the effects of treatments for different conditions and specialities. The information is intended for use both by medical researchers and those funding medical research, to ensure that questions which are important to both practitioners and patients are being answered. The UK Database of Uncertainties about the Effects of Treatments (UK DUETs) which is part of NHS Evidence, a service provided by NICE (National Institute for Health and Care Excellence) giving medical practitioners quick and easy access to high quality evidence works with JLA to achieve this. Uncertainties about treatment effects are identified by UK DUETS using 3 different methods (NICE, 2014): questions from patients, carers or clinicians; recommendations for future research either in reports of systematic reviews or in clinical guidelines; new primary research or research summaries such as systematic reviews. JLA then use various methods including focus groups, the Delphi method (Thrusfield, 2005) and expert panels to formulate a top 10 of treatment uncertainties to be prioritised for future research. This system therefore utilises current best evidence and a relevant set of priorities to guide future research, ensuring that new research produced will be of maximum benefit to

clinicians in improving the care of their patients. In addition, JLA provide the JLA Guidebook (2014), an online resource containing detailed step-by-step guidance on JLA methods and protocols for use in establishing and maintaining Priority Setting Partnerships.

In addition to the JLA, various other organisations also collate current research evidence, and summarises of evidence, so that information needs and current gaps in knowledge can be more easily identified. One such organisation is The Cochrane Collaboration, a not-for-profit international organisation which publishes and updates an online library (The Cochrane Library), which contains a database of systematic reviews (The Cochrane Collaboration, 2014). These Cochrane Reviews use explicit methods to identify, select and critically appraise relevant studies to answer clearly formulated questions on the effects of interventions and the accuracy of diagnostic tests. The review provides a summary of the current evidence, and in cases where evidence is lacking, highlights these gaps in knowledge.

However, the process of conducting a systematic review is often lengthy, and previous research has suggested some systematic reviews may already be out-of-date by the time of publication (Shojania et al., 2007). Various other methods have been used by the medical profession in an attempt to summarise the current evidence on a particular topic, and so identify gaps in knowledge. Critically appraised topics (CATs) have less rigorous search strategies and are quicker to conduct than systematic reviews, although may not be as comprehensive. The Centre for Evidence-based Medicine at The University of Oxford even provide CATmaker, a downloadable critical appraisal tool to assist in the generation of CATs (CEBM, 2009). The Emergency Department of Manchester Royal Infirmary have developed BestBETs, a database of 'best evidence topics' (BestBETs, 2014). These are less rigorous than a CAT in terms of methodology but with the advantage of being quicker to perform. BestBETs were developed for the field of emergency medicine and critical care, where evidence is sometimes more

limited and decisions are often time-critical, therefore a more detailed summary of the evidence may not be appropriate. BestBETs provide the practitioner with a clinical bottom line, and highlight scenarios for which evidence is limited or lacking.

However while some of these resources may be quick and easy to use, such as BestBETs, others such as The Cochrane Library may present an overwhelming challenge for medical practitioners attempting to make a decision regarding a case. In the UK, the National Institute for Health and Care Excellence (NICE) have tackled these challenges by producing evidence-based clinical guidelines which are updated as new evidence emerges and have factors such as cost integrated. Internationally, other resources containing evidence-based clinical guidelines have also been developed. These include the Clinical Practice Guidelines Portal developed by the National Health and Medical Research Council (NHMRC, 2014) in Australia, and the National Guideline Clearinghouse which is an initiative of the Agency for Healthcare Research and Quality (AHRQ, 2014) in the United States.

1.3.2 Evidence-based veterinary medicine resources

CATs have also been used in veterinary medicine, with BARK (Banfield Applied Research and Knowledge) producing a CAT database (Banfield, 2014). BestBETs have also been adapted for use in veterinary medicine by the Centre for Evidence-based Veterinary Medicine at The University of Nottingham (BestBETs for Vets, 2014).

However the evidence-based resources available to veterinary practitioners are currently limited in comparison with those available to medical practitioners. An equivalent of UK DUETs and JLA does not exist in veterinary medicine, and the uncertainties frequently encountered by practitioners are currently unknown. Without knowledge of these uncertainties, it is difficult to establish priorities for future research. The first step in identifying possible

areas of uncertainty and topics for future research is to examine the veterinary caseload. By identifying patients, presenting complaints or conditions commonly encountered by veterinary surgeons, areas where the information need may be highest can start to be identified. Consideration of the veterinary caseload, alongside identification of knowledge gaps, is a useful way of helping to formulate potential research priorities. Techniques used by the JLA, such as focus groups of practitioners and owners, can then be used to refine this list into focused answerable questions which should be prioritised for future research.

1.4 The medical caseload

Primary care research focusing on caseload has been used within medicine to help identify priorities for future research and gaps in evidence via various different methods. Many of these methods have utilised sentinel practice networks to gather data direct from primary care practices. Green (2000) defined sentinel practices as "a network of primary care practices collecting a standard minimum data set and conducting carefully designed studies about problems and processes in primary care". Sentinel practice networks have been widely used in medicine and in some circumstances can be very large. For example, the Clinical Practice Research Datalink (CPRD, 2014) (formerly the General Practice Research Database (GPRD)) was designed to maximise the link between clinical NHS data from both primary care and secondary care (in the form of Hospital Episode Statistics) as well as data from other sources such as census data. Usage of the CPRD has led to over 890 clinical reviews and papers on a wide range of topics.

Much of the historical data relating to primary care consultations has been derived from the General Practice Morbidity Surveys produced by the Royal College of General Practitioners (RCGP, 2014). The most recent survey in 1991/1992 utilised data from 60 general practices with over half a million patients throughout England and Wales over the space of one year. All

consultations were classified by the doctor or practice nurse, using the World Health Organisation International Classification of Diseases (ICD) (WHO, 2014). Each consultation was assigned a diagnostic code, and where a diagnosis was uncertain, a predominant symptom code was entered. The results suggested diseases of the respiratory system were most prevalent in primary care accounting for 30% of consultations, followed by diseases of the nervous system and sense organs (17%) and diseases of the skin and subcutaneous tissue (15%).

A recent study by Schofield et al. (2011), used more recent data gathered in 2006 by the Royal College of General Practitioners and involved a subset of 47 practices across England and Wales. It was found that diseases classified under Chapter XII of the ICD (Disease of the skin and subcutaneous tissue), accounted for 15% of consultations which is consistent with the findings of the 1991/1992 General Practice Morbidity Survey. However, as many skin conditions such as neoplasms were not classified under Chapter XII of the ICD, the researchers additionally looked at all diagnoses which were considered a skin condition. These accounted for a further 9% of consultations, giving a total of 24% of consultations involving a skin condition of some description. Additionally, incidence data revealed that skin conditions, closely followed by respiratory conditions, were the most frequent reason for patients to present with a new problem. Dermatology teaching is currently limited in undergraduate and postgraduate curriculums, however Schofield et al. (2011) suggested this should be changed to reflect the caseload seen in primary care.

In addition to looking at commonly encountered conditions in primary care, other researchers have focused on the complexity of the consultation. Flocke et al. (2001) looked at the number of problems discussed during family practice consultations, along with how they were raised, how they affected consultation timing and how well they were reflected in the billing record. Data were gathered by seven 1st year medical students using direct observation of 266 randomly selected adult patient consultations involving 37

physicians. Flocke et al. (2001) found that visit duration ranged from 2 to 65 minutes, with a median of 15 minutes. In total, 718 problems were discussed giving an average of 2.7 problems per consultation, and 73% of patients discussed more than one problem with their physician. The majority of problems were raised by the patient (58%), with 36% being raised by the practitioner and the rest by another person in the room. Problems raised by patients were more likely to relate to acute illness. Additional problems were more likely to be raised during consultations where the first problem discussed related to a chronic problem or preventive medicine rather than an acute problem. Discussions of multiple problems were associated with longer consultation length, with the length of consultation increasing by approximately 2.5 minutes for each additional problem addressed. Flocke et al. (2001) also found that billing sheets were a poor representation of the numbers of problems discussed during the consultation. The number of problems recorded by observation and the number recorded on the billing sheet agreed in only 29% of cases, with the number recorded on the billing sheet lower in the majority of cases. However this study involved data collection by 1st year medical students, and it may be that their understanding of cases would be different from that of an experienced practitioner.

Beasley et al. (2004) also looked at the number of different problems discussed during family physician consultations in the United States using self-recording by practitioners rather than an external observer. The study recruited 29 members of the Wisconsin Research Network (WReN) and asked them to record all problems discussed during consultations in a physician problem log to be used specifically for research purposes. A problem was defined as any issue around which the physician gathered information and made a decision about during the encounter, even if the decision was to take no action. Beasley et al. (2004) compared data from the problem log and billing information with that from the patient chart/progress notes. Data were collected from 572 consultations involving adult patients, and It was found that overall, an average of 3.05 problems were recorded per patient in the

problem log. In one consultation, 10 separate problems were discussed. The number of problems recorded increased in patients over the age of 65, regular patients, and diabetic patients. However, an average of only 2.82 problems was recorded in the patient progress notes and only 1.97 in the bill. Beasley et al. (2004) noted that certain types of problems, such as mental health issues and substance abuse, appeared more likely to be missing from patient notes and billing than other types of problems. However this study required considerable additional work by the practitioner, which may have influenced willingness to participate, so this study may not be representative of all practitioners. In addition, the extra work required means this may not be a feasible method of gathering data in the long-term.

Other studies have looked at multiple problems and examined how these are raised by patients. One phenomenon which has been described during general practice consultations has been called the 'by the way' phenomenon or 'doorhandle remark'. This was described and analysed by Campion and Langdon (2004) who studied 237 consultations which had been recorded or video-taped, and looked for instances of patients raising new topics other than initial presenting complaint during the consultation. These 'topic shifts' occurred in 69 (29.1%) consultations, and consultations where multiple problems were discussed appeared to last significantly longer than single problem consultations.

1.5 The veterinary caseload

Various different methods have been used by other veterinary researchers, in an attempt to characterise the caseload of small animal veterinary practitioners. However some of these studies were conducted several years ago (Evans et al., 1974) and may not reflect the current veterinary caseload seen today. In addition, several of the studies were conducted outside of the UK and so may not reflect the caseload of a UK veterinary surgeon (Lumeij et al., 1998, Lund et al., 1999). Many studies focus on a specific disease or subset

of animals and many use an indirect method of data collection, relying either on data extracted from clinical records, insurance records or via questionnaire. While these methods have the advantage of allowing collection of a large volume of data over a short period of time, it is not clear how accurately such methods fully reflect the reality of the consultation. This section aims to summarise and evaluate previous studies which have attempted to assess the caseload of veterinary surgeons in first opinion small animal practice by various methodologies (Table 1).

Table 1. The methods of collecting data on veterinary caseload.

Studies collecting data through...	Method	Page
Veterinary practices	Sentinel practices	12
	Referral practice	13
	Extraction of records/clinical coding	14
	Routine visits	18
	Direct observation	21
	Vet questionnaires	21
Other methods	Owner questionnaires	25
	Insurance databases	27
	Disease surveillance schemes	28

1.5.1 Studies collecting data through veterinary practices

1.5.1.1 Sentinel practices

Development of a network of practices willing to be involved in practice-based research is vital in order to generate data which can be used by general practitioners. Mellor et al. (1999) developed a network of sentinel practices to gather data on the demographics of the equine population in Northern Britain. Practices were recruited by conducting a census of all practices in Scotland and Northern England providing equine veterinary care, then selecting a random sample of 25 practices from all who responded. The successful recruitment of this network of first opinion practices allowed

further practice-based research to be conducted, investigating the management and health of horses in Northern Britain (Mellor et al., 2001).

In contrast to this, there has been less discussion around sentinel practice networks in small animal veterinary research. In 1964, the Veterinary Medical Database (VMDB) was formed to collate medical records from North American veterinary schools, forming a network of small animal referral practices (VMDB, 2013). The potential uses of data from this network for research and disease surveillance has since been recognised, however the impact of referral bias on these data has also been acknowledged (Bartlett et al., 2010).

1.5.1.2 Data collected from referral practices

Previous practice-based research has often focused on gathering data from referral practices. In most cases, data are gathered from a single practice, with the Veterinary Medical Database (VMDB, 2013) being a rare exception. Limitations in the generalisability of these data have been highlighted and it appears that substantial referral bias exists. Bartlett et al. (2010) examined disease rates in animals presenting to four North American veterinary hospitals. Different conditions were seen in animals residing close to the hospital i.e. first opinion cases, compared with animals residing further away from the hospital i.e. referral cases. Therefore caseload and disease prevalence at a veterinary referral hospital and first opinion practice level are likely to differ significantly, and research conducted in one type of practice may not be generalisable to other types of practice.

Lund (1997) also looked at referral bias, comparing caseload between a veterinary teaching hospital and private veterinary practices. Data were extracted from clinical records and included practice-specific procedure codes and diagnostic codes from a standardised list. Data on patient characteristics such as species, breed, age, sex and neutering status, collectively known as

the patient's 'signalment' were also collected. It was found that the referral population differed from the first opinion population in terms of species and age, with fewer cats and fewer animals less than one year of age seen in the referral population. In addition, the diagnoses made and procedures performed also differed between the two populations, suggesting again that data collected in a referral practice may not be representative of cases in first opinion practice.

1.5.1.3 Data extracted from electronic records/clinical coding

SAVSNET (Small Animal Veterinary Surveillance Network) (SAVSNET, 2014) based at The University of Liverpool aims to provide information about the frequency of various diseases in small animal practice. This has been achieved firstly by working with diagnostic laboratories and secondly by working with various first opinion small animal practices (Radford et al., 2010, Tierney et al., 2011). Following successful pilot studies in 2009 and 2010, the group is currently collecting data in a number of practices, focusing on one specific condition during a particular period. This involves the vet answering a short implanted questionnaire integrated within the Practice Management Software systems (PMSs) at the end of each consultation (Tierney et al., 2011). The questionnaire was alternated to focus on three different syndromes during the pilot study (vomiting/diarrhoea, pruritus and aggression) with plans to expand this to other conditions. This information is then extracted alongside signalment data, treatment prescribed and postcode for spatial analysis. A three month pilot revealed a species breakdown of 68% dogs, 24% cats and 8% other species. In addition, 4% of animals were presented for vomiting and/or diarrhoea, while another 4% presented for pruritus. Only 0.3% were presented due to aggressive tendencies (Tierney et al., 2011).

Additionally, SAVSNET also collected clinical notes for free text analysis. This free text was utilised to determine antimicrobial prescribing patterns in first

opinion practice (Radford et al., 2011) by obtaining data from consultations in 16 small animal practices across England and Wales. Consultations involving all species were included, however consultations primarily for prophylactic treatment such as vaccinations were excluded. Prescribing patterns varied depending on the species being treated, with antimicrobials prescribed in 35.1% of dog consultations, 48.5% of cat consultations and 36.6% of rabbit consultations. Prescribing behaviour also varied between practices and 76 different antimicrobials were prescribed during the study. Baseline data gathered by SAVSNET is likely to be highly useful in identifying future disease outbreaks, by looking for sudden increases in the prevalence of certain presentations, or changes in prescribing behaviour. However, SAVSNET data will be less useful in providing an overview of the veterinary caseload, and so may not be useful in identifying uncertainties and prioritising future research.

VetCompass (Veterinary Companion Animal Surveillance System) is a UK wide diseases surveillance project based at the Royal Veterinary College (VetCompass, 2014). VetCompass investigates the range and frequency of small animal diseases by utilising data recorded in computerised clinical notes. Signalment data, clinical notes and VeNom (Veterinary Nomenclature) codes can then be extracted and analysed. VeNom codes are a standardised list of clinical veterinary terms which are embedded into the PMSs, so that each consultation can be coded by diagnosis (VeNom, 2014). The codes were developed from SNOMED codes (IHTSDO, 2014) which are diagnostic codes originally designed for use in human medicine as a consistent way to index and store clinical data. The VeNom codes adapted from these SNOMED terms are also made up predominantly of diagnosis terms; however they are now being expanded to include breeds, clinical signs and diagnostic procedures. By utilising the VeNom codes alongside signalment data and clinical notes, the VetCompass project has published findings on prevalence and risk factors for specific conditions such as canine chronic kidney disease (O'Neill et al., 2013b). A longitudinal study was conducted to determine the prevalence of chronic kidney disease, and then a nested case-control study conducted to

evaluate risk factors. Cases of chronic kidney disease were identified using a combination of VeNom codes and free text analysis, with a minimum of consistent history and blood biochemistry required for inclusion in the study. Control animals were selected from all dogs presented without a history indicative of kidney disease, using a random number generator. Older animals, insured animals, Cavalier King Charles Spaniels and Cocker Spaniels all appeared to be at higher risk of kidney disease. Kearsley-Fleet et al. (2013) have used similar methods to look at prevalence and risk factors for canine epilepsy. An advantage of this method is that the use of standardised language in the form of VeNom codes will simplify analysis; however this also assumes that veterinary surgeons will interpret diagnostic terms in a similar manner. Another concern with the use of codes consisting predominantly of diagnostic codes, is that it may not be suitable if the rate of diagnosis during first opinion consultations is low as suggested by Lund et al. (1999).

Lund et al. (1999) in the United States, also utilised the SNOMED (Systemised Nomenclature of Medicine) codes (IHTSDO, 2014). Data were collected from all clinical record entries involving dogs and cats in 52 private veterinary practices in the US. In addition to coded diagnostic data, information was also collected on signalment, body condition score and diet. Only 7% of dogs and 10% of cats were reported to be healthy, and dental calculus and gingivitis were found to be the most commonly reported condition. Diagnostic codes were not assigned for 64% of cases. This may be due to difficulties in selecting an appropriate code to fit the case, or perhaps that diagnoses were often not reached during a consultation. Lund et al. (1999) discussed that in a diagnosis-orientated study, there will be a tendency for conditions easily diagnosed on clinical examination, such as periodontal disease, to be over-represented. Similarly, diseases which require extensive investigations for diagnosis such as hypoadrenocorticism may be under-represented. This presents a large challenge for projects involving the selection of a single diagnostic code from a list. Designing a study in which the data collected has the potential to be clinical sign focused or problem-orientated, rather than diagnosis-orientated

may be more useful. Developing a method which could record the certainty of a diagnosis e.g. presumptive versus definitive diagnosis, could also be useful. While this study provides us with some interesting information about commonly encountered diseases in small animals in the USA, it is unclear how accurately these data reflects issues discussed between veterinary surgeon and owner during the consultation.

Banfield Applied Research and Knowledge (BARK) has also been set up to conduct practice-based research in Banfield Pet Hospitals in the United States (BARK, 2014). Banfield Pet Hospitals is a chain of over 800 practices with a common goal of providing high-quality, evidence-based veterinary medicine. A unique standardised computer system is used by all branches, which requires users to record mandatory elements such as temperature or presence of periodontal disease. This ensures detailed information can be collected for each consultation which can then be used by BARK to answer a specific question. The aim of BARK is to generate new knowledge which will support high quality evidence-based patient care through retrospective and prospective studies of records from around 2.5 million pets (BARK, 2014). In particular, the data is used to make recommendations on the prevention, diagnosis and treatment of disease. The findings from this research are distributed to both Banfield veterinary surgeons and the wider profession through various methods including podcasts, white papers and the Banfield Journal. However, while this serves as a rich source of population data, it is unclear how generalisable these data will be to practices outside of the Banfield group, or to practices in the UK.

A limitation of all methods which extract data from the clinical records, is that the validity of these methods is currently unknown. Studies in medicine have suggested that clinical notes do not fully reflect the content of the consultation (Flocke et al., 2001, Beasley et al., 2004). It is unclear whether the same is true of veterinary consultations. A study by Pollari et al. (1996) used electronic records to extract information about the frequency of post-

operative complications in dogs and cats after elective surgery. In an attempt to validate their methods, the study compared data extracted from electronic methods with data extracted from paper records and demonstrated variable consistency between the two methods. However to date, work has not been conducted to assess how accurately the clinical notes made by the vet, be they on paper or electronic record, reflect fully what actually happens in the consultation. Therefore most studies extracting data from PMSs make the assumption that data is entered accurately and reflects the consultation.

In order to address this assumption, ongoing work at the CEVM plans to compare data extracted from the clinical records with that gathered by direct observation (Jones-Diette, 2013, pers. comm.). This method extracts signalment data and clinical notes through the PMSs, followed by free text analysis. As this method utilises the standard clinical notes recorded for each consultation, it allows collection of detailed data without requiring additional work on the part of the veterinary surgeon. The method has so far been successfully piloted in one practice, and a subset of consultations has also been observed. Comparison of data obtained via extraction from the computerised record and via direct observation is currently being carried out, in order to ascertain how data from these sources differ.

1.5.1.4 Data collected on animals presented for routine health checks

Banyard (1998) examined 500 cats and dogs presenting for vaccination in Australia and concluded that 52% of animals had concurrent disease, with this level being higher in dogs than cats, and increasing with age. Most animals with concurrent disease were deemed to have disease of an intermediate grade rather than mild or severe disease. This highlights an important issue which warrants further investigation given the recent controversies over vaccinations, and in particular the vaccination interval (Day et al., 2010). Investigating whether the vaccination consultation has a role in detecting concurrent diseases is likely to be of importance in determining future

recommendations. Evidence is needed to determine whether the vaccination consultation is frequently used to discuss other health concerns. If this is the case, then a routine annual health check, that may or may not involve a vaccination, would potentially still be beneficial.

Roshier and McBride (2013) also looked at vaccination consultations to investigate how often behavioural problems were discussed. Annual booster vaccinations consultations for 17 different dogs were videotaped with clients also completing a questionnaire following the consultation. Whilst all clients reported that their dog had at least one behavioural problem in the questionnaire, with 58 behaviour concerns reported in total, discussions were only instigated for 10 of these behavioural concerns during the consultations. None of these 10 problems were explored fully or managed beyond the consultation. While other types of discussions were usually instigated by the veterinary surgeon, discussions regarding behaviour were instigated as often by the owner as they were by the veterinary surgeon. One limitation is that this is a small scale study, and only behavioural and not other health concerns were recorded. However, the number of concerns discussed supports the findings discussed above by Banyard (1998) suggesting that many animals presented for preventive medicine consultations may have concurrent disease. These findings also suggest that only a small number of owner concerns may be discussed during the consultation. Awareness of this and more detailed history-taking during preventive medicine consultations could result in identification of further concurrent disease in patients typically considered 'healthy'. Given that some previous practice-based research studies have excluded these 'healthy animal' consultations, it may be that conditions which are frequently discussed during these types of consultations are being missed, giving an inaccurate view of the veterinary caseload.

As with vaccination consultations, routine health checks for newly acquired animals may also be important to discuss health concerns and detect concurrent disease. This may be particularly important in the case of dogs

acquired from a rescue shelter as suggested by Wells and Hepper (1999). Their study involved a postal survey of owners of newly acquired rescue centre dogs and found that 53.7% of dogs had had an illness within the first 2 weeks of leaving the shelter. While some of these illnesses may have been acquired after leaving the shelter, the prevalence of health problems among recently acquired dogs suggests the veterinary surgeons role may be important during this time period. The most common ailments were coughing and diarrhoea, followed by flea infestations, vomiting, skin problems, parvovirus and distemper. It was also found that dogs which suffered from these ailments, even if they were relatively minor, were more likely to be returned to the shelter (Wells and Hepper, 1999). This highlights the potential importance of routine health checks of such animals, and suggests that research may be needed to determine the frequency with which concurrent health problems are noted at routine checks.

However, the studies discussed above focus primarily on routine appointments for animals presumed to be healthy. Shaw et al. (2008) selected a random sample of 50 veterinary small animal practitioners in southern Ontario, and videotaped a total of 300 consultations, 6 for each of the practitioners. Half of these consultations were preventive medicine consultations, and the other half were consultations for a health problem. It was found that communication style differed considerably between the two types of consultation, with preventive medicine consultations being more relaxed, and problem consultations more likely to be described as hurried. Content also differed between the two consultation types, with more focus on lifestyle and social topics in preventive medicine consultations and more focus on biomedical topics in problem consultations. Therefore preventive medicine consultations may be fundamentally different from consultations for a health problem. Consideration of all types of veterinary consultations, and all problems discussed during each consultation, would give a more accurate view of the day-to-day caseload of a first opinion practitioner.

However comparison of the problems discussed in these two different types of consultation may also be important in understanding caseload.

1.5.1.5 In consult/observational data collection

One study which collected data direct from the consult room was conducted by Hill et al. (2006). It involved observation of small animal consultations by 4th and 5th Year veterinary undergraduates during their Extramural Studies (compulsory time spent "seeing practice" during undergraduate veterinary training). This study focused on dermatological problems and detailed information was collected on consultations involving skin problems, with basic details being collected for all other consultations. Of the patients presented, 62.6% were dogs, 28.1% were cats and 9.2% other species. Hill et al. (2006) also found that preventive medicine was the most common reason for presentation in dogs and cats, followed closely by skin conditions which accounted for 21.4% of all consultations. In exotic animals, skin complaints were found to be the most common reason for presentation, followed by preventive medicine. However as the study was focused primarily on gathering information about skin conditions, little information was available on animals presenting for non-dermatological problems. In addition data were collected by various students at different stages of their veterinary degree, which could have led to inconsistencies in what was recorded.

1.5.1.6 Veterinary surgeon questionnaires

Evans et al. (1974) conducted a survey of BSAVA members and asked them to collect data during 5 separate one week periods. Data were gathered from 28757 consultations involving 61 veterinary surgeons. The study found that 72% of animals examined were dogs, with just 25% cats and 3% exotics. Around half of the cases seen during the Evans et al. (1974) study were medical, with skin and ear problems being the most frequently seen. Vaccinations consultations accounted for just 13% of all cases. In addition just

one in sixty consultations involved a laboratory test. However as this study was conducted over 30 years ago, and given the advancements in veterinary medicine over that time, it is likely that these results are no longer representative of veterinary practice in the UK today.

Another UK-based survey of veterinary practitioners, this time a pilot study, investigated the caseload of first opinion vets and considered the feasibility of collecting surveillance data on the small animal population. Robotham and Green (2004) recruited 15 practices to collect data via a paper questionnaire for each first consultation on up to 4 separate days during 2000/2001, and gathered data from 2631 animals presented for consultation. The most common disease was ear disease accounting for 4% of cases followed by skin diseases. However over 50 different diseases were diagnosed making it difficult to draw any meaningful conclusions about individual diseases given the small numbers in each category. The researchers also encountered difficulties with a non-response to many questions as well as many errors in the data. This may be due to the extra time commitment required by the veterinary surgeon to complete the questionnaire, or difficulty in interpreting some of the questions. Additionally, the grouping of relatively small amounts of data by specific categories such as diagnosis may not be useful, particularly if definitive diagnosis is rare. Meaningful analysis of such data would require either a very large dataset, or careful categorisation of data in order to make it more manageable.

Nielsen et al. (in press) conducted a postal survey of veterinary surgeons registered with the Royal College of Veterinary Surgeons (RCVS). Veterinary surgeons currently undertaking some clinical work were asked which species were most commonly presented, and which conditions or presentations they saw most frequently in these species. These conditions or presentations were then categorised by body system, and by whether they related to a specific diagnosis or clinical sign, for ease of analysis. It was found that dogs, followed by cats then rabbits were the three species most commonly reported by

veterinary surgeons. While some veterinary surgeons listed a specific diagnosis, many listed clinical signs e.g. lameness rather than osteoarthritis. Common clinical signs and diagnoses listed varied widely between species. This study relies on recall from veterinary surgeon's memory rather than the recording of cases and so may be prone to bias and influenced by recent cases or outbreaks of disease. However the results could be highly useful when used in conjunction with data from cases, discussion with vets, and review of current literature, to identify gaps in knowledge and formulate research priorities.

Davies (2009) used a questionnaire method, not to investigate caseload directly, but to determine the actions taken by veterinary surgeons. General veterinary practitioners and veterinary cardiologists were given an identical questionnaire, which contained two example cases of dogs in congestive heart failure, one caused by mitral valve degeneration and the other by dilated cardiomyopathy. Vets were asked what action they would take, if any, for each case, in terms of medical treatment, management advice, and further investigation. They were also asked when they would see the dog back for a revisit. Data were collated for 56 general practitioners (12.1% response rate) and 10 specialists (50.0% response rate). Treatments and management strategies varied widely between vets, for example 26 different drug combinations were suggested for the treatment of DCM. Evans et al. (2011b) suggested that such variability was a good indicator for uncertainty about the effects of treatments within the medical profession, and so it may be that the same is true of the veterinary profession. Davies (2009) also found differences in the actions suggested between general practitioners and cardiologists. This further reinforces findings by Bartlett et al. (2010) which suggested that data from referral practice may not be generalisable to first opinion practice.

Questionnaires conducted outside of the UK show a wide variation in caseload seen by vets in different areas. Lumeij et al. (1998) conducted a

postal survey of veterinary practitioners in The Netherlands. A telephone survey was also conducted for a small random sample to determine reliability. The questionnaire asked practitioners about the percentage of consultations involving different species during 1994. Cats were found to be the most commonly presented species (46%), followed by dogs (44%) with other species accounting for 10%. Of the other species presented, rabbits accounted for 32%, birds 30% and rodents 26%. However as this study was conducted outside of the UK, it may not be representative of the types of patients presenting to veterinary practitioners in the UK. In contrast a questionnaire based study by Heath and Niethe (2000) in Australia found that dogs occupied 54% of consultations and cats 35% of consultations, with considerable variation between different regions in terms of species caseload seen. However the methods and the response rate to the questionnaire were not clear, so it is difficult to interpret the results of this particular study accurately.

Ebell et al. (2013) took a different approach to looking at the caseload, by examining the number of clinical questions raised by veterinary consultations. A total of 12 general practitioners in 6 private practices were asked to report any clinical questions that they had about each consultation they conducted. Questions were collected by an observer, who briefly interviewed the vet after each consultation in 5 of the 6 practices. In the 6th practice, questions were submitted by email. Veterinary surgeons were also given a data collection pocket card to record clinical questions when the observer wasn't present. Questions were then categorised into different types e.g. 'What is the cause of symptom X?' or 'Is test X indicated in situation Y?'. Ebell et al. (2013) collected 157 questions in total, though it is unclear how many consultations these questions spanned. A total of 99 questions concerned dogs, 33 concerned cats and the remaining 22 either concerned more than one species or did not specify a species. Over half of the questions were about treatment (53%) and a further 20% were about diagnosis. In terms of body system affected, endocrine was the most commonly mentioned, with 18

questions raised on this topic, followed by musculoskeletal, with 12 questions raised on this topic. In contrast to previous studies which have found dermatology to be a frequently encountered area, Ebell et al. (2013) found only 8 questions were raised on this topic.

1.5.2 Data collected via other methods

1.5.2.1 Owner questionnaires

Davies (2011) took a slightly different approach and conducted an internet-based questionnaire of pet owners, to look at clinical signs which may trigger an owner to present their animal to a veterinary surgeon. The survey provided owners with a list of clinical signs, described in simple rather than medical terms e.g. 'pink or red-coloured urine' rather than haematuria. Participants were then asked which signs they thought were serious enough to require veterinary attention in an older animal. The survey was completed by 690 participants, and responses varied widely depending upon the clinical sign being considered. The majority of participants (86.2%) considered haematuria serious enough to require veterinary attention, in comparison with only 52.3% for halitosis. Such results are of importance as how serious an owner perceives a sign to be may influence how likely they are to present the animal to a veterinary surgeon. Halitosis is often a sign of periodontal disease, which may therefore be under-represented in the vet-visiting population. However this study has many limitations, a separate survey on the site hosting the questionnaire found that only 55.9% of visitors to the site were pet owners, with many others being from a veterinary background. It is therefore unclear as to whether the appropriate participants were reached. In addition, this questionnaire looked only at owner attitudes and may not reflect the action the owners would decide to take were they to see these clinical signs in their own pet.

Dogslife, a joint project between the Roslin Institute and the Royal (Dick) School of Veterinary Studies at The University of Edinburgh, also gathers the majority of its data from owner questionnaires (Dogslife, 2014). The project has recruited Kennel Club-registered Labrador Retrievers with owners asked to complete web-based questionnaires throughout their dog's life. Questions are asked regarding any health problems encountered by the animal, along with the corresponding veterinary diagnosis as reported by the owner, which is then coded using VeNom codes where possible(VeNom, 2014). Owners are provided with a form which can be completed by their veterinary surgeon, should they attend a non-routine consultation with their animal. It is hoped that this will identify potential risk factors for disease, and if successful, can be expanded to include other breeds. However as this project relies on owner reporting of health conditions and focuses on a single breed, its ability to give an overview of the common conditions encountered by veterinary surgeons is currently limited.

The PDSA Animal Wellbeing (PAW) 2013 report summarised the findings of an online survey of over 11,000 dog, cat and rabbit owners conducted by the PDSA and YouGov (PDSA, 2014). The survey asked owners about various aspects of animal welfare covering environment, diet, behaviour, companionship and health. An online survey of veterinary professionals was used to generate an ideal scenario for each welfare need, and owner answers were then scored out of 100, based on how closely these needs were met. Scores for health raised some concern, particularly for rabbits for which a score of only 47 was reached. The study revealed that a large proportion of animals were not vaccinated, neutered, wormed, microchipped, insured or registered with a vet. However, it is unclear whether participants in this survey are representative of UK pet owners in general. In addition, many of the topics covered, including vaccination and routine neutering, are controversial even within the veterinary profession (Day et al., 2010, Beauvais et al., 2012)

1.5.2.2 Data collected from insurance records

The majority of studies based on data collected from insurance companies have been conducted in Scandinavia where rates of pet insurance are high (Bonnett and Egenvall, 2010). In the insurance data used in these studies, diagnoses are assigned by veterinarians based on a commonly used registry of diagnostic codes, and usually only one diagnostic code is assigned (Egenvall et al., 2009). Bonnett and Egenvall (2010) looked at patterns of disease and death in insured dogs and cats. It was found that survival had increased over the 7 year study period and considerable differences in survival were seen between breeds. Deaths due to traumatic disease decreased with age, whilst death due to other causes e.g. degenerative and neoplastic conditions increased with age. Other studies utilising insurance data have focused on specific breeds (Egenvall et al., 2000) and specific diseases including bone tumours (Egenvall et al., 2007) and Diabetes mellitus (Fall et al., 2007, McCann et al., 2007). The benefits and limitations of such insurance data have been discussed in depth by Egenvall et al. (2009). Benefits include large amounts of easily accessible data with high statistical power, while limitations include unknown underlying accuracy and frequent use of non-specific codes. In Sweden the insured dog population appears to be representative of the Swedish dog population at large (Sallander et al., 2001), though it is unclear whether the same is true of the cat population.

However this method may be less useful in the UK where the proportion of pets insured is still low. Asher et al. (2011) estimated that around 2 million dogs in the UK are insured, based on data provided by the Association of British Insurers. This is only a small proportion of the total UK dog population, which was estimated to be around 9.4 million based on a public survey (Asher et al., 2011).The PDSA Animal Wellbeing (PAW) report surveyed over 11,000 pet owners and found that 52% of dogs, 31% of cats and 6% of rabbits were insured. However it is unclear whether the survey respondents are likely to be representative of all UK pet owners. While there have been some attempts to

use UK pet insurance databases to look at certain conditions, for example neoplasia in dogs (Dobson et al., 2002), its remains unclear how representative the insured pet population is of the UK pet population as a whole. In addition, the use of insurance databases is likely to be an inappropriate method of examining the consultation in detail, as usually only one diagnostic code is allowed, meaning only one condition can be recorded (Egenvall et al., 2009). Minor problems, for which no insurance claim is submitted, and those excluded from claims e.g. behavioural problems, are also likely to be missed.

1.5.2.3 Disease surveillance schemes

Various groups in the UK, some of which have been discussed previously, are looking at small animal disease surveillance and are summarised below (Table 2). Many of these projects are focused on monitoring a particular area or set of specific conditions. Some of these surveillance schemes have been summarised in more depth by Carruthers (2009), who also discussed their limitations, in particular that many rely on reporting by the veterinary surgeon and so are prone to bias.

In Australia, veterinary pharmaceutical company Virbac have launched a surveillance system for the tracking and mapping of small animal infectious diseases. Participating veterinary practices record details of infectious diseases, which generates a real-time map on the Disease Watchdog website (Disease Watchdog, 2014). Around 40% of Australian veterinary practitioners have registered and participated in the scheme since it began in 2010, with tick paralysis being the most commonly reported disease, followed by canine parvovirus. Cases of parvovirus were found to cluster in areas of low socioeconomic status, and the risk of death from this disease was associated with both breed and season. However, while this method is likely to be highly useful for surveillance, it does rely on reporting of cases by veterinary surgeons, which may be incomplete e.g. due to time constraints. In addition,

only certain diseases are monitored, so it cannot provide information about the wider caseload.

Table 2. Disease surveillance schemes in the UK.

Name	Disease(s) being monitored	Website
Canine Health Scheme	Hip and Elbow Dysplasia in susceptible breeds	www.thekennelclub.org.uk/item/308
Computer-based Investigation of Companion Animal Diseases Awareness (CICADA)	13 diseases including distemper and flystrike	uk.cicadasurvey.com
The Acarus Laboratory	Arthropod transmitted diseases	www.langfordvets.co.uk/diagnostic-laboratories/diagnostic-laboratories/pcr-acarus
Dog and Cat Travel and Risk Information (DACTARI)	Disease risks due to Pet Travel Scheme (PETS)	archive.defra.gov.uk/foodfarm/farmanimal/diseases/vetsurveillance/dactari/
Suspected Adverse Reactions Surveillance Scheme (SARSS)	Adverse events relating to medications	www.vmd.defra.gov.uk/public/adverse.aspx
Small Animal Veterinary Surveillance Network (SAVSNET)	Using laboratories and a network of sentinel practices to monitor disease	www.savsnet.co.uk
VetCompass (Veterinary Companion Animal Surveillance System)	Nationwide survey of small animal disease	www.rvc.ac.uk/vetcompass

1.6 Decision making in the veterinary consultation

Whilst various studies have looked at the patients presenting to first opinion practice, and some even the reasons for presentation or eventual diagnosis, few studies have looked at the decisions made and actions taken during the consultation. During a veterinary consultation, many decisions need to be made. These include questions around diagnosis, prognosis, treatment, management and control of disease (Cockcroft and Holmes, 2003). In recent years, there has been a move within medicine to involve patients in the decision-making, moving away from the traditional paternalistic approach towards a patient-centred approach (Kaba and Sooriakumaran, 2007). Shaw et al. (2004) suggested this approach could be used in veterinary medicine, which adds further complexity to the decision making process, as decisions may involve not only the veterinary surgeon, but also the owner and the patient. Whilst many veterinary surgeon factors (e.g. expertise, facilities or previous experience) may influence decision making, owner factors (e.g. personal values or financial circumstances) and patient values (e.g. temperament or concurrent disease) may also have an impact on the action taken (Everitt, 2011).

Everitt (2011) looked at decision-making in the small animal consultation using qualitative methods involving a combination of video-taping consultations followed by video-cued interviews with the veterinary surgeon. In total, data were collected from 69 consultations involving 22 different veterinary surgeons from 11 practices. It was found that decision-making in the veterinary consultation was complex, with consultations rarely following the Calgary-Cambridge guide, the consultation method traditionally taught to UK veterinary students (Mossop and Gray, 2008). The discussion of multiple topics often added to this complexity, and whilst there were similarities with medical consultations, there were also many differences which appeared to have an impact on decision-making. These differences included the status or value placed on an animal, the fee-based nature of veterinary practice

compared with state-funded medical provision in the UK and the option of euthanasia in veterinary practice. It was also found that in veterinary consultations, decision-making is more of a negotiated activity between practitioner and owner, compared with medical consultations. Veterinary practitioners were observed to 'float ideas' and discuss various options with owners prior to making a decision which takes into account owner and patient circumstances. However, as a qualitative study, this study was designed to look at the decision-making process in great depth in a small number of studies, so it is unclear how representative these data are of all veterinary consultations. A quantitative study looking at decision-making by measuring the actions taken by veterinary surgeons in a larger number of consultations may help to complement the results of this study.

Understanding the decisions made and actions taken by veterinary surgeons is a vital step to improving patient care by directing future research towards areas of most need. By looking at how veterinary surgeons currently approach cases, conditions for which there are inconsistencies in the investigations and treatments by practitioners can be identified. Utilising a process similar to that conducted by the James Lind Alliance in medicine (JLA, 2014) would be useful in determining where uncertainties lie in the approach to a particular condition which would assist in formulating research priorities. Therefore determining the decisions that veterinary surgeons currently make, be it in relation to the type of diagnostic tests to perform or the type of treatment to administer, is a vital step to prioritising research.

1.7 Current gap in knowledge

In summary, in order to be able to practice evidence-based veterinary medicine, high quality evidence on topics which are relevant to both veterinary practitioners and owners is needed. However, as the evidence base may be limited in veterinary medicine (Cockcroft and Holmes, 2003) a list of priorities for future research needs to be generated. These priorities need to

be in the form of a focused, answerable clinical question which addresses areas of uncertainly of importance to practitioners, similar to those developed in medicine (JLA, 2014). However before these more focused questions can be formulated, background data on the caseload of veterinary surgeons is needed as a starting point for discussions. Identification of common scenarios in first opinion veterinary practice, including common species, breeds, clinical signs, diagnoses and interventions will make formulation of future research priorities more manageable by signposting commonly encountered areas of interest. Many previous studies have looked at caseload data on a large scale using indirect methods e.g. extraction of computerised records (Lund et al., 1999). However consultations appear to be complex, both in terms of the number of problems discussed and the decision-making process (Everitt, 2011). Understanding at what point decisions are commonly made along the path from clinical sign to definitive diagnosis could help to ensure future research is aimed at supporting decision making at these points.

1.8 Aims and objectives

The aim of the study is to develop a novel data collection method which will allow the gathering of detailed data on small animal consultations by direct observation without placing additional workload on the consulting veterinary surgeon. A second aim is to determine the common scenarios encountered during the consultation in order to help direct future research and veterinary education towards areas relevant to first opinion practitioners. Specifically the study will aim to answer:

- Which patients are commonly presented?
- Which problems do they present with?
- What diagnoses are made during the consultation (if any)?
- What actions are taken by the veterinary surgeon?

1.9 Outline of the study

Chapter 2 describes the recruitment and characteristics of the participating sentinel practices.

Chapter 3 describes the methods used during the study, including development of the data collection tool and associated resources including definitions and dictionaries.

Chapter 4 gives an overview of the consultations and patients for which data were recorded during the study.

Chapter 5 describes the problems discussed during the study, in terms of clinical signs, clinical examination abnormalities, body system affected and diagnostic tests performed.

Chapter 6 describes the diagnoses made for the problems which were discussed in Chapter 5, while **Chapter 7** will describe the outcomes for each problem in terms of actions taken.

Chapter 8 focuses on preventive medicine consultations, and will describe how these differ from other types of consultations.

Chapter 9 describes the feedback sessions conducted with the sentinel practices following the main study.

Chapter 10 gives a final summary of the main conclusions, as well as some suggestions for future work following on from this study.

Chapter 2. Recruitment of a network of sentinel practices to conduct practice-based research in first opinion small animal veterinary medicine

2.1 Introduction

Green (2000) defined sentinel practices as 'a network of primary care practices collecting a standard minimum data set and conducting carefully designed studies about problems and processes in primary care'. Sentinel practice networks have been widely used in medicine, however to date the use of sentinel practices in veterinary research has been relatively limited. Nielsen et al. (in press) conducted a questionnaire of RCVS members and found that three-quarters worked in private practice, with the majority working with small animals. Therefore developing a network of first opinion practices seeing small animal cases should be a priority in order to promote relevant veterinary research.

Selection of a network of sentinel practices which would allow results to be generalisable to the rest of the UK is a challenging task. One of the challenges of selecting a representative sample of practices, is that little is known about the characteristics of a typical UK veterinary practice. Surveys of the profession are regularly conducted by the Royal College of Veterinary Surgeons (RCVS) by distribution of postal questionnaires to all members. However the range of answers given by respondents varied widely, suggesting that there may not be a 'typical' veterinary surgeon, nor a 'typical' veterinary practice (Robinson and Hooker, 2006).

The type and size of sentinel practice network needed is also highly dependent on the type of research being conducted, and the intensity of involvement with each individual practice. A large random sample of practices would minimise bias, making results more generalisable, however this is unlikely to be practical. A large convenience sample, such as those recruited

by VetCompass and SAVSNET may be a more realistic aim, however smaller convenience samples may be more appropriate where intensive data collection is being conducted with each practice. While this may make selection of a representative sample of practices difficult, understanding the characteristics of these practices and their staff may influence how data collected during practice-based research can be interpreted.

The aim was to develop a small network of sentinel practices to work with the Centre for Evidence-based Veterinary Medicine (CEVM) to conduct practice-based research. Basic data were gathered on the practices recruited, to identify practice-specific factors which may influence the interpretation of future data collected.

2.2 Materials and Methods

Prior to the recruitment of the sentinel practices, approval was obtained from the ethics committee at the School of Veterinary Medicine and Science, The University of Nottingham for the collection of data through direct observation, and subsequent analysis of these data. The study complied with The University of Nottingham (2010) Code of Research Conduct and Research Ethics.

2.2.1 Practice selection

A convenience sample of 8 sentinel practices were recruited to the study, the locations of which can be seen in Figure 2. Practices recruited were a combination of those who had been involved with a previous practice-based study and had expressed interest in future research (Dean, 2013, pers. comm.), and practices who already had links with/expressed interest in working with the CEVM.

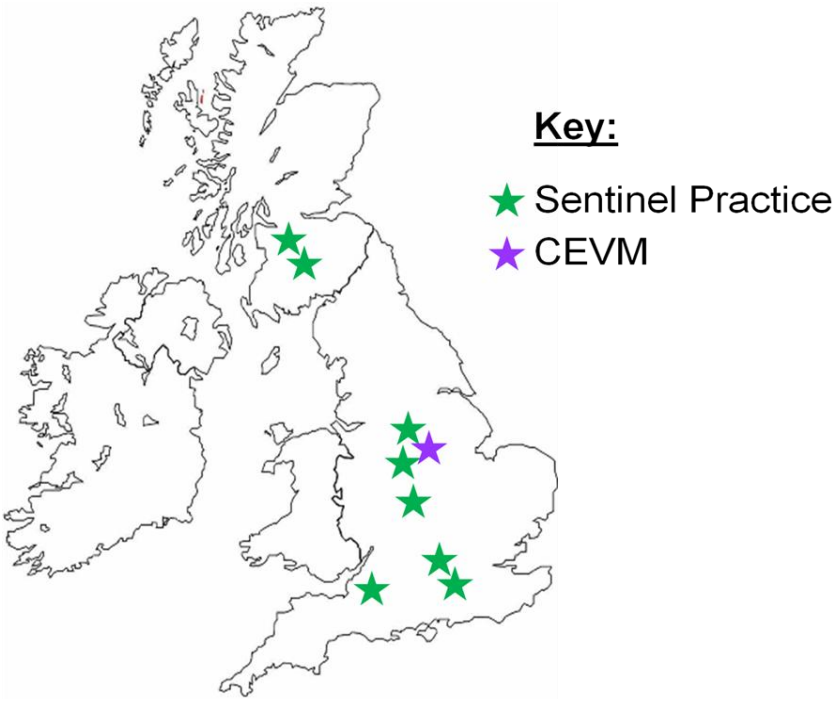


Figure 2. The locations of the 8 sentinel practices recruited into the study. Exact locations of the practices are not shown to retain anonymity of the practices involved.

2.2.2 Practice support

Support was provided for all sentinel practices during their involvement in the practice-based research through various different methods including talking through the research project with staff prior to the study, provision of information sheets and posters (Appendix A) for the waiting room and feedback of results at the end of data collection. Discussions with sentinel practices helped to identify any other areas in which the CEVM could support the practices during their involvement with practice-based research. These included assistance with or advice relating to journal clubs, practice meetings and CPD (Continuing Professional Development) for veterinary surgeons and veterinary nurses.

Talks were conducted with lay and veterinary staff to ensure they were able to answer the most common client questions regarding the research being conducted within the sentinel practice. Pilot study days were also used as an

opportunity for practice support, in order to address any concerns by practice staff surrounding feasibility of the project.

Posters were supplied to each practice which were displayed in the waiting room area for clients to read (Appendix A). These contained information about the aims of the study, the type of data collected, that it would be anonymised (no owner information collected) and the ways the client could opt out of the study. Additionally, each client presenting for a veterinary consultation was asked to read an information sheet which provided similar information, as well as contact details for the CEVM should the client wish to opt out at a later date (Appendix A).

2.2.3 Questionnaire

A questionnaire (Appendix B) was developed to gather basic data on each sentinel practice, including information on consultations, staff, out-of-hours arrangements and preventive medicine protocols amongst other things. The questionnaire was completed by a single researcher during face to face discussions with a representative of each practice, usually the veterinary surgeon or practice manager involved in arranging visits to the practice. The questionnaire was completed twice for each practice, once at the start of data collection and once at the end. This ensured any changes which occurred at the practices were accounted for.

2.3 Results

2.3.1 Practices

Practices were spread across England and Scotland, had 1 to 8 branches and a range of out-of-hours arrangements (Table 3).

All practices were first opinion practices, with Practices 1-7 being regular ‘day clinics’ and Practices 8 being an Emergency/Out-of-hours clinic serving

approximately 30 private practices and 2 charity practices. Data on client base was not analysed as many practices were unsure of their current number of clients, and this was potentially sensitive information.

Table 3. Characteristics of the sentinel practices recruited to the study.

Practice no.	Location	Species seen	No. branches	Out-of-hours arrangements
1	Midlands	Mixed	8	Night team[1]
2	Midlands	Small animal	1	Day staff rota[2]
3	Midlands	Mixed	2	Day staff rota[2]
4	South East	Mixed	2	Day staff rota[2]
5	South East	Small animal	3	External service[3]
6	South West	Small animal	1	External service[3]
7	Scotland	Small animal	3	External service[3]
8	Scotland	Small animal	1	Emergency clinic[4]

[1]The practice employed a separate night team to conduct out-of-hours work

[2]Out-of-hours work was conducted by the regular day staff

[3]Out-of-hours work was conducted by an external out-of-hours service

[4]The practice was a specialist out-of-hours practice

During the course of the study, various changes took place in the basic characteristics of the practices:

- Practice 1 moved its main small animal branch to a new purpose built premises with improved facilities
- Practice 2 changed from covering their own out-of-hours, to use of a specialist emergency service providing cover for several local practices
- Practice 6 became part of a larger veterinary group consisting of 5 other practices, who also provided out-of-hours cover for the practice
- Practice 7 acquired a 4th branch

The dates upon which each practice was visited, both during the data collection tool development phase and during the main data collection period are shown in Table 4.

