Paper

Capturing the complexity of first opinion small animal consultations using direct observation

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Various different methods are currently being used to capture data from small animal consultations. The aim of this study was to develop a tool to record detailed data from consultations by direct observation. A second aim was to investigate the complexity of the consultation by examining the number of problems discussed per patient. A data collection tool was developed and used during direct observation of small animal consultations in eight practices. Data were recorded on consultation type, patient signalment and number of problems discussed. During 16 weeks of data collection, 1901 patients were presented. Up to eight problems were discussed for some patients; more problems were discussed during preventive medicine consultations than during first consultations ($P<0.001$) or revisits ($P<0.001$). Fewer problems were discussed for rabbits than cats ($P<0.001$) or dogs ($P<0.001$). Age was positively correlated with discussion of specific health problems and negatively correlated with discussion of preventive medicine. Consultations are complex with multiple problems frequently discussed, suggesting comorbidity may be common. Future research utilising practice data should consider how much of this complexity needs to be captured, and use appropriate methods accordingly. The findings here have implications for directing research and education as well as application in veterinary practice.

Introduction

Veterinary practitioners deal with a considerable number of clinical cases on a daily basis, and are therefore a valuable yet underused source of clinically-relevant research data. Some studies have utilised electronic patient records and clinical coding to gather data on small animal veterinary caseload from consultations (Lund and others 1999, Radford and others 2011, O'Neill and others 2013). Other studies have used questionnaires completed by the veterinary surgeon after each consultation to gather data on caseload (Robotham and Green 2004, Tierney and others 2011). Such methods have the distinct advantage of allowing rapid collection of data from a large number of consultations and so will be useful for surveillance and identification of risk factors for disease. However, Everitt and others (2013) examined a small sample of consultations in greater depth using video-recording and found they were often more complex than expected, frequently involving the discussion of more than one problem. This raised concerns as to whether previously used methods are able to capture the full complexity of the veterinary consultation and so a method which is able to gather more detailed data from each consultation is needed. Understanding the complexity of the consultation will also be useful when directing veterinary curricula, particularly when teaching

consultation skills, and will also have applications in first opinion practice (e.g. scheduling of appointments).

Studies in human healthcare have shown that direct observation methods capture a greater number of problems discussed per consultation than suggested by the clinical record (Flocke and others 2001); however, it is unclear whether the same pattern is seen in veterinary medicine. Hill and others (2006) used a direct observation method to gather data from consultations; however, this study focused predominantly on skin conditions and is of little relevance to the veterinary caseload as a whole. Using a similar method to gather data from all types of consultations could allow more detailed data to be gathered from each consultation, enabling the complexity of the consultation to be explored.

The aim of this study was to develop a data collection tool to allow detailed data to be gathered from first opinion small animal consultations by direct observation. A second aim was to investigate the complexity of first opinion small animal consultations by describing the basic characteristics of the consultations and patients, and determining the number of problems discussed for each patient presented.

Materials and methods

Practice selection

A convenience sample of eight sentinel practices conducting small animal work in England and Scotland was recruited to the study. Practices recruited were those involved in a prior collaboration (Dean and others 2013) or those who had expressed interest in working with the Centre for Evidence-based Veterinary Medicine (CEVM). Mixed and small animal practices were included and the number of veterinary surgeons carrying out small animal work in each practice ranged from 3 to 20.

Method development

A data collection tool was designed to collect data by direct observation of consultations. The tool was developed through discussion with colleagues in the CEVM and veterinary surgeons in the sentinel practices. The tool was initially developed in Microsoft

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Office Word 2010 and then transferred to Cardiff Teleform Version 10.5.1 (Verity Inc, Cambridge) for ease of data entry and processing. Completed forms were then scanned and verified in Teleform prior to being exported to a Microsoft Office Access 2010 database for analysis. During verification, a random sample of 10 per cent of fields from each batch was checked for accuracy. The tool underwent pretesting at two sentinel practices by the primary investigator (NR) and another author (RD) in August 2010. Following the pretest, a more extensive pilot study was conducted between September 2010 and March 2011, with data collected by the primary investigator during a single day at each of the eight sentinel practices recruited. The pretest and pilot studies helped to identify any issues relating to design of the data collection tool, the feasibility of collecting such data and highlight any client or vet concerns with data collection. The reliability of the tool (Petrie and Sabin 2009) was tested in May 2012 at one sentinel practice and involved the primary researcher and another author (MB) observing the same series of consultations. The two datasets were collated and sorted by a third researcher (RD). Agreement was then assessed by comparing each variable recorded in each consultation between the two datasets. The final version of the tool was used to collect data during two separate one week periods at each of the eight sentinel practices. The primary investigator observed consultations by a number of different vets during regular weekday consulting hours between April 2011 and June 2012.

Data collection tool
The data collection tool enabled characteristics of the consultations such as signalment of the patients presented, problems discussed, diagnoses made and actions taken to be recorded. A separate data collection form was completed for each patient presented during each consultation. Data on signalment, which consisted of species, breed, age, sex and neutering status, were collected from the clinical records. Species, age and sex/neutering status were recorded using closed fields, while open fields were used to record breed. Breed data were coded using a breed dictionary, which was developed from the list of Kennel Club recognised breeds for dogs (The Kennel Club 2014), Governing Council of the Cat Fancy breeds listed for cats (GCCF 2013) and British Rabbit council breeds listed for rabbits (BRC 2010). Breed information was not collected for other species. All remaining data, including whether multiple patients were presented, type of consultation, number of problems discussed and all data gathered on each problem discussed, were collected by direct observation of the consultation. Closed fields were used to record whether multiple patients were presented (choosing from yes/no) and the type of consultation (choosing from a defined list). Consultations were categorised into one of the following types based on a series of definitions (see online supplementary appendix 1): First consultation; Recheck; Ongoing; Recurrent; Monitoring; 2nd opinion; Preventive medicine; and Elective euthanasia. Where it was not possible to determine consultation type from direct observation alone, the clinical records were checked for clarification. The total number of problems discussed per patient was also recorded, up to a maximum of four problems, as was whether each problem involved a specific health problem or preventive medicine. 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. For each problem discussed, the data collected included clinical signs, clinical exam abnormalities, body system affected, diagnosis made and actions taken; these data will be reported in separate papers.

Following the