Table 4. The dates upon which the practices were visited during tool development and validation and during the main data collection period.

	Tool development			**Main data collection**	
Practice	**Pre-test**	**Pilot**	**Validation**	**Week 1**	**Week 2**
1	11 August 2010	20 October 2010	21 May 2012	04 April 11 – 08 April 11	28 May 2012 – 01 June 2012
2	26 August 2010	13 October 2010	n/a	11 July 2011 – 15 July 2011	09 January 2012 – 13 January 2012
3	n/a	26 October 2010	n/a	23 May 2011 – 27 May 2011	14 November 2011 – 18 November 2011
4	n/a	09 March 2011	n/a	18 April 2011 – 21 April 2011	14 May 2012 – 18 May 2012
5	n/a	14 January 2011	n/a	24 October 2011 – 28 October 2011	30 January 2012 – 03 February 2012
6	n/a	14 December 2010	n/a	25 July 2011 – 29 July 2011	18 June 2012 – 22 June 2012
7	n/a	18 January 2011	n/a	16 May 2011 – 20 May 2011	20 February 2012 – 24 February 2012
8	n/a	19 January 2011	n/a	26 September 2011 – 30 September 2011	12 March 2012 – 16 March 2012

2.3.2 Consultations

In total, 6 of the sentinel practices (1, 2, 3, 5, 6 and 7) consulted throughout the day, with a range of 1-4 vets consulting at any one time. Practice 4 consulted in 2 distinct consulting periods of 2 hours, one in the morning and one in the evening, with the remainder of the day being used for large animal visits, operating, diagnostic tests and emergencies. Practice 8 saw emergencies throughout evenings/weekends as necessary. With the exception of the emergency practice, all practices were appointment only, and all except one scheduled 10 minute appointments (Table 5). A range of different practice management software systems were used.

Table 5. Characteristics of the consultations at the 8 sentinel practices.

No.	Consult length (minutes)	Appointment vs. open surgery	PMSs[2]	Nurse Consults
1	10	Appointment	AT Veterinary Systems	Yes
2	10	Appointment	Robovet (Vet Solutions)	Yes
3	10	Appointment	Rx Works	Yes
4	15	Appointment	Vet One	No
5	10	Appointment	Verifac Evolution	Yes
6	10	Appointment	Jupiter	Yes
7	10	Appointment	Jupiter Voyager	Yes
8	N/A[1]	N/A[1]	Premvet (Vet Solutions)	No

[1]N/A Not applicable due to the practice being a specialist out-of-hours clinic

[2]PMSs Practice management software systems

During the course of the study, Practice 8 changed its Practice Management Software to RxWorks.

In total 6 practices held nurse consultations, ranging from the occasional consultation on request to regular nurse clinics. The range of procedures carried out in these nurses clinics varied widely between practices. Practice 1 provided the widest range of nurse clinic services, indicating that all procedures listed in Question 4 (Appendix B), with the exception of anal gland

expression, were frequently performed. Additionally, blood pressure checks, blood sampling and diabetes clinics were also performed during their nurses clinics.

While most practices believed they did have protocols on aspects of preventive medicine, many were unsure of the specifics, so these data were not analysed.

2.3.3 Staff

Total numbers of staff employed by each practice are shown in Table 6. Numbers shown include both full and part time staff, as a few practices found it difficult to categorise some of their staff into either group due to variability in their working hours and out-of-hours commitments.

Table 6. The numbers of staff employed (either part-time or full-time) by each practice recruited to the study.

No.	Vets	QVNs[1]	Trainee VNs[2]	Reception	Other
1	20	14	2	7	12
2	8	10	3	7	4
3	10	7	3	6	0
4	3	2	2	2	0
5	8	7	1	16	6
6	8	8	2	8	2
7	5	3	5	4	0
8	5	6	0	8	1

[1] QVNs Qualified Veterinary Nurses

[2] Trainee VNs Trainee or student Veterinary Nurses

A range of special interests in a particular species or discipline were reported by veterinary surgeons in all 8 practices, and in addition to the 15 veterinary surgeons currently holding a certificate (Table 7), a further 10 were currently studying for a Certificate. Practice 3 included one vet with an interest in acupuncture, whilst one vet at Practice 4 had an interest in both acupuncture

and homeopathic medicine. Additionally, Practice 7 held regular clinics allowing clients to consult a visiting veterinary chiropractor. Number of vets per practice varied widely, while the number of years qualified varied both within and between practices (Table 7).

Table 7. Characteristics of veterinary surgeons doing small animal work across the 8 sentinel practices.

No.	No. vets doing small animal work	Years qualified: median (range)	No. certificate holders
1	20	9.5 (3-24)	8
2	8	11 (2-28)	3
3	10	21.5 (2-38)	1
4	3	12 (4-36)	1
5	8	12.5 (1-40)	0
6	8	26 (6-35)	1
7	5	8 (2-30)	0
8	5	9 (5-20)	1

During the study period, the following changes occurred:

- Practice 1: 3 veterinary surgeons (none certificate holders) left the practice. 4 new veterinary surgeons were employed, 2 of whom were Certificate holders. An existing veterinary surgeon gained a Certificate.
- Practice 5: 2 veterinary surgeons left and 1 veterinary surgeon joined the practice. An existing veterinary surgeon gained a Certificate.
- Practice 6: 2 veterinary surgeons left and 2 new veterinary surgeons joined the practice.
- Practice 7: 2 veterinary surgeons left and 2 new veterinary surgeons joined the practice.
- Practice 8: 3 veterinary surgeons left and 3 new veterinary surgeons joined the practice.

2.4 Discussion

A small number of practices were recruited to this study, which was ideal for the detailed nature of the data collected in this initial research study of the CEVM. Additionally the recruitment of a small number of practices allowed for collection of further detail on various aspects of the practice and its staff both at commencement and completion of the study. This detail may be vital

in interpreting much of the data collected, as it provided information on the special interests of veterinary surgeons, and other aspects which may influence the caseload seen. For example, the range of procedures conducted in nurses clinics varied widely between practices, which could influence the caseload seen in each practice. Preventive medicine procedures, such as nail clipping, microchipping and in Practice 1, second vaccinations, were often conducted in nurses clinics, meaning these procedures may be under-represented in veterinary consultations.

There is little data on what constitutes a 'typical' UK veterinary practice, therefore it is unclear whether the characteristics of the practices recruited are reflective of UK practice as a whole. Some data on UK veterinary surgeons and the practices they work in has been generated from the Royal College of Veterinary Surgeons (RCVS) surveys of the profession. However, the survey yielded a response rate of 47% in 2006 (Robinson and Hooker, 2006) with characteristics of non-responders unknown, therefore the results may not be true of the profession as a whole. Despite this, a comparison of data from this survey with the characteristics of the sentinel practice and their veterinary surgeons to the current study may still be useful to identify similarities as well as inconsistencies. The sentinel practices were spread across England and Scotland, however several practices were located within easy reach of the CEVM meaning it may be difficult to generalise the results to other UK practices, particularly if there is regional variation in the prevalence of some diseases.

The use of an appointment system with 10 minute consultations and electronic patient records was relatively consistent across the practices. This is consistent with findings of the RCVS Survey of the Profession 2006, which reported that 94% of practices kept computer records of patient and client details, with 91% of these also using this system to record clinical information (Robinson and Hooker, 2006). However many different practice management systems were used, highlighting the potential challenges of gathering data via

alternative methods such as making use of computerized records. A similar range of out-of-hours arrangements were observed in sentinel practices compared with the RCVS respondents, with some practices handling their own out-of-hours cases, others using an external emergency service, one using a dedicated night team, and one being an emergency out-of-hours clinic. In total, 57% of sentinel practices did their own out-of-hours work, compared with 60.5% of RCVS survey respondents. However while these proportions are similar, the small sample size of sentinel practices, and the fact that the RCVS survey responses were from individual vets rather than practices means it is difficult to compare these two values.

Characteristics of individual veterinary surgeons including time qualified, additional qualifications and special interests varied widely even within practices. Everitt (2011) looked at decision-making in small animal veterinary consultation through video-taping of consultations followed by a video-cued interview with the consulting vet. It was found the individual characteristics and preferences of the veterinary surgeon often heavily influenced the decision-making process. Therefore if we are interested in the consultation process, the characteristics of the individual veterinary surgeons involved in the study, rather than simply the practices as a whole may be of more relevance. Median time qualified was 19 years in the 2010 RCVS survey respondents (Robertson et al., 2010), while median time qualified ranged from 8 to 26 years in the sentinel practices. Only 2 practices had a median age above 19, suggesting the population of vets at the sentinels may be more recently qualified than those answering the RCVS survey. One explanation for this is that the RCVS survey was also to retired, as well as practicing, veterinary surgeons. Nielsen et al. (in press) also surveyed RCVS members and found respondents were younger than those in the 2010 RCVS survey. However, when retirees were excluded, the populations were very similar in both studies. Additionally, a much higher number of veterinary surgeons in the sentinel practices were found to either have a certificate or be working towards one, than found by the RCVS survey. It may be that involvement in

completing a certificate may increase awareness of or willingness to be involved in research, and/or decrease likelihood of completing a RCVS survey. Additionally the differences in years qualified between RCVS survey respondents and sentinel practice vets could potentially influence the likelihood to have enrolled for or completed a Certificate.

Although the findings from the sentinel practice questionnaire can be compared to existing data from the RCVS, it remains unclear how representative data from either is of all UK veterinary practices. While this means there will be limitations to the generalisability of the results generated, the practicalities of conducting research of this nature mean that alternative methods of recruiting practices may be unrealistic. Over time, as practice-based research becomes more commonplace, recruitment of a larger sample of UK practices, and/or selection of a random sample of veterinary practices may become an option. However, the successful recruitment of a small number of sentinel practices, through an alternative method such as a convenience sample, is a vital first step to raise awareness of, and involve practising veterinary surgeons in, practice-based research. Additionally the variation in basic characteristics of the practices recruited for this study means that comparisons can be made between data collected from each practice. From such comparisons, hypotheses can be generated as to practice-specific characteristics which may influence the types of cases seen.

2.5 Conclusions

The characteristics of a 'typical' UK veterinary practice, or even practitioner are current unknown, however the convenience sampling used in this study provides a starting point for integrating research into practice.

Chapter 3. Development and piloting of a tool for the collection of data by direct observation of small animal consultations

3.1 Introduction

Several different methods have been used to gather data from first opinion veterinary practice, including questionnaires (Robotham and Green, 2004), insurance databases (Egenvall et al., 2009) and extraction from computerised records (Lund et al., 1999). However these methods can have limitations, particularly if the aim is to assess the veterinary caseload in detail and capture the complexity of the consultation. There is a need for an alternative method which is able to gather accurate, detailed information from each consultation.

A different method which may address the limitations of indirect methods would be direct observation of the consultation by a researcher. This could be conducted either by recording of consultations or by direct observation of consultations. Videotaping of the consultation would allow easier validation of the method, as direct observation of the consultation by multiple researchers is likely to be impractical. However recording of the consultation raises various potential ethical issues (Themessl-Huber et al., 2008). Direct observation on the other hand, will allow the researcher to become more thoroughly integrated into the practice team, and may potentially be more effective in increasing awareness of practice-based research to both practice staff and clients. This method has been used successfully in medicine to record data from primary care consultations (Flocke et al., 2001). There has been little previous research using this method in veterinary medicine however one such study, discussed above, was conducted by Hill et al. (2006). Another advantage of this method is that it requires little to no extra work on the part of the consulting veterinary surgeon.

Development of a tool to collect data by direct observation, without impeding the day-to-day running of the practice, may have many potential advantages. Primarily, it may encourage more veterinary surgeons to become involved in practice-based research, if the tool allows data collection with a minimum impact on consulting time. The presence of a researcher in the room may also raise owner awareness and acceptance of research in practice. While such a method will not yield high quantities of data from many cases, it will allow more detailed data to be gathered on each individual consultation. It may also potentially be used as a comparator in the validation of other methods, for example analysis of free text in clinical notes.

The aim of this chapter was to develop and pilot a data collection tool which could be used to collect data by direct observation of first opinion veterinary consultations. Additionally a second aim was the development of efficient methods for processing and categorising these data.

3.2 Materials and Methods

The timeline and process for development of the data collection tool can be seen in Figure 3.

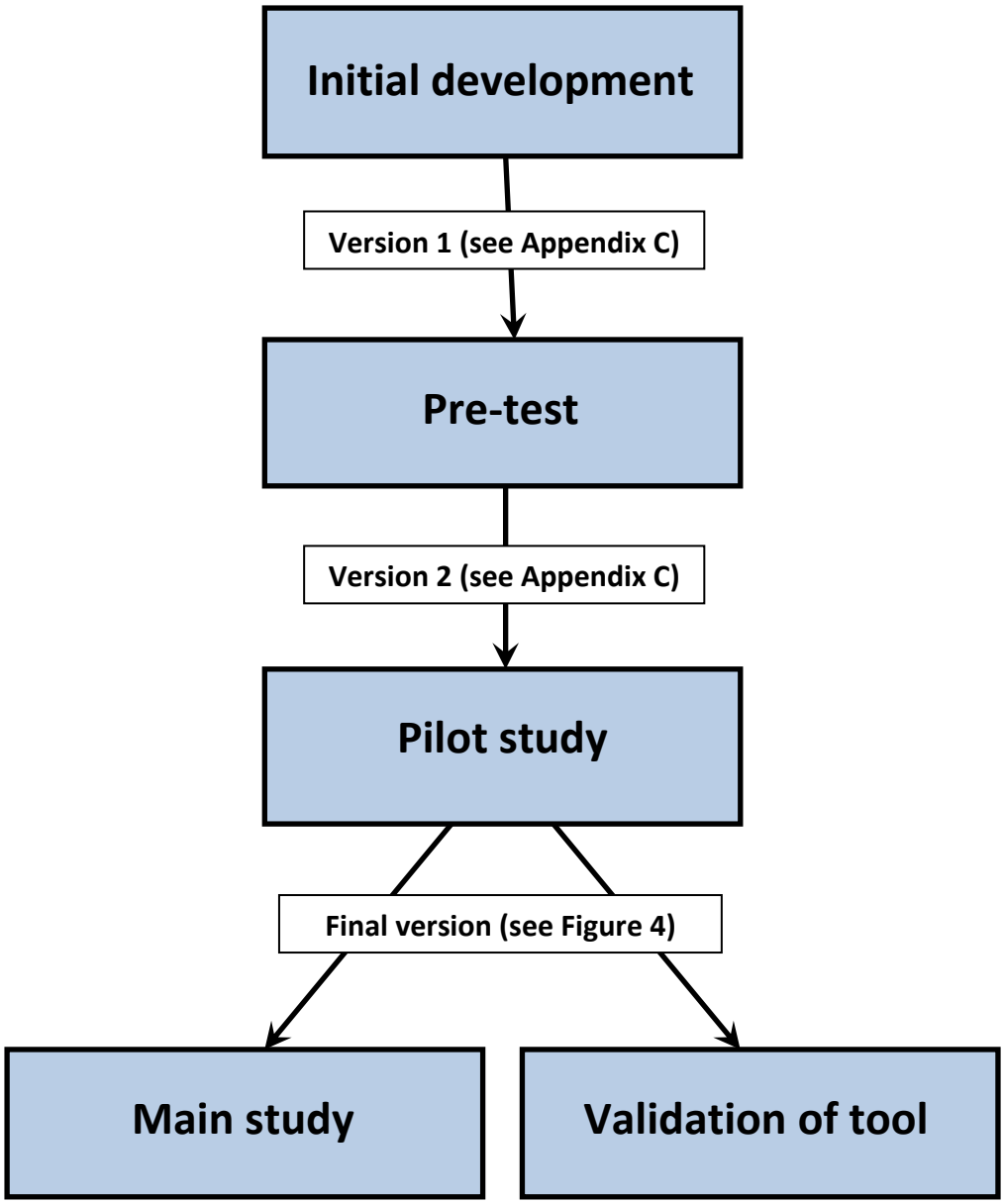


Figure 3. Stages of data collection tool development

3.2.1 Initial development

The data collection tool was initially developed using Microsoft® Office Word 2010. The aim was to make the data collection form span no more than two sides of A4 so it would be of a practical size and length to complete in a consulting room during a ten minute consultation. The tool was designed to collect data on the signalment of the animal presenting, as well as all problems discussed during the consultation. A problem was defined as 'any two-way discussion between owner/carer and vet regarding any aspect of the

patients health and wellbeing' in order to include issues relating to preventive medicine as well as current health problems. This was based on a definition developed by Flocke et al. (2001), however the definition was adapted to record problems resulting in a discussion, rather than all problems requiring a decision, as this was more appropriate to the direct observation method.

At the top of the data collection tool, fields were designed to record basic data including date, practice and consulting vet. In addition, fields were also created in order to assign a unique identifying number to each consultation and for each animal seen. Personal data such as owner or animal name, owner details or costs were not collected so that cases would be kept anonymous.

Initial development resulted in version 1 of the data collection form (see Appendix C). The form was developed through discussion with colleagues in the Centre for Evidence-based Veterinary Medicine (CEVM) and veterinary surgeons in the sentinel practices, to incorporate collection of data which could answer the following objectives:

Which patients are presented during small animal consultations?

A closed field was included to establish whether each patient was presented individually or along with other patients. Fields were designed to collect data on species, breed, age, and sex including neutering status. The species field was closed but some options also featured an open box for further detail where necessary. For example, if rodent was selected an open box was available to record the particular species of rodent. The breed field was an open field, and fields were available to record age in terms of years, months, weeks and days. Fields recording sex and neutering status were closed but allowed for unknown sex and/or neutering status.

With what problems do these patients present, and what additional problems are discussed during the consultation?

Closed fields were created to record the type of consultation, for which the options were: first consult, recheck, elective euthanasia, recurrent, second opinion, ongoing, monitoring, preventive medicine and other. Definitions were developed for these consultation types (Appendix D). A table with four columns was created on the second page of the questionnaire to record information on up to four problems discussed during the consultation. Each column contained an open box field for recording of reason for presentation, and a further open field to record associated clinical signs. A closed field was designed to record the affected body system for each problem discussed (body system definitions used are listed in Appendix D). The design allowed selection of multiple options within the body system field where appropriate. A non-specific category was added to the design to record systemic conditions, or those unable to be classified.

Is a diagnosis reached during the consultation and if so what diagnosis is made?

A closed field was created and replicated in each column to record whether or not a diagnosis was reached. An open box below this was designed to allow recording of the specific diagnosis made.

What is the outcome of the consultation, i.e. does the patient receive treatment, diagnostic work up etc?

A field incorporating the outcome type of the consultation was created with options of the following categories: Nothing, Manage, Therapeutic treatment, Prophylactic treatment, Work up, Euthanasia, Refer. Definitions were developed to accompany these outcome types to ensure consistent categorisation of data (Appendix D) and multiple outcome types could be selected for each problem. An open field to record specific outcomes, for

example “cephalexin tablets” or “rabies serology blood test” was also included.

Additional closed fields on the type of clinical examination performed (if any) were created to determine whether this affected the likelihood of related abnormalities or incidental findings being found. A further closed field was created to note whether any abnormalities were detected on clinical examination, with a corresponding open field to record these findings in further depth where necessary. Data were also collected on any diagnostic tests performed or planned during the consultation for each problem discussed, with definitions being developed to categorise tests as ‘In Consult’ or ‘Post Consult’ (Appendix D).

3.2.2 Pre-testing the data collection tool

The tool was initially trialled during a brief preliminary session at two sentinel practices (situated close to the CEVM) by the primary investigator and another researcher (RD). Each session lasted two hours and was used to establish whether the tool could be used to effectively collect data. The tool was used to record data for all patients presented to one veterinary surgeon during this two hour period, and for all problems discussed for each patient. Each researcher observed consultations in a separate consultation room with a different veterinary surgeon to ensure the tool worked in a variety of situations. The pre-test was also used to identify any issue relating to feasibility or client/vet concerns.

3.2.3 Piloting the data collection tool

Following the pre-test, the tool was transferred from Microsoft® office Word 2010 to Cardiff Teleform® Version 10.5.1 (Verity Inc., Cambridge) to allow for ease of data entry and processing. This software allowed the design of forms incorporating all types of fields from multiple choice to free text boxes.

Completed forms could then be scanned, recognised and the data verified and exported to an external database.

Data were collected by the primary investigator during a single day at each of the eight sentinels practices recruited resulting in a total of eight pilot days of data collection. The pilot was conducted between September 2010 and March 2011. Clients were given an information sheet by a member of the reception team on entering the practice (Appendix A), which explained why the study was being conducted and what information was being collected. It gave the client the opportunity to opt out of the study at this or any later stage if they did not wish their animal to be included. The pilot study was important to ensure that the information could be practically distributed to and understood by clients. In addition, other methods of informing clients and staff about the research were discussed with partners and practice managers at each sentinel practice e.g. waiting room posters and presentations to lay staff. No extra questions were asked of vet or owner during the consultation, in order to avoid influencing the consultation in any way. The pilot gave staff at all 8 sentinel practices the opportunity to discuss any concerns about the methods of the study prior to the main data collection period.

3.2.4 Data entry and dictionaries

All data from the pilot study were scanned and verified using Cardiff Teleform® Version 10.5.1 (Verity Inc.), before being exported to a Microsoft® Office Access 2010 database. Data entry and processing was carried out by the primary researcher to ensure consistency in categorisation. Following scanning into Cardiff Teleform® Version 10.5.1 (Verity Inc.), a standard verification process was conducted. This consisted of manual entry of free text fields and verifying closed field entries where uncertainty could exist, for example where a B could be mistaken for an 8. A random sample of 10% of fields from each batch was also checked.

Data on breed, clinical signs, clinical abnormality, diagnosis and outcome were categorised at data entry by development of various dictionaries. This was to assist with analysis at a later stage, by ensuring that free text recorded during the consultation could later be coded in a standardised way. For example, many different terms exist to describe lower urinary tract disease in cats, however all cases of this condition were coded as iFLUTD (idiopathic Feline Lower Urinary Tract Disease) rather than using alternative terms such as Feline Urological Syndrome. This ensured that all cases with this diagnosis could be quickly and easily identified during analysis. Dictionaries linked with Cardiff Teleform® Version 10.5.1 (Verity Inc.) had a predictive function, which made data entry and verification quicker and more efficient, and eliminated problems caused by typographical errors and spelling mistakes during analysis.

Breed dictionaries were based on Kennel Club recognised breeds for dogs (Kennel Club, 2014), Governing Council of the Cat Fancy breeds listed for cats (GCCF, 2014) and British Rabbit Council breeds listed for rabbits (BRC, 2014). Breed information was not collected for other species. All remaining dictionaries were put together by working through the Merck Veterinary Manual (Merck, 2014) in order of body system to create a comprehensive list which was amended during the pilot study (Appendix E). VeNom codes (VeNom, 2014) were also used as a starting point for some dictionaries, in particular Diagnosis. To ensure the dictionary was comprehensive, the BSAVA Small Animal Formulary was used to ensure all frequently used medications were included (Ramsey, 2008).

3.2.5 Validation of the data collection tool

During May 2012, validation of the data collection tool was carried out at one of the sentinel practices. The practice used for validation was selected as it was both local to the CEVM, and had large consulting rooms which could accommodate two researchers. A period of 3 hours was spent during which

the primary investigator and another researcher (MB) observed the same series of consultations and completed a data collection form for each patient seen. Collation of the two sets of forms was completed by a third researcher (RD) (Appendix F). The third researcher then also sorted and ordered the data ready for comparison. Agreement was then assessed for each individual data field for all 8 potential problems which could be recorded for an individual patient. For closed fields, the two fields were deemed to be in agreement if the same option(s) had been selected, or if both fields were blank. For open fields, the two fields were deemed to be in agreement if they would subsequently be coded in the same way by the primary researcher using the dictionaries.

3.2.6 Main study

The final version of the tool (Figure 4) was used to collect data during two separate one week periods spent in each of the 8 practices (Chapter 2) between April 2011 and June 2012. Data were collected by a single researcher for all consultations observed during regular weekday consulting hours, with a separate form completed for each animal presented. For Practice 8 (see Chapter 2), which was a specialist out-of-hours clinic, data were collected between 6pm and 6am on weekdays.

3.3 Results

3.3.1 Pre-test

The data collection tool was initially developed between June and August 2010 and the pre-test conducted in August 2010. Version 1 of the data collection tool which was used in the pre-test can be found in Appendix C. Overall, the tool appeared to work well during first opinion small animal consultations. Fields which worked well during the pre-test, and to which no amendments were made included the date, practice, consultation number, animal number, vet initials, species and clinical exam type fields.

Amendments made to the data collection tool following the pre-test included dividing the 'Ongoing' option within the consult type field into 'Ongoing: acute' and 'Ongoing: chronic' to help distinguish between newer versus more long term problems. An 'admit/discharge' option was added to consultation type, as these consults were a frequent reason for the selection of the 'other' category, and it was felt that they should be categorised separately. Definitions for each consultation type were refined to ensure all circumstances would be covered, regardless of how long had passed since the previous consultation, and regardless of who had requested the consultation (Appendix D). Additionally, age, breed and sex/neutering status fields were expanded to allow recording of age, breed and sex/neutering status up to 3 times according to computerised clinical records, according to the veterinary surgeon, and/or according to the owner, as it was found that these were not always consistent. The general open box field recording all clinical examination abnormalities was amended and replicated in each column of the problem table to allow recording of clinical examination abnormalities relating to each individual problem discussed.

Fields created to record reason for presentation and clinical signs were merged into a single open box field, as there was frequent overlap between the data recorded in these two fields. This field was subsequently used to record both the problem summary (one option selected from: new problem; pre-existing problem; preventive medicine; elective euthanasia for each problem) as well as any more specific clinical signs mentioned (e.g. pruritis) if applicable. A further closed field was added to each problem in order to record whether each individual problem discussed had initially been raised by the owner, by the veterinary surgeon or by a prompt e.g. a booster reminder card. Due to variation in diagnostic process between consultations, the 'yes/no' options for the diagnosis field were replaced with a series of definitions for diagnosis type. For example, osteoarthritis was diagnosed based on history and clinical examination only in some consultations (a

presumed diagnosis), whilst in others the diagnosis was given pending confirmation by radiography (a working diagnosis). The definitions, which helped to distinguish between these types of cases, were: Definitive, Working, Presumed, Open, Previous and Not Applicable (Appendix D) and only one diagnosis type could be selected for each problem.

3.3.2 Pilot

The pilot study was conducted between September 2010 and March 2011 and Version 2 of the data collection tool used during the pilot study can be found in Appendix C. During the eight day pilot study, data were collected on 181 consultations involving 199 animals. Information was recorded on a total number of 454 problems. During this time, only 1 client requested not to be included in the study; the reason for opting out was unknown.

Following the amendments made after the pre-test, a few further refinements were made to the data collection tool during and after the pilot study. A further closed question was added specifically for use in one sentinel practice, an emergency out-of-hours clinic, following input from the veterinary surgeons in this practice. This was in order to record whether the client was from a private or PDSA (Peoples Dispensary for Sick Animals) clinic, as it was noted that this may have an impact on the types of cases seen. The number of separate problems which could be recorded per animal was increased from 4 to 8 as several animals were presented with between 5 and 8 problems during the pilot study. In order to do this, the table from page 2 of the data collection tool was replicated on page 3 to allow collection of data relating to problems 5 to 8. Fields recording data, practice and animal identifier number were replicated on the third page to ensure this page could be linked back should it become separated from the rest of the data collection tool. In addition, a closed question regarding whether the animal was weighed was added, after difficulties in determining whether a weight check should be classed as a diagnostic test under some circumstances.

Definitions of clinical examination type were developed to ensure all clinical examinations would fit into only one category: Full, Focused and None (Appendix D). This also improved clarity as to which procedures were considered part of a clinical exam, and so which were an 'In Consult' diagnostic test. In particular, the decision was made that temperature checks, rectal exams, and full lameness and neurological exams were all to be consistently recorded as diagnostic tests.

All dictionaries were further expanded as the pilot study progressed, for example Jack Russell Terrier was added to the breed list as while not Kennel Club recognised, this breed was frequently listed on clinical records. New presenting complaints/clinical signs and diagnoses were added to their respective lists as they were encountered. VeNom codes (www.venomcoding.org) were not found to be useful for the diagnosis dictionary because a precise diagnosis was found to be rarely made in first opinion practice. Therefore the decision was made to begin with a smaller more general dictionary which could be amended as new diagnoses were encountered. Additionally, as the VeNom codes predominantly focused on diagnostic codes rather than clinical sign codes at the time of dictionary design, it was decided that two dictionaries focusing on clinical signs and diagnosis respectively would be most suitable for the study. Outcomes were grouped by type again to simplify data processing at a later stage. For example, enrofloxacin would be categorised under 'antibiotic', while removal of a skin mass would be classified under 'therapeutic surgery (soft tissue)'.

3.3.3 Categorisation of data

Fields recording body system, specific diagnosis, outcome type and specific outcome all worked reasonably well during both the pre-test and pilot studies. However, categorising data consistently from these fields was often complex. Various situations were encountered where the category into which a particular piece of information should fit was debatable and some examples

are given below. Where challenges were encountered in categorisation of data, discussion with colleagues was used to decide on an appropriate categorisation method. Records of these discussions were kept as a reference to refer back to, to ensure consistent categorisation of similar cases in the future.

Anal furunculosis: Anal furunculosis could be classified under the gastrointestinal or the skin body system. After discussion with colleagues, it was decided that it would be consistently categorised under gastrointestinal. Similarly, all anal gland impactions and abscesses were categorised as gastrointestinal.

Hernias/ruptures: An umbilical hernia could be classified as musculoskeletal as it is a defect in the muscle of the body wall. However, if a loop of intestine was present within the hernia, an argument could be made that this should be categorised as gastrointestinal. Similarly, other body systems could potentially be involved depending upon the location of the hernia or rupture. Given the potential involvement of various different body systems, it was decided that all hernias/ruptures would be categorised under non-specific.

Lipomas: A lump which feels fatty in nature on palpation may be a lipoma. It could be argued that histopathology is required to make a definitive diagnosis, or it could be argued that clinical examination alone is sufficient to make a diagnosis with a reasonable degree of confidence. In this situation, the 'Diagnosis Type' definitions were useful, so diagnosis of a lipoma purely on manual palpation was considered a presumed diagnosis. If a fine needle aspirate was taken during the consultation which confirmed the diagnosis then this was considered to be definitive, while if the results were still pending at the close of the consult the diagnosis would be considered to be a working diagnosis.

3.3.4 Validation

Data were recorded from 9 consultations all conducted by the same veterinary surgeon involving 9 different animals. Agreement between fields was therefore assessed as a proportion of all 9 animals or all 72 possible problems which could have been recorded (8 problems per animal) depending upon what was most appropriate. The primary researcher (NR) recorded a total of 23 problems, while the additional researcher (MB) recorded 24 problems. Problems were sometimes recorded in a different order by each researcher during the consultation, so a third researcher (RD) sorted the raw data to simplify comparison between the two sets of data. Agreement between the two observers ranged from 45.8% to 100.0% depending upon the data field of interest, with agreement for all fields shown in Table 8.

Table 8. Proportion of agreement for each field of the data collection tool between two observers during the validation study.

		Agree		Disagree	
Field	**No. times recorded**	**n**	**%**	**n**	**%**
Consultation type	9	8	88.9	1	11.1
Species	9	9	100.0	0	0.0
Breed (Records)	9	8	88.9	1	11.1
Age	9	8	88.9	1	11.1
Sex/Neutering	9	9	100.0	0	0.0
Clinical exam type	9	9	100.0	0	0.0
Weight	9	8	88.9	1	11.1
Clinical signs	24	19	79.2	5	20.8
Exam normal?	24	16	66.7	8	33.3
Exam findings	24	22	91.7	2	8.3
Raised by	24	11	45.8	13	54.2
Body system	24	17	70.8	7	29.2
Diagnostic test type	24	17	70.8	7	29.2
Specific tests	24	19	79.2	5	20.8
Diagnosis	24	15	62.5	9	37.5
Specific diagnosis	24	15	62.5	9	37.5
Outcome type	24	12	50.0	12	50.0
Specific outcome	24	21	87.5	3	12.5

A high level of agreement was seen for fields recorded directly from the clinical records e.g. species, breed, age and sex, as well as those with a small number of straightforward definitions e.g. clinical exam type. High levels of agreement were also found for free text fields where dictionaries were used to code entries at data entry, for example clinical exam findings and specific outcome. Lower levels of agreement were found for fields involving coding at the time of consultation using the complex list of definitions e.g. diagnosis type.

3.3.5 Main study

The final version of the data collection tool, which was used in the main study period, is shown in Figure 4. This appeared to work well during the main study and there were no major issues with its feasibility. It was noted during the main study that consultations often seemed to be much longer than the 10 minutes allocated for them. Therefore, a final amendment to the data collected was made to allow consultation length to be recorded during the final two weeks of the main study. This was to help establish whether there was any correlation between consultation length and other aspects of the consultation such as number of problems discussed. Consultation length was recorded for week two of data collection in practices 1 and 6 (see Chapter 2) using a stopwatch. Timing started when the client entered the consultation room and was stopped once the client had left. Any time spent out of the room by the veterinary surgeon e.g. taking the animal to the prep room for a blood test, was included provided the client remained in the consultation room. However it did not include reading clinical notes prior to the consultation, talking to the client in the waiting room and writing notes following the consultation, or preparing medications or samples if the client had already left the consultation room (Everitt, 2011). Consultation length was recorded for each consultation, rather than each individual animal presented.

Page 1

☐☐ / ☐☐ / ☐☐ Date (DD/MM/YY) ☐☐☐ Practice ☐☐☐☐ Consult. No. ☐☐☐☐ / ☐ Animal. No. ☐☐☐ Vet Initials VN Client type ☐ Private ☐ PDSA

Questionnaire

1. Were multiple animals presented? Complete a separate questionnaire for each animal. ☐ Yes ☐ No

2. Select the best description of the type of case from the following options:

☐ First Consult ☐ Recheck ☐ Elective Euth ☐ Recurrent ☐ 2nd Op
☐ Ongoing: Acute ☐ Ongoing: Chronic ☐ Monitoring ☐ Prev Med ☐ Admit/Discharge
☐ Other

3. Which species was presented during the consult?

☐ Dog ☐ Cat ☐ Rabbit ☐ Ferret
☐ Rodent ☐ Bird ☐ Reptile ☐ Other

4. What was the animals breed?

Records: Vet: Owner:

5. What was the animals age?

Records: Y M W D Vet: Y M W D Owner: Y M W D

6. What was the animals sex including neutering status?

	MN	ME	FN	FE	MU	FU	U
Records:	☐	☐	☐	☐	☐	☐	☐
Vet:	☐	☐	☐	☐	☐	☐	☐
Owner:	☐	☐	☐	☐	☐	☐	☐

7. Was a clinical exam performed? ☐ Yes: full exam ☐ Yes: focused exam ☐ No

If yes, were any abnormalities detected? ☐ Yes ☐ No

8. Was the animal weighed during the consultation period? ☐ Yes ☐ No

Page 2

	Problem 1	Problem 2	Problem 3	Problem 4
Problem summary/ clinical signs				
Related C.E. findings?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Raised by	☐ Owner ☐ Vet ☐ Prompt	☐ Owner ☐ Vet ☐ Prompt	☐ Owner ☐ Vet ☐ Prompt	☐ Owner ☐ Vet ☐ Prompt
Bodysystem affected	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav
Diagnostic tests	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None
In Cons				
Post Cons				
Diagnosis	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A
Outcome	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other

Page 3

☐☐ / ☐☐ / ☐☐
Date (DD/MM/YY)

☐☐ Practice

☐☐☐☐ / ☐ Animal. No.

	Problem 5	Problem 6	Problem 7	Problem 8
Problem summary/ clinical signs				
Related C.E. findings?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Raised by	☐ Owner ☐ Vet ☐ Prompt	☐ Owner ☐ Vet ☐ Prompt	☐ Owner ☐ Vet ☐ Prompt	☐ Owner ☐ Vet ☐ Prompt
Bodysystem affected	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav
Diagnostic tests	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None
In Cons				
Post Cons				
Diagnosis	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A
Outcome	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other

Figure 4. Final version of the data collection tool used in the main data collection period and validation.

3.4 Discussion

The development of the data collection tool, along with its accompanying definitions and dictionaries of terms, allowed the efficient, repeatable and valid recording and processing of information from small animal consultations. Using the tool it was possible to gather information on the patients presented, the problems discussed during the consultation, any diagnosis made and the outcome of the consultation. The method of processing these data through use of Cardiff Teleform® Version 10.5.1 (Verity Inc) was efficient and accurate. This tool has now been successfully used as a template to develop a similar tool for use in geriatric small animal consultations (Cook, 2011) and large animal consultations (Ecroyd, 2011).

The results of the tool validation were highly variable between the two fields. Fields showing a high level of agreement were generally those which involved recording data from the clinical notes e.g. sex/neutering status or used simple definitions e.g. clinical exam results so required little training beforehand. However fields which involved more complex definitions such as raised by, diagnosis type, outcome type tended to have a much lower level of agreement. Whilst the primary researcher (NR) had observed and recorded almost 2000 consultations by the time the validation study was undertaken, the additional researcher (MB) had not used the data collection in any consultations previously. This additional researcher had access to the definitions to study prior to the validation period, but did not have these definitions for reference during the consultations. This could potentially explain why levels of agreement were high for fields which required little knowledge of complex definitions yet low for those requiring a considerable amount of familiarity prior to using the tool. However it is also possible that the inconsistencies seen may be down to differences in opinion as to how some data should be coded. The validation study was only possible in one practice due to space limitations. In addition, it could only be conducted in a

small number of consultations due to the feasibility of having two researchers present in the consultation room for an extended amount of time. Ideally, the additional researcher would have had more time allowed to become familiar with the tool, as well as the opportunity to become used to using the tool during consultations prior to the validation study being carried out. This would have minimised the likelihood that differences in recording were due to one researcher being less familiar with the tool. However the benefits gained from having two researchers validate the tool in a greater number of consultations needs to be balanced with the feasibility of carrying this out. The results from this fairly small validation study suggest that data gathered is likely to be robust for many fields, however a larger validation study with more extensive training for additional researchers involved would be needed to better validate some fields.

While Hill et al. (2006) also used a direct observation method, the tool developed in the current study allowed the collection of data on all small animal consultations rather than focusing on a particular topic i.e. dermatology. In addition, Hill et al. (2006) utilised several veterinary students at different stages of their veterinary training, whilst the current study utilised a single researcher, a veterinary surgeon with previous experience of working in first opinion small animal practice. It is hoped that this method, in combination with the use of definitions and dictionaries, would maximise the reliability of the data by ensuring data are all coded in a similar way. Use of a single observer may mean that validity of the data is less certain, however the validation conducted for this tool shows promising results.

The development of the tool, including the series of definitions and dictionaries produced, highlights some unexpected difficulties in collecting and processing this type of data. Surprisingly large amounts of data were captured from the relatively small-scale pre-test and pilot studies which suggest that consultations may be highly complex. Up to 8 problems were discussed in some consultations, which emphasises the need to develop a

tool which can capture this complexity. Recording of all problems discussed during the consultation may reveal a very different picture of the veterinary consultation, as the presenting complaint may not always be the problem which takes priority for the veterinary surgeon or in some cases even the owner. Concurrent conditions may also affect the actions taken for a particular problem, for example pre-existing medication for another condition may impact the treatment choices for a new condition. This highlights the value of detailed observation of a small number of consultations, allowing more meaningful interpretation of the data collected.

Previous research has focused upon clinical coding and extraction of data from computerised clinical records (Lund et al., 1999, O'Neill et al., 2013b) which may not contain information on all problems discussed for various reasons e.g. method constraints, time constraints or vet priorities. It is well documented in medicine that multiple problems are often discussed during the consultation and co-morbidity is common (Flocke et al., 2001, Beasley et al., 2004) however little research has focused upon this topic in veterinary medicine. Banyard (1998) demonstrated that dogs and cats presenting for vaccination frequently had concurrent disease, however it is unclear whether this also applies to other types of consultation, and whether these concurrent health issues are discussed during the consultations. Previous research within medicine has also suggested that billing data and clinical records often don’t cover all problems noted or discussed during the consultation (Romm and Putnam, 1981, Flocke et al., 2001, Beasley et al., 2004). Therefore data collected through direct observation could be vital to establishing whether this also occurs in veterinary consultation, in order to establish the best methods for future practice-based research. Jones-Diette (2013, pers. comm.) has been conducting free-text analysis of clinical records, with a view to comparing the results to those from direct observation of the same consultations. This will help to establish how closely data gathered from clinical records reflects that recorded by direct observation.

However even when data collected by direct observation can be compared with that recorded in the clinical records, it is unclear which is likely to be the most accurate record of the consultation. There may be many reasons why details of a problem discussed during a consultation may not be recorded in the clinical notes. For example, time limitations, both in writing and reading of notes, prioritisation of problems, avoidance of 'information overload' and inability to recall all problems discussed could all contribute. Additionally, there could also be many reasons why a problem is recorded in the clinical records despite not being discussed during the consultation. For example, a clinical examination finding discussed during a previous consultation e.g. a heart murmur or mild periodontal disease, may be noted on clinical examination and recorded in the records, but not prioritised for discussion. It may be that discussions during consultations are tailored more to the information needs or the owner, whilst those recorded in the clinical notes are tailored to the information needs of the consulting veterinary surgeon and their colleagues.

It is also entirely possible that even the direct observation method does not capture all problems discussed, as it may be that the veterinary surgeon noted problems and made decisions without discussing these with the owner. In some cases, this may even be recorded in the clinical notes, despite not being captured through observation of the consultation. For example, if a veterinary surgeon were to note mild dental disease on clinical examination, the problem may not be prioritised for discussion during the consultation but could be recorded in the clinical notes for future reference. However, this method could be useful in highlighting common scenarios and decision-making points considered discussion-worthy during the consultation. An alternative method which has been used in medicine would be to ask the consulting veterinary surgeon to write a list of all separate problems encountered during the consultation, regardless of whether they were discussed. Flocke et al. (2001) found that this method yielded a higher number of problems than were recorded in the patient notes, and may

address some of the limitations of recording verbal discussions only. However this would require a large amount of additional work by the veterinary surgeon, and so would not achieve the aims of integrating practice-based research into everyday practice.

Another factor which increased the complexity of the tool was the number of different individual veterinary surgeons who were observed, each of whom may have had a different consultation style. Everitt (2011) noted that the decision-making process during the consultation was highly variable depending upon the consulting vet. Characteristics of individual veterinary surgeons involved in the current study, including years qualified and special interests, were discussed in more depth in Chapter 2. However Everitt (2011) also found that the individual owner has considerable influence on the decision-making process. Therefore it may be that even for a sample of consultations where the initial presenting complaint is the same, no two consultations are ever identical due to the influence of the veterinary surgeon, owner and perhaps even the patient. While the initial consultation may have been requested either by the owner, veterinary surgeon or a prompt (e.g. a booster vaccination reminder card), by introducing additional problems for discussion, or by influencing the action taken for a problem, both owner and vet are able to affect the content of the consultation. Therefore development of a tool which is able to capture the complexity of each individual consultation is vital. While the tool developed will help to record in detail what happened in each consultation, it can only speculate as to why these patterns are seen. Further research could use qualitative methods to investigate the patterns identified, and further understand the influence of both veterinary surgeon and owner on the consultation process.

While the number of problems discussed increased the complexity of the tool, categorising these problems, particularly in terms of consultation type, body system and diagnosis type also presented many challenges. However the development of definitions helped to address many of these issues and

could also be used as a starting point for the categorisation of consultation data extracted via other methods. Discussion with colleagues and the recording of decisions made regarding categorisation were of vital importance to maximise validity of the data, and ensured that the coding of data were not based purely on the primary investigator's opinion. Where a diagnosis was made, coding of specific diagnoses using dictionaries also presented challenges. Development of dictionaries revealed that while the VeNom codes (VeNom, 2014) have previously been found to be useful in larger scale studies (O'Neill et al., 2013b, Dogslife, 2014) there were various difficulties encountered in categorising data from these first opinion practices. The complex issues surrounding diagnosis shall be discussed in further depth in Chapter 6.

Various limitations in the method used were identified, including the convenience sample of practices, the inability to collect data on a large number of cases quickly and the Hawthorne effect (Eckmanns et al., 2006). These will be discussed in more depth in Chapter 4.

3.5 Conclusions

A method to collect data by direct observation of consultations, without disturbing the day-to-day running of the practice, was successfully developed. The difficulties in development of the tool reflect the complexities of consultations carried out by small animal veterinary surgeons. Concurrent disease may be present, various interactions may occur and a definitive diagnosis may not always be reached. This demonstrates the need for a flexible yet easy to use data collection tool such as this one to effectively utilise data collected from first opinion practice. It may also assist in the validation of alternative methods of data collection and processing such as analysis of free text from clinical notes.

Chapter 4. Consultations and patients

4.1 Introduction

Veterinary consultations are the cornerstone of small animal veterinary practice, therefore gathering more information about these consultations, and the patients presenting during them, is vital to understanding the veterinary caseload. Various studies have attempted to identify the signalment of animals presenting to veterinary practices, both in the UK and internationally. These studies have used various different methods, including gathering of data from clinical records (Lund et al., 1999, Tierney et al., 2011), questionnaires (Evans et al., 1974, Lumeij et al., 1998, Robotham and Green, 2004) and direct observation of consultations (Hill et al., 2006). All of these previous studies have looked at the species of animals presenting to small animal veterinary practices.

Whilst several studies have looked at species of animal presented, breed, age and sex and neutering status have been reported less frequently. O'Neill et al. (2013a) looked at longevity of dogs presenting to UK veterinary practice and found that lifespan varied considerably with breed, neutering status and insurance status. Studies focusing on the age of animals presenting for consultation have suggested that young animals are more frequently presented as patients than older animals (Lund et al., 1999, Robotham and Green, 2004). However, it is unclear how accurately these represent current veterinary practice in the UK. Therefore there is a need to gather further signalment data on animals presented to UK veterinary practitioners. The PAW 2013 report (PDSA, 2013) asked veterinary surgeons and vet nurses what they believed would be the biggest welfare issue in 10 years' time. Health issues related to pedigree or unsuitable breeding was the most frequent answer, suggesting tackling this may be a priority for the veterinary profession. Understanding which breeds are frequently presented will be vital in prioritising future research surrounding breed-related health problems.

Understanding the age distribution, sex and neutering status will help further identify frequently presented animal groups, which will be necessary in order to ensure focused research questions are formulated.

The aim of this chapter was to use the data collection tool to determine the types of the consultations and patients encountered by veterinary surgeons in small animal practice. For consultations, the aim was to determine the type of consultation, e.g. first consultation or revisit, as well as the type of clinical examination performed during the consultation. For patients, the aim was to determine the signalment of the animals presented in terms of species, breed, age, sex and neutering status, and the accuracy of this signalment data in the clinical records.

4.2 Materials and Methods

The data collection tool and methods described in Chapter 3 were used to collect data on the consultations observed and the patients presented in the sentinel practice network (Chapter 2). Definitions for consultation type and clinical examination type (Appendix D), and dictionaries for breed (Appendix E) were utilised.

Descriptive statistics were generated using IBM® SPSS®. Pivot tables were used to generate frequency data for all variables analysed except for age and consultation length. For these two variables, histograms and descriptive statistics (median and interquartile range) were generated. Breed, age, sex and neutering status data were analysed for agreement between different data sources e.g. clinical records and vet, observer or owner. This was carried out by first identifying animals for which these data were available from the clinical records. From these, animals for which data for the comparator was also complete (veterinary surgeon, observer or owner) were identified. Agreement between data from the clinical records and the comparator was then assessed. Electronic records were used as the 'gold standard' to be

compared against as this was the entry most likely to be complete. For age, only year, and not month, week or day was considered when looking at agreement. For example, an animal listed as 5 years and 7 months in the clinical records would be considered to be 5 years old for the purposes of the comparison. So an owner stating the same animal to be 5 or 5 and a half years old would be considered to be in agreement with the records, whilst an owner stating the animal to be 6 years old would be in disagreement with the records.

Data will be presented in the following order:

- Consultations
    - Number of animals presented per consultation
    - Consultation length
    - Consultation type
    - Clinical examination type (by consultation type)
- Patients
    - Species
    - Breed (by species)
    - Age (by species)
    - Sex/neutering status (by species)

Data will be presented for all animals presented during the consultations observed. The only exception to this shall be where individual species data is presented. Where this is the case, only the data for the 3 most frequently presented species, as identified by frequency data across all animals presented, shall be shown. Data presented will be that from page 1 of the data collection tool discussed in Chapter 3. All percentages shown will be based on the total number of patients presented unless otherwise stated.

4.3 Results

A summary of the data collected, is show in Figure 5. Totals are also shown for the three most commonly presented species. These will be the values used throughout the analysis unless otherwise stated. Where data were not available for all consultations/animals due to missing data, the total number analysed is stated.

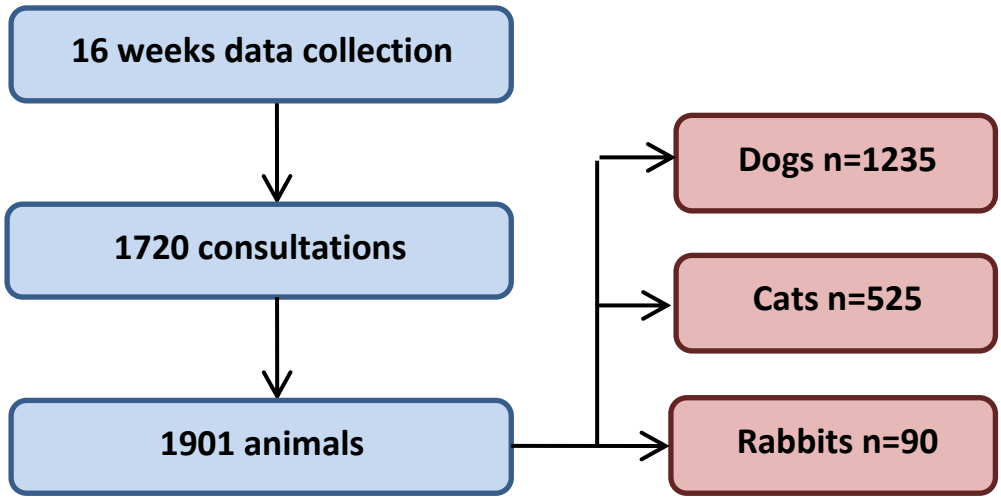


Figure 5. The total number of animals overall, as well as for the three most commonly presented species.

4.3.1 Consultations

Number of animals presented

In the 1720 consultations, 1901 animals were presented in total. Multiple animals were presented in 148 consultations (8.6%) and the highest number of animals presented in a single consultation was 7 (Table 9). This was a litter of 7 neonatal puppies presented for a routine health check.

Table 9. The number of animals presented per consultation.

No. animals per consult	n	%[1]
1	1572	91.4
2	129	7.5
3	11	0.6
4	4	0.2
5	3	0.2
6	0	0.0
7	1	0.1
Total	**1720**	**100**

[1]Percentages shown are based on the total number of consultations (n=1720)

Consultation length

Data on consultation length were recorded for 182 consultations involving 203 animals. The data were not normally distributed, and were skewed to the right, due to there being several very long consultations. Consultations ranged in length from 51 seconds to 36 minutes 45 seconds. Median consultation length was 9 minutes 49 seconds (Interquartile range (IQR) 7 minutes 16 seconds to 13 minutes 48 seconds).

Of the 182 timed consultations, 166 involved a single animal with a median length of 9 minutes 34 seconds (IQR 7 minutes 8 seconds to 13 minutes 19 seconds). Multiple animals (up to 5 per consultation) were presented in the remaining 16 consultations, the median length of 14 minutes 39 seconds (IQR 10 minutes 3 seconds to 19 minutes 40 seconds).

Type of consultation

Data on the type of consultation was available for 1900 animals (99.9%) presented. Preventive medicine was the most common type of consultation (n=654; 34.4%). Around a quarter of consultations were first consultations (n=485; 25.5%), with reviews of pre-existing consultations, such as recheck

(n=363; 19.1%) also a common consultation type. Only 29 animals (1.5%) were presented for elective euthanasia (Table 10).

Table 10. The distribution of consultation type, grouped by who had requested the consultation.

Requested by	Consultation type	n	%[1]
Owner	First Consult	485	25.5
	Ongoing: acute	93	4.9
	Ongoing: chronic	34	1.8
	Recurrent	80	4.2
	2nd opinion	2	0.1
	Elective euthanasia	29	1.5
Veterinary surgeon	Recheck	363	19.1
	Monitoring	63	3.3
	Admit/discharge	90	4.7
Any	Preventive medicine	654	34.4
	Other	7	0.4
	Total	**1900**	**100**

[1]Percentages shown are based on the total number of patients for which consultation type data were available.

Clinical examination type

Data were available for clinical examination type for 1889 animals (99.4%). The 12 cases where these data were missing included the 1 animal for which consultation type was missing and the remaining 11 were elective euthanasia consultations where the observer was not present for the full consultation. Of the 1889 animals for which data were available, a full clinical exam was performed for 1145 animals (60.6%), with a focused exam performed in a further 594 animals (31.4%). No clinical exam was performed for 150 animals (7.9%). Full clinical examinations were performed most frequently in preventive medicine consultations (n=600; 91.7%) followed by monitoring consultations (n=44; 69.8%) (Table 11). Clinical examinations were performed

least frequently in elective euthanasia consultations (n=3; 16.7%), followed by admit/discharge consultations (n=18; 20.0%).

Weighing

Data on whether the animal was weighed was also available for 1889 animals (99.4%). Again, the 12 animals for which these data were not available included the 1 animal for which consultation type was missing and the remaining 11 were those animals presented for elective euthanasia where researcher was not present for the full consultation. Of these 1889 animals, 896 (47.4%) were weighed during the consultation. Animals were weighed most frequently during monitoring consultations (n=41; 65.1%), followed by preventive medicine consultations (n=402; 61.5%). No animals were weighed during elective euthanasia consultations (Table 11).

Table 11. The distribution of clinical examination type performed and weighing of patients among different consultation types.

	Clinical exam type			Weighed?		
Consult type	**Type**	**n**	**%[2]**	**Yes/No**	**n**	**%[2]**
First consult	Full	287	59.2	Yes	250	51.5
	Focused	191	39.4	No	235	48.5
	None	7	1.4			
	Total	**485**	**100**		**485**	**100**
Ongoing: acute	Full	43	46.2	Yes	29	31.2
	Focused	49	52.7	No	64	68.8
	None	1	1.1			
	Total	**93**	**100**		**93**	**100**
Ongoing: chronic	Full	19	55.9	Yes	16	47.1
	Focused	14	41.2	No	18	52.9
	None	1	2.9			
	Total	**34**	**100**		**34**	**100**
Recurrent	Full	39	48.8	Yes	48	60.0
	Focused	41	51.3	No	32	40.0
	None	0	0.0			
	Total	**80**	**100**		**34**	**100**
2nd opinion	Full	1	50.0	Yes	1	50.0
	Focused	1	50.0	No	1	50.0
	None	0	0.0			
	Total	**2**	**100**		**2**	**100**
Elective euthanasia[1]	Full	0	0.0	Yes	0	0.0
	Focused	3	16.7	No	18	100.0
	None	15	83.3			
	Total	**18**	**100**		**18**	**100**
Recheck	Full	109	30.0	Yes	96	26.4
	Focused	234	64.5	No	267	73.6
	None	20	5.5			
	Total	**363**	**100**		**363**	**100**
Monitoring	Full	44	69.8	Yes	41	65.1
	Focused	16	25.4	No	22	34.9
	None	3	4.8			
	Total	**63**	**100**		**63**	**100**

Admit/discharge	Full	3	3.3	Yes	13	14.4
	Focused	15	16.7	No	77	85.6
	None	72	80.0			
	Total	**90**	**100**		**90**	**100**
Preventive medicine	Full	600	91.7	Yes	402	61.5
	Focused	26	4.0	No	252	38.5
	None	28	4.3			
	Total	**654**	**100**		**654**	**100**
Other	Full	0	0.0	Yes	0	0.0
	Focused	4	57.1	No	7	100.0
	None	3	42.9			
	Total	**7**	**100**		**7**	**100**

[1]Data is only shown for 18 of the 29 elective euthanasia consultations as data were missing for the remaining 11

[2]Percentages shown are based on the total number of patients for which consultation type, clinical examination type and weighing data were available.

Clinical examination abnormalities

Of the 1739 animals for which either a full or focused clinical examination was performed, 1343 animals (77.2%) had at least one abnormality detected on clinical examination. The remaining 396 animals (22.8%) had no abnormalities detected on clinical examination during the consultation. Specific clinical abnormalities detected on clinical examination, and the problems they related to, will be examined in more depth in Chapter 5.

4.3.2 Patients

Species

The three most frequently presented species were the dog (n=1235; 65.0%), cat (n=525; 27.6%) and rabbit (n=90; 4.7%) (Table 12), and so further analysis will focus on these species only.

Table 12. Distribution of species presented.

Species	n	%[1]
Dog	1235	65.0
Cat	525	27.6
Rabbit	90	4.7
Rodent	30	1.6
Bird	12	0.6
Ferret	8	0.4
Reptile	1	0.1
Total	**1901**	**100**

[1]Percentages shown are based on the total number of patients for which species data were available.

Breed

Dog

Breed was listed in the clinical records for 1213 of the 1235 dogs presented (98.2%). Of this number, 959 were pedigree (79.1%), with 98 different breeds of dog featuring in the data. The most commonly presented breed of dog according to the clinical records was the Labrador Retriever (Figure 6). For breed, agreement between clinical records and observer (96.0%) was higher than between clinical records and owner (80.6%) (Table 13).

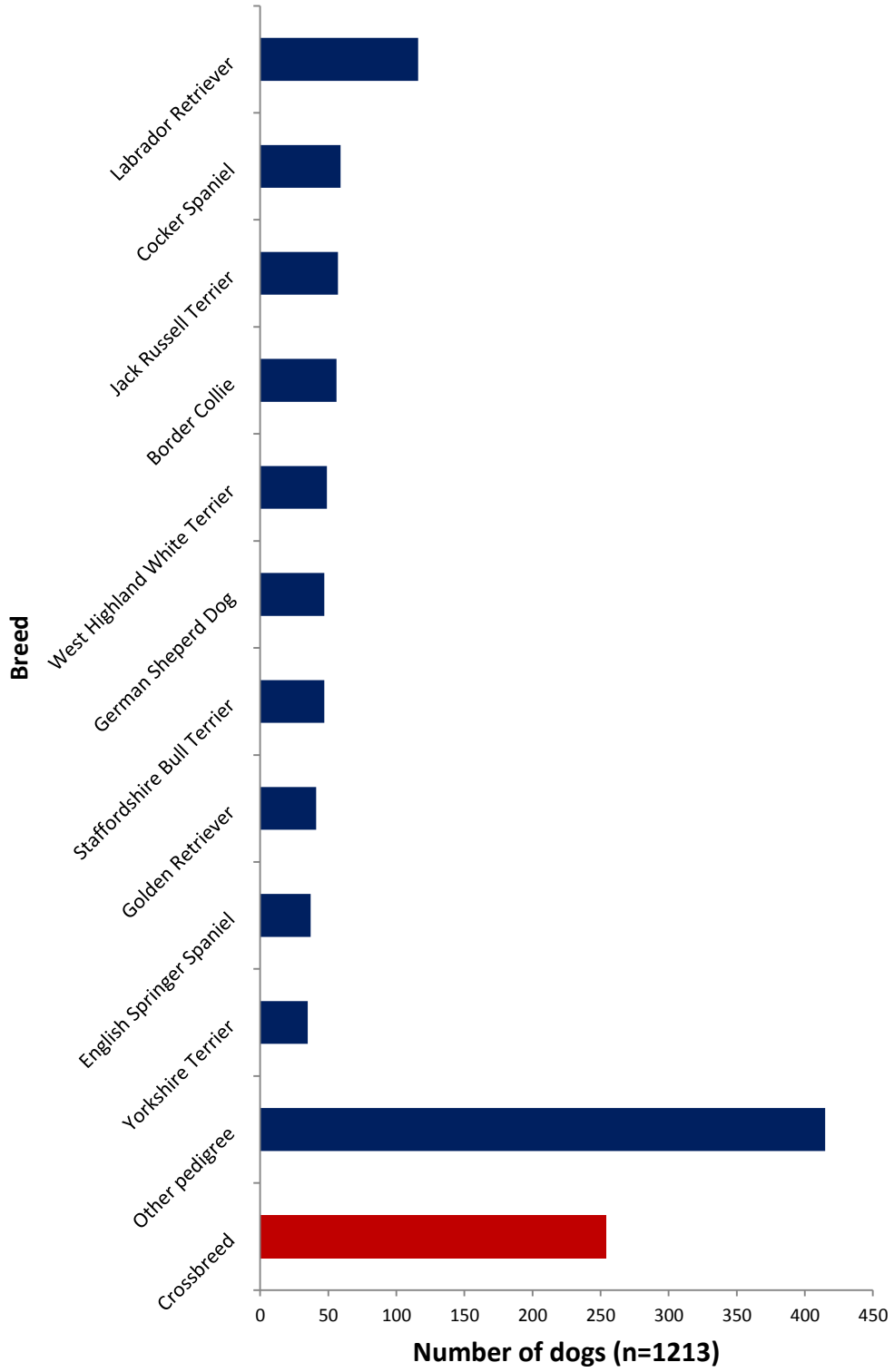


Figure 6. Distribution of dog breeds presented, with the 10 most frequently presented breeds shown individually. Pedigree breeds are shown in blue and crossbreeds are shown in red.

Cat

Breed was listed on the clinical records for 510 cats (97.1%). The most frequently presented breed was the Domestic Short Hair (74.9%; n=382) with the Domestic Long Hair accounting for a further 9.0% (n=46) of records. In total, 79 pedigree cats (15.5%) were presented from 15 different breeds, with the most common being the Burmese (2.5% of 510 cats; n=13) followed by Persian and British Short Hair (both 2.4%; n=12). Agreement for was high between both clinical records and observer (92.7%) and clinical records and owner (100.0%) (Table 13).

Rabbit

Breed was listed on clinical records for 67 of the 90 rabbits presented (74.4%). For animals with breed data available, most common breed presented was Lop (35.8%; n=24) followed by Dwarf Lop (20.9%; n=14) then Lionhead (16.4%; n=11). Agreement for breed was much higher between clinical records and observer (81.5%) than between clinical records and owner (12.5%) (Table 13).

Table 13. The distribution of agreement where breed data were available from both clinical records and observer, or from clinical records and owner, for the three most frequently presented species.

	Records	Comparison data			Agree (with records)		Disagree (with records)	
Species	**n**	**Type**	**n**	**%[2]**	**n**	**%**	**n**	**%**
Dog	1213	Obs.[1]	1210	99.8	1162	96.0	48	4.0
		Owner	36	3.0	29	80.6	7	19.4
Cat	510	Obs. [1]	505	99.0	468	92.7	37	7.3
		Owner	5	1.0	5	100.0	0	0.0
Rabbit	67	Obs. [1]	65	97.0	53	81.5	12	18.5
		Owner	8	11.9	1	12.5	7	87.5

[1] Obs. = observer

[2]Percentages shown are based on the total number of patients of each species for which comparison data were available.

Age

Age was listed in the clinical records for 1173 dogs (95.0%), 486 cats (92.6%) and 79 rabbits (87.8%). Young animals under 1 year of age are the most frequently presented group for dogs (Figure 7a), cats (Figure 7b) and rabbits (Figure 7c).

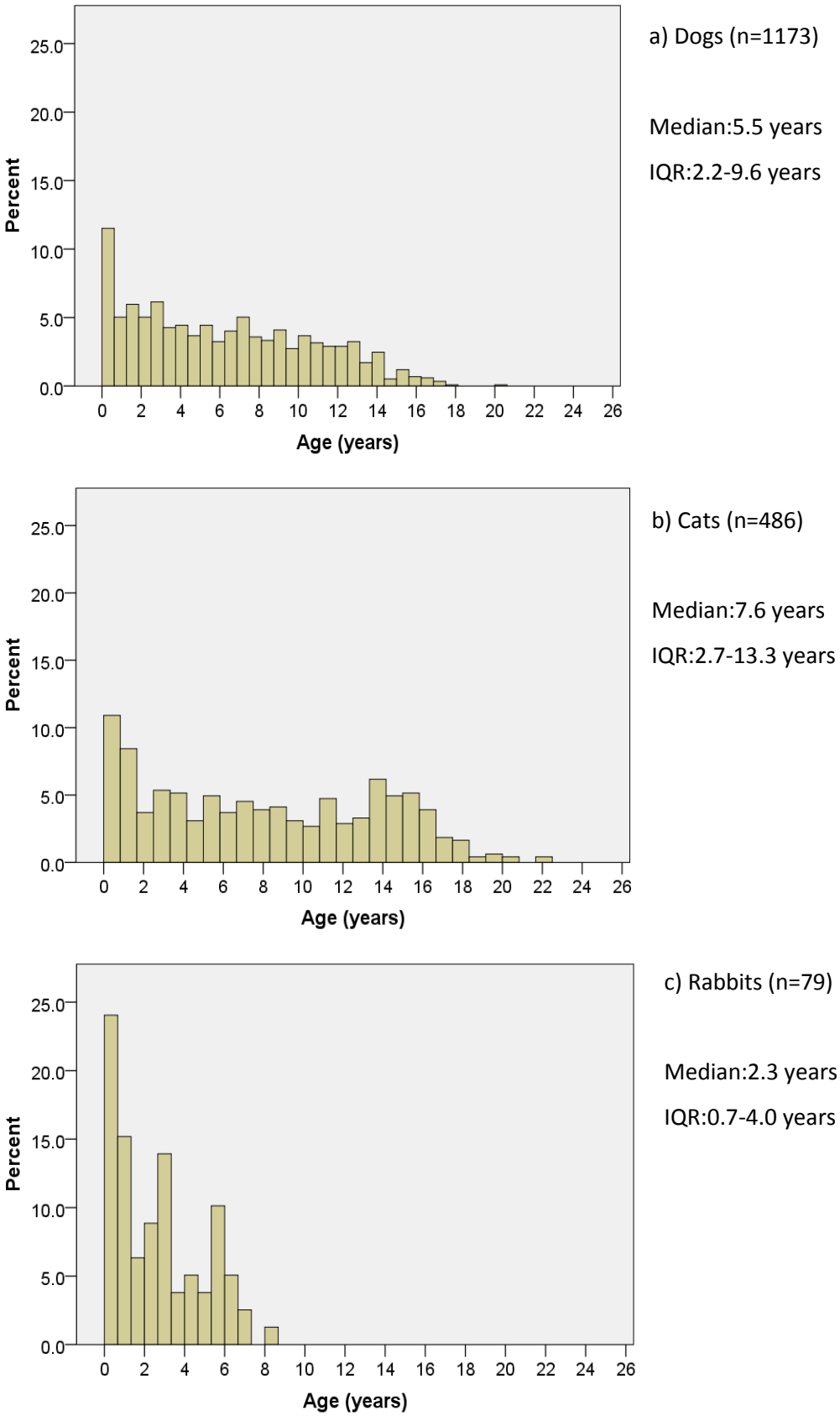


Figure 7. The age distribution of a) dogs, b) cats and c) rabbits presented for consultation. Median and interquartile ranges (IQR) are given for each.

While dogs and rabbits appear to show a gradual decline in number of animals presented with age, cats shown a second peak at around 14 years of age (Figure 7b). The population of cats (median age 7.6 years) presented appears to be older than dogs (median age 5.5 years), while both are older than the population of rabbits presented (median age 2.3 years).

For age, agreement was high between clinical records and veterinary surgeon for cats (n=4; 80.0%) and rabbits (n=2; 100.0%), however agreement was lower between clinical records and owner (77.4%, 65.2% and 72.2% for dogs, cats and rabbits respectively) (Table 14).

Table 14. The distribution of agreement where age data were available from both clinical records and veterinary surgeon, or from clinical records and owner, for the three most frequently presented species.

	Records	**Comparison data**			**Agree (with records)**		**Disagree (with records)**	
Species	**n**	**Type**	**n**	**%[1]**	**n**	**%**	**n**	**%**
Dog	1173	Vet	2	0.2	1	50.0	1	50.0
		Owner	248	21.1	192	77.4	56	22.6
Cat	486	Vet	5	1.0	4	80.0	1	20.0
		Owner	106	21.8	69	65.1	37	34.9
Rabbit	79	Vet	2	2.5	2	100.0	0	0.0
		Owner	18	22.8	13	72.2	5	27.8

[1]Percentages shown are based on the total number of patients of each species for which comparison data were available.

Sex/Neutering Status

Sex and neutering status were listed in the clinical records of 1811 animals for the 1901 for which data were recorded (95.3%). Of these, 901 were female (49.8%), while 910 were male (50.2%). In total, 803 animals were entire (44.3%), while 1008 were neutered (55.7%). Sex and neutering status were listed on the clinical records for 1185 dogs (96.0%), 500 cats (95.2%) and 80

rabbits (88.9%). Cats were the most frequently neutered species (n=371; 74.2%), whilst rabbits were the least frequently neutered (n=24; 30.0%). In dogs, neutering rates were similar for male and female animals, however for cats and rabbits, male animals were neutered more frequently than female animals (Table 15).

Table 15. Distribution of sex/neutering status among the three most commonly presented species.

		Sex			**Neuter status**		
Species		**Type**	**n**	**%[1]**	**Type**	**n**	**%[1]**
Dog	1185	Female	607	51.2	Entire	299	25.2
					Neutered	308	26.0
		Male	578	48.8	Entire	280	23.6
					Neutered	298	25.1
					Total	**1185**	**100**
Cat	500	Female	235	47.0	Entire	70	14.0
					Neutered	165	33.0
		Male	265	53.0	Entire	59	11.8
					Neutered	206	41.2
					Total	**500**	**100**
Rabbit	80	Female	39	48.8	Entire	29	36.3
					Neutered	10	12.5
		Male	41	51.3	Entire	27	33.8
					Neutered	14	17.5
					Total	**80**	**100**

[1]Percentages shown are based on the total number of patients for which sex and neutering data (from the clinical records) were available.

Agreement was relatively high for sex for all species, whether comparing clinical records with observer or owner (87.0%-99.3%) (Table 16). Agreement was also very high for neutering status of rabbits between clinical records and observer (100.0%) and clinical records and owner (100.0%)(Table 17). However agreement was lower between clinical records and observer for both dogs (69.2%) and cats (83.2%).

Table 16. The distribution of agreement where sex data were available from both clinical records and observer, or from clinical records and owner, for the three most frequently presented species.

	Records	Comparison data			Agree (with records)		Disagree (with records)	
Species	**n**	**Type**	**n**	**%[1]**	**n**	**%**	**n**	**%**
Dog	1185	Obs[2]	403	34.0	398	98.8	5	1.2
		Owner	214	18.1	212	99.1	2	0.9
Cat	500	Obs[2]	137	27.4	136	99.3	1	0.7
		Owner	52	10.4	48	92.3	4	7.7
Rabbit	80	Obs[2]	22	9.1	20	90.9	2	9.1
		Owner	23	13.0	20	87.0	3	13.0

[1]Percentages shown are based on the total number of patients for which comparison data were available.

[2]Observer

Table 17. The distribution of agreement where neutering status data were available from both clinical records and observer, or from clinical records and owner, for the three most frequently presented species.

	Records	Comparison data			Agree (with records)		Disagree (with records)	
Species	**n**	**Type**	**n**	**%[1]**	**n**	**%**	**n**	**%**
Dog	1185	Observer	403	34.0	279	69.2	124	30.8
		Owner	214	18.1	192	89.7	22	10.3
Cat	500	Observer	137	27.4	114	83.2	23	16.8
		Owner	52	10.4	47	90.4	5	9.6
Rabbit	80	Observer	22	9.1	22	100.0	0	0.0
		Owner	23	13.0	23	100.0	0	0.0

[1]Percentages shown are based on the total number of patients for which comparison data were available.

4.4 Discussion

Preventive medicine consultations are the most common consultation type, which is consistent with the findings of Hill et al. (2006). For this reason, preventive medicine consultations will be considered in further depth in Chapter 8. The proportion of animals presented for elective euthanasia (1.5%)

was much lower than found by Evans et al. (1974) (4.0%). The reasons for the difference are unclear, but possible explanations could include an increase in the range of treatments options available, or a change in attitudes towards veterinary care since Evans et al. (1974) initial study. However care should be taken when drawing conclusions here, as the difference may be due to differences in the data collection method. Whilst Evans et al. (1974) used a questionnaire method, the current study used direct observation of consultations. As the current study only observed a proportion of consultations in each practice, it is possible that elective euthanasia consultations were more likely to be seen by other veterinary surgeons in the practice, to avoid the ethical difficulties surrounding observation of euthanasia consultations. It is also unclear whether Evans et al. (1974) classed a consultation as euthanasia only if euthanasia was requested at the start of the consultation, or if consultations where euthanasia was the end result were also included. The results relating to outcome of the consultation may shed further light on this, and will be considered in Chapter 7.

Consultation length ranged widely which reflects previous findings by Everitt (2011). However Everitt (2011) found a mean consultation length of 11 minutes 45 seconds, while in the current study median consultation length was around 2 minutes shorter than this. The differences seen could be due to variations between practices, individual veterinary surgeons or even number or types of problem discussed, particularly as a relatively small number of consultations were timed in both studies. However, even the shorter median consultation length identified in the current study was only a few seconds short of the 10 minute time slot allocated. Given that this did not include other tasks related to the consultation e.g. reading and writing of clinical notes, this raises concerns that a 10 minute consultation may be insufficient in first opinion practice. As expected, presenting more patients generally lead to a longer consultation, however it did not increase consultation length as dramatically as expected. This could be due to the types of consultations where multiple animals were presented, or it may be that discussions could

relate to multiple animals simultaneously, for example, in the discussion of infectious disease, or routine preventive measures e.g. parasiticides. The issues surrounding consultation length shall be discussed in further detail in Chapter 5.

While the majority of animals receive some kind of clinical examination, clinical examination type appears to vary depending upon consultation type. Similarly the proportion of animals weighed, which could be considered a part of the clinical examination, varies with consultation type. This may suggest that veterinary surgeons begin the decision-making process very early in the consultation, as decisions regarding the clinical examination vary depending upon the reason for presentation. Full clinical examination and weighing is performed very frequently in preventive medicine consultations and previous research has suggested these consultations may be fundamentally different from appointments relating to a current health problems. Shaw et al. (2008) found considerable differences in both communication style and content between wellness appointments and problem appointments. The results of the current study suggest these differences may extend to clinical examination type as well, therefore these consultations may have fundamental differences in the decision-making process.

Over three-quarters of all animals had at least one abnormality detected on clinical examination. This is perhaps surprising given that over a third of animals presented for preventive medicine, and so would be presumed to be a healthy animal. However, this high proportion of clinical examination abnormalities may represent incidental findings on clinical examination. Lund et al. (1999) extracted data from veterinary clinical records and also found that most animals had abnormalities on clinical examination. In fact, only 7% of dogs and 10% of cats were deemed to be healthy on clinical examination. Banyard (1998) looked at vaccination consultations and found that even amongst these animals presumed to be healthy, 52% were found to suffer from concurrent disease. Chapter 5 will look the specific abnormalities

detected on clinical examination, and may shed some light as to why so few animals can be considered truly 'healthy'.

The signalment of patients presented during this study shows similarities to the results of previous studies. While it is still unclear if the practices and their patients involved in this study are representative of UK veterinary practice as a whole, the results relating to patients presented appear consistent with the findings of previous studies. Dogs were found to be the most frequently presented species followed by cats which is similar to the findings of other studies (Evans et al., 1974, Lund et al., 1999, Robotham and Green, 2004, Hill et al., 2006, Tierney et al., 2011). However it differs from the findings of Lumeij et al. (1998), who found cats were the most commonly presented species. Other species, including rabbits accounted for 7.4% of all patients in the current study which was higher than reported by Evans et al. (1974) but lower than reported by other studies (Lumeij et al., 1998, Hill et al., 2006). The reasons for these differences are unclear, but possible explanations could include a change in popularity of certain pets over time or in different areas, or a change in attitude towards presenting some species for veterinary attention. Caseloads of individual veterinary surgeons could also play a role in the species seen. Two veterinary surgeons involved in the current study had allergies triggered by rabbits and avoided cases involving this species. In several of the practices, there was a veterinary surgeon with a special interest in exotic species, so the amount of time spent with these veterinary surgeons may have influenced the caseload seen.

The majority of dogs presented were pedigree, which is consistent with findings from other studies (Lund et al., 1999, Robotham and Green, 2004). The Labrador Retriever was most frequently presented breed of dog which is again consistent with findings by Lund et al. (1999) but differs from those of Robotham and Green (2004) who identified the West Highland White Terrier as the most commonly presented pedigree dog breed. However examination of the top ten dog breeds identified by Robotham and Green (2004) reveals

this list is very similar to the top ten breeds identified in the current study. The most frequently presented cat breed was the Domestic Short Hair, followed by the Domestic Long Hair, which is consistent with findings by Lund et al. (1999). The similarities in breed data to previous studies suggest that while there are likely to be some regional variations, breeds presented to veterinary surgeons in the UK may be similar to those presented in other countries such as the United States.

Breed information is important, as some conditions can have a genetic basis, with certain breeds being predisposed. The PAW 2013 report (PDSA, 2013) found that veterinary professionals reported health issues related to pedigree breeding as their largest welfare concern. Therefore, in order to tackle this issue, identifying the breeds most frequently presented to veterinary surgeons is an important starting point in prioritising future breed-specific research. Breed-specific research is already being conducted by DogsLife, a longitudinal study investigating health in Kennel Club registered Labrador Retrievers (Dogslife, 2014). This breed was selected as it is the most commonly registered dog breed according to the Kennel Club (2014). Eventually, the aim is to expand the DogsLife study to look at other breeds. However, the results from the current study could be used to formulate more focused research breed-specific questions which could be used in the prioritisation of future research.

For dogs, cats and rabbits, animals under 1 year of age were the most frequently presented age group, which is consistent with previous findings (Robotham and Green, 2004, Hill et al., 2006). The second peak seen in cats around 14 years of age may be consistent with the second modal group identified by Lund et al. (1999), though this was at a much younger age of 4-7 years. This second peak was not seen in dogs or rabbits, and may represent a particular group of diseases unique to senior cats. Data presented in Chapters 4 and 5 may shed more light on the common clinical signs and diseases affecting cats presented to veterinary practitioners, which may help to explain

why a peak is seen in cats around 14 years of age. This peak may also explain why median and interquartile ranges for age in cats are higher than dogs, as it could be that a higher number of older cats are presented to veterinary surgeons. It is also consistent with recent suggestions than cats have increased longevity compared with dogs. Data from the Banfield State of Pet Health Report (2013) suggested that dogs live 11 years on average whilst cats live 12.1 years on average. However some studies have also shown that longevity in dogs may be highly variable depending upon breed and size parameters such as height and weight (Greer et al., 2007, Patronek et al., 1997). Therefore examining these age data further for differences between pedigree breeds could help to identify the ages and life stages at which different breeds are presenting to veterinary practitioners. The age of rabbits presented seems to fit with previous literature reporting an average lifespan of 5-10 years, but did not support anecdotal reports of rabbits reaching up to 14 years of age (Lennox, 2010). However, it is unclear if the age of animals presented is reflective of the lifespan of each species, as the reasons for presenting an animal to the veterinary surgeon, as well as the barriers to this, are not yet fully understood.

Cats were the most frequently neutered species, followed by dogs then rabbits which is consistent with previous findings (Robotham and Green, 2004). However, more dogs (66%) and cats (89%) were reported to be neutered in the PAW 2013 report (PDSA, 2013) than in the current study. This may be due to the large number of young animals presented in the current study, many of which may have been younger than the age of routine neutering. Murray (2013) surveyed cat owners and found younger cats were less likely to be neutered. Only 48% of cats aged 4-12 months were neutered, compared with 92% of cats over 6 months and over (Murray, 2013). Inaccuracy of clinical records is another possible explanation for the lower number of neutered animals in the current study, particularly if the animal was not neutered at the practice at which it is now registered. The current study found that neutering rates were similar between male and female dogs,

while male cats and rabbits were more likely to be neutered than females of the same species. In contrast Robotham and Green (2004) found that while male rabbits were more likely to be neutered than female rabbits, for cats and dogs, female animals were more likely to be neutered than male animals. Lund et al. (1999) reported different results again, with male cats more frequently neutered than female cats and female dogs were neutered more frequently than male dogs. Again, it is possible that accuracy of clinical records could be responsible for some of the differences seen. However, the differences seen could reflect differences in the attitude towards neutering over time and in different areas. The routine neutering of different sexes and species has been subject to controversy over recent years, with much debate taking place as to the benefits, risks and appropriate age of neutering (Beauvais et al., 2012, Root Kustritz, 2007). Therefore the differences seen could reflect neutering preferences of individual veterinary surgeons or practices. However, this is currently speculation, and further work to understand the motivations behind routine neutering of pets and the factors which affect this may shed further light on these differences.

Agreement between clinical records and veterinary surgeon, observer or owner, is highly variable for signalment data. Agreement varied with species but was generally higher for breed and sex than for age and neutering status. Where inconsistencies were found, it was unclear whether the clinical records or the comparator (i.e. veterinary surgeon, observer or owner) was correct. Previous studies have suggested that clinical records may not always be an accurate source of information. Dean (2010) used clinical notes to establish history of vaccination and other injectable treatments in cats presenting to veterinary practice. However frequent discrepancies were found even within the notes for a single consultation, with billed injectables and those recorded in clinical notes often not being consistent. Therefore, information extracted from clinical notes should be treated with caution until it can be validated. This is important to bear in mind, particularly as many larger-scale practice-based research projects collect data direct from the clinical records.

Understanding where inaccuracies occur, not only in signalment data, but in other aspects of the clinical records, is vital to understanding the limitations of such data.

The results from this Chapter will be useful in guiding the undergraduate veterinary curriculum, by ensuring new graduates are adequately prepared for the species they will encounter in first opinion practice. However, it should be remembered that the current study looked only at small animal practice, and the proportion of caseload involving equine and farm animals also needs to be taken into account when directing veterinary education.

The results are a useful starting point to guide future veterinary research. In order to form a focused clinical question for future research, the signalment of the group of patients of interest needs to be identified. Therefore understanding which animal groups are frequently presented to veterinary surgeons is a vital starting point in formulating research priorities. Considering the results of this study alongside an assessment of the current literature will help to identify gaps in knowledge. Involvement of veterinary surgeon opinions, and even owner opinions could also be used to identify research priorities. Nielsen et al. (in press) surveyed veterinary surgeons and found that while dogs were reported to be a frequently encountered species more commonly than rabbits, veterinary surgeons perceived there to be less information available for rabbits than for dogs. Therefore, when prioritising research questions, it is important not only to identify groups of animals commonly presented, but also identify gaps in the evidence, and take into account the information needs of veterinary surgeons. Ebell et al. (2013) examined the information needs of veterinary surgeons by looking at the clinical questions encountered during consultations. It was found that clinical questions were raised about dogs three times more often than cats, though this could in part be influenced by the caseload of the 12 veterinary surgeons who participated in this study. It should however be remembered that identification of animal groups where further research is needed forms only a

small part of the PICO question. Establishing common presentations (Chapter 5), conditions (Chapter 6) and interventions (Chapter 7) for which existing evidence is limited is crucial before priorities for future research can be fully formulated.

There are various limitations to this study which need to be considered when interpreting the results. The network of sentinel practices used was a convenience sample, so it is unclear how representative of UK first opinion veterinary practices this network is likely to be. However, given the nature of the research, and the fact that practice-based research is conducted relatively infrequently in veterinary research, it was felt a convenience sample was the most practical method of gathering such data. Willingness of the practice, individual veterinary surgeons and other staff to participate in the research was vital to ensure its success. As veterinary practice-based research becomes more commonplace, it may be that a random sample of practices or even veterinary surgeons could be approached for involvement in future studies. However there are currently many barriers to this, including feasibility of an additional observer in the consultation room and willingness of practices or individual veterinary surgeons to be involved in practice-based research. The dates for visiting each practice and the consultations observed were also selected based on convenience. Seasonal differences or perhaps even caseload differences between individual vets could therefore have an impact on the results. Further details of the sentinel practice network and schedule of visits, along with characteristics of the practices and veterinary surgeons are discussed further in Chapter 2.

When comparing the number of practices recruited and the number of consultations from which data were collected with that of other practice-based research studies, the numbers are relatively small. This was intentional in the design of the study, as the aims did not include disease surveillance, which can better be achieved by many of the larger scale projects discussed in Chapter 1 e.g. SAVSNET (2014), VetCompass (2014), Watchdog (2014) and

BARK (2014). However, this could have introduced bias into some aspects of the caseload, particularly when considering some of the less commonly presented species. The focus of this study was to examine the complexity of the consultation by considering a small number of consultations in depth. Therefore, striving to collect data from a larger number of consultations would have been impractical, and ultimately have led to a reduction in the quality and quantity of data able to be gathered from each consultation.

Another potential limitation of this study is known as the Hawthorne effect (Eckmanns et al., 2006) which is a change in behaviour by a subject simply because they know they are being studied or observed. This change in behaviour could apply not only to the veterinary surgeon conducting the consultation, but also to the owner presenting the animal for consultation. It is even possible that the presence of an additional researcher could affect the behaviour of the patient resulting in a change in the consultation. Whilst this is unlikely to have any effect on some factors, for example signalment, others, such as clinical examination type or weighing of the animal could be affected. This effect is difficult to get around in any practice-based research project, as informed consent of both the veterinary surgeon and owner is essential. However the presence of the observer in the consultation may mean that this effect is amplified by methods which use direct observation of consultations.

4.5 Conclusions

Signalment of animals presented shows reasonable similarity to the results of previous studies and could be used as a starting point to formulate focused clinical questions for future research. However this needs to be conducted in combination with the data to be presented over the next 3 chapters. The accuracy of clinical records is unclear, as there appear to be inconsistencies with data from other sources. This may have implications for methods of data collection which utilise clinical records.

Chapter 5. Problems

5.1 Introduction

In order to direct future research towards areas relevant to practitioners, it is vital to understand not only which patients are commonly presented but also which health problems they commonly present with. Considering the consultation from the point of view of the number and types of problems discussed may be useful in understanding how veterinary surgeons spend their time and therefore in which areas future research would be most valuable.

Various studies have looked at the nature of the problems with which small animals are presented to the veterinary surgeon. Lund et al. (1999) looked at data extracted from clinical records and reported the most common disorders recorded for cats and dogs. However while some of these were specific diagnoses (e.g. lipoma), clinical signs (e.g. vomiting) were also amongst the most commonly reported disorders. This emphasises the importance of understanding the decision making process, and at what point a decision is made. It may be that specific diagnoses are rarely reached, and decisions are often made based on clinical signs. If this is the case, identification of the most common clinical signs, rather than diagnoses, should be the focus of future research. Other studies have grouped problems by body system to identify common patterns in the veterinary caseload (Evans et al., 1974, Robotham and Green, 2004, Hill et al., 2006). All of these studies identified skin and ear conditions to be amongst the most common problems encountered. Hill et al. (2006) also found preventive medicine to be the most common reason for presentation in dogs and cats, and the second most common in other species. In contrast, Evans et al. (1974) found that vaccination consultations accounted for only 13% of caseload.

However, whilst many previous studies have considered the reason for presentation, few within veterinary medicine have considered the complexity of the consultation in relation to the additional health concerns discussed. Studies within medicine have shown that patients frequently present with multiple problems, averaging at 3.05 problems per encounter, with 10 problems recorded in one consultation (Beasley et al., 2004). Everitt (2011) videotaped veterinary consultations and found that additional problems were frequently discussed. However this was a qualitative study examining only a small number of consultations in great depth. Beasley et al. (2004) also suggested that not all of the problems discussed during medical consultations were recorded in patient progress notes or billing records. Therefore studies within veterinary medicine which use these as data sources may be unable to capture all problems discussed using this method. A method such as direct observation may be better able to capture any additional problems discussed during the consultation.

The aim of this chapter was to collect data on the problems discussed during the veterinary consultation. More specifically, to determine the number and types of problems discussed, clinical signs noted, clinical abnormalities identified, body systems affected and diagnostic tests performed.

5.2 Methods

The data collection tool and methods described in Chapter 3 were used to collect data on the problems discussed during consultations in the sentinel practice network (Chapter 2). Definitions for who raised the problem, body system and diagnostic test type (Appendix D), and dictionaries for clinical signs, clinical examination abnormalities and diagnostic tests (Appendix E) were utilised.

Descriptive statistics were generated using IBM® SPSS®. Pivot tables were used to generate frequency data for all variables. Where data were to be

collated, e.g. for all 8 problems, pivot tables were generated for each field. The results were then collated in a separate dataset prior to the generation of further pivot tables to generate collated frequency data.

For number of problems, data will be presented by species and also on consultation length. For all other results reported, data will be presented for presenting and non-presenting problems, and by species. Data are presented in the following order:

- Number of problems
- Problem summary
- Clinical signs
- Related clinical exam abnormalities (i.e. were abnormalities related to the problem detected)
- Specific clinical exam abnormalities (i.e. which abnormalities were detected)
- Raised by
- Body systems
- Type of diagnostic tests
- Specific diagnostic tests

Data presented will be that relating to all problems recorded on pages 2 and 3 of the data collection tool discussed in Chapter 3, incorporating the section from the problem summary/clinical signs field, to the diagnostic tests field. All percentages shown will be based on the total number of problems discussed for the relevant problem type or species unless otherwise stated.

5.3 Results

5.3.1 All problems

A summary of the data collected in terms of number of problems, is show in Figure 8. Where data were not available for all problems due to missing data, the total number analysed is stated.

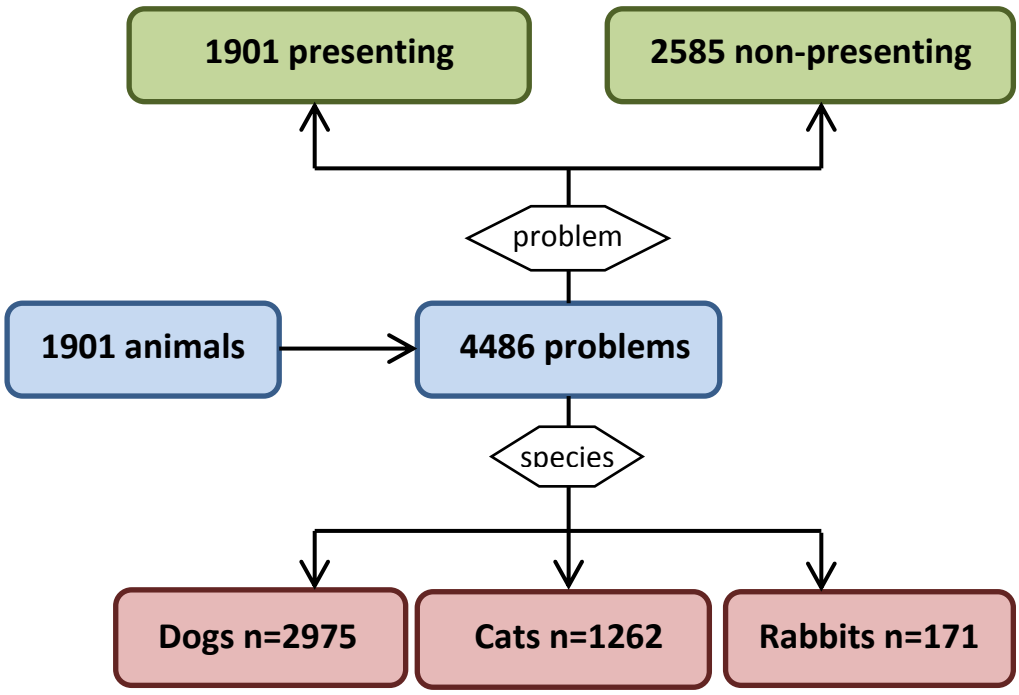


Figure 8. The total number of problems recorded (n=4486) in the 1901 animals presented.

Number of problems

More than one problem was discussed for almost two thirds of the animals presented (65.4%; n=1243). This varied between species with more than one problem discussed for 814 dogs (65.9%), 368 cats (70.1%) and 47 rabbits (52.2%). Discussion of multiple problems was common with up to 8 discussed for some dogs and cats (Figure 9). However there was a tendency to discuss fewer problems in rabbit consultation than for other species.

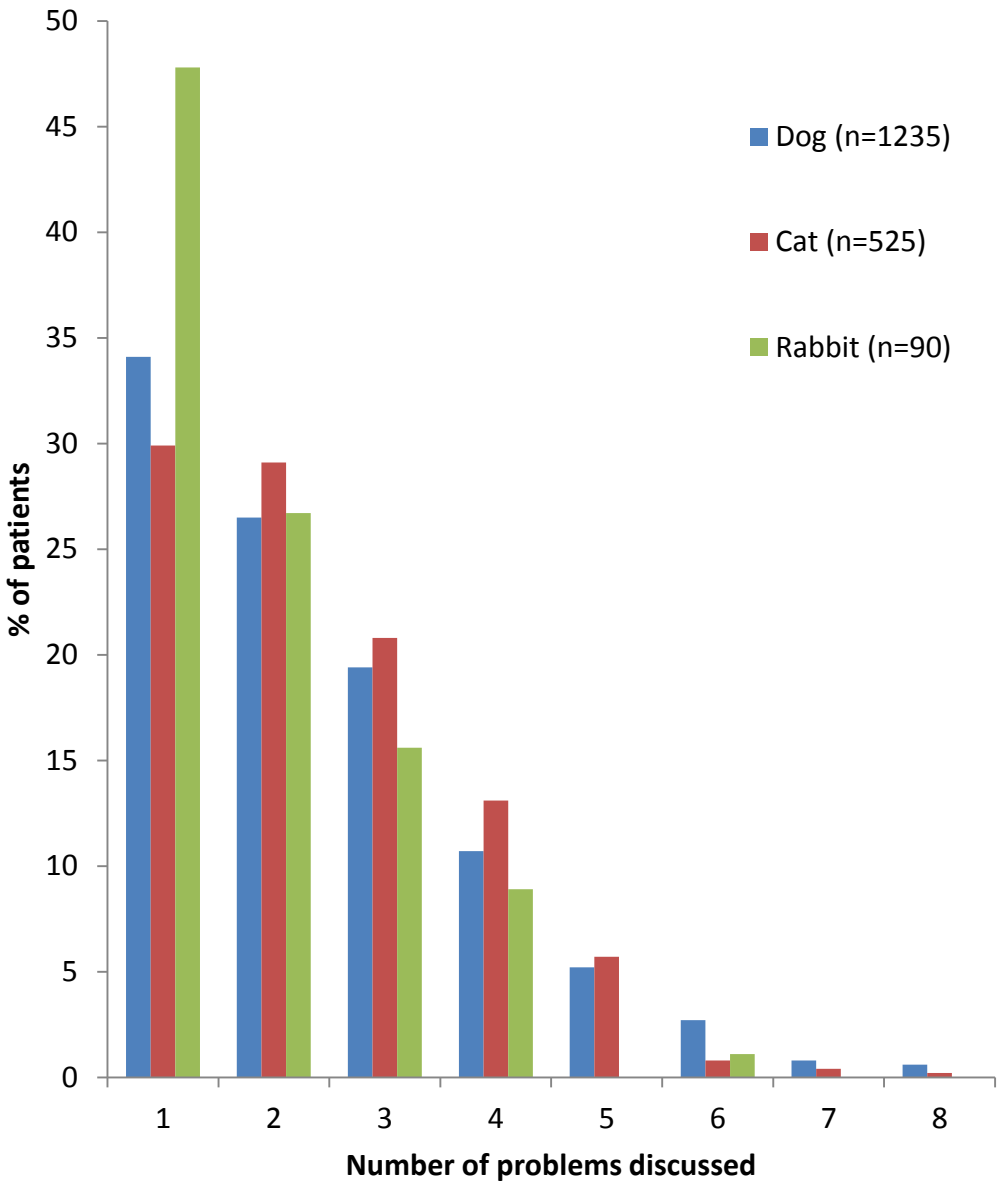


Figure 9. The frequency with which multiple problems were discussed during a consultation in the three most frequently presented species.

Consultation length appeared to gradually increase with the number of problems discussed, however this was not statistically assessed. Median consultation length ranged from 8 minutes 15 seconds (consultations where 2 problems were discussed) to 19 minutes 20 seconds (consultations where 6 problems were discussed) (Figure 10).

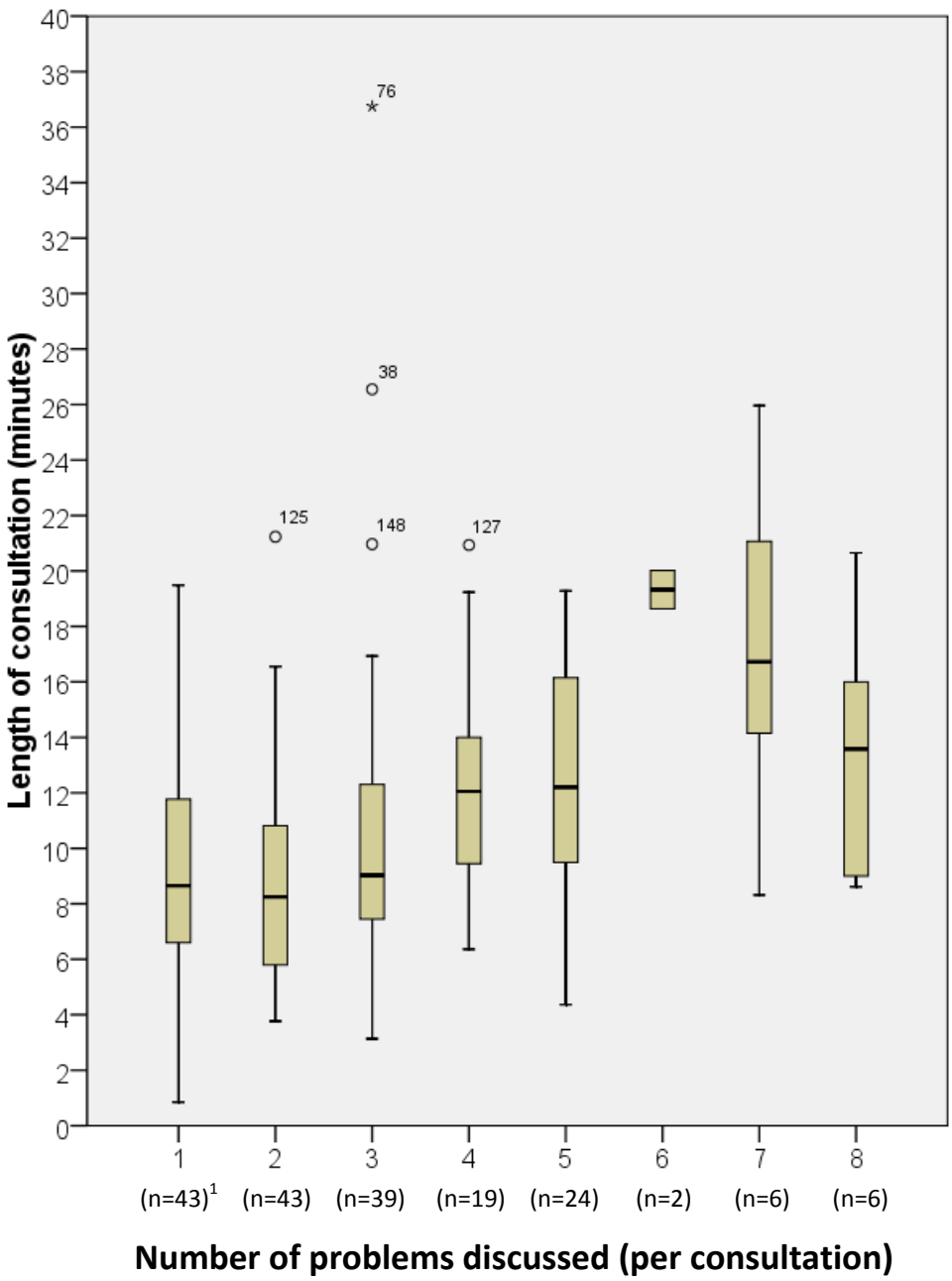


Figure 10. Consultation length in minutes for the 182 timed consultations, shown by the total number of problems discussed. The bottom and top of the boxes represent the first and third quartiles, while the central line within the box represents the median. The top and bottom of the lines represent the lowest and highest values, excluding any outliers which are shown as individual numbered data points.

[1]Number of consultations timed as shown in brackets below each problem number

Problem summary

New problems were more common amongst non-presenting problems (n=1205; 46.6%) than presenting problems (n=482; 25.4%). Problems relating to preventive medicine were more common as presenting (n=690; 36.3%) than non-presenting problems (n=590; 22.8%)(Table 18). Problems relating to preventive medicine were also discussed more frequently for rabbits (n=68; 39.8%) than for dogs (n=817; 27.5%)or cats (n=381; 30.2%)(Table 19).

Table 18. Distribution of problem summary for all problems, presenting problems and non-presenting problems.

	All		Presenting		Non-presenting	
Problem summary	**n**	**%**	**n**	**%**	**n**	**%**
New problem	1687	37.6	482	25.4	1205	46.6
Pre-existing problem	1495	33.3	705	37.1	790	30.6
Elective euthanasia	24	0.5	24	1.3	0	0.0
Preventive medicine	1280	28.5	690	36.3	590	22.8
Total	**4486**	**100**	**1901**	**100**	**2585**	**100**

Table 19. Distribution of problem summary for the three most frequently presented species.

	Dogs		Cats		Rabbits	
Problem summary	**n**	**%**	**n**	**%**	**n**	**%**
New problem	1096	36.8	485	38.4	56	32.7
Pre-existing problem	1045	35.1	391	31.0	46	26.9
Elective euthanasia	17	0.6	5	0.4	1	0.6
Preventive medicine	817	27.5	381	30.2	68	39.8
Total	**2975**	**100**	**1262**	**100**	**171**	**100**

5.3.2 Problems (excluding preventive medicine)

As shown in the problem summary section, preventive medicine accounts for a large proportion of all problems and much of the subsequent data to be considered, such as clinical signs and abnormalities identified on examination

will not be applicable to these problems. Therefore all subsequent data in this chapter will exclude problems relating to preventive medicine which will be discussed in chapter 8. The number of problems to be considered are summarised in the flow chart in Figure 11.

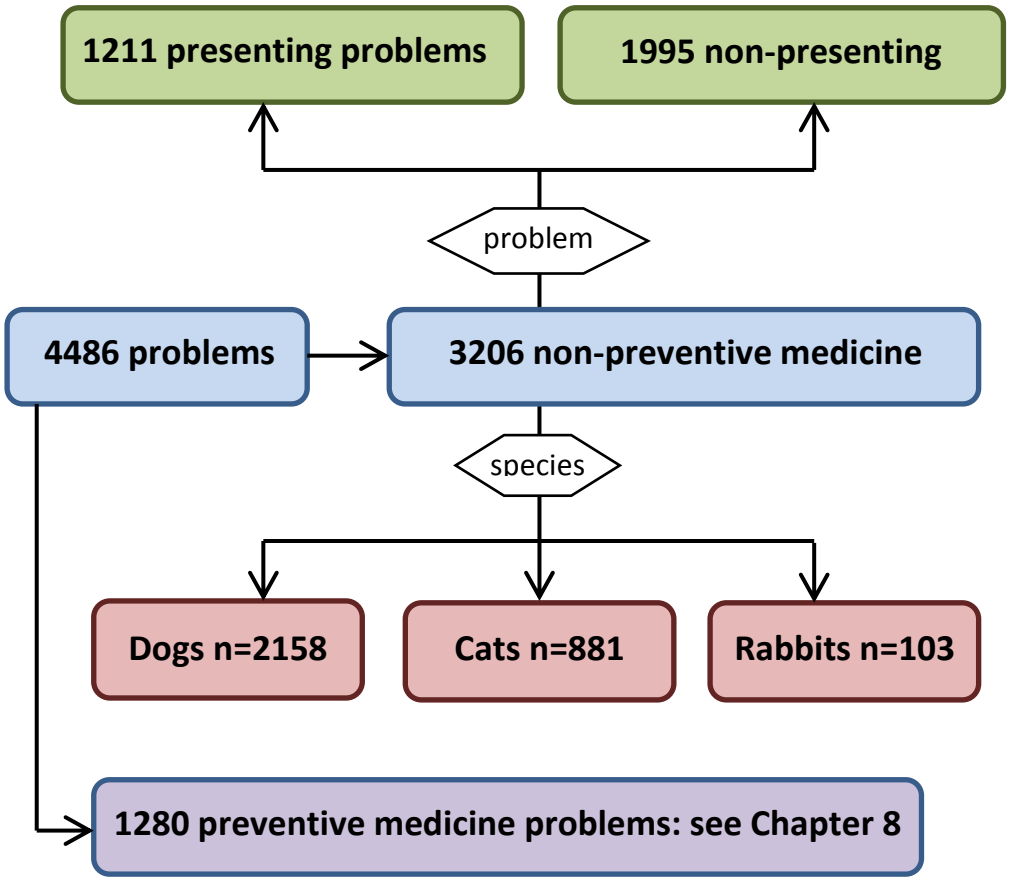


Figure 11. The total number of problems, number of presenting and non-presenting problems, and number of problems for the three most frequently presented species, excluding preventive medicine problems.

Clinical signs

Clinical signs recorded varied between presenting and non-presenting problems and between species. Inappetence (n=103; 8.5%) and lameness (n=75; 6.2%) were common clinical signs for presenting problems, while overweight/obese (n=179; 9.0%) and tartar (n=135; 6.8%) were common for non-presenting problems (Table 20). Skin lump was the most common clinical

sign for dogs (n=139; 6.4%), weight loss for cats (n=70; 7.9%) and inappetence for rabbits (n=15; 6.9%) (Table 21).

Table 20. The 10 most frequently recorded clinical signs for all problems, presenting problems and non-presenting problems.

Problems	Total n	Clinical sign	n	%[1]
All	3206	Overweight/obese	179	5.6
		Skin lump	169	5.3
		Tartar	136	4.2
		Vomiting	130	4.1
		Weight loss	130	4.1
		Inappetence	124	3.9
		Lameness	108	3.4
		Diarrhoea	104	3.2
		Weight gain	92	2.9
		Polydipsia	90	2.8
Presenting	1211	Inappetence	103	8.5
		Lameness	75	6.2
		Vomiting	75	6.2
		Diarrhoea	64	5.3
		Lethargy	57	4.7
		Weight loss	54	4.5
		Pruritus	53	4.4
		History of trauma	49	4.0
		Skin lump	48	4.0
		Pain	40	3.3
Non-presenting	1995	Overweight/obese	179	9.0
		Tartar	135	6.8
		Skin lump	121	6.1
		Weight gain	89	4.5
		Weight loss	76	3.8
		Heart murmur	71	3.6
		Vomiting	55	2.8
		Ocular discharge	52	2.6
		Polydipsia	49	2.5
		Behavioural problem	42	2.1

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total n column).

Table 21. The 10 most frequently recorded clinical signs for the three most frequently presented species.

Species	Total n	Clinical signs	n	%[1]
Dog	2158	Skin lump	139	6.4
		Overweight/obese	121	5.6
		Tartar	94	4.4
		Lameness	88	4.1
		Diarrhoea	78	3.6
		Vomiting	76	3.5
		Pruritus	71	3.3
		Weight gain	58	2.7
		Polydipsia	52	2.4
		Licking feet	50	2.3
Cat	881	Weight loss	70	7.9
		Inappetence	64	7.3
		Vomiting	54	6.1
		Overweight/obese	46	5.2
		Tartar	41	4.7
		Polydipsia	36	4.1
		Weight gain	31	3.5
		Heart murmur	31	3.5
		Skin lump	26	3.0
		Lethargic	23	2.6
Rabbit	103	Inappetence	15	6.9
		Ocular discharge	11	5.2
		Weight loss	8	4.7
		Overweight/obese	7	3.4
		Matted fur	7	2.9
		Dragging limb	5	2.7
		Overgrown teeth	4	2.1
		Dental abnormality	4	2.0
		Ataxia	3	1.9
		Diarrhoea	3	1.6

[1]Percentages shown are based on the total number of problems for each species (shown in the Total n column).

Related clinical examination abnormalities

Of the 3206 problems discussed, data were missing from the clinical abnormalities field for 12 animals (0.4%), 11 of which were elective euthanasia consultations. Therefore data were available for 1199 presenting (99.0%) and 1995 non-presenting problems (100.0%). Abnormalities were detected more frequently for presenting (n=866, 72.2%) than non-presenting problems (n=1268; 63.6%) (Table 22). Data were available for 2149 problems in dogs (99.5%), 878 in cats (99.7%) and 103 in rabbits (100.0%). Abnormalities were detected more frequently for rabbits (n=78; 75.5%) than for dogs (n=1406; 65.4%) and cats (n=613; 69.8%) (Table 23).

Table 22. Number of problems for which abnormalities were detected for all problems, presenting problems and non-presenting problems.

	All problems		**Presenting**		**Non-presenting**	
Abnormalities?	**n**	**%[2]**	**n**	**%[2]**	**n**	**%[2]**
Yes	2134	66.8	866	72.2	1268	63.6
No	908	28.4	232	19.3	676	33.9
N/A	152	4.8	101	8.4	51	2.6
Total	**3194**	**100**	**1199**	**100**	**1995**	**100**

[1]N/A category contains problems where a clinical examination was not performed.

[2]Percentages shown are based on the total number of problems for each problem type (shown in the Total row).

Table 23. Number of problems for which abnormalities were detected for the three most frequently presented species.

	Dog		Cat		Rabbit	
Abnormalities?	**n**	**%[2]**	**n**	**%[2]**	**n**	**%[2]**
Yes	1406	65.4	613	69.8	78	75.7
No	650	30.2	219	24.9	19	18.4
N/A[1]	93	4.4	46	5.2	6	5.8
Total	**2149**	**100**	**878**	**100**	**103**	**100**

[1]N/A category contains problems discussed during consultations where a clinical examination was not performed.

[2]Percentages shown are based on the total number of problems for each species (shown in the Total row).

Specific clinical examination abnormalities

For analysis of specific clinical examination abnormalities, problems where no clinical examination was performed and detection of abnormalities was not possible were excluded. After exclusion of these problems data were available for 3042 problems, of which 1098 were presenting problems and 1944 were non-presenting problems. Lameness (n=64; 5.8%) followed by erythema and wound (n=61; 5.6%) were the most common abnormalities for presenting problems, while overweight/obese (n=199; 10.2%) followed by tartar (n=162; 8.3%) were the most common for non-presenting problems (Table 24).

Problems for which the N/A option was selected for related clinical exam abnormalities (i.e. those where no clinical exam was performed) were excluded leaving data available for 2056 problems in dogs, 832 problems in cats and 97 problems in rabbits. Specific abnormalities on clinical examination varied between the species, with overweight/obese most common in dogs (n=141; 6.9%), weight loss in cats (n=86; 10.3%) and ocular discharge, overgrown incisors and obese/overweight in rabbits (all n=10; 10.3%) (Table 25).

Table 24. The 10 most frequently recorded clinical examination abnormalities for all problems, presenting problems and non-presenting problems.

Problems	Total n	Abnormality	n	%[1]
All	3042	Overweight/obese	202	6.6
		Tartar	171	5.6
		Skin lump	159	5.2
		Weight loss	152	5.0
		Weight gain	100	3.3
		Wound	94	3.1
		Erythema	89	2.9
		Heart murmur	87	2.9
		Ocular discharge	79	2.6
		Lameness	77	2.5
Presenting	1098	Lameness	64	5.8
		Erythema	61	5.6
		Wound	61	5.6
		Pyrexia	60	5.5
		Weight loss	60	5.5
		Skin lump	51	4.6
		Alopecia	37	3.4
		Ocular discharge	36	3.3
		Inflamed ear	35	3.2
		Thin	32	2.9
Non-presenting	1944	Overweight/obese	199	10.2
		Tartar	162	8.3
		Skin lump	108	5.6
		Weight loss	92	4.7
		Weight gain	87	4.5
		Heart murmur	81	4.2
		Ocular discharge	43	2.2
		Alopecia	35	1.8
		Waxy ear	35	1.8
		Gingivitis	34	1.7

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total n column).

Table 25. The 10 most frequently recorded clinical examination abnormalities for the three most frequently presented species.

Species	Total n	Abnormality	n	%[1]
Dog	2056	Overweight/obese	141	6.9
		Skin lump	133	6.5
		Tartar	110	5.4
		Erythema	73	3.6
		Lameness	65	3.2
		Weight loss	56	2.7
		Weight gain	55	2.7
		Waxy ear	52	2.5
		Heart murmur	49	2.4
		Inflamed ear	44	2.1
Cat	832	Weight loss	86	10.3
		Tartar	58	7.0
		Overweight/obese	48	5.8
		Wound	47	5.6
		Weight gain	42	5.0
		Heart murmur	37	4.4
		Thin	26	3.1
		Ocular discharge	25	3.0
		Alopecia	23	2.8
		Gingivitis	23	2.8
Rabbit	97	Ocular discharge	10	10.3
		Overgrown incisors	10	10.3
		Overweight/obese	10	10.3
		Weight loss	9	9.3
		Matted fur	7	7.2
		Scurf	6	6.2
		Molar spurs	4	4.1
		Wound	4	4.1
		Ataxia	3	3.1
		Weight gain	3	3.1

[1]Percentages shown are based on the total number of problems for each species (shown in the Total n column).

Raised by

Data on who raised the problem were available for 3194 problems (99.6%), 1199 presenting problems (99.0%) and 1995 non-presenting problems

(100.0%). Approximately two thirds of problems were raised by the owner (62.6%, 60.1% and 64.0% for all problems, presenting problems and non-presenting problems respectively). The remaining problems were raised by the veterinary surgeon (37.4%, 39.9% and 36.0% for all problems, presenting problems and non-presenting problems respectively).

Data were complete on who raised the problem for 2149 problems in dogs (99.6%), 878 in cats (99.7%) and 103 in rabbits (100.0%). The majority of problems were raised by the owner (63.1%, 59.5% and 64.1% for dogs, cats and rabbits respectively). The remaining problems were raised by the veterinary surgeon (36.9%, 40.5% and 35.9% for dogs, cats and rabbits respectively).

Body systems

Body system data were available for 3194 of the 3206 problems (99.6%). The 12 problems for which data on body system was missing were all presenting problems and where those discussed previously, 11 of which were elective euthanasia consultations for which the researcher was not present for the full consultation.

Whilst more than one body system could be selected where necessary, a single body system only was selected for 3084 problems (96.2%). Two body systems were selected for 122 problems (3.8%). Of these 122 problems, the most common combinations of body systems selected were musculoskeletal/neurological (n=25), cardiovascular/respiratory (n=12) and skin/musculoskeletal (n=12).

Skin was the most frequently affected body system for both presenting and non-presenting problems (Figure 12). Gastrointestinal problems were the second most frequently affected body system for presenting problems, while the category non-specific was the second most frequently affected for non-

presenting problems. Dental and behavioural problems were recorded more frequently as non-presenting than presenting problems. Body system affected also varied between species (Figure 13). Skin and musculoskeletal problems were more common in dogs than in cats and rabbits. Respiratory, endocrine and urinary problems were more common in cats than other species. Dental and non-specific conditions were more common in rabbits than other species.

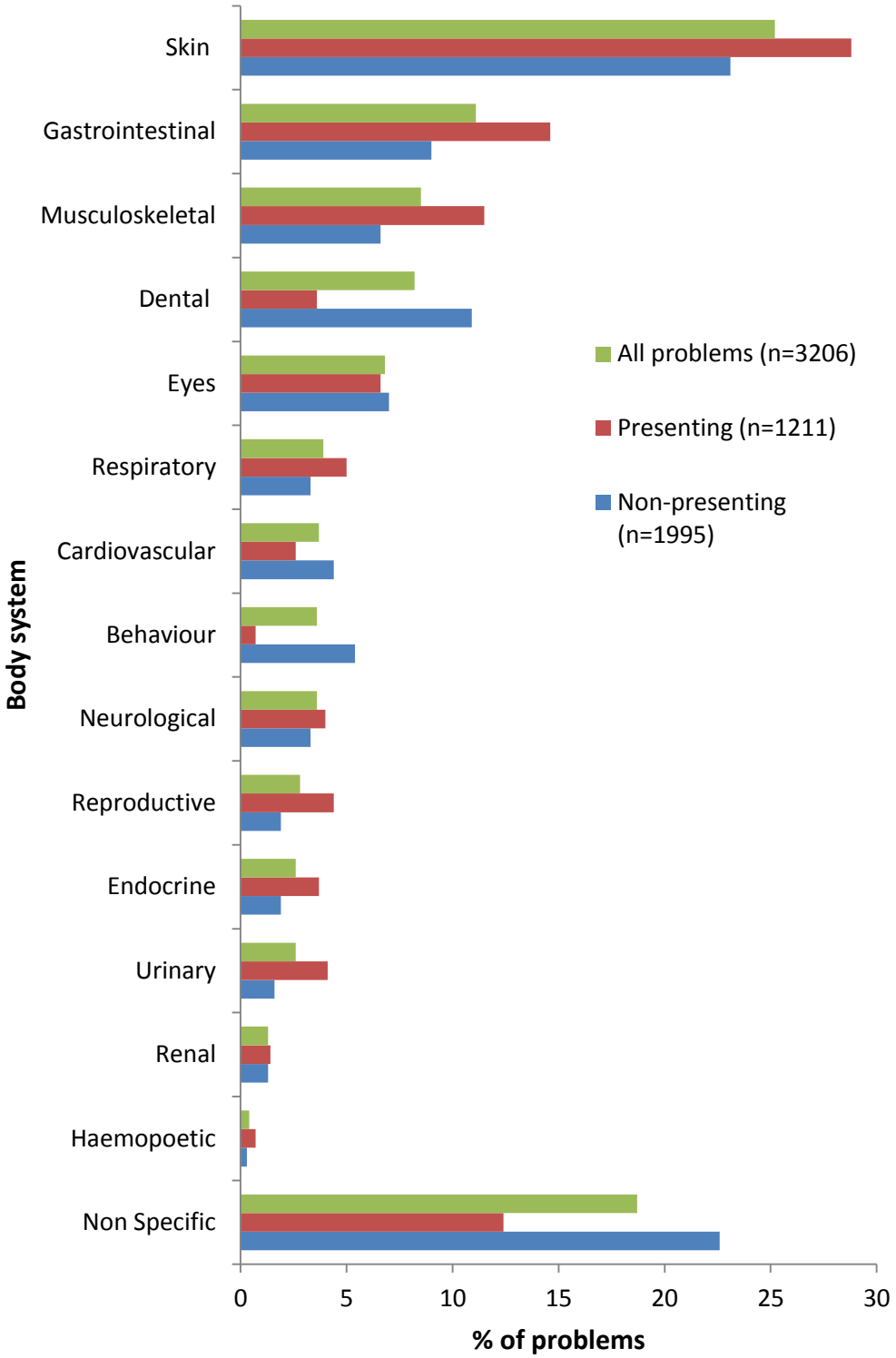


Figure 12. Body systems affected by all problems, presenting and non-presenting problems for all patients. The non-specific category was selected for both systemic diseases or where the body system(s) affected was unclear.

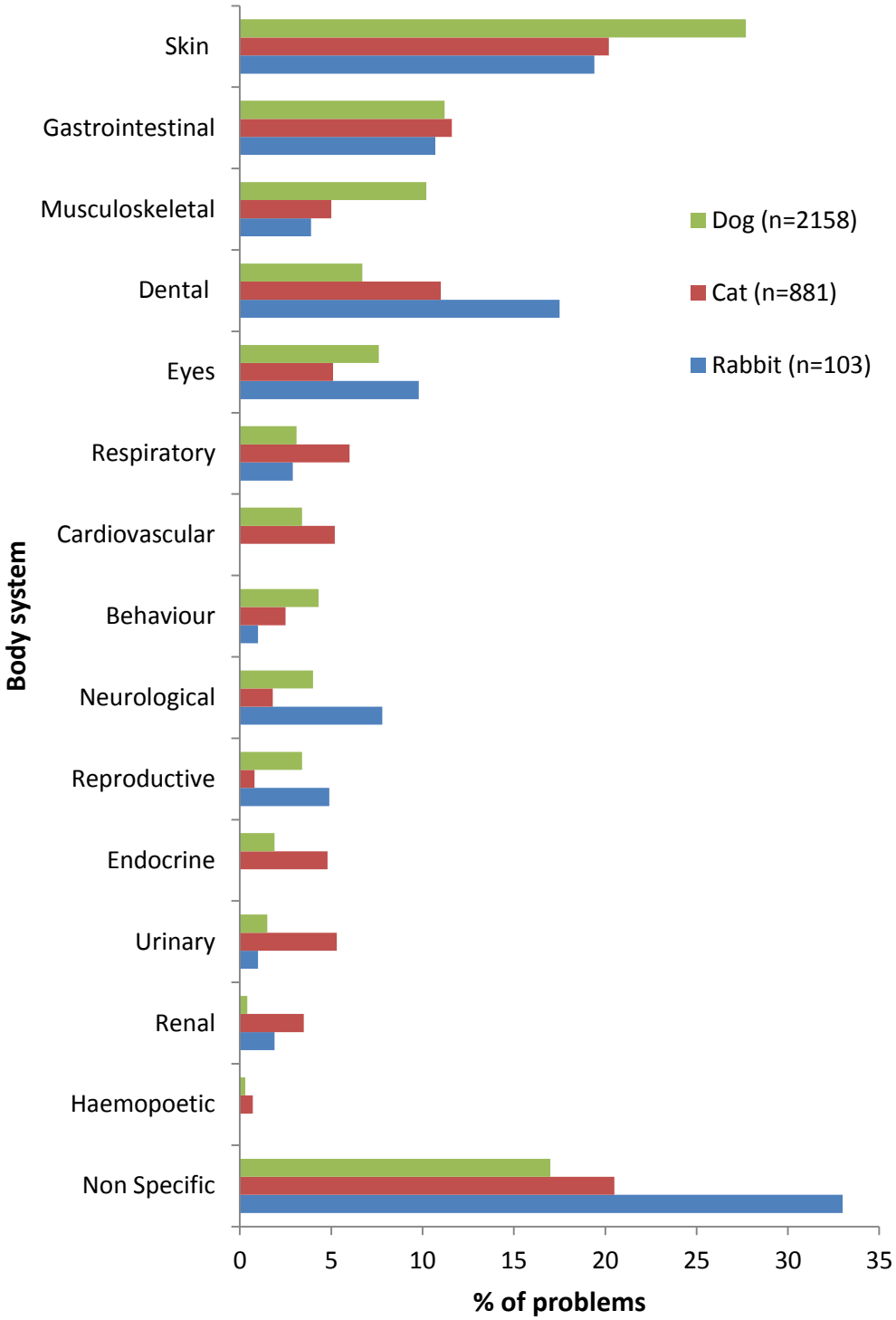


Figure 13. Body systems affected by all problems for the 3 most frequently presented species. The non-specific category was selected for both systemic diseases or diseases where it was unclear which body system(s) were affected.

Type of diagnostic tests

The diagnostic tests closed field was complete for 3150 (98.3%) problems, 1194 (98.6%) presenting problems and 1956 (98.0%) non-presenting problems. No diagnostic tests were performed for the majority of problems (n=2252; 71.5%), though this number was higher for non-presenting (n=1703; 87.1%) compared with presenting problems (n=549; 46.0%). Overall, in consult tests (n=561; 17.8%) were performed more frequently than post consult tests (n=244; 7.7%) (Table 26).

Table 26. The types of diagnostic tests performed for all problems, presenting problems only and non-presenting problems.

	All problems		**Presenting**		**Non-presenting**	
Type of diagnostic test	**n**	**%[1]**	**n**	**%[1]**	**n**	**%[1]**
In consult	561	17.8	406	34.0	155	7.9
Post consult	244	7.7	158	13.2	86	4.4
Both	93	3.0	81	6.8	12	0.6
None	2252	71.5	549	46.0	1703	87.1
Total	**3150**	**100**	**1194**	**100**	**1956**	**100**

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total row).

Data were complete on type of diagnostic test for 2131 (98.7%) problems in dogs, 864 (98.1%) problems in cats and 99 (96.1%) problems in rabbits. Diagnostic tests were performed more frequently for problems affecting dogs (n=607; 28.5%) and cats (n=259; 30.0%) than for problems affecting rabbits (n=19; 19.2%)(Table 27).

Table 27. The types of diagnostic tests performed for the 3 most frequently presented species.

	Dogs		Cats		Rabbits	
Type of diagnostic test	**n**	**%[1]**	**n**	**%[1]**	**n**	**%[1]**
In consult	404	19.0	130	15.0	17	17.2
Post consult	146	6.9	94	10.9	2	2.0
Both	57	2.7	35	4.1	0	0.0
None	1524	71.5	605	70.0	80	80.8
Total	**2131**	**100**	**864**	**100**	**99**	**100**

[1]Percentages shown are based on the total number of problems for each species (shown in the Total row).

Specific diagnostic tests

The specific diagnostic test open field was complete for 3150 (98.3%) problems, 1194 (98.6%) presenting problems and 1956 (98.0%) non-presenting problems. Temperature checks were the most common in-consult diagnostic tests (9.2%, 21.7% and 1.5% for all problems, presenting problems and non-presenting problems respectively). Otoscopic examination of the ear canal was the second most frequently performed (3.7%, 5.7% and 2.4% for all problems, presenting problems and non-presenting problems respectively) (Table 28). Blood tests were the most frequently performed post-consult test for all problems (n=194; 6.2%), presenting problems (n=127; 10.6%) and non-presenting problems (n=67; 3.4%) (Table 29).

Data were available on specific diagnostic tests for 2131 (98.7%) problems in dogs, 864 (98.1%) problems in cats and 99 (96.1%) problems in rabbits. Temperature checks were the most common in-consult test for dogs (n=176; 8.3%) and cats (n=103; 11.9%), while otoscopic examination of the oral cavity was the most common in rabbits (n=15; 15.2%)(Table 30). Blood tests were the most common post-consult test for dogs (n=107; 5.0%) and cats (n=87; 10.1%). Only 2 post-consult tests were performed in rabbits (Table 31).

Table 28. The 10 most frequently performed in-consult diagnostic tests for all problems, presenting problems and non presenting problems.

Problems	Total n	Test	n	%[1]
All	3150	Temperature check	289	9.2
		Otoscopy	115	3.7
		Opthalmoscopy	80	2.5
		Rectal examination	63	2.0
		Fluorescein	49	1.6
		Urinalysis	30	1.0
		Schirmer tear test	20	0.6
		Lameness examination	17	0.5
		Fine needle aspirate	16	0.5
		Otoscopy of oral cavity	15	0.5
Presenting	1194	Temperature check	259	21.7
		Otoscopy	68	5.7
		Opthalmoscopy	52	4.4
		Fluorescein	42	3.5
		Rectal exam	38	3.2
		Urinalysis	21	1.8
		Schirmer tear test	14	1.2
		Bloods	12	1.0
		Fine needle aspirate	12	1.0
		Lameness examination	11	0.9
Non-presenting	1956	Otoscopy	47	2.4
		Temperature check	30	1.5
		Opthalmoscopy	28	1.4
		Rectal examination	25	1.3
		Urinalysis	9	0.5
		Fluorescein	7	0.4
		Lameness exam	6	0.3
		Otoscopy of oral cavity	6	0.3
		Schirmer tear test	6	0.3
		Fine needle aspirate	4	0.2

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total n column).

Table 29. The 10 most frequently performed post-consult diagnostic tests for all problems, presenting problems and non-presenting problems.

Problems	Total n	Test	n	%
All	3150	Blood test	194	6.2
		Radiography	47	1.5
		Urinalysis	46	1.5
		Ultrasound	26	0.8
		Histopathology	19	0.6
		Swab (culture and sensitivity)	13	0.4
		Fine needle aspirate	8	0.3
		Swab (in-house microscopy)	7	0.2
		Faecal examination	7	0.2
		Endoscopy	6	0.2
Presenting	1194	Blood test	127	10.6
		Radiography	41	3.4
		Urinalysis	27	2.3
		Histopathology	19	1.6
		Ultrasound	18	1.5
		Swab (culture and sensitivity)	11	0.9
		Fine needle aspirate	8	0.7
		Swab (in-house microscopy)	7	0.6
		Endscopy	6	0.5
		Faecal examination	6	0.5
Non-presenting	1956	Blood test	67	3.4
		Urinalysis	19	1.0
		Ultrasound	8	0.4
		Radiography	6	0.3
		Impression smear	3	0.2
		Blood pressure	2	0.1
		Swab (culture and sensitivity)	2	0.1
		Exploratory surgery	1	0.1
		Faecal examination	1	0.1
		Fungal culture	1	0.1

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total n column).

Table 30. The 10 most frequently performed in-consult diagnostic tests for the three most frequently presented species.

Species	Total n	Test	n	%[1]
Dog	2131	Temperature check	176	8.3
		Otoscopy	101	4.7
		Rectal examination	59	2.8
		Opthalmoscopy	53	2.5
		Fluorescein	36	1.7
		Schirmer tear test	19	0.9
		Lameness examination	17	0.8
		Urinalysis	16	0.8
		Fine needle aspirate	13	0.6
		Ultrasound	9	0.4
Cat	864	Temperature check	103	11.9
		Opthalmoscopy	25	2.9
		Urinalysis	14	1.6
		Fluorescein	13	1.5
		Otoscopy	12	1.4
		Blood test	5	0.6
		Rectal examination	4	0.5
		Blood pressure	3	0.3
		Fine needle aspirate	2	0.2
		Woods lamp	2	0.2
Rabbit	99	Otoscopy of oral cavity	15	15.2
		Temperature	8	8.1
		Neurological examination	1	1.0
		Otoscopy	1	1.0
		Opthalmoscopy	1	1.0

[1]Percentages shown are based on the total number of problems for each species (shown in the Total n column).

Table 31. The 10 most frequently performed post-consult diagnostic tests for the three most frequently presented species.

Species	Total n	Test	n	%[1]
Dog	2131	Blood test	107	5
		Radiography	28	1.3
		Urinalysis	23	1.1
		Histopathology	17	0.8
		Ultrasound	17	0.8
		Swab (culture and sensitivity)	10	0.5
		Swab (in-house microscopy)	7	0.3
		Faecal examination	5	0.2
		Endoscopy	3	0.1
		Skin scrapes	2	0.1
Cat	864	Blood test	87	10.1
		Urinalysis	20	2.3
		Radiography	16	1.9
		Ultrasound	8	0.9
		Blood pressure	3	0.3
		Endoscopy	3	0.3
		Fluid analysis	3	0.3
		Faecal examination	2	0.2
		Fine needle aspirate	2	0.2
		Histopathology	2	0.2
Rabbit	99	Radiography	1	1.0
		Swab (culture and sensitivity)	1	1.0

[1]Percentages shown are based on the total number of problems for each species (shown in the Total n column).

5.4 Discussion

Consultations appear to be complex, often requiring the veterinary surgeon to make many decisions, from the type of clinical examination to perform to the type of diagnostic tests to carry out. To add to this complexity, veterinary surgeons often have to make these decisions for more than one problem. Multiple problems are discussed during the majority of consultations which is consistent with the findings by Everitt (2011) that additional topics other than

the reason for presentation were often raised during some consultations. The frequency with which multiple problems were discussed also suggests that there may be some similarities with medicine, where this is also a frequent occurrence (Flocke et al., 2001, Beasley et al., 2004). Much of the existing evidence from previous veterinary research, particularly in relation to interventions, has often specified strict inclusion and exclusion criteria, excluding animals with concurrent disease. Haggstrom et al. (2008) looked at the treatment of myxomatous mitral valve disease in dogs, and excluded animals with any clinically significant concurrent disease. Olivry et al. (2002) looked at the treatment of atopic dermatitis in dogs with cyclosporine, but excluded animals with evidence of microbial skin infection, a common concurrent condition in dogs with this condition. The frequency with which multiple problems are discussed during a single consultation suggest that concurrent disease may be common, therefore the patients eligible for these studies may not represent typical cases of disease.

In addition, it appears that the discussion of multiple problems could be associated with an increase in consultation length. This reflects findings in medicine by Flocke et al. (2001) that discussion of additional problems increases consultation length by 2.5 minutes on average. Everitt (2011) found that veterinary consultations involving animals presented for a new problem were around 4 minutes longer on average than those presented for an ongoing problem. Further work could look at the influence of other factors on consultation length, for example species or age of the animal presented or body system affected. Findings from such research could have implications for the scheduling of veterinary appointments to ensure efficient running of the practice. If consultation length can be predicted based on minimal information, e.g. signalment or type of problem, the standard 10 minute time-slot could be replaced with an appointment length tailored to the individual case.

Fewer problems are generally discussed in rabbit consultations and there are many possible explanations for this. These could include fewer concurrent health problems, less familiarity with rabbit clinical examination and diseases by the veterinary surgeon or fewer health problems noted by the owner. Rabbits are prey species and so will often hide the signs of disease, particularly in the early stages potentially making it difficult for both veterinary surgeons and owners to detect (Meredith, 2006). Studies of medical consultations have suggested that fewer problems are discussed when dealing with new problems and cases of acute disease (Flocke et al., 2001). Therefore it may be that a rabbit's ability to hide disease results in them being presented in a severe and acutely-ill stage of disease, meaning the presenting problem takes priority. In fact, inappetence was the most common clinical sign in rabbits and is a clinical sign generally requiring urgent attention in this species (Rees Davies, 2006). However, previous research has suggested that cats, due to being solitary hunters, also hide disease (Harris, 2013), yet the number of problems discussed is higher for cats than for rabbits. An alternative explanation could be a difference in attitude towards veterinary treatment of rabbits means only advanced or urgent disease is addressed in these animals. The PAW 2013 report (PDSA, 2013) revealed far fewer rabbits were registered with a practice than dogs or cats, and so veterinary attention may often be sought only when needed, rather than in advance. Attitude to veterinary treatment of this species could also explain why fewer diagnostic tests were performed. There is likely to be a combination of factors accounting for these results and so future research could focus on gathering data from a larger number of rabbit consultations to allow these to be examined in depth.

New problems were introduced more frequently as non-presenting than as presenting problems. Flocke et al. (2001) found that additional problems were raised more frequently in medical consultations where the presenting complaint was a chronic pre-existing problem, compared with those where the presenting complaint was a new problem. It may be that a similar pattern

is seen in veterinary consultations, with those involving pre-existing, chronic or less urgent disease being used as an opportunity to talk about new problems.

Clinical signs varied between presenting and non-presenting complaints, and showed some similarities to the findings from other studies. Lameness and obesity in dogs, inappetence in cats, and dental tartar and gingivitis in both species were all identified as common problems by Lund et al. (1999), which echoes the results of the current study. Pruritus and skin lumps were identified as the most common clinical signs for skin conditions by Hill et al. (2006) which again mirrors the findings of the current study. Tierney et al. (2011) found that pruritus, vomiting and diarrhoea were all common presenting complaints, while aggression was relatively rare, which again is consistent with findings in the current study.

Overweight/obese was the most common problem discussed overall in the current study, which is consistent with previous literature suggesting the prevalence of obesity in companion animals is high worldwide. Studies in the UK (Courcier et al., 2010), USA (Lund et al., 1999), France (Colliard et al., 2009) and Australia (McGreevy et al., 2005) have also demonstrated obesity to be common amongst cats and dogs. White et al. (2011) found that 79% of vet-visiting dog owners reported they had discussed their dog's weight with their veterinary surgeon at some point. However, being overweight/obese was rarely a reason for presentation, which may suggest that owners may not see this problem as a priority. Davies (2011) surveyed owners and found that only 54.5% considered obesity serious enough to require veterinary attention. It may even be that some owners do not recognise being overweight/obese as a problem. White et al. (2011) interviewed dog owners attending a small animal veterinary practice, and investigated owner perceptions of the dog's weight. Owners of dogs defined as overweight by the veterinary surgeon were significantly more likely to underestimate their dog's weight compared with owners of dogs defined as not overweight. Therefore veterinary

surgeons may have a role to play in educating owners about obesity, in order to increase awareness and understanding of this common problem.

Skin lumps were a very common clinical sign and clinical examination abnormality in dogs. This is consistent with findings by Trotman (2009), who conducted prospective recording of all mass lesions affecting dogs presenting to a first opinion practice over a 15 day period. Trotman (2009) recorded 188 mass lesions in 1101 dogs, of which 42 (22.3%) were the presenting problem and the remaining 129 (68.6%) were a non-presenting problem. Interestingly, this is consistent with the current study, where skin lumps were also more frequently recorded as a non-presenting problem than as a presenting problem. This could be due to a number of reasons, including failure of owners to detect lumps or failure to prioritise lumps for discussion with the veterinary surgeon. Interestingly, Trotman (2009) found that action was taken for only 38.3% of lumps, meaning the majority were not acted upon. It could be that consultations for other problems provide an opportunity for veterinary surgeons to monitor such lumps for any changes, perhaps explaining why these are frequently encountered as a non-presenting problem.

Problems were raised more often by the owner than by the veterinary surgeon. This closely reflects findings in medicine, where problems have been found to be raised more often by the patient (58%) than by the physician (36%) (Flocke et al., 2001). This adds further to the complexity of the consultation, suggesting that owners have a large amount of influence over how the consultation proceeds, by deciding which problems to discuss, and when to raise these. It is unclear when during the consultation these problems were raised, however determining this could be important in understanding how these additional problems influence decision-making. Dysart et al. (2011) looked at the effect of veterinary solicitation of client concerns (i.e. asking the client the reason for their visit at the start of the consultation) on the raising of new problems at the end of the consultation. It

was found that a veterinary solicitation featured in only 37% of consultations and client answers to this question were cut short in 55% of cases. Consultations not containing a solicitation were 4 times more likely to result in additional problems being raised during the closing segment of the consultation. This has been called the doorhandle effect or 'by-the-way' phenomenon (Campion and Langdon, 2004). Therefore veterinary-client communication can influence how the consultation proceeds by determining when during the consultation problems are raised. Knowledge of concurrent disease may influence aspects of decision-making (e.g. consideration of drug interactions), so decision-making could differ between consultations where client concerns are solicited early, and those where new problems are raised in the late stages. Now that the current study has established that multiple problems are frequently discussed, further work could focus on when these problems are raised, and how communication can be improved to assist the decision-making process.

In terms of body system affected, considerable differences were seen between presenting versus non-presenting problems, however skin was the most frequently affected for both types of problems. This is consistent with findings of Evans et al. (1974), Robotham and Green (2004) and Hill et al. (2006) who all found skin and ear diseases to be the most commonly occurring. It also reflects findings in medicine where skin conditions are the most common reason for a patient to present with a new problem (Schofield et al., 2011). It could be that skin diseases are genuinely more common, or it may be that owners are more likely to present an animal with skin disease than with another type of disease.

Behavioural problems were usually non-presenting rather than presenting. This demonstrates why recording the primary reason for presentation only may fail to highlight the importance of some aspects of the veterinary consultation. The finding that behavioural problems tend to be non-presenting problems may be due to a difference in owner attitudes towards

these types of problems. It may be that owners do not prioritise such problems, see them as less urgent, or seek advice from other sources and so whilst they are rarely the reason for presenting, they are often discussed as an additional problem. Roshier and McBride (2013) videotaped canine annual booster vaccination consultations and found that behavioural problems were frequently discussed as an additional problem during vaccination consultations. However a questionnaire of owners following the consultation revealed that many of the dogs presented had behavioural problems which were not discussed. A qualitative study focusing on the attitudes of both owners and veterinary surgeons towards behavioural problems may help shed light on why animals are rarely presented with these problems.

Evans et al. (1974) reported that diagnostic tests were rarely performed, in only around 1 in 60 cases, which mirrors the findings of the current study were diagnostics were not performed for the majority of consultations. Hill et al. (2006) found otoscopic examination to be the most frequently performed diagnostic test, which is again mirrored by the results of the current study. However it is difficult to compare these results as Hill et al. (2006) predominantly focused on skin consultations only. The wide range of diagnostic tests performed during the current study suggests that a wide range of options are available to veterinary surgeons, adding further complexity to the decision-making process.

The results from this chapter could be used in combination with those from Chapter 4 to identify common scenarios in first opinion veterinary practice. This could be used to guide both veterinary education, by identifying common clinical signs, clinical exam abnormalities or affected body systems new graduates are likely to encounter upon graduation, and as a starting point to direct future research. A survey by Nielsen et al. (in press) asked veterinary surgeons to identify three conditions or presenting complaints they saw most commonly for up to four species they treated in practice. The results closely reflect the findings of the current study, for example, skin was the most

frequently identified body system in dogs, followed by the gastrointestinal and musculoskeletal systems. Additionally the answers given by veterinary surgeons frequently related to clinical signs, for example lameness, rather than specific diagnoses such as osteoarthritis. This could simply be due to the way in which the question was asked, or may suggest that veterinary surgeons feel they deal with clinical signs and syndromes more frequently than specific diagnoses. If this is the case, data presented during this Chapter could be highly useful in prioritising future research towards clinical signs e.g. vomiting, or diagnostic tests, rather than towards specific diagnoses. Even where a specific diagnosis is made, results from this chapter suggest that decisions are still made prior to this e.g. type of clinical examination or diagnostic tests to perform. Therefore clinical sign-focused research would assist veterinary decision-making at this early stage, where diagnosis-focused research cannot. Chapter 6 will consider diagnosis in further depth, looking at the type of diagnosis made, if at all, and the specific diagnosis made. The results may then shed some light on where in the diagnostic process, from clinical signs to definitive diagnosis, are the most appropriate points to focus future research that will aid veterinary surgeons in the decision-making process.

There are many limitations to this study, for example convenience sampling of practices, the effect of an extra observer in the room and the validity of the data collection tool, however these have been discussed in more depth in Chapter 4.

5.5 Conclusions

Consultations are frequently complex, often involving multiple decision-making points for several different problems. When directing future research and veterinary education towards commonly encountered areas, it is important to consider not only problems with which patients present, but also the additional problems frequently raised during the consultation.

Chapter 6. Diagnoses

6.1 Introduction

A diagnosis has been defined as "the label given to a disease with certain clinical or pathologic characteristics applicable to a particular case" (Radostits et al., 2000). However in first opinion practice a definitive diagnosis may not always be reached, yet decisions on how to proceed still have to be made. Lund et al. (1999) found that a diagnosis was only reached in 36% of consultations. This could be because data included transactions not involving a consultation or could represent difficulty in accurately coding a diagnosis.

In contrast, Brodbelt et al. (2011) looked at clinical coding of dog and cat consultations and found a diagnosis was recorded in 67% of cases. Even higher rates of diagnosis were identified by Hill et al. (2006), who found a diagnosis was reached for 77.6% of skin cases. The proportion of skin cases where a diagnosis was reached varied only slightly between species. However it is unclear how a diagnosis was defined in this study, and as several 4th and final year students were involved in data collection each may have had a different understanding of what constituted a diagnosis.

There are many possible reasons why these studies found such contrasting results. Hill et al. (2006) used direct observation, and so only true consultations, and not transactions which did not involve an animal were recorded. Additionally, direct observation by researchers rather than coding of a diagnosis by the consulting veterinary surgeon may have removed some difficulties encountered in diagnostic coding. Finally, given that only skin conditions were recorded in the second study, as opposed to all conditions, it may be that a higher proportion of skin complaints reach a final diagnosis, perhaps because these complaints are easier to visualise on clinical examination.

Taking all these factors into account, the proportion of consultations for which a diagnosis is reached is currently unknown, and may vary depending upon the type of problem, experience or expertise of the consulting veterinary surgeon, time pressure and financial constraints. Understanding the types of diagnosis made in clinical practice, and how frequently these are made will help to focus future research, by determining where decisions are made along the path from clinical presentation to definitive diagnosis. It will also provide a starting point to understanding the effects of making a diagnosis on the outcome of a case, which may help us answer the question: When is a diagnosis necessary? In medicine, it has been suggested that diagnoses are only useful where they change the action taken, eventual outcome of a case or provide a prognosis (Del Mar et al., 2006). However, where a diagnosis is made, determining which conditions are most frequently diagnosed will also help to direct research, by ensuring new research is likely to be of maximum benefit to practitioners.

The aim of this chapter was to determine the frequency with which a diagnosis was made, the types of diagnosis made, and which specific diagnoses were made for all problems discussed during first opinion small animal consultations.

6.2 Materials and Methods

The data collection tool and methods described in Chapter 3 were used to collect data on the type of diagnosis and specific diagnosis made. Definitions for diagnosis type (Appendix D), and the diagnosis dictionary (Appendix E) were utilised.

Descriptive statistics were generated using IBM® SPSS® Statistics 19. Pivot tables were used to generate frequency data for both diagnosis type and specific diagnosis. For further analysis of subsets of the dataset, e.g. by species or body system, the appropriate cases were selected by filtering out

cases which did not fit the criteria of interest prior to the generation of Pivot tables.

As in the previous chapter, data will be presented only for those problems which did not relate to preventive medicine. Where specific diagnoses are listed the 10 most frequently recorded diagnoses shall be displayed. The only exception to this is specific diagnosis within body system, where the 3 most frequently recorded diagnoses shall be displayed.

Data will be presented in the following order:

- Diagnosis type
    - For all problems, presenting and non-presenting problems
    - By species
    - By who raised the problem
    - By body system
- Specific Diagnosis
    - Number of problems for which two diagnoses were listed
    - For all problems, presenting and non-presenting problems
    - By species
    - By body system

All percentages shown will be based on the total number of problems discussed for that problem type, species or body system etc. unless otherwise stated.

6.3 Results

6.3.1 Diagnosis type

Of the 3206 non-preventive medicine problems, data were missing for 14 problems, 11 of which were presenting problems relating to elective

euthanasia consultations. Data on diagnosis type was available for the remaining 3192 problems (99.6%) with the number of presenting and non-presenting problems shown in Figure 14.

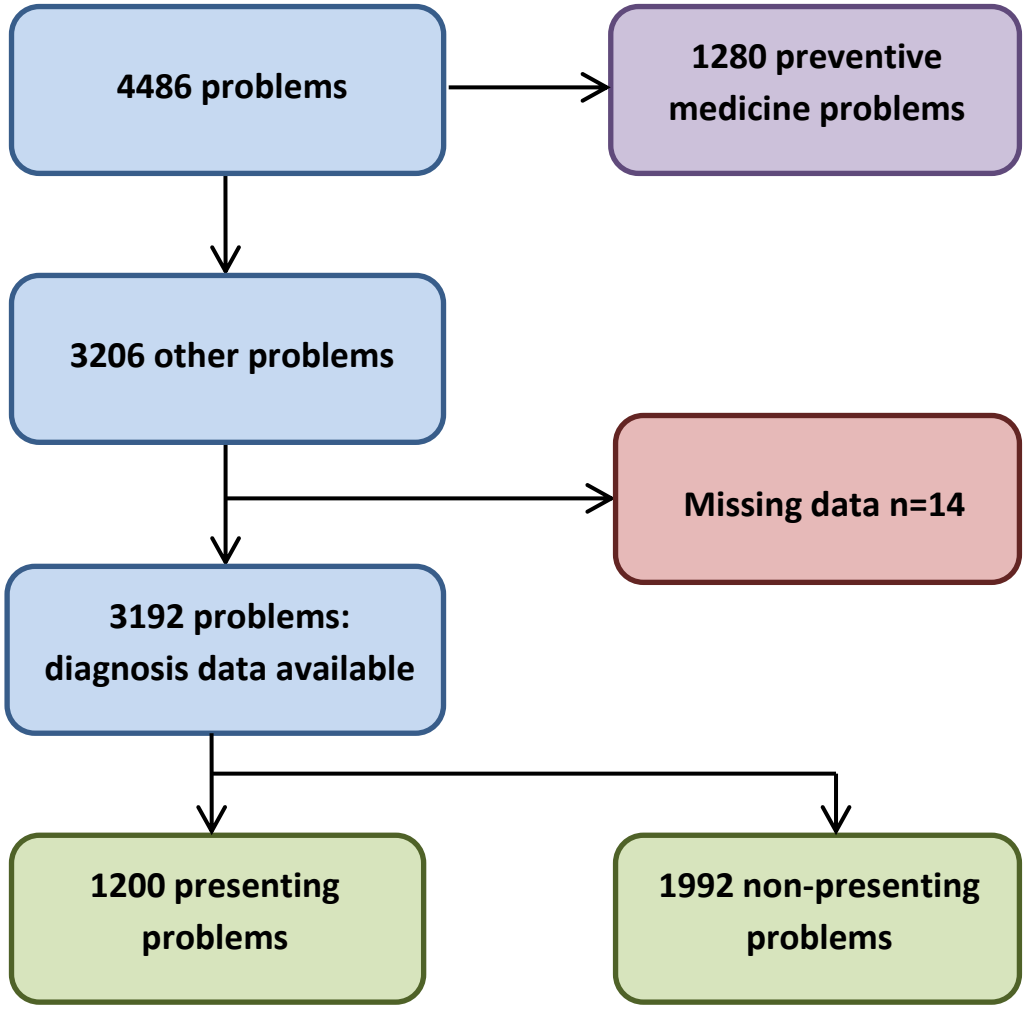


Figure 14. Flow chart showing the numbers of problems included in analysis of diagnosis type, including the number of presenting and non-presenting problems.

Definitive diagnoses were reached for approximately one-fifth of all problems (n=660; 20.7%), however they were reached more frequently for non-presenting problems (n=508; 25.5%) than presenting problems (n=152; 12.7%) (Table 32). Previous diagnosis was the most common diagnosis type (n=1116; 35.0%) with working diagnosis was the least common diagnosis type (n=70; 2.2%).

Table 32. The diagnosis type reached for all problems, presenting problems and non-presenting problems.

	All problems		Presenting		Non-presenting	
Diagnosis type	**n**	**%[1]**	**n**	**%[1]**	**n**	**%[1]**
Definitive	660	20.7	152	12.7	508	25.5
Working	70	2.2	53	4.4	17	0.9
Presumed	478	15.0	195	16.3	283	14.2
Open	868	27.2	251	20.9	617	31.0
Previous	1116	35.0	549	45.8	567	28.5
Total	**3192**	**100.0**	**1200**	**100.0**	**1992**	**100.0**

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total row).

Species

Figure 15 shows the number of problems for which data on diagnosis type were available for the 3 most frequently presented species.

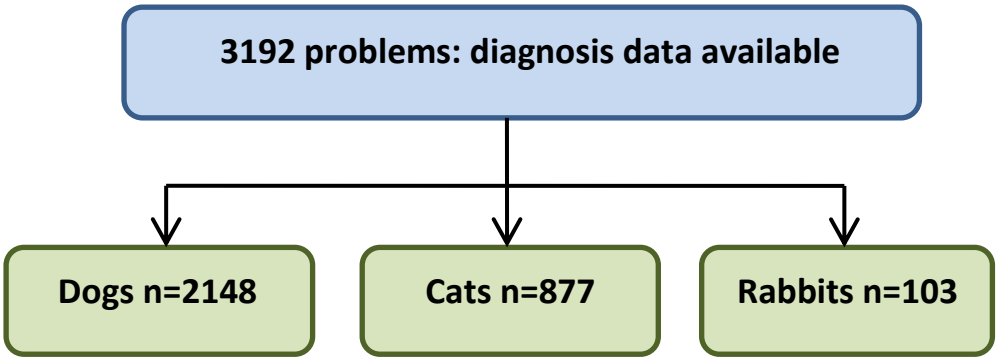


Figure 15. The number of problems for which data on diagnosis type were available for the 3 most frequently presented species.

In all species, previous and open diagnoses are the most common diagnosis types. Definitive diagnoses are reached less frequently (n=17; 16.5%) and presumed diagnoses more frequently (n=21; 20.4%) for rabbits than for other species (Table 33).

Table 33. Problems resulting in each diagnosis type for the 3 most frequently presented species.

	Dog		Cat		Rabbit	
Diagnosis type	**n**	**%[1]**	**n**	**%[1]**	**n**	**%[1]**
Definitive	444	20.7	189	21.6	17	16.5
Working	36	1.7	32	3.6	0	0.0
Presumed	329	15.3	110	12.5	21	20.4
Open	543	25.3	275	31.4	26	25.2
Previous	796	37.1	271	30.9	39	37.9
Total	**2148**	**100.0**	**877**	**100.0**	**103**	**100.0**

[1]Percentages shown are based on the total number of problems for each species (shown in the Total row).

Raised by

Figure 16 shows the number of problems raised by the owner or vet for which diagnosis data were available.

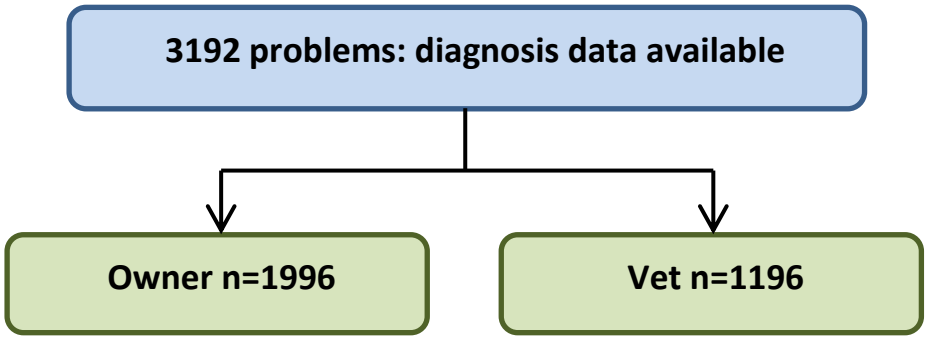


Figure 16. The number of problems for which data on diagnosis type were available for problems raised by the owner and veterinary surgeon.

Definitive diagnoses are reached more frequently for problems raised by the veterinary surgeon (n=286; 23.9%) than those raised by the owner (n=375; 18.8%). A similar pattern is seen for previous diagnoses (49.4% and 26.1% for problems raised by veterinary surgeon and owner respectively). Presumed and open diagnoses are more frequently reached for problems raised by the owner (20.6% and 32.3% presumed and open diagnoses respectively,

compared with problems raised by the veterinary surgeon (5.7% and 18.9% presumed and open diagnoses respectively) (Table 34).

Table 34. Diagnosis type reached from problems raised by the owner versus those raised by the veterinary surgeon.

	Owner		**Vet**	
Diagnosis type	**n**	**%**	**n**	**%**
Definitive	375	18.8	286	23.9
Working	45	2.3	25	2.1
Presumed	411	20.6	68	5.7
Open	644	32.3	226	18.9
Previous	521	26.1	591	49.4
Total	**1996**	**100.0**	**1196**	**100.0**

[1]Percentages shown are based on the total number of problems raised by owner or veterinary surgeon (shown in the row).

Body System

Diagnosis type made varied depending upon body system affected. Definitive diagnoses were made most frequently for dental (n=169; 64.5%) and least frequently for cardiovascular, neurological, endocrine and renal (all n=0; 0.0%) systems. Working diagnoses were made most frequently for endocrine (n=14; 17.1%) and least frequently for dental, endocrine, renal and haemopoetic (all n=0; 0.0%) systems. Presumed diagnoses were made most frequently for urinary (n=27; 32.9%) and least frequently for endocrine (n=2; 2.4%) systems. Open diagnoses were made most frequently for behaviour (n=82; 70.7%) and least frequently for haemopoetic (n=0; 0.0%) systems. Previous diagnoses were made most frequently for endocrine (n=65; 79.3%) and least frequently for behavioural (n=3; 2.6%) (Table 35).

Table 35. The proportion of problems affecting each body system resulting in each diagnosis type.

Diagnosis type		Skin	Gastrointestinal	Musculoskeletal	Dental	Eyes	Respiratory	Cardiovascular	Behavioural	Neurological	Reproductive	Urinary	Endocrine	Renal	Haemopoetic	Non-specific
Definitive	n	176	37	5	169	50	4	0	9	0	24	3	0	0	1	192
	%[1]	21.8	10.4	1.8	64.5	22.8	3.2	0.0	7.8	0.0	26.1	3.7	0.0	0.0	7.7	31.9
Working	n	7	9	10	0	0	11	3	0	2	6	4	14	3	0	3
	%[1]	0.9	2.5	3.7	0.0	0.0	8.7	2.5	0.0	1.8	6.8	4.9	17.1	7.1	0.0	0.5
Presumed	n	123	79	66	9	32	29	6	22	31	18	27	2	2	2	42
	%[1]	15.2	22.1	24.4	3.4	14.6	23.0	5.0	19.0	27.2	19.8	32.9	2.4	4.8	15.4	7.0
Open	n	171	105	36	2	35	48	81	82	39	13	17	1	9	0	273
	%[1]	21.1	29.4	13.3	0.8	16.0	38.1	67.5	70.7	34.2	14.3	20.7	1.2	21.4	0.0	45.4
Previous	n	332	127	154	82	102	34	30	3	42	30	31	65	28	10	91
	%[1]	41.0	35.6	56.8	31.3	46.6	27.0	25.0	2.6	36.8	33.0	37.8	79.3	66.7	76.9	15.1
Total	**n**	**809**	**357**	**271**	**262**	**219**	**126**	**120**	**116**	**114**	**91**	**82**	**82**	**42**	**13**	**601**

[1]Percentages shown are based on the total number of problems for each body system (shown in the Total n row).

6.3.2 Specific diagnosis

As with diagnosis type, data on specific diagnosis were available for 3192 non-preventive medicine problems (see Figure 14). Of the 3192 problems for which a diagnosis was applicable, at least one specific diagnosis was listed for 2324 problems (72.8%) and two specific diagnoses were listed for 288 problems (9.0%). As expected, the 868 problems for which no specific diagnosis was listed were problems which for which an open diagnosis was recorded.

Overall, presenting and non-presenting

Overweight/obese was the most common diagnosis made overall (n=210; 6.6%) as well as for non-presenting problems (n=207; 10.4%). Otitis externa was the most common diagnosis for presenting complaints (n=65; 5.4%), and many other skin conditions featured amongst the most common specific diagnoses. Periodontal disease was also a common diagnosis for non-presenting problems (n=186; 9.3%) (Table 36).

Species

The specific diagnoses made appear to differ between the species. Overweight/obese is a common diagnosis in all species (6.7%, 6.2% and 9.7% in dogs, cats and rabbits respectively). Dental disease is also common across all species in the form of periodontal disease (5.7% and 9.9% in dogs and cats respectively) or dental malocclusion (14.6% in rabbits). However, a number of species-specific diseases are also seen, e.g. iFLUTD (idiopathic feline lower urinary tract disease) in cats (2.7%) and *E. cuniculi* infection in rabbits (3.9%) (Table 37).

Table 36. The most frequently recorded specific diagnoses for all problems, presenting and non-presenting problem.

Problems	Total n	Diagnosis	n	%[1]
All	3192	Overweight/obese	210	6.6
		Periodontal disease	210	6.6
		Normal at present	152	4.8
		Osteoarthritis	126	3.9
		Otitis externa	108	3.4
		Wound	92	2.9
		Atopic dermatitis	82	2.6
		Pyoderma	54	1.7
		Conjunctivitis	46	1.4
		Hyperthyroidism	38	1.2
Presenting	1200	Otitis externa	65	5.4
		Wound	63	2.0
		Osteoarthritis	49	4.1
		Atopic dermatitis	42	3.5
		Pyoderma	36	3.0
		Abscess	34	2.8
		Conjunctivitis	32	2.7
		Gastroenteritis	26	2.2
		Soft tissue injury	25	2.1
		Corneal ulcer	22	1.8
Non-presenting	1992	Overweight/obese	207	10.4
		Periodontal disease	186	9.3
		Normal at present	134	6.7
		Osteoarthritis	77	3.9
		Otitis externa	43	2.2
		Atopic dermatitis	40	2.0
		Wound	29	1.5
		Lipoma	28	1.4
		Wart	27	1.4
		Flea infestation	25	1.3

[1]Percentages shown are based on the total number of problems for each problem type (shown in the Total n column).

Table 37. The 10 most frequently recorded specific diagnoses for the three most frequently presented species.

Species	Total n	Diagnosis	N	%[1]
Dog	2148	Overweight/obese	143	6.7
		Periodontal disease	123	5.7
		Osteoarthritis	107	5.0
		Normal at present	106	4.9
		Otitis externa	101	4.7
		Atopic dermatitis	78	3.6
		Wound	57	2.7
		Pyoderma	46	2.1
		Anal gland impaction	36	1.7
		Dietary indiscretion	36	1.7
Cat	877	Periodontal disease	87	9.9
		Overweight/obese	54	6.2
		Hyperthyroidism	38	4.3
		Wound	31	3.5
		Normal at present	25	2.9
		Abscess	24	2.7
		iFLUTD[2]	24	2.7
		Chronic renal failure	21	2.4
		Cystitis	19	2.2
		Osteoarthritis	19	2.2
Rabbit	103	Dental malocclusion	15	14.6
		Overweight/obese	10	9.7
		Gastrointestinal stasis	9	8.7
		Normal at present	8	7.8
		Cheyletiellosis	7	6.8
		Dacrocystitis	7	6.8
		Abscess	6	5.8
		Encephalitozoon cuniculi infection	4	3.9
		Upper respiratory tract infection	3	2.9
		Wound	2	1.9

[1]Percentages shown are based on the total number of problems for each species (shown in the Total n column).

[2]iFLUTD idiopathic Feline Lower Urinary Tract Disease

Body System

For some body systems one specific diagnosis accounts for a large proportion of problems, while for others the top 3 specific diagnoses still account for only a small proportion of all problems affecting that body system. Periodontal disease (n=210; 80.2%), osteoarthritis (n=126; 46.5%), and hyperthyroidism (n=38; 46.3%) all account for a large proportion of specific diagnoses made in their respective body systems (Table 38).

Table 38. Three most common specific diagnoses for each body system. Preventive Medicine has been excluded as diagnoses are not applicable for this system.

Body system	Total n	Specific diagnosis	n	%[1]
Skin	809	Otitis externa	108	13.3
		Wound	86	10.6
		Atopic dermatitis	82	10.1
Gastrointestinal	357	Anal gland impaction	37	10.4
		Dietary indiscretion	36	10.1
		Gastroenteritis	26	7.3
Musculoskeletal	271	Osteoarthritis	126	46.5
		Soft tissue injury	34	12.5
		Cranial cruciate ligament injury	27	10.0
Dental	262	Periodontal disease	210	80.2
		Dental malocclusion	15	5.7
		Fractured/chipped tooth	12	4.6
Eyes	219	Conjunctivitis	46	21.0
		Corneal ulcer	22	10.0
		Cataract	18	8.2
Respiratory	126	Cat flu	13	10.3
		Upper respiratory tract infection	9	7.1
		Kennel cough	7	5.6
Cardiovascular	120	Congestive heart failure	24	20.0
		Mitral valve degeneration	14	11.7
		Hypovolaemic shock	4	3.3
Behaviour	116	Normal at present	6	5.2
		Incomplete house training	5	4.3
		Noise phobia	3	2.6
Neurological	114	Deafness	15	13.2
		Idiopathic epilepsy	12	10.5
		Idiopathic vestibular syndrome	6	5.3
Reproductive	91	Mammary tumour	10	11.0
		Cryptorchid	7	7.7
		Pyometra	7	7.7

Urinary	82	Cystitis	25	30.5
		iIFLUTD[2]	24	29.3
		USMI[3]	11	13.4
Endocrine	82	Hyperthyroidism	38	46.3
		Diabetes mellitus	16	19.5
		Hyperadrenocorticism	9	11.0
Renal	42	Chronic renal failure	29	69.0
		Encephalitozoon cuniculi infection	2	4.8
		Nephrolithiasis	2	4.8
Haemopoetic	13	Lymphoma	5	38.5
		Hypertension	2	15.4
		Normal at present	2	15.4
Non specific	601	Overweight/obese	210	34.9
		Normal at present	48	8.0
		Side effect of treatment	12	2.0

[1]Percentages shown are based on the total number of problems for each body system (shown in the Total n column).

[2] iFLUTD idiopathic feline lower urinary tract disease

[3] USMI urethral sphincter mechanism incompetence

6.4 Discussion

Categorising diagnosis, even into a detailed series of definitions such as those used during this study, proved to be complex and challenging. Even when keeping a record of how previous problems had been recorded, often decisions regarding how a diagnosis should be categorised were not clear cut. For example, for the purposes of this study, a diagnosis of osteoarthritis was considered definitive if it was confirmed on radiography, whilst a diagnosis based on history and clinical examination alone would be considered presumptive. However, some veterinary surgeons may consider signalment, history and clinical examination to be sufficient for a definitive diagnosis in many cases. Others may consider even radiography insufficient, requiring further diagnostics such as joint taps and advanced imaging for a definitive

diagnosis. This leads us to the question: what is a diagnosis? Del Mar et al. (2006) suggested that a diagnosis was a label given to a disease which was used to help make management decisions and provide a prognosis. They noted that classification of diseases is changing all the time and the boundaries around a particular diagnosis are arbitrary. It may be that in fact there are many levels of diagnosis, for example, is a diagnosis of hyperadrenocorticism sufficient, or is it necessary to refine this diagnosis further to determine whether it is pituitary-dependent hyperadrenocorticism or adrenal-dependent hyperadrenocorticism? The answer to this question may vary depending upon the individual case and circumstances, for example, in a first opinion versus a referral setting. This leads on to another important question: Is a diagnosis necessary, and if so, what level of diagnosis? Del Mar et al. (2006) also addressed this question, discussing the usefulness of a diagnosis. They concluded that the function of a diagnosis was to aid the practitioner in the decision-making process by assisting them in selecting the most appropriate treatment, advice and prognosis for their patients. However they also noted that there may be circumstances within medicine where a diagnosis is not necessary in order to do this. For example, they noted that women with dysuria were likely to show resolution of their symptoms with a course of antibiotics regardless of the cause, therefore a diagnosis was usually unnecessary.

In order to consider whether a definitive diagnosis is necessary in veterinary medicine, we need further information on how making a diagnosis affects decision-making and influences the outcome of the consultation. This will be considered further in Chapter 7, alongside various other factors affecting the outcome of the consultation.

Definitive diagnosis is reached during the consultation for only a small proportion of problems, which fits with findings by Lund et al. (1999). Difficulties in categorising and coding diagnosis data represented a potential challenge for both the current study and that by Lund et al. (1999). The

diagnostic codes used by Lund et al. (1999) were adapted from the SNOMED codes developed for medicine, and it may be that there are challenges in utilising these codes in first opinion veterinary practices. Egenvall et al. (2009) discussed the limitations of insurance databases and noted that the assignment of non-specific codes including no diagnosis was often a common occurrence, which could also be due to failure to reach a definitive diagnosis, difficulties in coding or a combination of both. In addition, insurance databases only allow for submission of one diagnostic code. Results from Chapter 5 suggest that consultations involving only 1 problem are the exception rather than the rule; however results from the current chapter also suggest that assigning a single diagnosis for a single problem is not always possible. Therefore insurance databases may not be an appropriate source of data if we are interested in capturing the complexity of the consultation.

The VeNom coding group (VeNom, 2014) have also developed a list of diagnostic codes based on the SNOMED codes, which have been used in both referral and first opinion veterinary practice. Coding has the distinct advantage of ensuring all data can be recorded in the same way, which simplified collation and analysis of the data. The list of VeNom codes is extremely comprehensive and currently contains over 2000 diagnostic codes, so is likely to be highly useful in a referral hospital setting. However they may not necessarily be as useful in first opinion practice, particularly where definitive diagnosis is rare as suggested by the current study. Interestingly, a pilot study by Brodbelt et al. (2011) found that a diagnosis was recorded using the codes in 67% of dog and cats consultations. However, it is unclear how valid these diagnoses are, and how accurately they reflect the actual diagnosis. In addition, it is unclear whether the diagnostic code selected reflected the presenting problem or other problems discussed during the consultation. During the current study, the researcher initially used the VeNom codes as a starting point for the development of a diagnosis dictionary, however while they were very comprehensive and likely to be useful in a referral practice, they were found to have limited use for this

particular study. Many of the diagnoses listed were very specific (e.g. multiple different types of glomerulonephropathy, only diagnosable by renal biopsy). However, during this study, the small number of animals presenting with renal disease rarely received a definitive diagnosis and did not progress beyond having the body system affected identified. Diagnoses given were generally less specific e.g. chronic renal failure. Ensuring any list of codes to be used in first opinion practice includes terms at a suitable level of diagnosis is vital to ensuring they will be useful to both first opinion practitioners and veterinary researchers. VeNom codes are continually being added to and now incorporate a list of clinical signs as well as diagnostic codes. Given the low number of definitive diagnoses made during the current study, this may be the way forward in adapting diagnostic coding to a first opinion practice situation.

Surprisingly, definitive diagnoses were made more frequently for non-presenting versus presenting problems during the current study. However closer examination of the specific diagnoses made may shed some light as to why this may be the case. Overweight/obese and periodontal disease were the two most frequently recorded specific diagnoses for non-presenting problems, yet were not amongst the most common diagnoses for presenting problems. Both conditions can be easily and definitively diagnosed on clinical examination, perhaps explaining why these were frequently diagnosed as non-presenting problems. It may also be that these conditions are diagnosed as non-presenting problems as they are not prioritised as a reason for presentation by owners. Davies (2011) in the internet-based questionnaire of pet owners found that halitosis, a common sign of periodontal disease, was only considered to warrant a visit to the veterinary surgeon by 52.3% owners, which was lower than for any other clinical sign. Therefore such conditions may often be incidental findings identified by the veterinary surgeon during clinical examination. This could potentially explain why definitive diagnoses are more frequently reached for problems raised by the veterinary surgeon compared with those raised by the owner.

There appeared to be less certainty surrounding diagnosis in rabbits, with definitive diagnoses made less often and presumed more often than other species. This is perhaps unsurprising given than the results from Chapter 5, which revealed diagnostic tests were performed less frequently in this species. The potential issues surrounding health and attitudes towards veterinary treatment in this species have already been discussed in further depth in Chapter 5, however the results relating to diagnosis further confirm that rabbit consultations may be fundamentally different from those involving dogs and cats. Fewer problems are discussed, fewer diagnostics performed and fewer diagnoses made, therefore understanding why these differences exist is vital to understanding how veterinary surgeons can improve the welfare of this species. A qualitative study to determine the attitudes of owners and vets towards veterinary treatment of rabbits, perhaps in the form of questionnaires or focus groups, may help to shed some light on these differences.

Diagnosis type varied with body system; therefore the findings by Hill et al. (2006) that over three-quarters of skin conditions resulted in a diagnosis can likely not be extrapolated to problems affecting other body systems. The findings that open diagnoses were made for the majority of behavioural problems supports findings by Roshier and McBride (2013), who found that the majority of behavioural problems were not discussed in depth, if at all, nor were they investigated. It is unclear currently whether this is due to recommendations by the veterinary surgeon, or a decision not to investigate by the owner, and understanding this is vital to determining how behavioural problems can be best addressed. The results from Chapter 5 suggest these problems are usually discussed as non-presenting problems; therefore it may be that behavioural problems are rarely prioritised for discussion. The PAW 2013 report (PDSA, 2013) suggested that specific behavioural problems e.g. aggression and phobias, are now common in companion animals, despite the fact that these specific diagnoses were rarely reached during the current

study, even for behavioural problems. Chapter 7 will move on to look at outcomes of consultations, and will consider the impact of not making a diagnosis upon the actions taken for these problems. However, longer term outcomes of such cases is also important, and it may be that recognition of and discussion around behavioural problems at an early stage is more likely to result in successful long term management.

The specific diagnoses made show similarities to the results of other studies which have looked at caseload in first opinion practice, with otitis externa being amongst the most common specific diagnoses (Lund et al., 1999, Robotham and Green, 2004, Hill et al., 2006). Otitis externa and osteoarthritis as well as skin conditions such as atopic dermatitis and pyoderma all featured amongst the most common diagnoses for dogs in both the current study and that by Lund et al. (1999). Other skin conditions, including atopic dermatitis, pyoderma, abscess, lipoma and wart were frequently identified, either for all species or individual species in both the current study and previous literature (Lund et al., 1999, Hill et al., 2006). This is perhaps unsurprisingly given the finding in Chapter 5 that skin was the most frequently affected body system. Other specific diagnoses, such as osteoarthritis, Feline Lower Urinary Tract Disease(FLUTD), cystitis, abscesses and chronic renal failure reported by Lund et al. (1999) closely mirror those identified during the current study. This may suggest that while some local variation exists, commonly encountered conditions do not differ vastly between the UK and the USA, and have changed little over the past decade.

Many diagnoses made were species-specific e.g. idiopathic Feline Lower Urinary Tract Disease (iFLUTD) in cats and *Encephalitozoon cuniculi* infection in rabbits. This highlights the importance of looking at data for each individual species when formulating research priorities. While some specific diagnoses e.g. overweight/obese and periodontal disease may be more common overall as they are common across all species, the nature of these conditions may vary between species. This is the case for various companion animal diseases

e.g. the pathophysiology of diabetes mellitus differs considerably between dogs and cats (Rand et al., 2004). Therefore research into a disease in one species cannot necessarily be extrapolated to the same condition in other species. The results of this chapter can be used alongside those of Chapters 3 and 4 to identify common groups of patients with a particular diagnosis, as a starting point to generating a list of future research priorities. However, as definitive diagnoses are not made for most problems, veterinary surgeons frequently have to make decisions regarding a case without having reached a definitive diagnosis. Future research could also focus on clinical signs or 'syndromes' rather than specific diagnoses, thereby directing research towards decision-making points for which evidence is currently lacking.

The results will also be useful in guiding veterinary curriculum, by identifying diseases most commonly encountered in the species most frequently presented. However the low rate of definitive diagnosis suggests the curriculum may also need to focus more on dealing with clinical cases prior to reaching a diagnosis. For example, it may be justified to assign more teaching time to the approach to weight loss or innappetance in the cat than to the treatment and management of confirmed chronic renal failure in this species, as the latter situation is encountered less frequently. As with directing future research though, it is also important to consider not only which situation will be frequently encountered by a new graduate, but also which will represent the biggest challenge for a recently qualified vet.

Interesting, diagnoses associated with skin lumps were not amongst the most common diagnoses in dogs, despite skin lumps being the most common clinical sign and second most common exam abnormality in this species (Chapter 5). One explanation is that given the wide range of different conditions which could cause a skin lump, only a small number with each individual diagnosis were seen. However another explanation is that skin lumps in this species rarely reached a definitive diagnosis. This is consistent with findings by Trotman (2009), as is the finding that lipoma was a common

diagnosis reached for skin lumps. Given that a diagnosis may often not be reached there may be implications for interpreting diagnosis data on skin lumps from other sources, particularly laboratory databases. Trotman (2009) found that only 18.1% of lumps were sent for histopathological diagnoses, so data collected from these secondary sources are unlikely to be representative of a typical lump seen by a first opinion practitioner.

Some of the limitations of this study have been discussed in Chapter 4, however there are some limitations which apply specifically to diagnosis. The data were collected by observation and so were heavily dependent upon what the veterinary surgeon discussed with the owner during the consultation. For example if a veterinary surgeon has a clinical suspicion or 'gut feeling' regarding diagnosis, this will only be recorded if it is discussed with the owner so initial diagnostic suspicion may be missed. In addition, observer effect may particularly applicable to diagnosis, as presence of an observer could potentially affect the consideration of additional, more unusual diagnoses, willingness to commit to a diagnosis, or keenness to reach a diagnosis at the earliest opportunity. Another limitation of this study is that diagnoses, particularly those which are presumptive and for which gold standard tests have not been performed, may be inaccurate. While this is likely to be the case to some extent, consideration of only those conditions which have been definitively diagnosed with a gold standard test is likely to introduce even more bias, as conditions which can be easily diagnosed will be over-represented. Conditions which are not easily diagnosed (e.g. hypoadrenocorticism) or which present with vague clinical signs (e.g. lethargy) are likely already under-represented. Use of a series of definitions to give more information on the nature of the diagnosis appears to be a good solution to this as it does not exclude diagnoses which are 'less certain' yet still allows some assessment of the degree of evidence supporting a diagnosis.

6.5 Conclusions

Definitive diagnoses are made in the minority of consultations, therefore future research priorities may need to include questions focused around clinical signs, rather than simply diagnoses, in order to assist veterinary surgeons during decision-making. The low rate of definitive diagnoses may have implications for clinical coding using standardised nomenclature, as there may need to be a switch in focus from diagnostic codes to codes encompassing clinical presentations.

Chapter 7. Outcomes

7.1 Introduction

While there has been a growing amount of practice-based research within veterinary medicine over recent years, much of the focus has been on the patients and the conditions with which they are diagnosed, rather than the action taken or 'outcome' of the consultation. Measuring the decisions made for a particular condition is important from an evidence-based veterinary medicine perspective, as it helps determine how quickly, if at all, new evidence is being adopted by practitioners (Cockcroft and Holmes, 2003). In addition, focusing future research towards treatments could help address the information needs of practitioners. A recent study by Ebell et al. (2013) found that over half of the clinical questions raised by veterinary surgeons during the consultation related to treatments.

Within medicine there has been much more of a focus upon the efficacy of common interventions, particularly within the evidence-based movement. The Cochrane Library has been set up primarily to collate the best available evidence on the effects of interventions used to prevent, treat or manage disease (The Cochrane Collaboration, 2014). The James Lind Alliance also focuses on treatments, by developing research priorities on uncertainties surrounding treatment effects (JLA, 2014). The development of evidence-based medicine has also assisted in banishing the myth 'more is better' when it comes to treatment (Evans et al., 2011a). Rather than simply opting for the most intensive treatment option or combination of treatments, which may be associated with unpleasant side effects, more consideration is now given to the benefit:risk ratio of each treatment option prior to making a decision. It has been acknowledged that for some conditions watchful waiting i.e. monitoring only, is often the best course of action. These include non-severe acute otitis media in children (McCormick et al., 2005), prostate cancer (Holmberg et al., 2012) and inguinal hernia (Kendall and Murray, 2006).

A few studies have looked at the actions taken during veterinary consultations in a more focused way e.g. for skin problems (Hill et al., 2006), congestive heart failure (Cobb, 2011), antimicrobial prescribing (Radford et al., 2011) and glucocorticoid usage (O'Neill et al., 2012). Other research has focused on veterinary decision-making, using a combination of videotaping consultations and video-cued interviews of practitioners (Everitt, 2011). However little is known about the actions by veterinary surgeons across all consultations and conditions. Understanding the actions taken by veterinary surgeons, and the factors which influence this is a vital first step before further hypotheses surrounding decision-making can be generated and prioritised for future research. It is currently unclear whether watchful waiting is as frequently used in veterinary medicine as it is in medicine, or whether some form of treatment is perceived as necessary to give owners 'value for money'. It is also unknown whether there are conditions for which a wide range of different treatment and management options are administered, which in medicine is a good indicator that uncertainty surrounding treatment exists (Evans et al., 2011b). Frequent use of treatments which contradict the best evidence available may also suggest problems with awareness or implementation of this evidence by practitioners.

The aim of this chapter was to determine the types of outcome selected by veterinary surgeons for all problems discussed during the consultation. In addition, the specific outcomes selected will also be detailed. The effect of various factors on the outcome of the consultation will be examined, including the influence of making a diagnosis on the outcome of the consultation.

7.2 Materials and Methods

The data collection tool and methods described in Chapter 3 were used to collect data on the type of outcome and specific outcomes selected. Definitions for outcome type (Appendix D), and the specific outcomes dictionary (Appendix E) were utilised.

Descriptive statistics were generated using IBM® SPSS® Statistics 19. Pivot tables were used to generate frequency data. As described in the previous chapter, data will be presented only for those problems which did not relate to preventive medicine. Where specific outcomes are listed the 10 most frequently recorded outcomes will be reported. The exception to this shall be specific outcome by body system where the 3 most frequently recorded outcomes shall be displayed. Data will be presented in the following order:

- Outcome type
    - Number of problems with multiple outcome types recorded
    - For all problems, presenting and non-presenting problems
    - By species
    - By who raised the problem
    - By body system
    - By diagnosis type
- Specific outcome
    - Number of problems with multiple specific outcomes recorded
    - For all problems, and non-presenting problems
    - By outcome type
    - By species
    - By body system

Percentages shown for outcome type will be based on total number of outcome types selected for each problem type, species, body system etc. unless otherwise stated. Percentages shown for specific outcome will be

based on total number of problems discussed for each problem type, species etc. as in previous chapters unless otherwise stated.

7.3 Results

7.3.1 Outcome type

As with diagnosis data outcome type data were listed for 3192 of the 3206 presenting problems. Of the 14 problems for which data were missing, 11 were elective euthanasia consultations in which the researcher was not present for the full consultation. A total of 4112 outcomes types were selected for the 3192 problems (Figure 17).

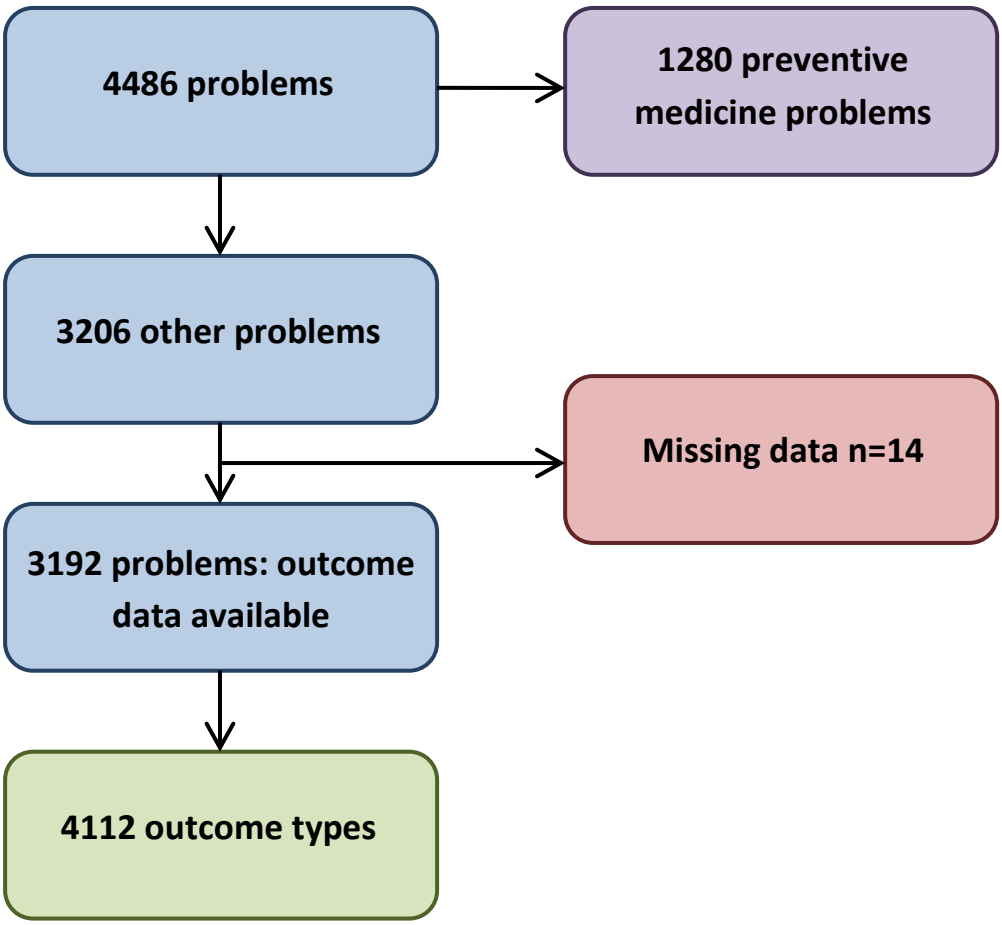


Figure 17. The number of outcome types discussed for all problems where outcome type data were available.

More than one outcome type was selected for 816 (25.6%) of problems, with up to 4 different outcome types selected in some cases (Table 39). The 2376 problems resulting in only one outcome type included 1101 problems where that outcome type was Nothing (other than non-specific monitoring).

Table 39. The number of outcomes types selected for all non-preventive medicine problems for which outcome type data were available.

No. outcomes types	**n**	**%**
1	2376	74.4
2	716	22.4
3	96	3.0
4	4	0.1
Total	**3192**	**100**

All problems, presenting problems and non-presenting problems

In total, 1811 outcome types were selected for the 1200 presenting problems and 2301 outcome types were selected for the 1992 non-presenting problems.

Therapeutic treatment was the most common outcome overall (n=1295; 31.5%) and for presenting problems (n=880; 48.6%), while management advice was more common for non-presenting problems (n=628; 27.3%). Referral (n=16; 0.4%) and euthanasia (n=64; 1.6%) were rare outcomes for all problems. An outcome of Nothing accounted for 26.8% (n=1101) of all outcomes taken. Nothing was a less common outcome for presenting problems (n=117; 6.5%) than for non-presenting problems (n=984; 42.8%) (Table 40).

Table 40. The outcome type selected for all problems, presenting and non-presenting problems.

	All problems		Presenting		Non-presenting	
Outcome type	**n**	**%[1]**	**n**	**%[1]**	**n**	**%[1]**
Therapeutic treatment	1295	31.5	880	48.6	415	18.0
Management	1061	25.8	433	23.9	628	27.3
Work up	333	8.1	229	12.6	104	4.5
Refer	16	0.4	8	0.4	8	0.3
Euthanasia	64	1.6	54	3.0	10	0.4
Other	242	5.9	90	5.0	152	6.6
Nothing	1101	26.8	117	6.5	984	42.8
Total	**4112**	**100**	**1811**	**100**	**2301**	**100**

[1]Percentages shown are based on the total number of outcome types selected for each problem type (shown in the Total row).

Outcomes classed as Other were mostly problems where the owner wished to consider the options further, where the animal was not presented by the owner, or where the veterinary surgeon decided to seek advice from another source.

Species

In total, 2787 outcome types were selected for the 2148 problems affecting dogs, 1120 outcome types were selected for the 877 problems affecting cats and 135 outcome types were selected in the 103 problems affecting rabbits.

Therapeutic treatment, management and nothing were the three most common outcomes for all three species. An outcome of Nothing was taken more often for dogs (n=759; 27.2%) and cats (n=302; 27.0%) than for rabbits (n=25; 18.5%). Management advice was given most commonly for problems affecting rabbits (n=46; 34.1%) and least frequently for those affecting cats (n=226; 20.2%). Euthanasia was most frequent in rabbits (n=8; 5.9%) (Table 41).

Table 41. The outcome types recorded for the 3 most frequently presented species.

	Dog		Cat		Rabbit	
Outcome type	**n**	**%[1]**	**n**	**%[1]**	**n**	**%[1]**
Therapeutic treatment	869	31.2	357	31.9	46	34.1
Management	772	27.7	226	20.2	46	34.1
Work up	198	7.1	130	11.6	2	1.5
Refer	14	0.5	1	0.1	0	0.0
Euthanasia	33	1.2	19	1.7	8	5.9
Other	142	5.1	85	7.6	8	5.9
Nothing	759	27.2	302	27.0	25	18.5
Total	**2787**	**100**	**1120**	**100**	**135**	**100**

[1]Percentages shown are based on the total number of outcome types selected for each species (shown in the Total row).

Raised by

In total, 2502 outcome types were selected for the 1996 problems raised by the owner, and 1610 outcome types were selected for the 1196 problems raised by the veterinary surgeon.

Therapeutic treatment was the most common outcomes for problem raised by both the owner and veterinary surgeon, followed by management advice and nothing (Table 42).

Table 42. The outcome types recorded for problems raised by the owner and veterinary surgeon.

	Owner		Vet	
Outcome type	**n**	**%[1]**	**n**	**%[1]**
Therapeutic treatment	814	32.5	481	30.0
Management	600	24.0	461	28.6
Work up	202	8.1	131	8.1
Refer	12	0.5	4	0.2
Euthanasia	54	2.2	10	0.6
Other	133	5.3	109	6.8
Nothing	687	27.5	414	25.7
Total	**2502**	**100**	**1610**	**100**

[1]Percentages shown are based on the total number of outcome types selected for problems raised by the owner or veterinary surgeon (shown in the Total row).

Body system

Outcome type varied considerably with body system affected. Therapeutic treatment was given most often for endocrine problems (n=65; 50.8%) and least often for behavioural problems (n=9; 6.6%). Management advice was given most often for behavioural problems (n=55; 40.1%) and least often for cardiovascular problems (n=3; 2.1%). Work up was conducted most often for endocrine problems (n=36; 28.1%) and least often for musculoskeletal problems (n=3; 0.8%). Referral was most common for musculoskeletal (n=3; 0.8%) and eye (n=2; 0.8%) problems and least common for dental, reproductive, urinary, endocrine, renal and haemopoetic problems (all n=0; 0.0%). Euthanasia was most common for haemopoetic problems (n=1; 6.9%) and least common for reproductive and endocrine problems (both n=0; 0.0%). Other outcomes were most common for renal problems (n=6; 10.2%) and least common for haemopoetic problems (n=0; 0.0%). Nothing (other than non-specific monitoring) was most common for cardiovascular problems (n=77; 53.1%) and least common for endocrine problems (n=1; 0.8%) (Table 43).

Table 43. Outcomes types selected for problems relating to each body system.

Outcome type		Skin	Gastrointestinal	Musculoskeletal	Dental	Eyes	Respiratory	Cardiovascular	Behavioural	Neurological	Reproductive	Urinary	Endocrine	Renal	Haemopoetic	Non-specific
Therapeutic treatment	n	419	191	176	75	99	56	34	9	45	28	51	65	20	8	95
	%[1]	38.9	38.7	45.4	23.9	38.8	35.7	23.4	6.6	32.8	23.9	43.6	50.8	33.9	50.0	13.8
Management	n	283	137	120	97	35	14	3	55	14	12	20	20	13	1	258
	%[1]	26.3	27.8	30.9	30.9	13.7	8.9	2.1	40.1	9.7	10.3	17.1	15.6	22.0	6.3	37.4
Work up	n	42	45	3	4	9	24	18	2	13	16	21	36	12	3	87
	%[1]	3.9	9.1	0.8	1.3	3.5	15.3	12.4	1.5	9.0	13.7	17.9	28.1	20.3	18.8	12.6
Refer	n	3	1	3	0	2	1	0	1	1	0	0	0	0	0	4
	%[1]	0.3	0.2	0.8	0.0	0.8	0.6	0.0	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.6
Euthanasia	n	4	10	7	3	1	2	2	5	8	0	1	0	3	1	20
	%[1]	0.4	2.0	1.8	1.0	0.4	1.3	1.4	3.6	5.5	0.0	0.9	0.0	5.1	6.3	2.9
Other	n	50	21	22	26	12	10	11	12	11	11	10	6	6	0	42
	%[1]	4.6	4.3	5.7	8.3	4.7	6.4	7.6	8.8	7.6	9.4	8.5	4.7	10.2	0.0	6.1
Nothing	n	277	88	57	109	97	50	77	53	53	50	14	1	5	3	183
	%[1]	25.7	17.8	14.7	34.7	38	31.8	53.1	38.7	36.6	42.7	12.0	0.8	8.5	18.8	26.6
Total	**n**	**1078**	**493**	**388**	**314**	**255**	**157**	**145**	**137**	**145**	**117**	**117**	**128**	**59**	**16**	**689**

[1]Percentages shown are based on the total number of outcome types selected for each body system (shown in the Total n row).

Diagnosis type

Outcome type varied considerably depending upon the Diagnosis type made. Therapeutic treatment and no action were selected less frequently and management advice more frequently for definitive diagnoses compared with presumed diagnoses (Table 44). Unsurprisingly, work up was selected most frequently for Working diagnoses.

Table 44. The outcomes types selected for problems resulting in each diagnosis type.

		Definitive	**Working**	**Presumed**	**Open**	**Previous**
Therapeutic treatment	n	220	27	219	180	649
	%[1]	27.6	24.5	35.1	16.6	43.3
Management	n	315	10	146	163	427
	%[1]	39.5	9.1	23.4	15.1	28.5
Work up	n	15	70	0	177	71
	%[1]	1.9	63.6	0.0	16.3	4.7
Refer	n	3	0	2	6	5
	%[1]	0.4	0.0	0.3	0.6	0.3
Euthanasia	n	5	0	15	25	19
	%[1]	0.6	0.0	2.4	2.3	1.3
Other	n	39	3	44	80	76
	%[1]	4.9	2.7	7.1	7.4	5.1
Nothing	n	200	0	198	452	251
	%	25.1	0.0	31.7	41.7	16.8
Total		**797**	**110**	**624**	**1083**	**1498**

[1]Percentages shown are based on the total number of outcome types selected for each diagnosis type (shown in the Total row).

7.3.2 Specific outcome

As with outcome type data, data on specific outcomes were missing for 14 problems. Specific outcomes of monitoring only were listed for 1101 of the 3192 problems (34.5%), all of which were those problems where an outcome type of Nothing (other than non-specific monitoring) was selected. More than one specific outcome was recorded for 982 problems (30.8%), with up to 5 specific outcomes selected for some problems (Table 45).

Table 45. Number of different specific outcomes listed for all problems for which data were available. The total for 1 specific outcome includes 1101 problems where 'monitoring only' was the only specific outcome listed.

No. specific outcomes	n	%
1	2210	69.2
2	574	18.0
3	296	9.3
4	73	2.3
5	39	1.2
Total	**3192**	**100**

[1]Percentages shown are based on the total number of problems discussed (shown in the Total row).

Outcome Type

Medications including antibiotics (n=386; 29.8%) were among the most common therapeutic treatments, while dietary advice (n=509; 48.0%) was the most common management advice given (Table 46).

All problems, presenting and non-presenting

Antibiotics were the most common specific outcome for presenting problems (n=339; 28.3%), while dietary advice was given more frequently for non-presenting problems (n=366; 18.4%). Non-steroidal anti-inflammatory drugs (n=330; 10.3%), topical treatments (n=214; 6.7%) and blood tests (n=194;

6.1%) were also common specific outcomes for all problems discussed (Table 47).

Table 46. The 10 most frequently selected specific outcomes for outcome types where different specific outcomes were possible.

Outcome type	Total n	Specific outcomes	n	%[1]
Therapeutic treatment	1295	Antibiotics	386	29.8
		NSAIDs[2]	330	25.5
		Topical treatment	214	16.5
		Steroid	118	9.1
		Pain relief	82	6.3
		Hormone control (non-repro)[3]	61	4.7
		Soft tissue surgery	51	3.9
		Fluid therapy	49	3.8
		Dental procedure	36	2.8
		Empty anal glands	35	2.7
Management	1061	Dietary advice	509	48.0
		Bathing/cleaning	134	12.6
		Exercise advice	132	12.4
		Nutraceutical	76	7.2
		Ear cleaner	69	6.5
		Dental hygiene	54	5.1
		Buster collar	52	4.9
		Grooming/coat brushing	38	3.6
		Behavioural modification	36	3.4
		Bandaging	30	2.8
Work up	333	Blood test	194	58.3
		Radiography	47	14.1
		Urinalysis	46	13.8
		Ultrasound	26	7.8
		Histopathology	19	5.7
		Swab (culture and sensitivity)	13	3.9
		Fine needle aspirate	8	2.4
		Swab (in-house microscopy)	7	2.1
		Faecal examination	7	2.1
		Endoscopy	6	1.8

[1]Percentages shown are based on the total number of problems discussed resulting in each outcome type (shown in the Total n column).

[2]NSAIDs Non-steroidal anti-inflammatory drugs

[3]Hormone control (non-repro) Therapeutic control of non-reproductive hormones

Table 47. The 10 most frequently recorded specific outcomes for all problems, presenting and non-presenting problems.

Problems	Total n	Diagnosis	n	%[1]
All	3192	Dietary advice	509	15.9
		Antibiotic	386	12.1
		NSAIDs[2]	330	10.3
		Topical treatment	214	6.7
		Blood test	194	6.1
		Bathing/cleaning	134	4.2
		Exercise advice	132	4.1
		Steroid	118	3.7
		Pain relief	82	2.6
		Nutraceutical	76	2.4
Presenting	1200	Antibiotic	339	28.3
		NSAIDs[2]	271	22.6
		Topical treatment	145	12.1
		Dietary advice	143	11.9
		Blood test	126	10.5
		Bathing/cleaning	99	8.3
		Steroid	93	7.8
		Exercise advice	79	6.6
		Buster collar	50	4.2
		Fluid therapy	43	3.6
Non-presenting	1992	Dietary advice	366	18.4
		Topical treatment	69	3.5
		Blood test	68	3.4
		NSAIDs[2]	59	3.0
		Exercise advice	53	2.7
		Antibiotic	49	2.5
		Nutraceutical	44	2.2
		Ear cleaner	39	2.0
		Bathing/cleaning	35	1.8
		Steroid	25	1.3

[1]Percentages shown are based on the total number of problems discussed for each problem type (shown in the Total n column).

[2]NSAIDs Non-steroidal anti-inflammatory drugs

Species

Antibiotics, dietary advice and NSAIDs were the three most common specific outcomes for all three species. All three of these outcomes were selected more frequently in rabbits than in dogs or cats (Table 48).

Table 48. The 10 most frequently recorded specific outcomes for the three most frequently presented species. Only 6 were recorded for rabbit problems.

Species	Total n	Specific outcome	n	%[1]
Dog	2148	Dietary advice	359	16.7
		Antibiotic	233	10.8
		NSAIDs[2]	216	10.1
		Topical treatment	176	8.2
		Exercise control	121	5.6
		Blood test	104	4.8
		Bathing/cleaning	92	4.3
		Steroid	85	4.0
		Nutraceutical	67	3.1
		Ear cleaner	64	3.0
Cat	877	Antibiotic	130	14.8
		Dietary advice	117	13.3
		NSAIDs[2]	99	11.3
		Blood test	90	10.3
		Bathing/cleaning	35	4.0
		Steroid	33	3.8
		Topical treatment	28	3.2
		Hormone control (non-repro)[3]	28	3.2
		Fluid therapy	24	2.7
		Pain relief	24	2.7
Rabbit	103	Dietary advice	27	26.2
		Antibiotic	16	15.5
		NSAIDs[2]	15	14.6
		Topical treatment	10	9.7
		Burr teeth	8	7.8
		Bathing/cleaning	6	5.8

[1]Percentages shown are based on the total number of problems discussed for each species (shown in the Total n column).

[2]NSAIDs Non-steroidal anti-inflammatory drugs

[3]Hormone control (non-repro) Therapeutic control of non-reproductive hormones

Body system

Specific outcomes by body system affected are often body system specific e.g. anal gland expression for gastrointestinal problems; behavioural modification for behavioural problems. However others are common across body systems e.g. dietary advice; antibiotics (Table 49).

Table 49. The three most frequently recorded specific outcomes for each body system.

Body system	Total n	Specific outcome	n	%[1]
Skin	809	Antibiotic	178	22.0
		Topical treatment	121	15.0
		Bathing/cleaning	105	13.0
GI	357	Dietary advice	121	33.9
		Antibiotic	77	21.6
		Empty anal glands	35	9.8
MSK	271	NSAIDs[2]	140	51.7
		Dietary advice	64	23.6
		Nutraceutical	51	18.4
Dental	262	Dietary advice	65	24.8
		Dental hygiene	54	20.6
		Dental procedure	36	13.7
Eyes	219	Topical treatment	88	40.2
		NSAIDs[2]	22	10.0
		Bathing/cleaning	19	8.7
Respiratory	126	Antibiotic	34	26.9
		Radiography	13	10.3
		Steroid	12	9.5
Cardiovascular	120	Diuretics	19	15.8
		Inodilator	18	15.0
		ACE Inhibitor[3]	13	10.8
Behaviour	116	Behavioural modification	36	31.0
		Pheromone diffuser	9	7.8
		Refer	4	3.4
Neurological	114	NSAIDs[2]	16	14.0

		Antiepileptic	13	11.4
		Blood test	8	7.0
Reproductive	91	Antibiotic	13	14.3
		NSAIDs[2]	7	7.7
		Soft tissue surgery	5	5.0
Urinary	82	NSAIDs[2]	25	30.5
		Dietary advice	18	22.0
		Urinalysis	17	20.7
Endocrine	82	Hormone control (non-repro)[4]	58	70.7
		Blood test	34	41.5
		Dietary advice	18	22.0
Renal	42	Prescription diet	13	31.0
		Blood test	10	23.8
		ACE Inhibitor[3]	6	14.3
Haemopoetic	13	Chemotherapy	3	23.1
		Blood test	2	15.4
		Steroid	2	15.4
Non specific	601	Dietary advice	229	38.1
		Blood test	64	10.6
		Antibiotic	35	5.8

[1]Percentages shown are based on the total number of problems discussed for each body system (shown in the Total n column).

[2]NSAIDs Non-steroidal anti-inflammatory drugs

[3]ACE Inhibitor Angiotensin converting enzyme inhibitor

[4]Hormone control (non-repro) Therapeutic control of non-reproductive hormones

7.4 Discussion

An outcome of Nothing or 'watchful waiting' accounts for around a quarter of all outcomes seen. This suggests that the watchful waiting, which has become common practice in evidence-based medicine, is also a common outcome in veterinary consultations. It should be remembered that a decision to take no action is still a decision in itself and often requires a decision making process just as in-depth as that for any situation where an action is taken. It is unclear

why watchful waiting was more common for non-presenting than presenting problems, though this could in part be due to prioritisation of the presenting complaint. Everitt (2011) looked at decision-making in consultations and noted that whilst clients frequently entered into discussion with veterinary surgeons resulting in a change in treatment plan, it was rare for them to refuse treatment altogether. Therefore the decision to take no action may be due to veterinary advice following a discussion of the options with the owner, rather than an owner refusal to treat. However this is currently speculation and further work could identify the types of cases where watchful waiting occurs, and investigate the decision-making process which leads to this outcome. Future research could also focus on the eventual long-term outcome of these cases in terms of disease progression, and help identify specific conditions where watchful waiting may have been beneficial.

Around three-quarters of outcomes involve some sort of advice or intervention. Several different outcome types or specific outcomes are often seen, further highlighting the complexity of the consultation. Given the frequency with which multiple problems are discussed as highlighted in Chapter 5, and the complexity of the outcomes seen, means decision-making is likely a complicated process.

Therapeutic treatment is the most common outcome, with multiple specific outcomes common, meaning polypharmacy may also be common. This has implications for future research, as animals on other treatments are often excluded from many intervention studies which may not be reflective of the reality of practice. For example Haggstrom et al. (2008) conducted a randomised controlled trial to compare the effect of pimobendan with that of benazepril hydrochloride on survival time in dogs with myxomatous mitral valve disease. Only certain cardiac treatments i.e. diuretics and digoxin were permitted during the trial, and the use of other therapeutic treatments was not permitted. However Davies (2009) surveyed veterinary surgeons and found that 91.1% of general practitioners and 100.0% of veterinary

cardiologists would treat a case of myxomatous mitral valve disease using polypharmacy. In addition, 35.7% of general practitioners and 83.3% of veterinary cardiologists stated they would have used both pimobendan and benazepril, with or without other medications, as part of their treatment plan. In addition, the current study also found that co-morbidity is common (see Chapters 4 and 5), which add further complexity to the issue of polypharmacy, as multiple drugs may be administered not only for a single condition, but also for other concurrent conditions.

When considering future research, priorities should not only focus on therapeutic treatments of disease. Management advice, particularly dietary advice is the most common veterinary recommendation made. This is perhaps unsurprising given that overweight/obese and periodontal disease were such common diagnoses (see Chapter 6). However evaluating owner compliance with and understanding of such recommendations is vital to ensure such recommendations are having the appropriate impact on animal health. Yaissle et al. (2004) found than only 32 out of 60 dogs recruited to a weight loss plan completed it suggesting that compliance with dietary advice, at least for obesity in dogs, is poor. Management and in particular dietary advice is given most frequently for rabbits, which may be due to the nature of diseases affecting this species. The PAW 2013 report (PDSA, 2013) found that rabbits fared worse than cats and dogs in terms of environment, diet, companionship, health and overall welfare. Therefore it may be that many of the conditions discussed in rabbits are in fact linked to poor husbandry and management, and so management advice is the most appropriate intervention. This is supported by the results of Chapter 6, which revealed many conditions thought to be linked with poor management to be amongst the most frequently diagnosed in rabbits e.g. dental malocclusion (Harcourt-Brown, 1996).

Euthanasia was a relatively rare outcome, which is consistent with findings by Evans et al. (1974). The option of euthanasia has frequently been cited as one

of the ways in which veterinary medicine differs from human medicine, and a potential obstacle to whether we can compare the decision-making process in the two fields (Everitt, 2011). While this should still be a consideration, it may be less of an issue than initially thought, as the vast majority of problems do not result in this outcome. However, it should be remembered that the use of direct observation may underestimate the number of consultations resulting in euthanasia, as these consultations, usually of a sensitive nature, may have been booked in with vets not currently being observed in order to avoid ethical issues.

Rabbits were the species most frequently euthanized which appears to fit closely with some of the discussions from other chapters. Fewer problems are discussed in these animals, possibly because they are prey species able to hide disease, so presenting problems may be more serious and likely to be prioritised. Therefore, many of these animals may be at an advanced state of disease, meaning euthanasia is often the most appropriate option. Veterinary surgeons may also feel they have limited treatment options in this species (Nielsen et al., in press) so uncertainties about treatments, lack of treatment options, or other factors such as financial implications could explain the higher rate of euthanasia.

Management advice was the most frequent outcome for behavioural problems in this study, yet therapeutic treatment was rare, which may be due to the limited medications available for treatment of these conditions. Interestingly, it has been suggested pharmacotherapy, alongside behavioural modification, may have a vital role in the treatment of many behavioural conditions, however this is only appropriate if a diagnosis is reached (Overall, 2001). Given that the majority of behavioural problems in the current study resulted in an open diagnosis (Chapter 6), this could explain why therapeutic treatment was so rarely given.

Referral was a rare outcome which is particularly interesting as much previous research has gathered data from referral practice. While such studies may provide useful information on referral caseload for that particular centre, they are unlikely to be representative of cases seen in first opinion practice particularly as so few are referred. Referral bias is previously been highlighted as a potential problem (Bartlett et al, 2010) and even if caseload in referral practice were reflective of first opinion practice, there may be differences in the outcome of cases. Davies (2009) asked veterinary practitioners and referral cardiologists how they would manage canine congestive heart failure, and found significant differences between the two groups of veterinary surgeons. Therefore, further research based in first opinion practice rather than referral practice needs to be conducted if we are to have an evidence base which is useful to general practitioners.

Antibiotics were amongst the most common specific outcomes for all species with usage highly variable between body systems, which is consistent with findings by Radford et al. (2011). Skin conditions were amongst those frequently treated with antibiotics in the current study, which fits with findings by Hill et al. (2006). However usage of these drugs and antimicrobial resistance in companion animals has caused recent controversy (Bhumbra, 2012). The British Small Animal Veterinary Association (BSAVA), in conjunction with the Small Animal Medicine Society (SAMSoc) produced the PROTECT guidelines relating to antimicrobial use to address these concerns (BSAVA, 2013). However, it was acknowledged that many of these recommendations are likely to change as new evidence comes to light.

Surprisingly, steroids were not among the most common treatments for skin conditions in the current study in contrast to findings by Hill et al. (2006). This may be due to advances in veterinary medicine and the availability of new treatments for atopic dermatitis, such as cyclosporine. Hill et al. (2006) also found ectoparasiticides to be a common treatment for skin conditions, a finding which was not echoed by the current study. This may be because

ectoparasiticides are used more frequently as a preventive treatment than as a therapeutic treatment. The PAW 2013 report (PDSA, 2013) found that 71% of dogs and 78% of cats are given at least some preventive treatment for fleas, and this proportion could potentially be even higher in a vet-visiting population such as that being studied.

The diagnosis type appears to have an impact on the outcome selected with higher rates of management advice, and lower rates of therapeutic treatment, for definitive compared with presumed diagnoses. This may partly be due to the type of condition as common conditions which can be easily definitively diagnosed e.g. periodontal disease and overweight/obese, are amenable to management changes such as diet and dental hygiene. Understanding the relationship between diagnosis and the outcome of the consultation is beyond the scope of the current study, but provides an interesting starting point from which theories around decision-making can be developed. It is also currently unclear how making a diagnosis, and the outcome selected based upon this, influences the eventual outcome of the case. Understanding whether making a diagnosis ultimately improves patient health longer term will help to identify when making a diagnosis is and isn't important. A quantitative study following cases over a longer period of time could help identify types of cases where making a diagnosis is crucial to improving outcome.

There are many potential limitations to this research, most of which have been discussed in previous chapters. However there are some limitations which specifically apply to outcomes. The Hawthorne effect (Eckmanns et al., 2006) which relates to a change in behaviour when being observed, may be a particular problem for this aspect of the study. Having a second veterinary surgeon in the consultation room may have influenced the decisions made by either owner or veterinary surgeon. For example, a veterinary surgeon may have been more likely to encourage diagnostic work-up for a particular case if they felt it was the 'correct' way to do things, rather than relying on clinical

suspicion. Additionally, while the study records what happens during the consultation, it cannot tell us why these particular decisions were made. This is particularly important when considering outcome, as previous research has suggested this decision is influenced by factors such as the owner to a large extent (Everitt, 2011). Factors such owner preferences, cost, facilities or treatments available and temperament of the animal may all influence the feasibility of a particular treatment plan. Further research, for example qualitative analysis of videotaped consultations to examine decision-making, is needed to understand this process in greater depth.

7.5 Conclusions

The results provide an overview of the interventions veterinary surgeons currently commonly use. While outcome appears to change with diagnosis type made, the effect of making a diagnosis on decision-making during the consultation, and longer term outcome of the case is still unclear, and warrants further investigation. Further analysis could pinpoint conditions for which there is considerable variability in the interventions given, which could help identify areas of uncertainty surrounding treatment.

Chapter 8. Preventive medicine consultations

8.1 Introduction

Previous studies have shown preventive medicine to be one of the most common aspects of veterinary medicine discussed during the first opinion small animal consultation (Hill et al., 2006). However, the degree to which preventive medicine dominates the workload of the veterinary surgeon may be a relatively new phenomenon. Evans et al. (1974) surveyed BSAVA members and found that vaccination consultations accounted for 11% of small animal consultations in total, while other types of preventive medicine were not recorded as a reason for consultation. Additionally, the domination of preventive medicine in the veterinary caseload may be unique to companion animal practice, as a small-scale pilot study looking at farm animal caseload by Ecroyd (2011) suggested preventive medicine to be rarely performed by the large animal veterinary surgeon.

Despite preventive medicine, and vaccination in particular, accounting for a large proportion of the veterinary caseload, the PAW 2013 report (PDSA, 2013) suggested that many animals were still not receiving preventive care. Many animals had never been vaccinated, neutered, microchipped, wormed or given flea preventatives, with a range of reasons given for not seeking these preventive treatments. However as the PDSA study surveyed all pet owners, some of whom were not registered with a veterinary practice (ranging from 10% of dogs to 44% of rabbits), it is difficult to extrapolate these results to a vet-visiting population.

Much concern has surrounded the results of the PAW report 2011 in terms of the risk of preventable infectious diseases and parasites (Vet Record, 2013). However the potential role of the preventive medicine consultation in addressing other aspects of health has not yet been addressed. Examining the preventive medicine consultation in further depth, to look at the types of

additional problems discussed, may provide further information about the role these consultations play in the overall health and welfare of the patient. Previous research has suggested that the preventive medicine consultation may be fundamentally different to other types of consultation in terms of communication style and content (Shaw et al., 2008). Therefore in order to understand preventive medicine consultations, it is vital to examine these separately from other consultations. Banyard (1998) looked at the general health of cats and dogs presenting for vaccination and found that 52% of animals were suffering from concurrent disease. Roshier and McBride (2013) videotaped canine annual booster vaccination consultations and found behavioural problems were frequently raised during these consultations. Examination of all types of preventive medicine consultations in all species, for all types of additional problems, may reveal more about the importance of these consultations in addressing concurrent disease. There has been much recent controversy surrounding vaccination, particularly with regards to the vaccination interval (Day et al., 2010) however, the vaccination consultation may have a role to play in other aspects of the animal's health and welfare.

The aim of this chapter was to determine the types of preventive medicine for which animals are presented, and describe preventive medicine consultations and other consultations in terms of the signalment of the patient and the types of additional problem discussed. Much of this chapter will therefore focus on the other aspects of animal health and welfare discussed during the preventive medicine consultation, rather than the preventive medicine procedure itself.

8.2 Materials and Methods

Data were generated using the data collection tool developed in Chapter 3. The data collection form, definitions (Appendix D) and dictionaries (Appendix E) detailed in Chapter 3 were used where appropriate.

Descriptive statistics were generated using IBM® SPSS® Statistics 19. Cases were split into two separate datasets, one where the presenting complaint was preventive medicine and the other where the presenting complaint did not relate to preventive medicine. The problem summary field, rather than consult type or body system field, was used to identify whether the presenting problem related to preventive medicine or not for consistency, as this was the method used to identify and exclude preventive medicine problems during Chapters 4, 5 and 6. Following split of the data into two separate datasets, frequency data were generated using Pivot tables.

Data will be presented in the following order:

- Types of preventive medicine consultations
- Comparison of preventive medicine and non-preventive medicine consultations
    - Consultations
        - Number of animals
        - Clinical exam type, abnormalities and weighing
    - Patients
        - Species
        - Age
        - Sex/Neutering status
    - Problems (non-presenting)
        - Problem number
        - Problem type
        - Raised by
        - Body system
        - Diagnosis type and specific diagnosis
        - Outcome type and specific outcome

Where data is shown from both types of consultations, data is only shown for non-presenting problems as presenting problems were excluded from the

analysis. This decision was made as the consultations were divided into the two separate groups on the basis of their presenting problems, and also because results from Chapters 4, 5 and 6 suggest that presenting problems appear to be fundamentally different from non-presenting problems. Throughout the results section, for simplicity the two groups shall be referred to as 'preventive medicine' (meaning all animals where preventive medicine was the reason for presentation) and 'other' (meaning all animals where the reason for presentation did not relate to preventive medicine).

As during Chapters 4, 5 and 6, non-presenting problems which relate to preventive medicine shall be removed from both data sets from problem type onwards. This is because many of the aspects of the problems being considered (e.g. clinical signs, diagnosis type), do not apply to preventive medicine problems.

Percentages shown for consultations and patients will be based upon the total number of animals presenting for preventive medicine consultations or other consultation unless otherwise stated. Percentages shown for non-presenting problems will be based upon the total number of non-presenting problems discussed for each consultation type, problem type, species etc. unless otherwise stated.

8.3 Results

Figure 18 shows the number of animals presenting for preventive medicine consultations versus the number of animals presenting for other types of consultations, as well as the total number of problems discussed for each of these. These will be the numbers used throughout this results section unless otherwise stated.

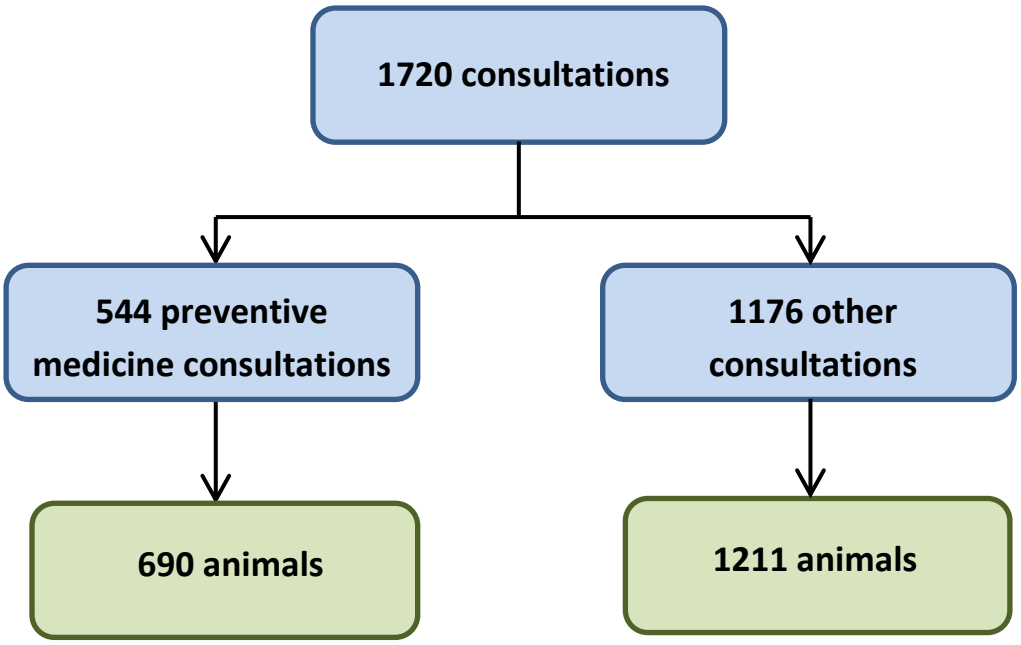


Figure 18. The number of animals presenting for preventive medicine consultations versus other types of consultations.

8.3.1 Types of Preventive Medicine consultations

Preventive medicine procedure

Vaccination is the most common presenting problem during preventive medicine consultations (n=572; 82.9%) (Table 50).

Table 50. The type of preventive medicine procedure for which the animal was presented (n=690 animals).

Preventive medicine procedure	n	%[1]
Vaccination	572	82.9
Routine check/advice	68	9.9
Clip nails	12	1.7
Admit (for prophylactic surgery)	11	1.6
Rabies serology	10	1.4
Discharge (after prophylactic surgery)	8	1.2
Prophylactic parasiticides	3	0.4
Prevention of season	3	0.4
Prevention of pregnancy	2	0.3
Microchip placement	1	0.1
Total	**690**	**100**

[1]Percentages shown are based on the total number of animals presenting for preventive medicine procedures (n=690).

Type of vaccination

Booster vaccinations (n=392; 65.0%) in dogs and cats are the most common vaccination consultations, whilst primary vaccination courses (n=119; 19.7%) involving these species are also frequently conducted (Table 51).

Table 51. The specific vaccinations requested for animals where vaccination was the reason for presentation.

Type of vaccination	n	%[2]
Booster[1]	392	65.0
Primary course (1st vaccination)[1]	60	10.0
Primary course (2nd vaccination)[1]	59	9.8
Kennel cough (Intranasal)	36	6.0
Restart (vaccines lapsed)	28	4.6
Myxomatosis (rabbits)	17	2.8
Viral haemorrhagic disease (rabbits)	7	1.2
Rabies (primary or booster)	4	0.7
Total	**603**	**100**

[1] administration of multivalent vaccinations in dogs and cats.

[2]Percentages shown are based on the total number of vaccinations requested (n=603) in all animals presented for vaccination (n=572).

The most common combination of vaccinations was booster vaccination and intranasal kennel cough vaccination, which was the reason for presentation in 24 dogs.

8.3.2 Comparison data: Consultations and Patients

Multiple animals

Multiple animals were presented more frequently in preventive medicine consultations (n=116; 21.3%) compared with other consultations (n=32; 2.7%). Up to 7 animals were presented in one preventive medicine consultation, whilst 4 was the maximum number of animals presented in other consultations (Table 52).

Table 52. The number of animals presented in for preventive medicine consultations versus other types of consultations.

No. animals per consult	Preventive medicine n	Preventive medicine %[1]	Other n	Other %[1]
1	428	78.7	1144	97.3
2	99	18.2	30	2.6
3	10	1.8	1	0.1
4	3	0.6	1	0.1
5	3	0.6	0	0.0
6	0	0.0	0	0.0
7	1	1.8	0	0.0
Total	**544**	**100**	**1176**	**100**

[1]Percentages shown are based on the total number of preventive medicine consultations or other consultations (as shown in the Total row).

Consultation length

Consultation length was recorded for 75 preventive medicine consultations, with a median length of 9 minutes and 35 seconds. A sample of 107 other consultations generated a median length of 9 minutes 56 seconds (Figure 19).

Clinical Examination

Data on the clinical examinations were available for 690 (100.0%) animals presenting for preventive medicine consultation and 1199 (99.0%) animals presenting for other types of consultations. Of the 12 consultations where clinical examination data were missing, 11 were elective euthanasia consultations for which the researcher was not present. Full clinical examinations are performed in the majority of preventive medicine consultations (n=604; 87.5%), while focused clinical examinations are frequently performed in other types of consultation (n=543; 45.3%) (Table 53).

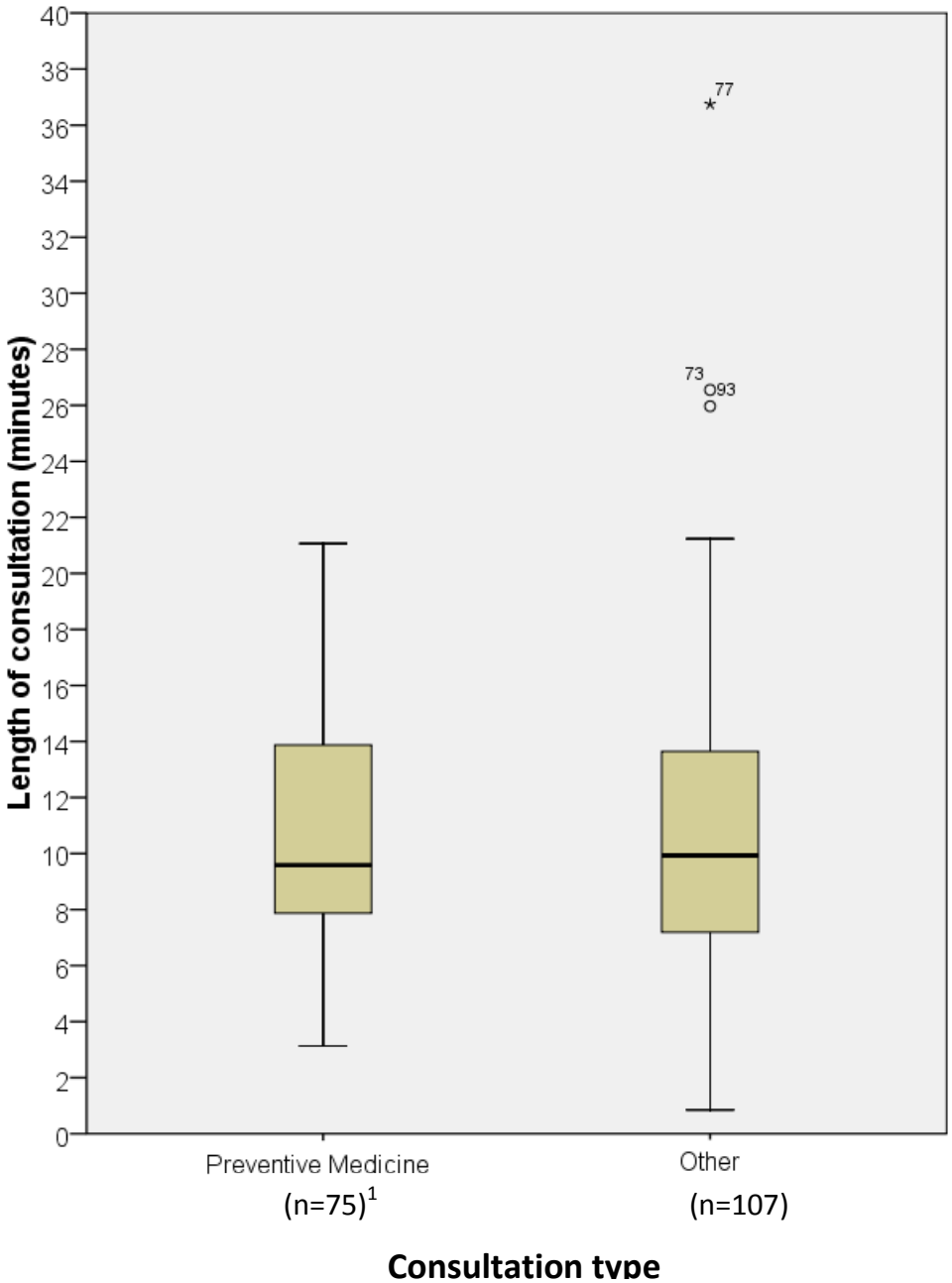


Figure 19. The length of preventive medicine consultations versus other consultations for consultations which were timed. The bottom and top of the boxes represent the first and third quartiles, while the line within the box represents the median. The top and bottom of the lines represent the highest and lowest values, excluding any outliers which are shown as individually numbered data points.

[1]Number of timed consultations shown in brackets below each consultation type

Table 53. The types of clinical examination performed in preventive medicine versus other consultations.

	Preventive medicine		Other	
Clinical exam type	**n**	**%[1]**	**n**	**%[1]**
Full	604	87.5	541	45.1
Focused	51	7.4	543	45.3
None	35	5.1	115	9.6
Total	**690**	**100**	**1199**	**100**

[1]Percentages shown are based on the total number of animals presenting for preventive medicine consultations or other consultations (as shown in the Total row).

At least one abnormality was detected on clinical examination in 394 (57.1%) preventive medicine consultations and 951 (79.3%) other consultations. In total, 414 (60.0%) animals presented for a preventive medicine consultations were weighed, and 485 (40.5%) animals presented for another type of consultation were weighed.

Species

Species of animal presented were relatively similar between the preventive medicine and other consultations (Table 54).

Table 54. The number of animals presenting for preventive medicine versus other types of consultations.

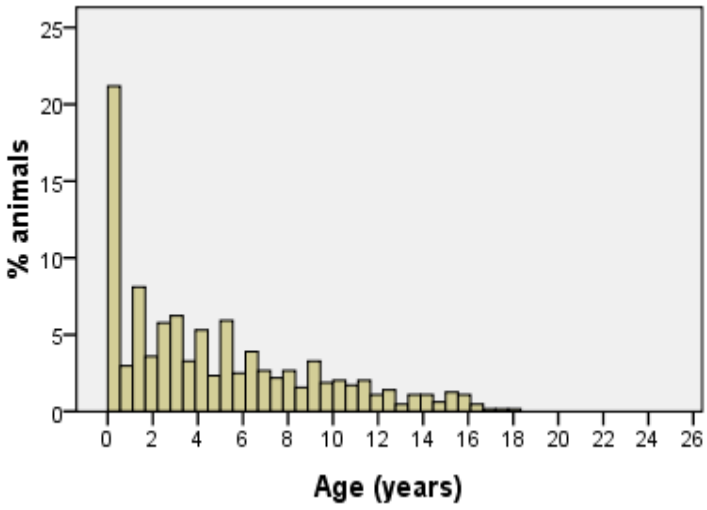
	Preventive medicine		Other	
Species	**n**	**%[1]**	**n**	**%[1]**
Dog	443	64.2	792	65.4
Cat	192	27.8	333	27.5
Rabbit	42	6.1	48	4.0
Rodent	5	0.7	25	2.1
Bird	0	0.0	12	1.0
Ferret	8	1.2	0	0.0
Reptile	0	0.0	1	0.1
Total	**690**	**100**	**1211**	**100**

[1]Percentages shown are based on the total number of animals presenting for preventive medicine consultations or other consultations (as shown in the Total row).

Age

Data for age according to the clinical records was complete for 642 (93.0%) animals presenting for preventive medicine consultations and 1133 (93.6%) animals presenting for other consultations. Young animals under a year of age were presented more frequently in preventive medicine (Figure 20a) than other consultations (Figure 20b).

a)

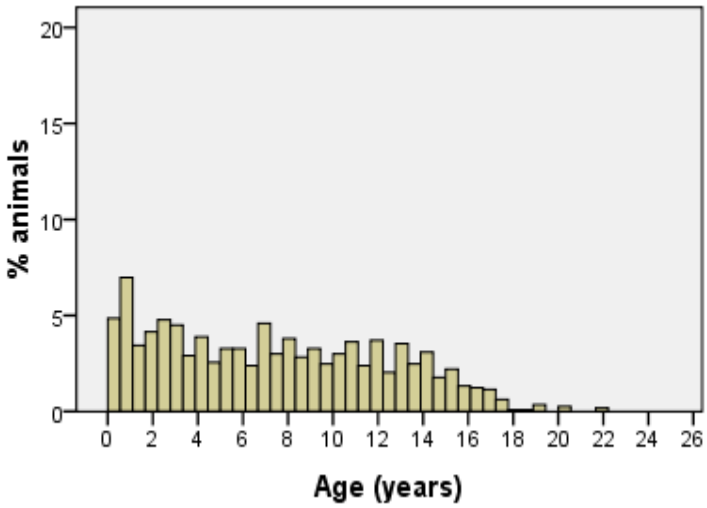


Preventive medicine (n=642)

Median = 3.6

IQR = 1.2-7.5

b)



Other (n=1133)

Median = 7.0

IQR = 2.9-11.5

Figure 20. Age distribution of animals presenting for preventive medicine consultation (a) versus other consultations (b)

Sex/Neutering status

Data were complete for sex and neutering status according to clinical records for 659 (95.5%) animals presenting for preventive medicine, and 1152 (95.1%) animals presenting for other consultation types. The sex/neutering status of animals presented for preventive medicine consultations was similar to those presented for other consultations (Table 55).

Table 55. Sex/neutering status of animals presenting for preventive medicine versus other types of consultations.

Consult type	Total n	Sex	n	%[1]	Neuter status	n	%[1]
Preventive medicine	659	Female	335	50.8	Entire	168	25.5
					Neutered	167	25.3
		Male	324	49.2	Entire	148	22.5
					Neutered	176	26.7
					Total	**659**	**100**
Other	1152	Female	565	49.0	Entire	248	21.5
					Neutered	317	27.5
		Male	587	51.0	Entire	238	20.7
					Neutered	349	30.3
					Total	**1152**	**100**

[1]Percentages shown are based on the total number of animals presenting for preventive medicine consultations or other consultations (as shown in the Total n column).

8.3.3 Comparison data: Problems

Problem number

There appeared to be a tendency for more problems to be discussed during preventive medicine consultations compared with other types of consultation (Figure 21).

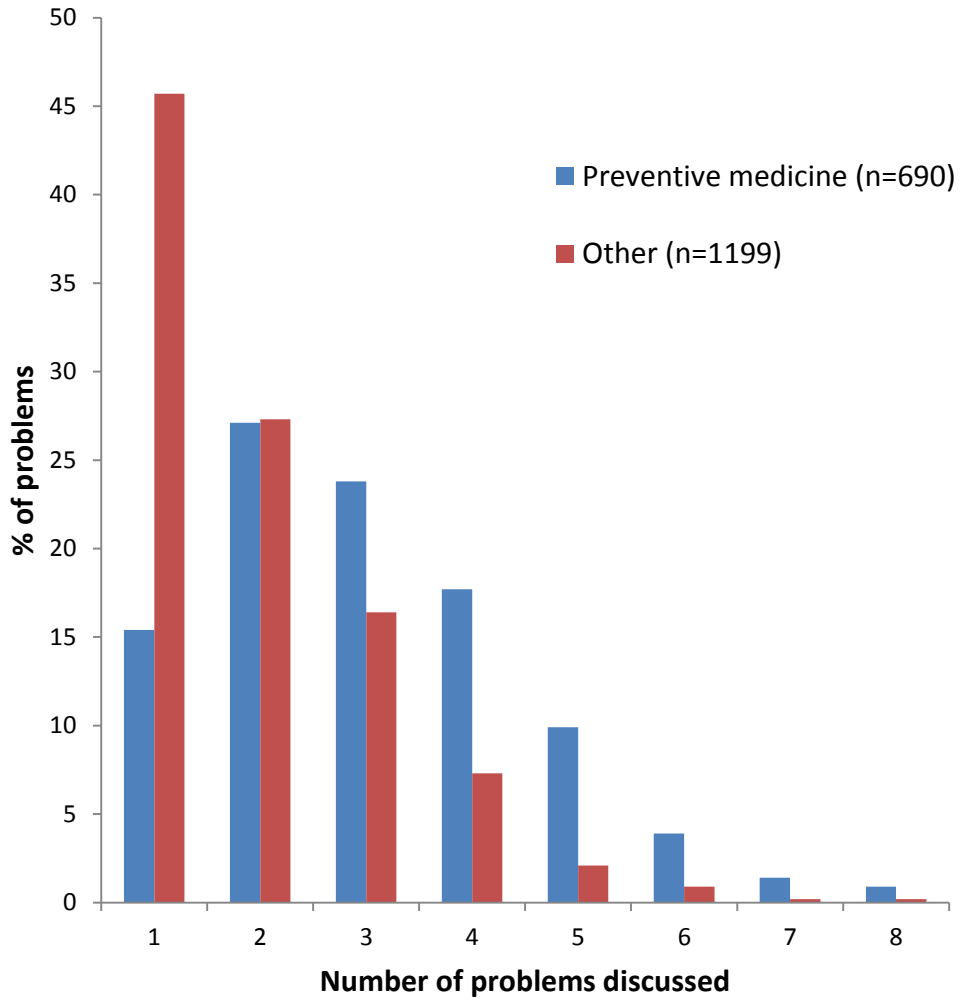


Figure 21. The number of problems discussed during preventive medicine versus other types of consultations.

The total number of problems discussed in each consultation type is shown in Figure 22. The non-presenting problems discussed during preventive medicine consultations (n=1390) shall now be compared with the non-presenting problems discussed during other types of consultations (n=1193).

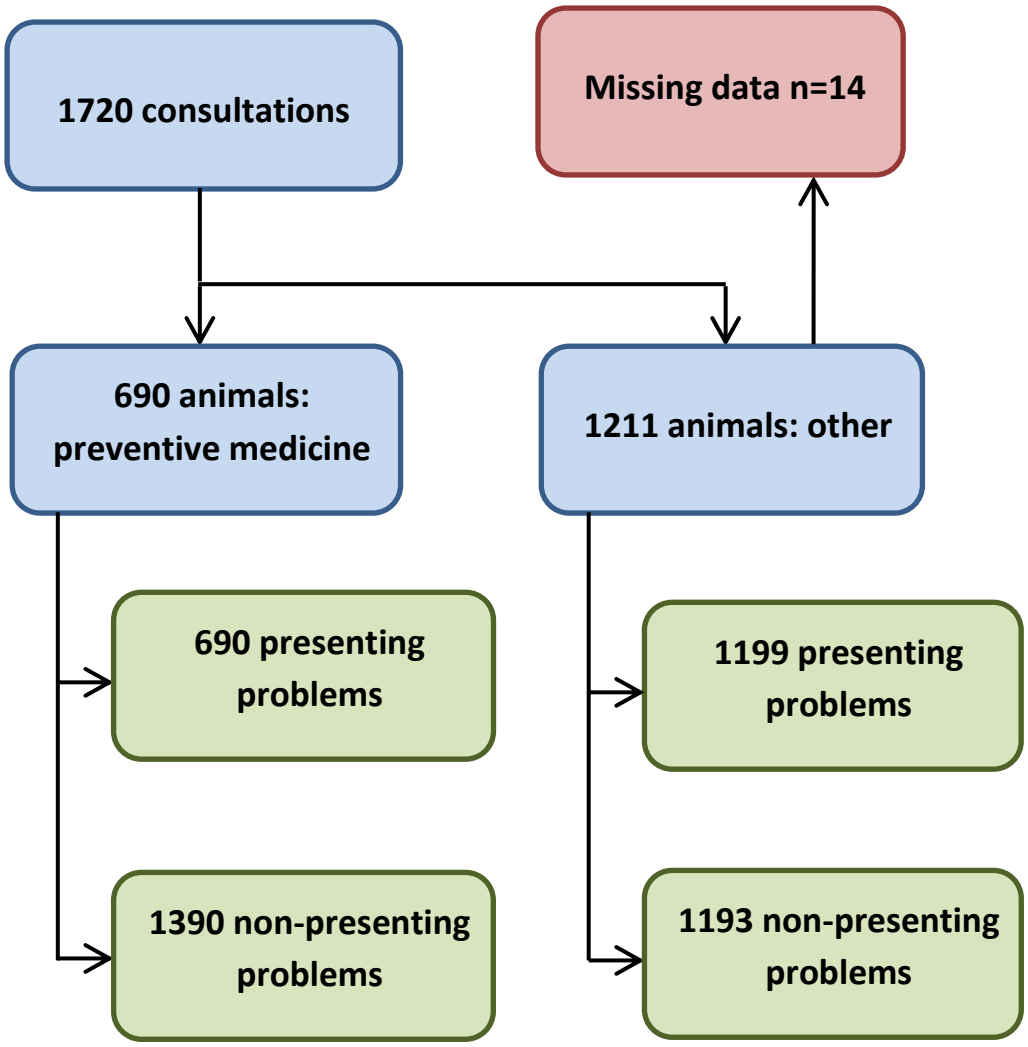


Figure 22. The number of problems discussed for all animals presenting for preventive medicine consultations and other consultations.

Problem type

New problems (as non-presenting problems) are frequently discussed in both types of consultation (45.5% and 47.9% in preventive medicine and other consultations respectively), while pre-existing problems are discussed less frequently in preventive medicine consultations (n=310; 22.3%) than in other consultations (n=479; 40.2%). Other aspects of preventive medicine are discussed more frequently in preventive medicine (n=447; 32.2%) than other (n=143; 12.0%) consultations (Table 56).

Table 56. Problem types of non-presenting problems discussed during preventive medicine consultations versus other consultations.

	Preventive medicine		Other	
Problem type	**n**	**%[1]**	**n**	**%[1]**
New problem	633	45.5	571	47.9
Pre-existing problem	310	22.3	479	40.2
Preventive medicine	447	32.2	143	12.0
Total	**1390**	**100**	**1193**	**100**

[1]Percentages shown are based on the total number of non-presenting problems discussed during preventive medicine consultations or other consultations (as shown in the Total row).

Non-presenting problems relating to preventive medicine account for a large proportion of problems in both types of consultation, and many of the other factors of interest e.g. raised by and diagnosis do not apply to preventive medicine. Therefore non-presenting problems relating to preventive medicine shall now be removed from both the preventive medicine consultations and other consultations dataset (Figure 23).

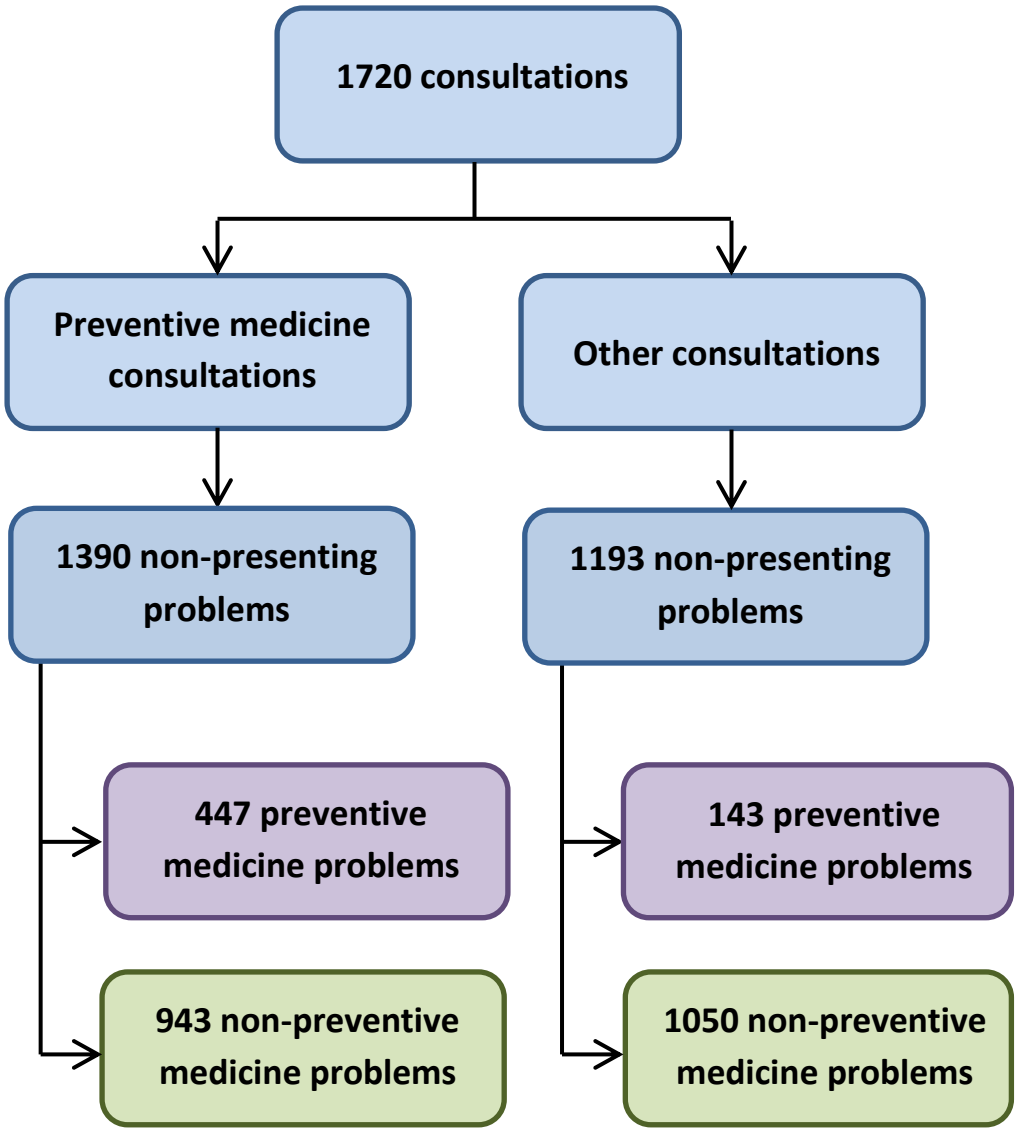


Figure 23. The numbers of non-presenting problems discussed in preventive medicine consultations and other consultations which relate to preventive medicine and which do not. Problems relating to preventive medicine shall be excluded from the remaining analysis.

Raised by

Slightly more problems were raised by the veterinary surgeon during preventive medicine consultations compared with other consultations. For preventive medicine consultations, 567 (60.1%) were raised by the owner, and the remaining 376 (39.9%) were raised by the veterinary surgeon. For other consultations, 709 (67.5%) were raised by the owner and the remaining 341 (32.5%) were raised by the veterinary surgeon.

Body system

Dental and behavioural problems are discussed more frequently in preventive medicine consultations compared with other consultations. Gastrointestinal, musculoskeletal, neurological, endocrine and renal problems are discussed less frequently in preventive medicine compared with other consultations (Figure 24).

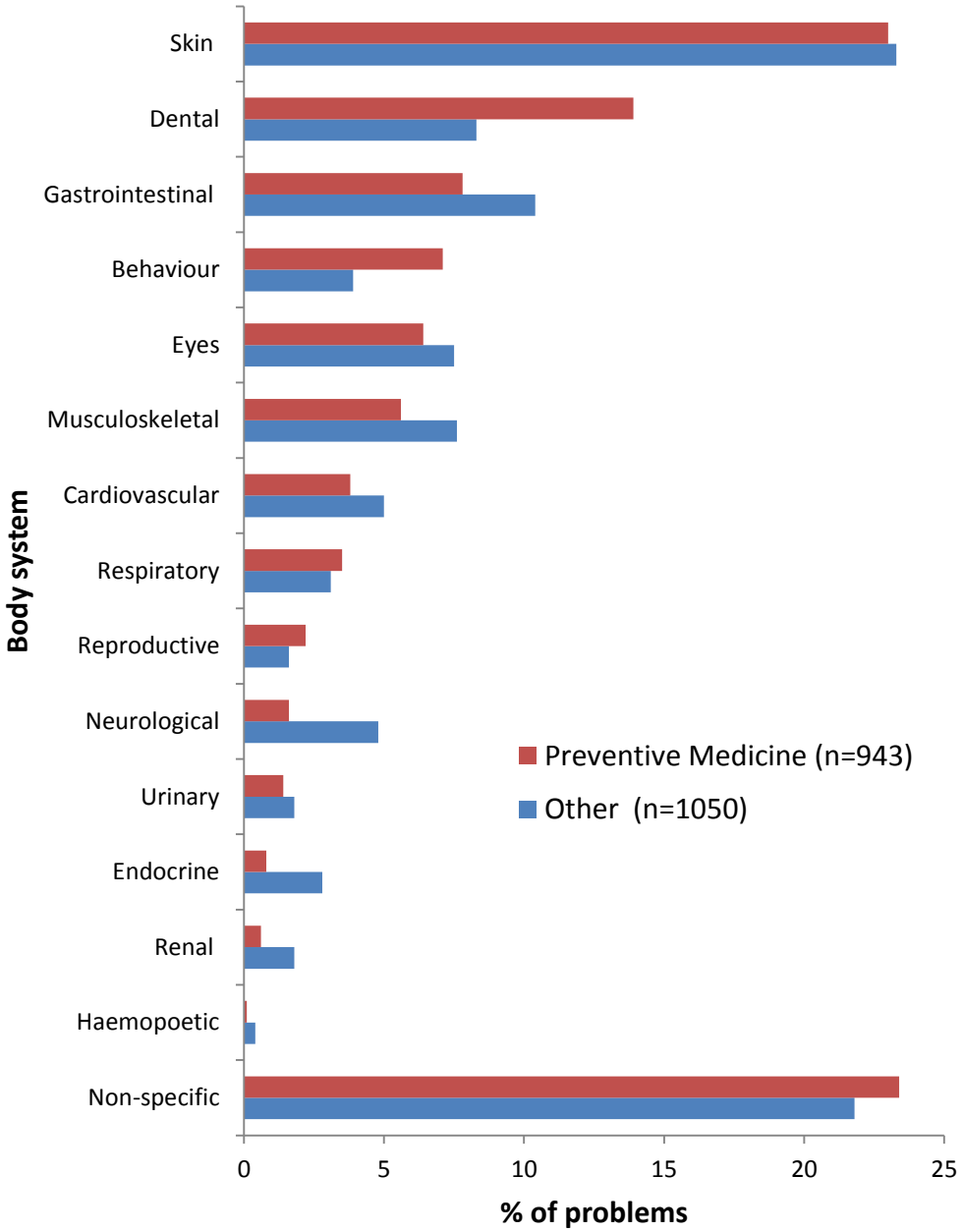


Figure 24. Body system affected by additional problems discussed in preventive medicine consultations, versus additional problems discussed in other consultations.

Diagnosis Type

Definitive diagnoses are reached more frequently during preventive medicine consultations (n=322; 34.1%) than during other consultations (n=186; 17.7%) (Table 57).

Table 57. Diagnosis type reached from problems discussed in preventive medicine consultations versus problems discussed in other consultations.

	Preventive medicine		Other	
Diagnosis type	**n**	**%[1]**	**n**	**%[1]**
Definitive	322	34.1	186	17.7
Working	5	0.5	12	1.1
Presumed	122	12.9	161	15.3
Open	268	28.4	350	33.3
Previous	226	24.0	341	32.5
Total	**943**	**100**	**1050**	**100**

[1]Percentages shown are based on the total number of non-presenting non-preventive medicine problems discussed during preventive medicine consultations or other consultations (as shown in the Total row).

Specific diagnosis

The four most common specific diagnoses made are periodontal disease, overweight/obese, normal at present and osteoarthritis in both types of consultation. Flea infestation is a common diagnosis is preventive medicine consultations (n=19; 2.0%) but does not feature amongst the most common diagnoses is other consultations (Table 58).

Table 58. The 10 most common specific diagnosis made for non-presenting non-preventive medicine problems discussed during preventive medicine consultations and other consultations.

Consultation type	Total n	Diagnosis	n	%[1]
Preventive medicine	943	Periodontal disease	117	12.4
		Overweight/obese	111	11.8
		Normal at present	84	8.9
		Osteoarthritis	32	3.4
		Otitis externa	23	2.4
		Flea infestation	19	2.0
		Atopic dermatitis	18	1.9
		Wound	15	1.6
		Wart	12	1.3
		Lipoma	7	0.7
Other	1050	Overweight/obese	96	9.1
		Periodontal disease	69	6.6
		Normal at present	50	4.8
		Osteoarthritis	45	4.3
		Atopic dermatitis	22	2.1
		Lipoma	21	2.0
		Otitis externa	20	1.9
		Wart	15	1.4
		Wound	14	1.3
		Hyperthyroidism	13	1.2

[1]Percentages shown are based on the total number of non-presenting non-preventive medicine problems discussed during preventive medicine consultations or other consultations (as shown in the Total n column).

Outcome type

Management advice is given more frequently in preventive medicine (n=365; 32.5%) than other (n=263; 22.3%) consultations. Therapeutic treatment and diagnostic work up are performed less frequently in preventive medicine consultations than other consultations (Table 59).

Table 59. The outcome types reached for non-presenting problems discussed during preventive medicine consultations versus non-presenting problems discussed during other consultations.

	Preventive medicine		Other	
Outcome type	**n**	**%[1]**	**n**	**%[1]**
Therapeutic treatment	164	14.6	251	21.3
Management	365	32.5	263	22.3
Work up	28	2.5	76	6.5
Refer	5	0.4	3	0.3
Euthanasia	0	0.0	10	0.8
Other	66	5.9	86	7.3
Nothing	495	44.1	489	41.5
Total	**1123**		**1178**	

[1]Percentages shown are based on the total number of outcome types selected for non-presenting non-preventive medicine problems during preventive medicine consultations or other consultations (as shown in the Total row).

Specific outcome

While dietary advice is the most common outcome in both types of consultations, the top 10 specific outcomes are otherwise fairly different. Management outcomes such as dietary advice, exercise advice, dental hygiene and behavioural modification are all given for a larger proportion of problems discussed in preventive medicine than other consultations (Table 60).

Table 60. The 10 most common specific outcomes recorded for non-presenting problems discussed during preventive medicine and other consultations.

Consultation type	Total n	Outcome	n	%[1]
Preventive medicine	943	Dietary advice	206	21.8
		Exercise advice	40	4.2
		Dental hygiene	38	4.0
		Topical treatment	29	3.1
		Ear cleaner	25	2.7
		Behavioural modification	24	2.5
		Bathing/cleaning	23	2.4
		Blood test	19	2.0
		Nutraceutical	17	1.8
		Dental procedure	16	1.7
Other	1050	Dietary advice	160	15.2
		Blood test	49	4.7
		NSAIDs[2]	46	4.4
		Topical treatment	40	3.8
		Antibiotic	39	3.7
		Nutraceutical	27	2.6
		Steroid	18	1.7
		Ear cleaner	14	1.3
		Exercise advice	13	1.2
		Bathing/cleaning	12	1.1

[1]Percentages shown are based on the total number of non-presenting non-preventive medicine problems discussed during preventive medicine consultations or other consultations (as shown in the Total n column).

[2]NSAIDs Non-steroidal anti-inflammatory drugs

8.4 Discussion

Preventive medicine was the most common reason for presentation in the observed small animal veterinary consultations, with most of these relating to vaccination. This is in contrast to findings by Evans et al. (1974) that vaccination accounted for only 11% of consultations. Therefore it appears that vaccination has become a much larger part of the caseload in recent years. The reasons for this increase are unclear, though could represent advancements in veterinary medicine over the past few decades, or

increasing owner acceptance of vaccination over this time. Canine parvovirus, a highly pathogenic viral infection against which canine vaccinations protect, did not emerge until 1978 (Hoelzer and Parrish, 2010), which could also partly explain why vaccination rates have increased since Evans et al. (1974) original study. Despite accounting for such a large proportion of caseload, a recent survey of dog, cat and rabbit owners revealed that there are still some unvaccinated pets. The PAW 2013 report (PDSA, 2013) revealed that 82% of dogs, 72% of cats and 46% of rabbits had received at least one vaccination. Only 61% of cats and 38% of rabbits had received booster vaccinations following on from their primary course. Knowledge of the number of unvaccinated animals is crucial in understanding the risk and potential impact of infectious disease outbreaks. Therefore understanding what drives owners to vaccinate their pet, and the barriers to vaccination, is likely to be an important area for future research.

The issues surrounding vaccination of small animals are complex. Despite vaccination forming a large part of the veterinary caseload, there are still many unvaccinated or inadequately vaccinated animals. In addition, there is controversy surrounding vaccination, particularly in relation to the vaccination interval. The WSAVA Vaccination Guidelines Group have produced a series of guidelines for vaccination protocols in dogs and cats, and have suggested that the aim should be to vaccinate more animals less often (Day et al., 2010). However, in light of the results of the current study, there is potential for impact upon the general health and welfare of individual patients by increasing the vaccination interval. In this study, both additional health problems and other aspects of preventive medicine were not only discussed, but also often acted upon. The increased number of problems discussed, and therefore decisions made, during these consultations, suggests that these consultations may be even more complex than other consultation types. Therefore the vaccination consultation may have an important role to play in detecting and managing concurrent disease, and may present a greater challenge during decision-making. This supports findings by Everitt

(2011) who observed that the discussion of additional problems, unrelated to the reason for presentation, appeared to be more common during vaccination consultations. The veterinary practices involved in the current study all advised yearly vaccination of cats and dogs, with most advising vaccination every 6-12 months for rabbits. It may be that an annual health check, with or without a vaccination, is advisable if the vaccination interval is increased, to ensure concurrent disease is detected (Day et al., 2010).

The role of the preventive medicine consultation in detecting and managing concurrent disease is also supported by other studies. Banyard (1998) looked at the prevalence of concurrent disease in dogs and cats presented for vaccination and found that over half of the animals presented had concurrent disease. This concurrent disease was moderate in nature in the majority of cases, but severe and debilitating in 3% of patients. Banyard (1998) suggested that a thorough clinical examination during the vaccination consultation may have an important role to play in the health and welfare of these animals. Interestingly, in the current study full clinical examinations and weighing were performed more frequently in preventive medicine consultations than other consultations, and abnormalities were frequently detected during these clinical exams. Therefore it may be that veterinary surgeons already recognise the value of a thorough clinical examination and are also skilled in detecting concurrent disease during these routine consultations. Given that the data included animals presenting for other types of preventive medicine, such as nail clipping, it may be that the figure for vaccination consultations alone is even higher.

Consultation length data also reinforces the finding that preventive medicine consultations are more complex than previously thought, as preventive medicine consultations were only slightly shorter than other types of consultation. This is consistent with findings by Everitt (2011) and Shaw et al. (2008), however both of these studies recorded even longer consultation times than the current study. Results from both of these studies and the

current study suggest that a 10 minute time-slot may be insufficient for many preventive medicine consultations, particularly when additional tasks such as clinical notes and dispensing are taken into account.

However, the role of the preventive medicine consultation in detecting and managing concurrent disease may still be falling short of reaching its full potential. Roshier and McBride (2013) videotaped dog vaccination consultations, following these up with owner interviews. Ten behavioural problems were discussed for the 17 dogs presented for vaccination. This echoes the findings of the current study, were behavioural problems were discussed more frequently during preventive medicine consultations than other studies. However, Roshier and McBride (2013) also followed up their observations with an owner questionnaire, which revealed a total of 58 behavioural concerns across the 17 dogs, the majority of which were not mentioned in the consultation. Roshier and McBride (2013) suggested veterinary surgeons could employ questioning and listening skills to increase the likelihood of behavioural problems being discussed.

Unsurprisingly, very young animals were more frequently presented for preventive medicine, presumably for primary vaccination courses, routine checks of newly acquired animals, or peri-operative examinations around the time for neutering. The PAW 2013 report (PDSA, 2013) suggested that the number of animals receiving annual booster vaccinations was lower than the number receiving their primary vaccination course, so this could go some way to explaining the high numbers of young animals. Given the much younger population of animals presenting for preventive medicine consultations compared with other populations, it is perhaps surprising that so many additional problems were discussed, and abnormalities detected on clinical examination. However Banyard (1998) found that while the likelihood of having concurrent disease increased with age, high levels of concurrent disease were seen in all ages groups, ranging from 41% of animals under 5 years of age, to 72% in animals over 10 years of age.

Pre-existing conditions were discussed less frequently in preventive medicine consultations compared with other consultations which could potentially explain the differences in outcome types despite similar specific diagnoses being reached for both consultation types. The tendency towards management, rather than therapeutic treatment or diagnostic work up in preventive medicine consultations, could reflect the early stage of the disease. Pre-existing problems could represent a more advanced stage of disease, which has progressed beyond the point of being managed with husbandry advice, requiring treatment or further investigation. Another possibility is that outcomes differ due to fundamental differences in terms of communication style and content between preventive medicine and other types of consultations. Shaw et al. (2008) found that client education focused more on lifestyle and social aspects for wellness appointments, while client education during problem appointments focused more on biomedical topics. Concern was expressed that the focus on biomedical topics during problem appointments could lead to the role of lifestyle and social aspects in the management of disease being neglected. As management advice was given more frequently during preventive medicine than other consultations during the current study, despite similar diseases being diagnosed, these concerns may be justified. However, it is also important to remember the effect of diagnosis type on outcome type as identified in Chapter 7. Definitive diagnoses were generally associated with more management and less treatment, which may be due to the types of problems which can easily be definitively diagnosed, rather than a direct effect of making a diagnosis. Problems discussed during preventive medicine consultations received a definitive diagnosis more frequently than problems discussed in other consultations, and so this could go part way to explaining why management is a more common action.

Veterinary surgeons raise problems more frequently in preventive medicine consultations compared with other consultations, which may in part be due

to the full clinical examination allowing clinical abnormalities to be detected. This may also explain why definitive diagnoses are reached more frequently for non-presenting problems discussed in preventive medicine consultations. A full clinical examination will allow the veterinary surgeon to easily diagnose conditions such as periodontal disease, which may be missed in a more focused examination. Therefore it is unsurprisingly that dental diseases are detected more frequently in preventive medicine than other consultations. Interestingly, 'normal at present' was the third most common specific diagnosis reached for additional problems discussed during preventive medicine consultations but was a specific diagnosis rarely reached in other consultations. This may suggest that problems discussed during preventive medicine consultations may be an opportunity for owners to put their mind at rest about certain health related issues.

There are many limitations to this study, most of which have been covered in other chapters, however there are some limitations specific to preventive medicine. One practice involved in the study was an emergency out-of-hours clinic. As no preventive medicine was performed at this clinic, all consultations observed here would fit into the other consultations. Given these are emergency consultations, this may have introduced some bias, as the cases at this practice may be fundamentally different. However these consultations accounted for only around 5% of all consultations observed and so the impact of this is unlikely to explain most of the differences seen.

Another limitation of this study was the observation of only veterinary consultations. Preventive medicine is unique in that many members of the practice may be involved in educating clients about or dispensing of prophylactic treatments, including veterinary nurses and reception staff. A questionnaire was conducted with all practices (see Chapter 2) and many had nurses' clinics where various preventive medicine procedures, such as nail clipping, weight checks for prophylactic parasiticides and even second vaccinations were performed. Additionally, time limits during consultations

meant that veterinary surgeons in some practices advised owners to direct requests for prophylactic parasiticides, or booking of neutering surgeries to reception staff following the consultation. This may have resulted in fewer non-presenting preventive medicine problems being recorded, or fewer appearing to have an action taken. A final limitation is that the study cannot shed any light on the prophylactic treatments themselves. However the intention of the study was not to directly address the controversies surrounding, for example vaccination itself, but to look at what veterinary surgeons currently do during these consultations. While this cannot determine whether any changes to the vaccination schedule should be made, it will help to assess the potential impact of changes to this on other aspects of the animal's health and welfare, other than the immunity to infectious diseases afforded by the vaccination.

8.5 Conclusions

Preventive medicine consultations appear to be fundamentally different from other types of consultations. Far from being a 'quick and easy' consultation, the preventive medicine consultation is often highly complex, taking just as much time as consultations for a health problem, and practices should bear this in mind when scheduling appointments. The preventive medicine consultation may present an important opportunity for both the veterinary surgeon and owner to discuss other aspects of preventive medicine and health, and to detect and manage concurrent disease.

Chapter 9. Practice feedback

9.1 Introduction

The final step of evidence-based medicine is to evaluate performance and determine what can be done better next time (Heneghan and Badenoch, 2006). This applies not only to clinical practice but also to research. In the case of practice-based research, feedback from practitioners could be vital to ensure future research conducted is feasible for all parties involved. In addition, feedback to the practitioners involved in a study is one way of increasing awareness of the study findings, which may lead to improved uptake of research. Haines and Donald (1998) suggested that clinicians, nursing staff and patients were usually the key players in implementing changes in primary care, therefore efforts to promote uptake of research should be focused to this audience. It was suggested that closer links between research and practice were vital to ensure continuing willingness of practitioners to be involved in research (Haines and Donald, 1998). Engaging practitioners will also allow them to play a role in focusing research priorities, ensuring results of future research will be relevant to these same practitioners. This is already successfully carried out in a structured way in medicine, utilising not only practitioners but also patients (JLA, 2014), and would be a useful method to adopt in veterinary medicine in order to help minimise research wastage.

The aim of this chapter was to feed the results of the practice-based research undertaken back to the practitioners involved, and to gather their opinions on the findings of the study.

9.2 Materials and Methods

Following completion of the main data collection period and initial analysis, arrangements were made to visit each of the practices involved to provide

feedback on some of the findings of the study. For each practice, data were presented from two datasets, one involving cases purely from that practice, the other involving cases from the other seven practices grouped together. Presentations were amended and refined following each visit, to ensure the data being presented was likely to be of interest to those attending. Topics which were not included in earlier presentations, but in which practices showed a particular interest, were incorporated into later presentations. For example, the first two presentations focused predominantly upon the presenting problems recorded for simplicity, however the practices expressed an interest in seeing data on the non-presenting problems and so this was included in the remaining presentations. Types of data presented included species presented, sex and neutering status, number of problems discussed, body system affected, diagnosis type and outcome type.

Visits for feedback sessions were arranged for a date and time most convenient for the practice to maximise attendance. Attendance by veterinary surgeons was optional, and varied between practices. Other staff members, including veterinary nurses and reception staff also attended the feedback sessions in many practices. Sessions were kept relaxed and informal, allowing staff to join and leave at their convenience to avoid impeding on other work commitments. Lunch was also provided as an incentive to attend. During visits, the main researcher involved in data collection presented the results, whilst a second member of the CEVM team recorded discussions in the form of handwritten notes. The veterinary staff were encouraged to share their thoughts on the data presented, and time was allowed for discussion during each presentation.

Where time was available, the veterinary staff were also asked which conditions they felt they saw commonly, which they would like further information on and how they had found the experience of practice-based research. After the feedback sessions, topics suggested for further research were compared with the data presented in Chapters 4-8 to determine

whether topics raised by practitioners were consistent with those identified as frequently occurring through direct observation. Where the topic suggested by a practitioner related to a clinical sign, clinical examination abnormality or specific diagnosis, the 10 most frequently encountered clinical signs, abnormalities or diagnoses, as identified by direct observation, were examined to see if the suggested topic was present. Where the suggested topic related to body system, the 5 most frequently encountered body systems, as identified by direct observation, were examined to see if the suggested topic was present. Narrative findings from the discussion that took place during these visits are given.

9.3 Results

The amount of time available for feedback sessions and the amount of discussion taking place varied between practices. Some of the recurrent themes within the discussions are outlined below.

9.3.1 Signalment

Signalment data presented was that collected from the clinical records, as this was deemed the most complete. Many staff were surprised by the proportion of cats and exotic species they saw, expecting either lower or higher numbers. Some of the potential reasons for the species distribution seen cited by the staff included the veterinary surgeon or branch observed. Staff at one practice noted that one of their veterinary surgeons did not generally see rabbits, due to an allergy to this species, whilst another vet in the practice ran lunchtime clinics specifically for cats.

Practice staff often stated the proportion of neutered animals was lower than they had expected, with staff at one practice commenting that they had seen a change in attitudes towards neutering in recent years. Another potential reason for this low rate cited by practice staff was inaccurate records with one vet asking ‘is this taken from the PC? As it may not be up-to-date’. Lack of

client education and a high number of clients wishing to breed their animal were also suggested by staff as potential reasons for the high number of entire animals. Staff at practices with a higher neutering rate cited client education by the practice as a potential reason for this.

9.3.2 Problem number

Most vets were aware that they often dealt with more than one problem during the consultation, but many were surprised that as many as 8 problems were discussed in some consultations. Several commented that clients often present with a 'list of problems' they would like to discuss. Staff at some practices also felt this occurred most frequently during vaccination consultations with one vet stating 'if it's a booster, they mention other stuff' and another suggesting that clients 'save problems up until booster time to save money'. Staff at some practices reported that they considered the consultation to be an opportunity for clients to raise health concerns, with one vet describing this as 'clients think they need their money's worth'. Staff at other practices felt time was an issue with discussing multiple problems during consultations. One vet stated that they didn't necessarily encourage discussion and that this may depend on how many other clients they had waiting, whilst another reported they often ran late during consulting periods due to the number of problems raised. Several vets suggested that there was often a disconnect between what the owner believed to be the most important problem, and what the veterinary surgeon believed to be the biggest concern.

9.3.3 Body system

Body system discussions often centred around preventive medicine, with some practice staff disappointed that their rate of preventive medicine was not higher. Some staff suggested preventive medicine consultations, in particular those involving a vaccination, were the 'quick and easy'

consultations whilst others commented that these were frequently the consultations where owners arrived with 'a list of problems'.

Staff at several practices showed interest in the high levels of musculoskeletal problems, with many citing specific presentations or conditions they commonly saw which fit into this category. These included lameness, limb pain, spinal pain, traumatic injuries (particularly road traffic accidents) and osteoarthritis. Staff at practice 8 (the emergency clinic) stated they saw musculoskeletal problems more frequently in animals presented by PDSA clients than by private clients.

Dental disease was also frequently mentioned with some staff stating they were expecting the frequency of this to be much higher. Staff at some practices perceived that owners did not notice or prioritise teeth problems, with one vet stating that it may be one of the things 'people just live with or are not aware of'. Obesity was cited as another area where owners may not be aware of the problem by one vet.

Staff at many practices stated they were expecting higher numbers for some body systems, in particular cardiovascular, renal and endocrine, commenting that heart murmurs, renal failure and hyperthyroidism were among some of the most frequently encountered conditions. One vet suggested that the low rate of cardiovascular conditions seen could be due to the breeds commonly encountered by the practice.

9.3.4 Diagnosis Type

Staff at all practices appeared to have a good awareness that a definitive diagnosis was rarely made with several vets reporting that they expected it to be lower as it was 'very difficult to do'. Staff at some practices speculated that there could be a difference between individual veterinary surgeons, relating to experience, in terms of the type of diagnosis made. One vet commented

that this could also be the case if individual veterinary surgeons see more ongoing cases, and therefore deal with more previously diagnosed cases.

9.3.5 Outcome Type

In terms of outcome type, staff at several practices were keen to compare how often they performed diagnostic work-ups in comparison to other practices, often being pleased if they performed these more frequently or disappointed if they performed these less frequently. One vet commented that they did fewer work-ups than 10 years previously, as clients often didn't have the money. Similarly, the proportion of problems for which no action was taken was often of interest to practice staff, with most seeing rarely taking no action to be a positive sign. One vet commented that making the decision to take no action is 'quite brave', while others suggested types of cases where no action would be appropriate including 'cats with heart murmurs' and 'a wart or small lump on an old dog'. Staff at most practices were aware that they rarely referred animals, stating that with the exception of complex surgeries or advancing imaging, they were able to deal with most cases themselves. One vet said they now frequently performed orthopaedic surgery on patients which would have been referred just a few years previously.

9.3.6 Common conditions/Suggestions for future research

Topics identified by practice staff as being commonly encountered and/or worthy of future research are shown in Table 61, with data also shown as to whether the topic was deemed frequently encountered based on the direct observation data gathered during the current study. In some cases, staff gave more specific suggestions for future research, for example, best approach to haemorrhagic diarrhoea, as this was stated to be a frequently encountered presentation, yet one that was often frustrating as a cause was rarely identified. Within discussions around preventive medicine, client compliance with preventive flea and wormed products were raised as an area urgently

requiring new evidence, particularly as many of these products no longer require a veterinary prescription. Staff at several practices also believed they were seeing true resistance to some flea preventatives and that this needed further investigation, with one vet suggesting they had a local 'superflea'. Staff at several practices stated that more evidence was needed to support the veterinary care of rabbits, and suggested that any additional evidence in this area would be useful rather than giving specific topics.

Table 61. Topics suggested by practice staff for future research during feedback sessions. Topics are grouped by the species for which the suggestions were made and also the type of topic e.g. a general body system or a specific disease. The direct observation data column shows whether this topic was deemed to be commonly encountered based on the data presented in Chapters 4-8.

Data from feedback to sentinel practices

Species	Topic type	Suggested topic	Direct observation data
All	Problem type	Preventive medicine	Yes
	Body system	Dental	Yes
		Cardiovascular	No
		Endocrine	No
Dog	Body system	Skin	Yes
		Musculoskeletal	Yes
	Clinical signs	Vomiting	Yes
		Diarrhoea	Yes
	Diagnosis	Anal gland impaction	Yes
		Osteoarthritis	Yes
Cat	CE abnormality[1]	Heart murmur	Yes
	Diagnosis	iFLUTD[2]	Yes
		Hyperthyroidism	Yes
		Chronic renal failure	Yes
Rabbit	N/A	Any	Yes

[1]CE abnormality — Clinical examination abnormality

[2]iFLUTD — Idiopathic Feline Lower Urinary Tract Disease

9.3.7 Practice-based research

Staff at several practices commented that it was interesting or useful to see the results of the study. Many vets also expressed an interest in being involved in further practice-based research, some even with ideas for future research projects. No negative feedback in relation to the study was received.

9.4 Discussion

This study has shown that involvement in practice-based research can be a positive experience for veterinary surgeons, with no negative feedback received and often a keenness to be involved in further studies. However given the face-to-face method used in feedback, practitioners may have been reluctant to express any negative feelings towards the researchers involved. Tierney et al. (2011) found that veterinary surgeons were generally positive about their involvement in practice-based research, with 70% reporting it had no impact or a positive impact on their working day. However Tierney et al. (2011) found 23% of veterinary surgeons did report a negative impact. This could be due to a difference in methods used by Tierney et al. (2011), which required completion of a short questionnaire at the end of each consultation, and the current study, which required no additional work. Therefore ensuring the benefits gained outweigh any additional work required may be vital to ensuring practice-based research is viewed positively by the individual practitioners involved. The benefits for practitioners of being involved in research will be discussed in more depth in Chapter 10.

It is important to bear in mind that attitudes towards practice-based research may differ between individual veterinary surgeons. This could explain why during feedback sessions, some veterinary surgeons appeared more interested in the results than others, with some showing great enthusiasm for being involved in future research. Therefore it may be that recruitment of a network of individual veterinary surgeons, rather than whole practices, could be a successful future approach to practice-based research. This could allow

veterinary surgeons to become involved in research, without feeling they are obligating their colleagues to also be involved. In order for practice-based research to become a successful and accepted practice, the recruitment of veterinary surgeons in practice with a strong interest in being involved in such research is vital. While this would also be a form of convenience sampling, and may result in a population of veterinary surgeons who are not representative of the UK veterinary profession as a whole, this may be a necessary trade-off. Recruiting individual practitioners with an interest in being involved in practice-based research has worked well in medicine through organisations such as the UK Dermatology Clinical Trials Network which is coordinated by the Centre for Evidence-based Dermatology at The University of Nottingham (UK DCTN, 2014). This is a collaborative network of individual dermatologists, nurses, researchers and patients who work together to conduct multi-centre clinical trials to answer clinical questions about the treatment or prevention of skin diseases. The network currently has 700 members, and is a good example of how individual practitioners rather than whole practices can become involved in practice-based research.

The positive response of practitioners to involvement in the study paves the way for further practice-based research to be conducted, potentially involving other species (e.g. farm animal and equine medicine) using the data collection tool developed in this study as a framework. One such pilot study of farm visits has already been successfully conducted (Ecroyd, 2011), and has suggested that the nature of consultations involving farm animal clinicians differs considerably from those conducted by small animal clinicians. Cook (2011) also adapted the data collection tool for a cross-sectional study investigating a more focused groups of small animal patients: geriatric animals. Building a network of practices and successfully integrating practice-based research into everyday practice, could also pave the way for other types of studies to be conducted. For example, multi-centre clinical trials comparing different treatment plans for commonly encountered conditions could be carried out. Additionally, the current sentinel practice network could

be expanded, meaning ongoing research could be conducted without expecting too much time commitment from each individual practice, potentially moving towards a more representative sample of practices.

Many of aspects of veterinary medicine suggested for future research by practitioners were also found to be commonly encountered clinical signs, body systems or diagnoses. The fact that there appears to be crossover in what veterinary surgeons believe is common and research-worthy, and the results from direct observation during this study, will make narrowing a list of topics for future research an easier task. Chapter 10 will suggest some possible areas where future research could be focused. It should be remembered that when deciding on areas to focus on for future research, the prevalence of a particular condition is not the only important factor to consider. Cardiovascular and endocrine conditions were frequently suggested as areas for future research, despite not being amongst the most common body systems identified by direct observation. This suggests that these conditions may represent a particular area of uncertainty for practitioners and this should be taken into account when setting research priorities. When formulating focused questions for future research, input from practitioners is vital to ensure research resources and funding are used wisely.

9.5 Conclusions

Engaging with practitioners within sentinel practices, both to conduct practice-based research and gain feedback on the results, has been successful. The quantitative results of data collection in this study, along with qualitative results from feedback to the practices, show many similarities and could be used in combination to begin to formulate research priorities. Qualitative methods such as focus groups, in which both veterinary surgeons and owners are engaged, will help refine research priorities further, ensuring they meet the needs of the research's end-users.

Chapter 10. Summary and conclusions

The results of the current study suggest that it is feasible to gather detailed data on first opinion small animal veterinary consultations using a direct observation method. While initially setting out to identify common scenarios in the veterinary caseload, the study has also raised some important points relating to veterinary decision-making, practice-based research and evidence-based veterinary medicine.

10.1 Learning from evidence-based medicine

Practice-based research is still conducted relatively infrequently in veterinary medicine, however the findings from the current study suggest that there may be many similarities with and much to be learned from practice-based research in primary care. For example, multiple problems are frequently discussed, and often impact upon consultation length in primary care (Flocke et al., 2001) which is consistent with the findings of the current study. One concern which has previously been raised, is that the option of euthanasia means decision-making is fundamentally different in veterinary consultations compared with medical consultations (Everitt, 2011). Euthanasia was a rare outcome in the current study, suggesting there may be less of a difference than originally thought. However, there are still differences between medical and veterinary consultations, for example, the existence of the NHS in the UK compared with predominantly private veterinary practices. This may make forming a network of practices, clinicians or patients for future research more of a challenge, as with the exception of larger chains of veterinary practices, there is no centralisation of clinical records between veterinary practices. In addition, the motivations for involvement in practice-based research and perceived obligation to contribute to the existing knowledge base, may be different between primary care and private veterinary practice.

10.2 Capturing the veterinary caseload

The results from the current study would suggest that far from being a straightforward pattern of history-taking, clinical examination, diagnosis then treatment, consultations are often complex. This has implications for future research gathering caseload data, as many of the practice-based research methods currently being used only allow for minimal data to be recorded from each consultation. Such methods allow data to be gathered from a much larger number of consultations, which will be highly useful for many purposes, for example identification of risk factors for disease and surveillance. However, for many areas of interest to evidence-based veterinary medicine, for example decision-making and patient outcomes, capturing the complexity of the consultation is vital to making meaningful conclusions. While the method used in the current study may not be feasible for longer term use, the complex data gathered does highlight the need to think about the most appropriate methods to use during practice-based research. It may be that a range of different methods will be useful, with each answering different types of questions, to build a more complete picture of first opinion veterinary practice.

The complexity of the consultation, as well as the low rate of definitive diagnosis, also has implications when thinking about the future of clinical coding using standardised nomenclature. Coding a consultation using a single diagnosis is unlikely to be appropriate in many cases due to the prevalence of comorbidity. In addition, there may need to be a shift in focus towards coding diagnoses in more general terms for first opinion practice, rather than using highly specific terms likely to only be encountered in referral practice. There may even need to be a shift towards using terms for clinical signs and presentations, as opposed to diagnoses. In addition, given the issues of time pressure raised during the current study, ensuring clinical coding is quick and easy for consulting veterinary surgeons to carry out may be an important factor in increasing the usefulness of this type of data.

10.3 Changing the approach to veterinary research

The results suggest there may be a need to change the way in which veterinary clinical research is conducted, in order to ensure that it reflects the reality of first opinion practice. Multiple problems and therefore comorbidity is common, yet animals with concurrent disease are often excluded from intervention trials. The results also suggest polypharmacy may be common, yet patients prescribed a variety of treatments are often excluded from clinical trials. Therefore future research may need to consider exclusion criteria carefully to make sure the sample being selected is representative of first opinion practice. Research focusing on drug interactions would also be useful for this reason. The current study suggests that definitive diagnoses are rarely made yet much research in veterinary medicine focuses on a specific diagnosis. Research focused on clinical signs may provide vital evidence at a decision-making point for which little evidence currently exists. Previous research has also been predominantly conducted in referral centres, despite the fact that referral is also a rare outcome, and referral cases are unlikely to be representative of those in first opinion practice (Bartlett et al., 2010). Clinical sign-focused research based in first opinion practice which takes into account concurrent disease, multiple decision-making points and polypharmacy is needed to ensure the results are relevant to general veterinary practitioners.

10.4 Impact on the veterinary profession

This study has identified the common scenarios encountered by veterinary surgeons, in terms of common presentations, clinical signs and diagnoses made. This will provide a starting block for prioritising future research within veterinary medicine by identifying 'what is common'. Future work can now focus on identifying specific questions within these commonly encountered scenarios which are both of importance to clinicians and currently lacking in

high quality evidence. The results of the study can also be used in directing undergraduate veterinary curriculum, ensuring graduates are well prepared for the caseload they will encounter upon entering practice. The results would be useful in amending curriculum to ensure the species, body systems, diagnostic tests and specific diseases encountered receive appropriate coverage. In addition, teaching centred around the approach to common clinical signs, rather than centred around specific diagnoses, would be more appropriate given the low rate of definitive diagnosis. The results could also be used to guide topics for postgraduate curriculum, for example for CPD and postgraduate Certificates and Diplomas.

In addition to the benefits for directing future research and education, the results will also be of benefit to veterinary practices, both when ensuring high quality care for their clients and patients and when making business decisions. The results could impact decisions made by veterinary practices and clinicians in terms of which CPD to attend, which diagnostic equipment to invest in and which specialist/nurses clinics to offer (e.g. weight clinics, dental clinics). Citing involvement in practice-based research could also be used in practice marketing, to demonstrate to clients a practice's commitment to contribute to wider veterinary knowledge. The results could also have implications for practices when thinking about other aspects of consultations and could help highlight appropriate areas where clinical audit could be carried out. For example, the data on number of problems discussed, along with data on consultation length and feedback discussions regarding time pressure in the consultation, could potentially be justification for a practice to trial an increase to 15 minute consultations. The financial impact of making this change, as well as the impact on patient care and client satisfaction, could be monitored through collaboration with practice-based researchers. The barriers to increasing consultation length are unknown, however financial impact is likely to be a major factor, as increasing consultation length may result in a need to increase consultation fees. However, if a longer consultation time allows problems to be investigated more thoroughly, this

may result in both a greater financial gain, and increased client satisfaction. This would perhaps make longer consultation lengths a more realistic long-term option for practices.

As another example, the fairly low frequency of weighing may trigger some practices to think about the potential reasons behind this, particularly in light of the high frequency with which obesity and weight loss were discussed. Location of weighing scales or number of weighing scales available could potentially be a factor, as could lack of practice policy on when animals should be weighed. Practices could potentially implement changes in an effort to ensure all animals presented are weighed where possible, and again the effects of making such changes could be monitored to determine whether there is a positive impact on practice. For example, regular weighing could help identify changes in weight at an earlier stage, leading to earlier detection and management of disease. It could also ensure accurate dosing of medications, which could lead to improved efficacy and reduced resistance to medications by avoiding underdosing, and reduction in undesirable side effects by reducing overdosing. These are just two examples where awareness of current practice may highlight areas in which changes could be made to the potential benefit of both the practice and their clients and patients.

10.5 Next steps

Based on the findings from the direct observation data (Chapters 4-8) and the practice feedback data (Chapter 9) some broad areas which may warrant future research can be suggested:

All species

- Preventive medicine, particularly vaccination and preventive parasiticides.

- Obesity, dental disease and owner attitudes towards these conditions as they were common diagnoses yet rare as a presenting problem.
- Antibiotics, particularly in relation to efficacy for skin, respiratory and reproductive conditions where these are commonly dispensed.

Dog

- Skin lumps, particularly in relation to the diagnostic approach and usefulness of 'watchful waiting' as they were common and cited by practitioners as an example of when they might take no action.
- Musculoskeletal problems, particularly lameness and osteoarthritis: work has already begun within the CEVM to look at research priorities around osteoarthritis (Belshaw, 2013, pers. comm.).
- Gastrointestinal problems, particularly vomiting, diarrhoea and anal gland impactions as these were common and frequently mentioned.

Cat

- Hyperthyroidism, iFLUTD and chronic renal failure as these were common and frequently mentioned by practitioners.
- Weight loss and inappetence as these were common clinical signs.

Rabbit

- Veterinary care of rabbits generally warrants further evidence as suggested during feedback sessions and by Nielsen et al. (in press).
- Commonly encountered presentations and conditions such as weight loss, inappetence and dental malocclusion may be prioritised first.

Further work is needed to assess the current level of evidence for the topics suggested above, in order to identify the gaps in evidence and to avoid repeating research. For example, several systematic reviews have been

conducted within veterinary dermatology, one of the most commonly discussed aspects of veterinary medicine in the current study (Olivry and Mueller, 2003, Nuttall and Cole, 2007). Therefore there may be less of a gap in knowledge for some skin conditions in comparison to other aspects of veterinary medicine. Identifying commonly encountered scenarios for which there are also knowledge gaps in the evidence can be used as a starting point to pinpoint specific areas of veterinary medicine where relevant uncertainties may lie.

Engaging not only veterinary professionals but also clients in the research prioritisation process is likely to be of importance to ensure future research priorities are relevant to all interested parties. JLA frequently engage a combination of practitioners, patients and carers in priority setting partnerships and a similar approach may be useful in veterinary medicine. This is likely to be particularly important in certain areas. For example, veterinary practitioners suggested preventive parasiticide use as an area for future research during feedback sessions, yet veterinary practitioners are not the only parties involved in advising pet owners on preventive care. Veterinary nurses and reception staff may also be involved in dispensing and advising on these products and many of these products can be acquired from sources other than the veterinary practice. Therefore it would also be useful to engage pharmacies, pet stores and other relevant parties. In addition, pet owners should be engaged, as they are the end users of these products, and so may have important questions not raised by other parties. Given that many parasiticides can be acquired without a veterinary prescription, involvement of both vet-visiting and non-vet-visiting pet owners is important to ensure contributions are sought from all relevant groups.

Finally, it should be remembered that while in the short term this study provides a starting point in directing future research, in the longer term the aim is that generating research priorities will eventually result in new evidence which can be utilised by clinicians. Haynes and Haines (1998) noted

that the dissemination of new evidence into practice was often very slow in medicine, as a result of various difficulties practitioners encounter with finding, appraising, interpreting and applying new evidence. Therefore, formulating priorities for future research is only useful if this process is followed up longer term, to ensure new evidence generated is appropriately disseminated to and implemented by practitioners. Haynes and Haines (1998) suggested several ways in which this could be achieved including creating accurate summaries of the best evidence which are quick to access, for example clinical guidelines.

10.6 Limitations of the study

One limitation of the study is that the effect of season or geographical location on caseload seen is unclear. The network of practices recruited was a convenience sample and visits were also arranged at times convenient for each practice. Conducting the study on a larger scale, by collecting data across a greater number of weeks at a wider range of practices, could help to further determine the effect of season and location on caseload. In addition, for euthanasia consultations, the researcher was often not present for the full consultation if at all. Therefore only limited data could be collected for these consultations. An alternative method, which does not require a researcher to be present in the consultation room, is likely to be more suitable when gathering data from these consultations.

Another limitation is that no statistical analysis was carried out on the data collected. Currently, only descriptive statistics have been performed, as the priority was to broadly identify relevant areas and patterns of interest. However, now that an overview of these data has been conducted, the next step would be to conduct statistical analysis of the data. Multi-level logistic regression could be carried out, with practices, veterinary surgeons and patients considered as different levels, in order to explore these patterns further.

One of the major limitations of this study was that the data collected simply recorded what happened but not why it happened. There are many possible explanations for the patterns seen and while it is possible to speculate and formulate hypotheses about some of these patterns, further investigation is needed to understand these patterns. Expertise or interests of the individual veterinary surgeon, practice facilities, owner preferences and many other factors could all impact upon the patterns seen. Given the complexity of the discussion, understanding the patterns seen in greater depth likely requires a study which includes some qualitative methods, focusing on a smaller number of consultations. This could expand on not only the work conducted in this study, but also that conducted by Everitt (2011). Videotaping of consultations, interviewing of veterinary surgeons, focus groups and questionnaires could all be used to further understand the patterns identified during the consultation, in terms of the raising of multiple problems, the diagnostic process and decision-making regarding the actions taken.

10.7 Conclusions

Practice-based research can be successfully conducted to gather data which is relevant and useful to practitioners. Consultations are complex so future research methods need to be able to capture and account for this complexity. The results have implications for veterinary surgeons and practices when making both decisions which will benefit their patients and business decisions. They also have implications for both veterinary researchers when directing future research towards relevant areas and veterinary educators when directing curriculum.

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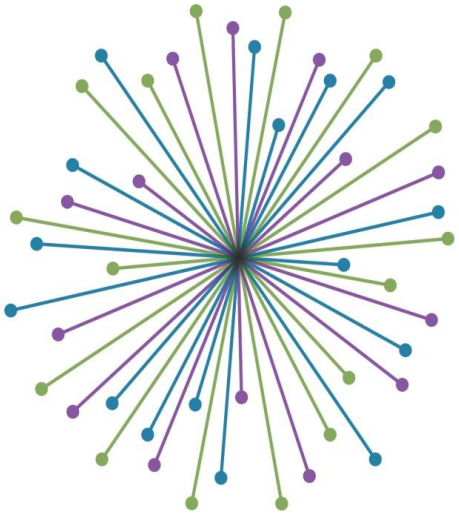
Appendix A. Informed consent

Information sheet handed to clients



CENTRE FOR EVIDENCE-BASED VETERINARY MEDICINE

Putting research into practice

The Centre for Evidence-based Veterinary Medicine (CEVM), based at the University of Nottingham Vet School and *INSERT PRACTICE NAME* are working together to learn more about the diseases that affect pets in the United Kingdom. To do this we need to record why animals are brought to the vets, what is wrong with them and what treatment they are given. This information is very important to us and by working together we can build on our knowledge of the problems pets encounter to improve the health of our pets.

Today when you see the vet, there will also be a member of staff (who is also a qualified vet) from the CEVM in the consulting room. With your permission this person will observe and record what happens during the consultation. They will not ask you or your vet to do anything or answer any questions. So, apart from an extra person in the room, your visit to the vets will proceed in the usual way.

We will record the species, breed and age of your animal and some information about why you have brought your pet to see the vet today. We will NOT record your name, your pets name or your address. This means any information collected is completely anonymous.

If you do not wish your pet to be included in this study, please tell reception or the vet when you enter the consulting room.

If you want to withdraw your pet from the study, you can do this at any time by contacting *INSERT PRACTICE NAME* or the Centre for Evidence-based Veterinary Medicine on 0115 951 6575 or CEVM@nottingham.ac.uk.

Thank you in anticipation of your help with this important study

Figure 25. Information handed to clients in the waiting room.

Information poster for practice notice boards

Who am I?
My name is Natalie, I am a qualified vet based at the Centre for Evidence-based Veterinary Medicine (CEVM) at the University of Nottingham Vet School. I have a pet cat named Pete and a rabbit named Frank.

Why am I here?
When you see the vet today, I may also be in the consulting room, observing and recording what happens during the consultation. I will record information about your pet including species, breed and age, as well as some information about why you have brought your pet in today. I will not be recording any personal details, such as your name, your pets name or your address, meaning all information collected will remain anonymous. I will also not need to ask you or the vet any questions, so the consult will proceed as normal, other than an extra person in the room.

Why am I collecting this information?
The CEVM are working together with Pets N Vets to learn more about the diseases that affect pets in the United Kingdom. To do this we need to record why animals are being brought to the vet, what is wrong with them and what treatment they are given. By working together, we hope that we can build on our knowledge of the problems pets encounter to improve the health of our pets.

What if I don't want my pets information collected?
If you do not wish your pet to be included in this study, please tell reception or the vet when you enter the consulting room. If you want to withdraw your pet from the study you can do this at any time by contacting Pets N Vets or the Centre for Evidence-based Veterinary Medicine on 0115 951 6575 or CEVM@nottingham.ac.uk.

Figure 26. Content of information poster displayed in practice waiting rooms.

Appendix B. Practice questionnaire

This questionnaire was completed initially by each practice either during the pilot study or during the first week of full data collection at that practice and repeated at each subsequent visit to record any changes.

About Your Practice

1. Which of the following species do you treat, and approximately what proportion of your daily work do they take up?

	% of daily work
Small animals	
Farm animals	
Equine	
Exotics	

2. What are the opening hours of the practice during a normal week? If you have set consulting periods, please give details of these in the table below, along with the usual number of vets consulting during each period.

Opening Times ..... to .....

	Start	Finish	No. vets consulting
Example	**9.00am**	**11.30am**	**3**

3. What kind of appointment system do you run, and what length is each appointment slot?

☐ Appointment only
☐ Open surgery
☐ Some of both

Length of appointment = ☐☐ minutes

4. a) Which Practice Management System do you currently use? E.g. Teleos

.....

.....

b) Have you ever used the VeNom (Veterinary Nomenclature) codes? ☐ Yes ☐ No

5. Is your practice part of the RCVS Practice Standards Scheme? If so which Tier are you currently?

☐ Tier I ☐ Tier II ☐ Tier III

6. What are your out of hours arrangements?

☐ Out of hours rota involving usual day staff
☐ Night staff employed only for out of hours work
☐ Joint rota with other local practices
☐ Emergency/Out-of-hours service such as Vets Now
☐ Other.....

7. Do you hospitalise animals on-site out of hours?

☐ Yes
☐ No
☐ Sometimes

8. Do you run a VIP Scheme, Pet Club or similar? Please give details if possible

.....

.....

9. What is your current client base?

Number of small animal clients .....

Total number of clients .....

10. Do you have a practice protocol on vaccination, in terms of vaccine brand used, timing of primary course, and timing of booster? If so please give details

Dog .....
.....
Cat.....
.....
Rabbit.....
.....

11. Do you have a practice protocol on worm and flea preventatives, in terms of products used, and timing? If so please give details

Dog.....
.....
Cat.....
.....
Rabbit.....
.....

12. Are there any particular times of year when it would/would not be convenient for the CEVM to arrange to visit the practice?

.....
.....
.....

About Your Staff

1. Please complete the following table with respect to staff numbers:

Staff member	Full Time	Part Time
Vets		
Qualified VNs		
Trainee/Student VNs		
Reception/Support staff		
Other (give details)		

2. Do you have regular visits to the practice from an external veterinary specialist, or veterinary paraprofessional, in order to run

specific clinics or to see individual cases? If so, please give details below

3. .....

.....

About Your Nurses

4. Does your practice run Nurses appointments? If your answer is 'Yes' please go to question 4, if your answer is 'No' please go to question 5

   ☐ Yes, dedicated Nurses clinic
   ☐ Yes, nurses appointments but not during specific clinic/consult period
   ☐ No

5. For each of the following procedures please indicate how often they are booked into a nurses appointment as opposed to a vet appointment. Please use the blank rows at the bottom of the table to list any other procedures which are performed during nurses appointments at your practice.

	Performed by nurses?		
	Frequently	Sometimes	Never
2nd Vaccinations			
Nail clipping			
Beak trimming			
Teeth trimming			
Microchipping			
Anal gland expression			
Perioperative checks			
Dental clinics			
Weight clinics			
Worm/flea checks			
Behavioural advice			
Bandage changes			
Admits/Discharges			

About your vets: complete for all vets involved in small animal work

Name	FT/PT	Year Qualified	School Qualified	% small animal work	Postgrad Qualifications (gained)	Postgrad qualifications (pending/enrolled)	Special interests

Appendix C. Questionnaire development

Version 1

Page 1

☐☐ / ☐☐ / ☐☐ ☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐ ☐☐☐

Date (DD/MM/YY) Practice Consultation Animal Vet initials

1. Were multiple animals presented? Complete a separate questionnaire for each animal Yes ☐ No ☐

2. Select the best description of the type of case from the following options:

   First consult ☐ Recheck ☐ Elective euth ☐ Recurrent ☐ 2nd op ☐
   Ongoing ☐ Monitoring ☐ Prev Med ☐ Other ☐

3. Which species was presented during the consult?

   Dog ☐ Cat ☐ Rabbit ☐ Ferret ☐
   Rodent ☐ ☐ Bird ☐ : ☐ Reptile ☐ ☐ Other ☐ ☐

4. What was the animal's breed? ☐

5. What was the animal's age?

   ☐ Years ☐ Months ☐ Weeks ☐ Days

6. What was the animal's sex including neutering status?

   ☐ MN ☐ ME ☐ FN ☐ FE ☐ MU ☐ FU ☐ U

7. Was a clinical exam performed? Yes: full exam ☐ Yes: focused exam ☐ No ☐

   If yes were any abnormalities detected? Yes ☐ No ☐

   If yes, give details .....

Page 2

	Problem 1	Problem 2	Problem 3	Problem 4
Presenting problem				
Clinical signs				
Body system affected	Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav ☐	Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav ☐	Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav ☐	Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav ☐
Diagnostic tests	None ☐ In-cons ☐ Post-cons ☐	None ☐ In-cons ☐ Post-cons ☐	None ☐ In-cons ☐ Post-cons ☐	None ☐ In-cons ☐ Post-cons ☐
Diagnosis	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐
Outcome	Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Other ☐ Refer ☐	Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Other ☐ Refer ☐	Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Other ☐ Refer ☐	Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Other ☐ Refer ☐

Figure 27. Version of the data collection tool

Version 2

Page 1

☐☐ / ☐☐ / ☐☐ ☐☐☐ ☐☐☐☐ ☐☐☐☐ / ☐ ☐☐☐

Date (DD/MM/YY) Practice Consult. No. Animal. No. Vet Initials

Questionnaire

1. Were multiple animals presented? Complete a separate questionnaire for each animal. ☐ Yes ☐ No
2. Select the best description of the type of case from the following options:

   ☐ First Consult ☐ Recheck ☐ Elective Euth ☐ Recurrent ☐ 2nd Op

   ☐ Ongoing: Acute ☐ Ongoing: Chronic ☐ Monitoring ☐ Prev Med ☐ Other
3. Which species was presented during the consult?

   ☐ Dog ☐ Cat ☐ Rabbit ☐ Ferret

   ☐ Rodent ☐ Bird ☐ Reptile ☐ Other
4. What was the animals breed?

   Records: Vet: Owner:
5. What was the animals age?

   Records: ☐ ☐ ☐ ☐ (Y M W D) Vet: ☐ ☐ ☐ ☐ (Y M W D) Owner: ☐ ☐ ☐ ☐ (Y M W D)
6. What was the animals sex including neutering status?

	MN	ME	FN	FE	MU	FU	U
Records:	☐	☐	☐	☐	☐	☐	☐
Vet:	☐	☐	☐	☐	☐	☐	☐
Owner:	☐	☐	☐	☐	☐	☐	☐

7. Was a clinical exam performed? ☐ Yes: full exam ☐ Yes: focused exam ☐ No

   If yes, were any abnormalities detected? ☐ Yes ☐ No

X

Page 2

	Problem 1	Problem 2	Problem 3	Problem 4
Problem summary/ clinical signs				
Related C.E. findings?	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A	☐ Yes ☐ No ☐ N/A
Raised by	☐ Owner ☐ Vet	☐ Owner ☐ Vet	☐ Owner ☐ Vet	☐ Owner ☐ Vet
Bodysystem affected	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav	☐ Skin ☐ MSK ☐ Neuro ☐ Eyes ☐ Urin ☐ Renal ☐ Repro ☐ GI ☐ Cardio ☐ Haemo ☐ Resp ☐ Endo ☐ Dental ☐ Non-sp ☐ Prev Med ☐ Behav
Diagnostic tests	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None	☐ In-cons ☐ Post-cons ☐ None
In Cons				
Post Cons				
Diagnosis	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A	☐ Open ☐ Definitive ☐ Presumed ☐ Prev. Dx. ☐ Working ☐ N/A
Outcome	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other	☐ Nothing ☐ Manage ☐ Work up ☐ Ther. Tx ☐ Euth ☐ Prop. Tx ☐ Refer ☐ Other

Figure 28. Version 2 of the data collection tool.

Appendix D. Definitions

Definitions used throughout the study are listed below. Definitions, or parts of definitions used from the initial development of the data collection tool are shown in black, while those added during development are highlighted in red.

Basic definitions:

Patient: "Any animal presented by its owner to the veterinary surgeon during a consultation"

Owner: "The person presenting the patient to the veterinary surgeon during the consultation"

Problem: "any two-way discussion between owner/carer and vet regarding any aspect of the patients health and wellbeing"

Consult Type definitions:

First consult: "a consultation requested by the owner where the animal has not been seen for the presenting problem within the last 12 months"

Ongoing: "a consultation requested by the owner where the animal has been seen for the problem previously and it has not resolved…"

Ongoing - acute: "...where the animal has been seen for the presenting problem within the last month"

Ongoing – chronic: "...where the animal has been seen for the presenting problem more than one month but less than 12 months previously, and the problem has not resolved during that time"

Recurrent: "a consultation requested by the owner where the animal has been seen for the presenting problem more than one month but less than 12

months previously, and the problem resolved for at least one month during that time"

2nd opinion: "a consultation requested by the owner where the animal has been seen for the presenting problem at a different veterinary practice within the last 12 months"

Elective euthanasia: "a consultation requested by the owner where the owner requests euthanasia of the animal at the start of or prior to the consultation"

Recheck: "a consultation requested by the veterinary surgeon where the animal has been seen for the presenting problem within the last month"

Monitoring: "a consultation requested by the veterinary surgeon where the animal has been seen for the presenting problem more than one month but less than 12 months previously"

Admit/discharge: "a consultation requested by the veterinary surgeon where the animal was presented primarily to admit to or discharge from the practice"

Preventive medicine: "a consultation where the presenting problem relates to preventive medicine" Includes: Vaccinations, microchipping, neutering, nail clipping, beak trimming, preventive worming, flea prevention, 6-month puppy/kitten checks, pre-operative check, prevention of pregnancy and prevention of season.

Other: "a consultation which does not fit into any of the above categories"

Clinical Examination definitions:

Full clinical exam: "A structured examination of the animal as a whole, involving the examination of several different bodysystems. To be classed as a full clinical exam it must include the following: Assessment of the overall condition of the animal including assessment of the skin and coat**;** Auscultation of the thoracic cavity**;** Palpation of the abdominal cavity**;** Brief visual examination of the eyes, ears, mouth (including mucous membranes)**.** It may include the following: Assessment of the lymph nodes**;** Assessment of peripheral pulses**;** Assessment of the skin/coat

The following are not considered as part of the standard clinical exam and are therefore considered extra in-consult diagnostic tests: Temperature check; Rectal exam; Lameness exam; Neurological exam; Otoscopic or opthalmoscopic exam"

Focused clinical exam: "A clinical examination where one or several body systems are examined separately, however all four criteria for a full examination are not met"

Raised by definitions:

Owner : "Any problem recorded relating to the patient which is first raised by the owner of the animal". This will always apply to the presenting problem for First Consult, Recurrent and Ongoing:Acute/Ongoing:Chronic consultations

Vet: "Any problem recorded relating to the patient which is first raised by the veterinary surgeon". This will always apply to the presenting problem for Recheck, Monitoring and Admit/Discharge consultations.

Prompt: "Any problem recorded where the visit was prompted by a recommendation, for example a booster reminder". This will always apply to routine vaccinations.

Diagnostic tests: "any diagnostic test or further investigation excluding history-taking and routine clinical examination, which will help to identify the underlying cause of the presenting complaint"

In-consult Diagnostic test: "A test performed in the consult, for which the results can be immediately obtained during the consult"

Post-consult Diagnostic test: "A test performed either during or after the consult, for which the results will not be obtained during the course of the consult"

Body system definitions

"Any disease, injury or set of clinical signs primarily affecting…"

Skin: "…the integumentary system including the external ear canal"

Musculoskeletal (MSK): "…the skeleton or skeletal muscles"

Neurological: "…the central or peripheral nerves including conditions of the brain and spinal cord"

Eyes: "…the eyes, eyelids (including third eyelid), tear ducts and other associated structures"

Urinary: "…the lower urinary tract including bladder and urethra"

Renal: "…the upper urinary tract including the kidneys and ureters"

Reproductive: " …the male or female reproductive tract, including prostate, testes, penis, uterus, ovaries, vagina, vulva and mammary glands, and encompassing problems of pregnancy, parturition and lactation"

Gastrointestinal: "…the gastrointestinal tract, liver, gall bladder and exocrine pancreas"

Cardiovascular: "…the cardiovascular system, including the heart, pericardium and blood vessels"

Respiratory: "…the respiratory system including lungs, trachea and nasal passages"

Haemopoetic: "…the haemopoetic or lymphatic system including blood cell disorders, bone marrow disorders and problems of the lymph nodes"

Endocrine: "…the endocrinological system including disorders or the pituitary, thyroid, adrenal or endocrine pancreas which results in a hormone imbalance"

Dental: "…the teeth, gums or related structures"

OR

Preventive Medicine: "Any consultation where an animal perceived by its owner to be healthy is presented primarily for measures taken to prevent problems for that animal, for example relating to disease or injury".

Non-specific: "Any disease, injury or set of clinical signs which cannot be fitted into one of the above categories".

Behavioural: "Any activity judged to be outside the normal behaviour pattern for animals of that age, where no underlying medical or physiological abnormality can be found".

Diagnosis definitions

Definitive diagnosis: "a situation where the diagnostic work-up is considered complete, and sufficient to diagnose the condition with a high level of confidence i.e. the 'gold standard' diagnostic test has confirmed the diagnosis"

Working diagnosis: "a diagnosis based on experience, clinical epidemiology and early confirmatory evidence provided by ancillary studies e.g. radiographic findings. Allow early management of the disease while awaiting special or more definitive tests"

Presumptive diagnosis: "a diagnosis based upon minimal evidence or clinical suspicion, upon which therapy or other non-diagnostic interventions may or may not be based including symptomatic treatment"

Open diagnosis: "a situation where no single differential diagnosis stands out as being significantly more likely, i.e. multiple differentials are equally likely at the conclusion of the consult"

Previous diagnosis: "a situation where a particular condition discussed during a consult has been diagnosed during an earlier consultation or set of investigations"

Not applicable: "a diagnosis is not necessary as the problem being discussed relates to preventive medicine"

Outcome definitions:

Therapeutic treatment: "administration or application of a remedy in an attempt to alleviate and/or cure a clinical sign, disease or injury".

Prophylatic treatment: "administration or application of a remedy to a patient in an attempt to prevent disease and/or injury".

Management: "any change in husbandry and/or animal care advised by the vet which may assist in reducing severity and/or frequency of a condition".

Work Up: "any diagnostic test or further investigation excluding history-taking and routine clinical examination, for which the results are not available by the end of the consultation and which will help to identify the underlying cause of the presenting complaint".

Refer: "any problem for which the animal is referred, either to an external specialist, or internally to another member of staff with expertise or a special interest in a particular field".

Euthanasia: "any case where the animal is euthanized during the consultation".

Other: "any outcome which does not fit into another category, including where time is being taken to consider the options after the consultation, prior to making a decision".

Nothing: "any problem where no action is taken, other than basic monitoring by the owner".

Appendix E. Dictionaries

The dictionaries developed are listed below. Entries in black are those added to dictionaries in the initial development of the tool, whilst those in red are entries were added either during tool refinement or during the main study period.

Breed dictionary

Breeds
Abyssinian
Affenpinscher
Afghan Hound
Airedale Terrier
Akita
Alaskan Malamute
American Bobtail
American Curl
American Short Hair
American Wire Hair
Anatolian Shepherd Dog
Angora
Australian Cattle Dog
Australian Shepherd
Australian Silky Terrier
Australian Terrier
Azawakh
Balinese
Basenji
Basset Bleu de Gascogne
Basset Fauve de Bretagne
Basset Griffon Vendeen (Grand)
Basset Griffon Vendeen (Petit)
Basset Hound
Bavarian Mountain Hound
Beagle
Bearded Collie
Beauceron
Bedlington Terrier
Belgian Dwarf

Breeds
Belgian Hare
Belgian Shepherd Dog (Greendale)
Belgian Shepherd Dog (Laekenois)
Belgian Shepherd Dog (Malinois)
Belgian Shepherd Dog (Tervueren)
Bengal
Bergamasco
Bernese Mountain Dog
Bichon Frise
Birman
Bloodhound
Bolognese
Bombay
Border Collie
Border Terrier
Borzoi
Boston Terrier
Bouvier des Flandres
Boxer
Bracco Italiano
Briard
British Giant
British Shorthair
Brittany
Bull Terrier
Bull Terrier (Miniature)
Bulldog
Bullmastiff
Burmese
Burmilla
Cairn Terrier
Californian
Canaan Dog

Breeds
Canadian Eskimo Dog
Cashmere Lop
Cashmere Lop (mini)
Catalan Sheepdog
Cavalier King Charles Spaniel
Cesky Terrier
Chartreux
Chesapeake Bay Retriever
Chihuahua (Long Coat)
Chihuahua (Smooth Coat)
Chinchilla
Chinese Crested
Chow Chow
Cirneco del'Etna
Clumber Spaniel
Cocker Spaniel
Colourpoint Short Hair
Continental Giant
Cornish Rex
Coton de Tulear
Crossbreed (Extra Large 40kg+)
Crossbreed (Large 20-40kg)
Crossbreed (Medium 10-20kg)
Crossbreed (Small <10kg)
Curly-coated Retriever
Dachshund (Long Haired)
Dachshund (Miniature Long Haired)
Dachshund (Miniature Smooth Haired)
Dachshund (Miniature Wire Haired)
Dachshund (Smooth Haired)
Dachshund (Wire Haired)
Dalmation
Dandie Dinmont Terrier
Deerhound
Devon Rex
Dobermann
Dogue de Bordeaux
Domestic Long Hair
Domestic Medium Hair
Domestic Short Hair
Dutch
Dwarf Lop
Egyptian Mau
English

Breeds
English Lop
English Setter
English Springer Spaniel
English Toy Terrier (Black and Tan)
Entlebucher Mountain Dog
Estrela Mountain Dog
Eurasier
Exotic Shorthair
Field Spaniel
Finnish Lapphund
Finnish Spitz
Flat-coated Retriever
Flemish Giant
Fox Terrier (Smooth)
Fox Terrier (Wire)
Foxhound
French Bulldog
French Lop
German Long Haired Pointer
German Lop
German Pinscher
German Shepherd Dog (Alsatian)
German Short Haired Pointer
German Spitz (Klein)
German Spitz (Mittel)
German Wire Haired Pointer
Giant Papillon
Giant Schnauzer
Glen of Imaal Terrier
Golden Retriever
Gordon Setter
Grand Bleu de Gascogne
Great Dane
Greater Swiss Mountain Dog
Greenland Dog
Greyhound
Griffon Bruxellois
Hamiltonstovare
Harlequin
Havanese
Himalayan
Hovawart
Hungarian Kuvasz
Hungarian Puli

Breeds
Hungarian Vizsla
Hungarian Wire Haired Vizsla
Ibizan Hound
Irish Red and White Setter
Irish Setter
Irish Terrier
Irish Water Spaniel
Irish Wolfhound
Italian Greyhound
Italian Spinone
Jack Russell Terrier
Japanese Akita Inu
Japanese Bobtail
Japanese Chin
Japanese Shiba Inu
Japanese Spitz
Javanese
Keeshond
Kerry Blue Terrier
King Charles Spaniel
Komondor
Kooikerhondje
Korat
Korean Jindo
Korthals Griffon
Labrador Retriever
Lagotto Romagnolo
Lakeland Terrier
Lancashire Heeler
LaPerm
Large Munsterlander
Leonberger
Lhasa Apso
Lionhead
Lop
Lowchen (Little Lion Dog)
Lurcher
Maine Coon
Maltese
Manchester Terrier
Manx
Mareema Sheepdog
Mastiff
Mexican Hairless (Intermediate)

Breeds
Mexican Hairless (Miniature)
Mexican Hairless (Standard)
Mini Rex
Miniature Lop
Miniature Pinscher
Miniature Poodle
Miniature Schnauzer
Munchkin
Neapolitan Mastiff
Netherland Dwarf
New Zealand White/Red
Newfoundland
Norfolk Terrier
Norwegian Buhund
Norwegian Elkhound
Norwegian Forest Cat
Norwich Terrier
Nova Scotia Duck Tolling Retriever
Ocicat
Old English Sheepdog
Oriental Long Hair
Oriental Short Hair
Otterhound
Papillon
Parson Russell Terrier
Patterdale Terrier
Pekingese
Persian
Pharaoh Hound
Pixie-bob
Pointer
Polish Lowland Sheepdog
Pomeranian
Poodle
Portuguese Podengo (Warren Hound)
Portuguese Water Dog
Pug
Pyrenean Mastiff
Pyrenean Mountain Dog
Pyrenean Sheepdog (Long Haired)
Ragamuffin
Ragdoll
Rex
Rhinelander

Breeds
Rhodesian Ridgeback
Rottweiler
Rough Collie
Russian
Russian Black Terrier
Russian Blue
Sable
Saluki
Samoyed
Savannah
Schipperke
Schnauzer
Scottish Fold
Scottish Terrier
Sealyham Terrier
Segugio Italiano
Selkirk Rex
Shar Pei
Shetland Sheepdog
Shih Tzu
Siamese
Siberian
Siberian Husky
Silver Fox
Singapura
Skye Terrier
Sloughi
Slovakian Rough Haired Pointer
Small Munsterlander
Smooth Collie
Snowshoe
Soft Coated Wheaten Terrier
Somali
Spanish Water Dog
Sphinx
St. Bernard
Staffordshire Bull Terrier
Standard Poodle
Sussex Spaniel
Swedish Lapphund
Swedish Vallhund
Tan Hare
Tibetan Mastiff
Tibetan Spaniel

Breeds
Tibetan Terrier
Tiffanie
Tonkinese
Toy Poodle
Turkish Angora
Turkish Van
Unknown
Weimaraner
Welsh Corgi (Cardigan)
Welsh Corgi (Pembroke)
Welsh Springer Spaniel
Welsh Terrier
West Highland White Terrier
Whippet
Yorkshire Terrier

Clinical signs dictionary

Clinical signs
Abdominal distension
Abdominal mass/swelling
Abdominal pain
Abdominal wall rupture
Abnormal colour faeces
Abnormal ear position
Abnormal ear smell
Abnormal jaw conformation
Abnormal posture
Abnormal smell
Abnormal test result
Abnormal urine colour
Abnormal urine smell
Abnormal vocalisation
Abscess
Adipsia
Admit appointment
Agalactia
Aggression towards animals
Aggression towards people
Alopecia
Angular limb deformity
Anisocoria
Anorexia

Clinical signs
Anuria
Apnoea
Arrhythmia
Ascites
Ataxia
Aural discharge
Aural haematoma
Bandage change
Beak abnormality
Been missing
Behavioural problem
Bleeding
Blepharospasm
Blindness/reduced vision
Blood in faeces
Blood test appointment
Borborygmi
Bradycardia
Bruising
Bulbous cranium
Bunny-hopping gait
Burping
Burr teeth
Burst abscess
Cartophen injection
Cataract
Chemosis
Chemotherapy appointment
Cherry eye
Choking
Circling
Clicking noise when walking
Clip beak
Clip nails
Collapse
Comatose
Constipation/Obstipation
Coprophagy
Corneal opacity
Cough
Coughing up sputum
Crusting
Crusty nose
Cryptorchid

Clinical signs
Cyanosis
Dead on arrival
Deafness
Decreased frequency of defecation
Deformed limb
Deformed nail/toe
Dental abnormality
Diarrhoea
Dietary indiscretion
Difficulty eating
Difficulty medicating
Difficulty standing
Difficulty walking
Discharge appointment
Discharging sinus tract
Disorientated/confused
Domed cranium
Doughy abdomen
Dragging limb
Dressing related complication
Drinking problem
Dry eye
Dyschezia
Dysphagia
Dysphonia
Dyspnoea
Dystocia
Dysuria
Ear abnormality
Ear hot
Ear injury
Ecto/endoparasiticides due
Ectoparasites seen
Egg bound
Elbow callus
Elective Euthanasia
Emaciated
Endoparasites seen
Epistaxis
Erythema
Excessive moulting
Excessive salivation/drooling
Exercise intolerance
Exopthalmus

Clinical signs
Eyelid abnormality
Eyelid mass
Facial paralysis
Faecal incontinence
Failure to grow
Failure to lose weight
Failure to put on weight
Falling
Feather plucking
Fitting
Flatulence
Foreign body (non-ingested)
Foreign body ingestion
Neck Lesions/FORLs (Feline Odontoclastic Resorptive Lesions)
Fracture suspected
Fractured/chipped tooth
Fussy with food
Gingival hyperplasia
Gingival recession
Gingivitis
Grinding teeth
Haematemesis
Haematochezia
Haematuria
Haemoptysis
Hairy ear canals
Halitosis
Head tilt
Heart murmur
History of scavenging
History of trauma
Honking
Hot spot
Hyperactivity
Hyperaemia mucous membranes
Hyperaesthesia
Hyperpigmentation
Hypothermia
Immunotherapy injection
Incomplete housetraining
Increased frequency of defecation
Increased respiratory effort
Increased respiratory noise

Clinical signs
Inguinal hernia
Injured/snapped claw
Innappetance
Innappropriate milk production
Innappropriate sexual behaviour
Innappropriate urination
Innappropriate vocalisation
Intraocular haemorrhage
Issue pet passport
Jaundice
Jaundiced mucous membranes
Ketotic smell
Lame
Lethargic
Lichenification
Licking back end
Licking feet
Licking wound
Licking/biting self
Limb pain
Limb paralysis
Loose tooth
Loss of balance
Low head carriage
Luxation suspected
Mammary abnormality
Mammary gland enlargement
Mammary mass
Mass/swelling (non-skin)
Matted faeces around bottom
Matted fur
Medication Review
Melaena
Microchip placement
Miosis
Missing teeth
Mothering inanimate objects
Moulting
Mouth breathing
Muscular atrophy
Muscular/limb pain
Mydriasis
Nail penetrating pad
Nasal abnormality

Clinical signs
Nasal discharge
Neck pain
Nervous/anxious
Nesting behaviour
Neutering advice
New problem
Noise phobia
Not grooming self
Not laying
Not passing faeces
Nystagmus
Obtunded
Ocular abnormality
Ocular discharge
Ocular injury
Off legs
Oliguria
Oral abnormality
Oral discharge
Oral mass
Oral ulceration
Overgrooming
Overgrown teeth
Overweight/obese
Pain
Pain on eating
Pale mucous membranes
Panting
Paraphimosis
Paresis/Paralysis
Paronychia
Patellar locking
Pawing at throat/mouth
Penile abnormality
Penile discharge
Perianal mass/swelling
Perineal hernia
Petechiation/ecchymoses
Plantigrade stance
Pododermatitis
Pollakiuria
Polydipsia
Polyphagia
Polyuria

Clinical signs
Poor coat
Poor control on the lead
Poor quality of life
Post op check
Praying stance
Pregnancy diagnosis
Pressure sores
Prevention of pregnancy
Prevention of season
Prolapse
Protective behaviour
Pruritis
Ptosis
Pustules
Pyrexia
Quiet
Rabies serology
Red eye
Regurgitation
Reluctant to move
Renomegaly
Repeat administration of treatment
Respiratory noise increase
Restless/unsettled
Retained deciduous teeth
Retching/gagging
Review after referral appointment
Review of previous problem
Roaming
Routine health check/advice
Rubbing eye
Rubbing mouth
Scabs
Scaling
Schiff-Sherrington posture
Scooting
Scratching ears
Scuffing feet
Scurfy/dry skin
Season abnormal
Seborrhoea
Separation anxiety
Shaking head
Shock

Clinical signs
Skin abnormality
Skin lesions
Skin lump
Sleeping alot
Sneezing
Spinal pain
Spraying/marking
Steroetypic behaviour
Stertor
Stick injury
Stiff
Strabismus
Stranguria
Stridor
Subcutaneous oedema
Suture removal
Swallowing excessively
Swollen eye
Swollen foot
Swollen joint
Swollen leg
Swollen muzzle/face
Swollen scrotum
Syncopal episode
Tachycardia
Tachypnoea
Tail abnormality
Tail chasing
Tartar
Tenesmus
Testicle swollen
Testicular abnormality
Thin
Third eyelid abnormality
Third eyelid injury
Third eyelid protruding
Toxin exposure
Travel anxiety
Trembling/shaking
Twitching
Umbilical hernia
Urinary incontinence
Urinating in unusual places
Urine scalding

Clinical signs
Urticaria
Vacant episodes
Vaccination
Vaginal hyperplasia
Vocalising excessively
Vomiting
Vulva inflamed
Vulval discharge
Vulval irritation
Waxy ears
Weakness
Weight check
Weight gain
Weight loss
Wheezing
Whelping
Wound
Wound problem post op

Clinical exam abnormalities dictionary

Clinical exam findings
Abdominal breathing
Abdominal distension
Abdominal mass
Abdominal pain
Abdominal rupture
Abnormal behaviour in consult
Abnormal head carriage
Abnormal milk
Abnormal size for age
Abnormal smell
Abnormal posture
Abscess
Absence of gut sounds
Agalactia
Aggression in consultation
Alopecia
Anal glands abnormal discharge
Anal glands full
Anisocoria
Apnoea

Clinical exam findings
Arrythmia
Ascites
Ataxia
Aural discharge
Aural haematoma
Aural mass
Beak abnormality
Bladder thickened
Bleeding
Blepharospasm
Blindness
Blocked bladder
Bony swelling
Borborygmi
Brachygnathia
Bradycardia
Bulbous cranium
Bunny hopping gait
Calcinosis cutis
Cataract
Cellulitis
Chemosis
Circling
Cleft lip
Cleft palate
Cold extremities
Collapse
Comatose
Comedones
Conjunctival tear
Conjunctivitis
Corneal abnormality
Corneal opacity
Corneal ulcer
Cough
Cranial draw present
Crepitus
Crusting
Crusty nasal planum
Cryptorchid
Cyanosed mucous membranes
Dead on arrival
Deafness
Deep pain absent

Clinical exam findings
Deformed nail/toe
Deformed nasal bones
Deformed tail
Deformed tooth
Dehydration
Dental abscess
Dental caries
Diaphragmatic rupture
Discharge from nail bed
Domed cranium
Doughy abdomen
Dragging limb
Dysphagia
Dyspnoea
Ectoparasite visible
Ectopic cilia
Ectropion
Emaciated
Empty feeling abdomen
Endoparasite visible
Enlarged prostate
Entropion
Epiphora
Epistaxis
Erythema
Excessive salivation
Exopthalmus
Eyelid mass
Facial paralysis
Faeces palpable in abdomen
Falling
Flystruck
Foetus palpable in birth canal
Foreign body (oral)
Foreign body in ear canal
Fractured/chipped tooth
Fragile/deformed nails
Full feeling abdomen
Gingival hyperplasia
Gingivitis
Goitre
Gum recession
Haematoma/bruising
Haematuria

Clinical exam findings
Hairy ear canal
Halitosis
Head tilt
Heart murmur
Hepatomegaly
Hotspot
Hyperaemic mucous membranes
Hyperaesthesia
Hyperpigmentation
Hypothermia
Impacted faeces around anus
Increased breath sounds
Increased respiratory effort
Inflamed ear canal
Inflamed larynx/pharynx
Inguinal hernia
Injured/snapped claw
Innappropriate milk production
Intraocular haemorrhage
IOP (Intraocular pressure) high
IOP (Intraocular pressure) low
Jaundiced mucous membranes
Jaw deformity
Joint effusion
Joint instability
Joint laxity
Jugular pulse
Keratitis
Ketotic smell
Lameness
Lichenification
Limb pain
Loose tooth
Lymphadenomegaly
Lymphangiectasia
Malocclusion
Mammary glands enlarged
Mammary glands inflammed
Mammary mass
Mandibular bumps
Mass/swelling (non-skin)
Matted faeces on bottom
Matted fur
Miosis

Clinical exam findings
Missing teeth
Molar spurs
Molar/incisor ribbing
Moulting
Muffled heart sounds
Muscular atrophy
Muscular pain
Mydriasis
Nail penetrating pad
Nasal discharge
Neck lesions (FORLs: Feline Odontoclastic Resorptive Lesions)
Neck pain
Neovascularisation
Nystagmus
Obtunded
Ocular discharge
Ocular mass
Open mouth breathing
Oral discharge
Oral mass
Oral soft tissue injury
Oral ulceration/inflammation
Overgrooming
Overgrown incisors
Overgrown nails
Overweight/obese
Pain
Pain over hips
Painful ear
Pale mucous membranes
Palpable fracture
Palpable luxation
Panting
Papules
Paraphimosis
Paresis/paralysis
Paronychia
Passed urine in consult
Penile discharge
Perianal mass
Perinanal inflammation
Perineal hernia
Plantigrade stance

Clinical exam findings
Pododermatitis
Poor coat
Poor condition
Pregnancy palpable
Pressure sores
Prognathia
Proprioceptive deficits
Proptosis
Pruritis
Ptosis
Puncture
Pustules
Pyoderma
Pyrexia
Quiet
Reduced air flow through nostril
Reflexes absent/reduced
Reflexes increased
Renal mass
Renomegaly
Restless
Retained deciduous teeth
ROM (range of movement) increased
ROM (range of movement) reduced
Ruptured tympanic membrane
Saliva staining
Scabs
Scaling
Scar
Schiff-Sherrington posture
Scleral neovascularisation
Scuffed claws
Scurf
Seborrhoea
Seizuring
Senile nuclear sclerosis
Seroma
Shrunken/knobbly kidneys
Skin lump
Skin plaque
Skin Tent
Slow capillary refill time
Snuffly
Spinal pain

Clinical exam findings
Stenosis
Stertor
Stiff gait
Strabismus
Stridor
Subcutaneous oedema
Sunken eyes
Suture material protruding
Swallowing frequently
Swollen face/muzzle
Swollen foot
Swollen jaw
Swollen joint
Swollen limb
Swollen scrotum
Swollen vulva
Tachycardia
Tachypnoea
Tacky mucous membranes
Tartar
Testicular mass
Testicular pain
Thin
Third eyelid injury
Third eyelid protrusion
Tibial thrust present
Tracheal pinch positive
Trembling/shaking
Turbulence over trachea
Twitching
Umbilical hernia
Urine scalding
Uroliths palpable
Urticaria
Vaginal discharge
Vaginal hyperplasia
Vaginal prolapse
Vaginitis
Valgus/varus
Waxy ear canal
Weak
Weak/thready pulses
Weight bearing abnormality
Weight gain

Clinical exam findings
Weight loss
Wet chin/slobbers
Wheeze/crackles on auscultation
Wound
Wound breakdown
Wound inflammed
Wound problem post
Wound problem post op

Diagnostic tests
Swab (culture and sensitivity)
Swab exam (microscopy)
Temperature check
Toxicological testing
Ultrasound
Urinalysis
Woods lamp
Xray/Radiography

Diagnostic tests dictionary

Diagnostic tests
BAL/TTW (Broncho-alveolar lavage/transtracheal wash)
Biopsy
Bloods
BP (blood pressure) measurement
Coat brushing
ECG (electrocardiography)
Endscopy
Exploratory surgery
Faecal exam
Fluid analysis
Fluorescein
FNA (Fine needle aspirate)
Food trial
Fungal culture
Impression smear
Intradermal skin test
IOP (intraocular pressure) measurement
Lameness exam
MRI (magnetic resonance imaging)/CT (computed tomography)
Neuro exam
Opthalmoscopy
Other
Otoscopic exam of oral cavity
Otoscopy
Parasite identification
Post mortem examination
Rectal exam
Sellotape strips
Skin scrapes
STT (Schirmer tear test)

Diagnosis dictionary

Diagnosis
Abdominal tumour
Abdominal wall rupture
Abnormal dental conformation
Abscess
Acromegaly
Acute renal failure
Addisons disease
Adrenal gland disease (ferrets)
Agalactia
Aggression
Aleutian disease
Allergic reaction/hypersensitivity
Anal adenoma
Anal furunculosis
Anal gland impaction
Anal gland infection
Anal gland tumour
Anaphylactic shock
Angular limb deformity
Anticoagulant rodenticide poisoning
Aortic stenosis
Aortic thromboembolism
Aspiration pneumonia
Atlantoaxial subluxation
Atopic dermatitis
Aural haematoma
Aural polyp
Babesiosis
Beak deformity
Behavioural problem
Bladder rupture

Diagnosis
Bladder tumour
Blocked bladder
Blood loss anaemia
BPH (Benign Prostatic Hyperplasia)
Brachial plexus avulsion
Brachycephalic Upper Airway Syndrome
Brain Tumour
Burn
Campylobacter
Canine cognitive dysfunction
Canine Distemper
Cat bite abscess
Cat flu
Cataract
CCLR (Cranial Cruciate Ligament Rupture)
CDRM (Chronic Degenerative Radiculomyopathy)
Cerebellar hypoplasia
Ceruminous gland tumours
Cherry eye
Cheyletiella
Chiari malformation
Chocolate poisoning
Cholangiohepatitis
Chronic bronchitis
Chronic renal failure
Cirrhosis of liver
Cleft lip
Cleft palate
Coccidiosis
Colitis
Collateral ligament rupture
Collie Eye Anomaly
Congestive Heart Failure
Conjunctivitis
Constipation/Obstipation
Contact allergy
Contracted tendons
Copper toxicity
Coprophagy
Corneal foreign body
Corneal lipidosis
Corneal ulcer
Craniomandibular osteopathy

Diagnosis
Crop impaction
Cryptorchid
Cushings disease
Cyclical flank alopecia
Cyst
Cystitis
Dacrocystitis/blocked tear duct
DCM (Dilated Cardiomyopathy)
Deafness
Demodectic mange
Dental abscess
Dental caries
Dental malocclusion
Dermatophytosis (ringworm)
Dermoid sinus/cyst
Detrusor instability
Diabetes insipidus
Diabetes mellitus
Diaphragmatic rupture
DIC (Disseminated Intravascular Coagulation)
Dietary indiscretion
Discospondylitis
Dry Eye (KCS)
Dystocia
E. Cuniculi
Ear injury
Ear mites
Eclampsia
Ectopic cilia
Ectopic ureter
Ectropion
Egg peritonitis
Elbow dysplasia
Endocarditis
Entropion
Environmental change
Eosinophilic enteritis
Eosinophilic granuloma complex
EPI (Exocrine Pancreatic Insufficiency)
Epilepsy (idiopathic)
Epiphora
Epithelioma
Epulis

Diagnosis
Ethylene glycol toxicity
Eyelid tear
Eyelid wart
Facial paralysis
Factor IX deficiency
FAD (Flea Allergic Dermatitis)
False pregnancy
FCE (Fibrocartilaginous Embolism)
FCGS (Feline Chronic Gingivostomatitis)
Fear aggression
Feline Acne
Feline Asthma
Feline dysautonomia
Feline orofacial pain syndrome
FeLV (Feline Leukaemia Virus)
Fibrosarcoma
FIP (Feline Infectious Peritonitis)
FIV (Feline Immunodeficiency Virus)
Fleas
Flystrike
Folliculitis
Food allergy
Foreign body in ear canal
FORLs (Feline Odontoclastic Resorptive Lesions/Neck lesions)
Fractured jaw
Fractured limb/toe
Fractured pelvis
Fractured/chipped tooth
Gastric dilatation without volvulus
Gastritis
Gastroenteritis
Gastrointestinal foreign body
GDV (Gastric Dilatation and Volvulus)
GI (Gastrointestinal) stasis
GI tumour
GI ulceration
Giardia
Gingivitis (without dental disease)
Glaucoma
Globe prolapse
Globe rupture
GME (Granulomatous Meningoencephalitis)
Grape toxicity

Diagnosis
Hairballs
Hairy ear canals
Harvest mites
HCM (Hypertrophic Cardiomyopathy)
Heart base tumour
Heat stroke-exhaustion
Hepatic lipidosis
Hepatitis
Hepatocutaneous syndrome
Hip dysplasia
Histiocytoma
Hormonal alopecia
Horners Syndrome
Hotspot
Hydrocephalus
Hydronephrosis
Hygroma (pressure sores)
Hypertension
Hyperthyroidism
Hypertrophic osteodystrophy
Hypervitaminosis A
Hypothyroidism
Hypovolaemic shock
IBD (Inflammatory bowel disease)
Ibuprofen toxicity
Idiopathic haematuria
Idiopathic Vestibular syndrome
iFLUTD (Idiopathic feline lower urinary tract disease)
IMHA (Immune-mediated haemolytic anaemia)
Immune mediated chorioretinitis
Immune-mediated arthritis
Immune-mediated thrombocytopaenia
In season
Inappropriate sexual behaviour
Incomplete housetraininig
Inguinal hernia
Injured/snapped claw
Innapropriate sexual behaviour
Insulinoma
Interdigital cysts
Interstitial fibrosis
Intervertebral disc rupture
Intestinal worm

Diagnosis
Intraocular haemorrhage
Intussusception
KC/ITB (Kennel Cough/Infectious Tracheobronchitis)
Keratinisation defect
Laryngeal paralysis
Laryngitis
Legg-Calve-Perthes Disease
Leishmaniasis
Lens luxation
Leptospirosis
Leukaemia
Lice
Limb paralysis
Lip fold dermatitis
Lipoma
Liver tumour
Lower respiratory tract infection
Lung lobe collapse
Lung tumour
Lungworm
Luxation
Lymphoma
Malabsorption disorder
Malasezzia dermatitis
Mammary tumour
Marking/spraying behaviour
Mast Cell Tumour
Masticatory myositis
Mastitis
Matts
Mediastinal tumour
Megaoesophagus
Melanoma
Meningitis
Metabolic bone disease
Metaldehyde toxicity
Metastatic neoplasia
Metritis
Mitral valve degeneration
Motion sickness
Muscular fibrosis
Myasthenia gravis
Myositis

Diagnosis
Myxomatosis
Nail bed infection
Nail deformity
Nasal aspergillosis
Nasal foreign body
Nasal tumour
Nasopharyngeal polyps
Nephroliths/Ureteroliths
Noise phobia
Normal at present
Normal geriatric change
NSAID toxicity
O. Osleri nodules
Ocular abscess
Ocular trauma
Ocular tumour
Oesophageal foreign body
Oesophageal injury
Oesophageal stricture
Oestrogen toxicity
Opiod toxicity
Optic neuritis
Oral foreign body
Oral Neoplasia
Orchitis
Osteoarthritis
Osteomyelitis
Osteosarcoma
Otitis externa
Otitis media/interna
Ovarian cysts
Ovarian remnant syndrome
Overgrown beak
Overgrown nail
Overshot jaw
Overweight/obese
Pancreatic carcinoma
Pancreatitis
Pannus (Chronic keratitis)
Panosteitis
Papilloma
Paracetomol toxicity
Paraneoplastic syndrome
Paraphimosis

Diagnosis
Parvovirus
Patella luxation
PDA
Pemphigus
Pericardial effusion
Perineal hernia
Periodontal disease
Peritonitis
Permethrin toxicity
PIE (Pulmonary Infiltrates of Eosinophils)
PKD (Polycystic Kidney Disease)
PLE (Protein Losing Enteropathy)
Pleural effusion
PLN (Protein Losing Nephropathy)
Pneumothorax
Pododermatitis
Polycythaemia
Portosystemic shunt
Post operative haemorrhage
PRA (Progressive Retinal Atrophy)
Pregnant
Primary bone marrow disorder
Proptosis
Prostatic cyst
Prostatic tumour
Prostatitis/Prostatic abscess
PRRA (Persistent Right Aortic Arch)
PTE (Pulmonary Thromboembolism)
Pulmonary contusions
Pulmonary foreign body
Pulmonary stenosis
Pulmonary/interstitial fibrosis
Puppy strangles
Pyoderma
Pyometra
Rabbit syphillis
Raisin toxicity
Rectal polyp
Rectal prolapse
Rectal stricture
Rectovaginal fistula
Reflex dyssynergia
Renal tumour
Restrictive cardiomyopathy

Diagnosis
Retained deciduous teeth
Retained placenta
Retinal detachment
Retrobulbar abscess
Rhinitis
Rib fracture
Roundworm
Salivary gland tumour
Salivary mucocoele
Sarcoptic mange
SARD (Sudden Acquired Retinal Degeneration)
Seborrheic dermatitis
Secondary to other problems
Senile nuclear sclerosis
Senility/dementia
Separation anxiety
Septal defect (ASD/VSD)
Septic arthritis
SIBO
Side effect/Complication of treatment
Sinusitis
Skin tag
Skin Tumour
SLE (Systemic Lupus Erythematosus)
Smoke inhalation
Soft tissue injury
Spinal Fracture
Spinal Tumour
Splenic rupture
Splenic tumour
Spondylosis
Squamous cell carcinoma of pinnae
Stomatitis
Stress
Stress of environmental change
Swollen hock syndrome
Syringo(hydro)myelia
Tail chasing behaviour
Tail fracture/injury
Tail injury
Tapeworm
Territorial aggression
Testicular torsion

Diagnosis
Testicular tumour
Third eyelid injury
Tibial crest avulsion
Tick
Toe deformity
Tonsilitis
Toxin exposure
Toxoplasmosis
Tracheal collapse
Tracheal hypoplasia
Traumatic hair loss
Travel anxiety
Trigeminal neuritis
Umbilical hernia
Undershot jaw
Underweight
Upper respiratory tract infection
Urine scalding
Uroliths
USMI (Urethral Sphincter Mechanism Incompetence)
Uterine adenocarcinoma
Uveitis
Vaginal hyperplasia
Vaginal polyp
Vaginitis
VHD (Viral Haemorrhagic Disease)
Von-Willebrands Disease
Wart
Waxy ear canals/otitis
Weaning
Wet tail
Whelping complete
Wobblers syndrome (CCSM)
Wound
Wound problem post op

Outcomes dictionary

Outcome
A1 blocker
ACE Inhibitors
Acupuncture
Anabolic steroid

Outcome
Analeptic
Antibiotic
Anticholinergic
Antidiarrhoeal
Antiemetic
Antiepileptic
Antifungal
Antihistamine
Antispasmodic
Appetite stimulant
B2 agonist
BAL/TTW (Broncho-alveolar lavage/Transtracheal wash)
Bandaging
Bathing/clipping/cleaning
Behavioural modification
Benzodiazepine
Beta blockers
Biopsy
Bloods
BP (blood pressure) measurement
Buster collar
Calcium channel blocker
CAM (complementary/alternative therapy other than homeopathy or acupuncture)
Cardiac glycoside
Chemotherapeutic agent
Clip nails/beak/teeth
Delay vaccine
Dental hygiene
Dental procedure
Dietary control
Diuretics
Ear cleaner
ECG (Electrocardiography)
Emetic
Empty anal glands
Endoscopy
Environmental control
Euthanasia
Exercise control
Faecal exam
Fluid analysis
Fluid therapy
FNA (Fine Needle Aspirate)

Outcome
Food trial
Fungal culture
Further work up/tx at own vets
GA/sedate for other non-surgical procedure
Gastroprotectant
General anaesthetic
General hygiene
Grooming/Coat brushing
H2 blockers
Homeopathy
Hormone control (non-reproductive)
Hormone control (reproductive)
Hospitalisation
Immune modulator
Immunotherapy
Impression smear
Injectable supplement/electrolyte
Inodilator
Intradermal skin test
IOP (Introcular pressure) measurement
Issue passport
Join Pet/VIP Club
Laxative
Local anaesthetic
Medicated shampoo
Methyxanthine
Microchip placement
Minor in-consult procedure
Monitor
Monitor specific parameter
MRI/CT (Magnetic Resonance Imaging/Computed Tomography)
MTP inhibitor
Mucolytic agent
Nail/beak/teeth trimming
NSAIDs (Non-steroidal Anti-Inflammatories)
Nutraceutical/Supplement
Other
Owner to consider
Oxygen therapy
Pain relief
Parasite identification
Parasiticide

Outcome
PETS advice/action
Pheromone diffuser
Phosphate binder
Physio/compress
Post Mortem Examination
Prescription diet
Probiotic
Pro-kinetic
Prophylactic surgery
Proton pump inhibitor
Refer in-house
Refer to external specialist
Sedative
Sellotape strip exam
Skin scrapes
SSRI
Start weaning
Steroid
Suture removal
Swab (culture and sensitivity)
Swab exam (microscopy)
Sympathomimetic
Therapeutic surgery (Orthopaedic)
Therapeutic surgery (Soft tissue)
Topical treatment
Toxicological testing
Trace owner
Tri/Tetracyclic antidepressant
Ultrasound
Urinalysis
Vaccine
Woods Lamp
Xanthine derivative
Xanthine oxidase inhibitors
Xray/Radiography

Appendix F. Raw validation data

Table 62. Table of raw data collected during the validation study.

Field	Consult no.	Researcher NR	MB
Consultation type	1	PREV MED	PREV MED
	2	RECHECK	RECHECK
	3	PREV MED	PREV MED
	4	AD/DIS	AD/DIS
	5	RECHECK	RECHECK
	6	PREV MED	PREV MED
	7	FIRST	FIRST
	8	AD/DIS	AD/DIS
	9	PREV MED	OTHER
Species	1	DOG	DOG
	2	DOG	DOG
	3	DOG	DOG
	4	DOG	DOG
	5	CAT	CAT
	6	CAT	CAT
	7	CAT	CAT
	8	DOG	DOG
	9	DOG	DOG
Breed (Records)	1	LAB	LABRADOR
	2	COCKER SPANIEL	COCKER SPANIEL
	3	MINIATURE PINSCHER	MINIATURE PINSCHER

	4	YORKSHIRE TERRIER	YORKSHIRE TERRIER
	5	DSH	TABBY
	6	MONGREL	MONGREL
	7	DSH	DSH/SILVER TABBY
	8	SBT	STAFFORDSHIRE BULL TERRIER
	9	SHIH TZU	SHIH TZU
Age (Records)	1	04/07/2000	04/04/2000
	2	11/05/2000	11/05/2000
	3	00/02/00	00/02/00
	4	00/05/00	00/05/00
	5	08/03/2000	08/03/2000
	6	00/03/00	00/03/00
	7	11/04/2000	
	8	00/03/00	00/03/00
	9	00/09/00	00/09/00
Sex (Records)	1	ME	ME
	2	MN	MN
	3	FE	FE
	4	FE	FE
	5	MN	MN
	6	FE	FE
	7	MN	MN
	8	FE	FE
	9	FN	FN
Clinical exam	1	focus	focus
	2	focus	focus
	3	focus	focus
	4	N	N
	5	focus	focus

	6	full	full
	7	focus	focus
	8	N	N
	9	full	full
Abnormalities	1	N	N
	2	Y	Y
	3	Y	Y
	4		
	5	Y	Y
	6	N	N
	7	Y	Y
	8		
	9	N	N
Weigh	1	N	N
	2	Y	N
	3	Y	Y
	4	N	N
	5	N	N
	6	Y	Y
	7	Y	Y
	8	N	N
	9	Y	Y
Problem summary 1	1	export to australia	moving to australias - rabies vacc blood sample
	2	POC dental r/v	post op teeth clean check
	3	vacc-1st	2nd vacc consult
	4	abdo pain, d/c apt - had fight, dyspnoea (r/v)	fight episode with owners other dog

	5	recheck CBA	re-chack after treatment for CBA
	6	2nd vacc	2nd vacc consult
	7	sore mouth, inappetant, pain when eating (new)	sore mouth?
	8	d/c hosp for parvo (R/v)	d/c from hospital after being treated for parvo
	9	general check, check teeth etc	monthly teeth check?
Clinical abnorm. (1)	1	n/a	n/a
	2	n	n/a
	3	n/a	n/a
	4	n/a	n/a
	5	y	y
	6	n/a	n/a
	7	y	y
	8	n/a	n/a
	9	n/a	n
Clinical exam abnorm. (1)	1		
	2	LOOKING GOOD	
	3		
	4		
	5	healing well	healing CBA
	6		
	7	gingivitis, weight loss	red gums - gingivitis
	8		
	9		

Raised by (1)	1	owner	owner
	2	owner	owner
	3	prompt	owner
	4	vet	owner
	5	vet	owner
	6	prompt	owner
	7	owner	owner
	8	vet	owner
	9	owner	owner
Body system (1)	1	prev med	prev med
	2	dental	dental
	3	prev med	prev med
	4	MSK	non-spec
	5	skin	skin
	6	prev med	prev med
	7	dental	dental
	8	GI	GI
	9	prev med	prev med
Diagnostic tests (1)	1	post	post
	2	none	none
	3	none	none
	4	none	none
	5	none	none
	6	none	none
	7	post cons	none
	8	none	none
	9	none	none
Specific test (1)	1	bloods	bloods
	2		

	3		
	4		
	5		
	6		
	7	bloods- electrolytes etc	
	8		
	9		
Diagnosis type (1)	1	n/a	n/a
	2	prev dx	prev dx
	3	n/a	n/a
	4	presumed	presumed
	5	prev dx	prev dx
	6	n/a	n/a
	7	definitive	presumed
	8	prev dx	missing
	9	n/a	n/a
Specific diagnosis (1)	1		
	2	peridontal diseases	
	3		
	4	?resp probs 1ary or 2ary to pain	dog painful after bite
	5	CBA	
	6		
	7	peridontal diseases	
	8	parvo	not sure how diagnosed?
	9		
Outcome type (1)	1	work up	work up
	2	nothing	nothing
	3	other	nothing
	4	ther tx	ther tx

	5	ther tx, manage	ther tx
	6	prop tx	prop tx
	7	ther tx, management, work up	ther tx
	8	manage, ther tx	manage, ther tx
	9	nothing	nothing
Specific outcome	1	bloods, frontline	blood tests for rabies
	2		
	3	delay vacc for a few days	2nd vacc postponed because of other problem
	4	NSAID - meloxicam	loxicam (oral medication)
	5	bathe in consult, ab inj (betamox)	betamox LA injection SC
	6	2nd vacc	2nd vacc given
	7	GA, fluids, dental, pain relief (vetergesic), supportive care, Bloods	admit for dental extraction and cleaning, pain medication
	8	sensitivity diet (little and often), Clavaseptin, metronidazole, zantac	claviseptin, metronidazole, Zantac, Royal canin sensitivity diet
	9		
Problem 2	1	hx heart murmur	moving to aus - frontline application
	2	o concerned re worms, v good appetite (new)	re-check ears
	3	lump on face - poss caught by other dog (new)	lump on face
	4		
	5		
	6	passing blood in faeces (new)	blood in faeces since temperature taken at vaccination
	7	was diabetic -resolved, inappetant poss PD?	not eating fro 1 week
	8	o asking re 2nd vacc - due in 2w	2nd vaccination
	9	flea and worm tx	off food intermittently
Clinical abnormalities (2)	1	n	n/a
	2	n	y
	3	y	y
	4		

	5		
	6	n	n/a
	7	y	y
	8	n/a	n/a
	9	n/a	n/a
Clinical exam abnormalities (2)	1	cant heart today	
	2		infection still present on otoscopic examination
	3	lump on faces al pain on palpation and red	lump on RHS of face
	4		
	5		
	6	gained weight, growing fine	
	7	weight loss	
	8		
	9		weight OK
Raised by (2)	1	owner	owner
	2	owner	owner
	3	owner	owner
	4		
	5		
	6	owner	owner
	7	vet	owner
	8	prompt	owner
	9	vet	owner
Body system (2)	1	cardio	prev med
	2	non-sp	skin
	3	skin	skin
	4		
	5		
	6	GI	GI

	7	endo	non-sp
	8	prev med	prev med
	9	prev med	non-sp
Diagnostic tests (2)	1	none	in cons
	2	none	in cons
	3	none	none
	4		
	5		
	6	none	none
	7	post cons	none
	8	none	none
	9	none	none
Specific test (2)	1		
	2		otoscopy
	3		
	4		
	5		
	6		
	7	Bloods BG	
	8		
	9		
Diagnosis type (2)	1	presumed	n/a
	2	open	prev dx
	3	presumed	presumed
	4		
	5		
	6	presumed	presumed
	7	Prev dx	presumed
	8	n/a	n/a

	9	n/a	presumed
Specific diagnosis (2)	1	normal at present	
	2	?related to teeth - been wormed	
	3	abscess, bite	
	4		
	5		
	6	related to change of food environment	might have been caused by change in diet
	7	diabetes mellitus	
	8		
	9		
Outcome type (2)	1		nothing
	2	nothing	ther tx
	3	ther tx	ther tx
	4		
	5		
	6	nothing	nothing
	7	work up	ther tx
	8	other	nothing
	9	prop tx	manage
Specific outcome (2)	1		
	2		added in ear cleaner
	3	antibiotics injected (betamox LA)	betamox LA injection sc
	4		
	5		
	6		
	7	bloods	admit for fluids and feeding
	8	delay vacc a little longer	address at recheck when tablets are finished
	9	advocate	boiled chicken, white fish
Problem 3	1		

	2	sleeps a lot during day	thinks it might have worms?
	3		
	4		
	5		
	6	discuss worm/fleas tx and VIP pet club	worming advice
	7		weight loss
	8		
	9	fussy w/ food, o conc re weight - think has lost	flea prevention
Clinical abnormalities (3)	1		
	2	n	n/a
	3		
	4		
	5		
	6	n/a	n/a
	7		missing
	8		
	9	n	n/a
Clinical exam abnormalities (3)	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
Raised by (3)	1		
	2	owner	owner
	3		

	4		
	5		
	6	vet	owner
	7		
	8		
	9	owner	vet
Body system (3)	1		
	2	non specific	GI
	3		
	4		
	5		
	6	prev med	prev med
	7		non-sp
	8		
	9	non-sp	prev med
Diagnostic tests (3)	1		
	2	none	none
	3		
	4		
	5		
	6	none	none
	7		post cons
	8		
	9	none	none
Specific test (3)	1		
	2		
	3		
	4		
	5		

	6		
	7		preGA bloods
	8		
	9		
Diagnosis type (3)	1		
	2	open	n/a
	3		
	4		
	5		
	6	n/a	n/a
	7		open
	8		
	9	presumed	n/a
Specific diagnosis (3)	1		
	2		
	3		
	4		
	5		
	6		
	7		has previously had DM
	8		
	9	normal at present	
Outcome type (3)	1		
	2	nothing	nothing
	3		
	4		
	5		
	6	nothing	nothing
	7		work up

	8		
	9	manage, other	nothing
Specific outcome (3)	1		
	2		
	3		
	4		
	5		
	6	already been done with advocate	cont regular advocate medication
	7		pre GA bloods
	8		
	9	recheck weight 3m, bland food	suggested using advocate
Problem 4	1		
	2	re-check ears	
	3		
	4		
	5		
	6	neutering advice	neutering advice
	7		
	8		
	9	o enq re vaccs/lifelong payments	worm prevention
Clinical abnormalities (4)	1		
	2	y	
	3		
	4		
	5		
	6	n/a	n/a
	7		
	8		
	9	n/a	n/a

Clinical exam abnormalities (4)	1		
	2	aural a/c?	
	3		
	4		
	5		
	6		
	7		
	8		
	9		
Raised by (4)	1		
	2	vet	
	3		
	4		
	5		
	6	owner	owner
	7		
	8		
	9	owner	vet
Body system (4)	1		
	2	skin	
	3		
	4		
	5		
	6	prev med	prev med
	7		
	8		
	9	prev med	prev med
Diagnostic tests (4)	1		
	2	in cons	

	3		
	4		
	5		
	6	none	none
	7		
	8		
	9	none	none
Specific test (4)	1		
	2	otoscopy	
	3		
	4		
	5		
	6		
	7		
	8		
	9		
Diagnosis type (4)	1		
	2	prev dx	
	3		
	4		
	5		
	6	n/a	n/a
	7		
	8		
	9	n/a	n/a
Specific diagnosis (4)	1		
	2	O.E.	
	3		
	4		

	5		
	6		
	7		
	8		
	9		
Outcome type (4)	1		
	2	manage, ther tx	
	3		
	4		
	5		
	6	other	nothing
	7		
	8		
	9	prop tx	nothing
Specific outcome (4)	1		
	2	ear cleaner, topical drops	
	3		
	4		
	5		
	6	wait till 6m	advised neutering from 6 months of age
	7		
	8		
	9	discuss joining VIP pet club	advise joining VIP pet club as cheaper
Problem 5	1		
	2		
	3		
	4		
	5		
	6	microchipping	microchipping advice

	7		
	8		
	9		vacc booster
Clinical abnormalities (5)	1		
	2		
	3		
	4		
	5		
	6	n/a	n/a
	7		
	8		
	9		n/a
Clinical exam abnormalities (5)	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
Raised by (5)	1		
	2		
	3		
	4		
	5		
	6	owner	owner
	7		
	8		

	9		owner
Body system (5)	1		
	2		
	3		
	4		
	5		
	6	prev med	prev med
	7		
	8		
	9		prev med
Diagnostic tests (5)	1		
	2		
	3		
	4		
	5		
	6	none	none
	7		
	8		
	9		none
Specific test (5)	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
Diagnosis type (5)	1		

	2		
	3		
	4		
	5		
	6	n/a	n/a
	7		
	8		
	9		n/a
Specific diagnosis (5)	1		
	2		
	3		
	4		
	5		
	6		
	7		
	8		
	9		
Outcome type (5)	1		
	2		
	3		
	4		
	5		
	6	other	nothing
	7		
	8		
	9		nothing
Specific outcome (5)	1		
	2		
	3		

4		
5		
6	delay till older - same time as spey	advised microchipping at a later stage as very small
7		
8		
9		advised joining VIP pet club as cheaper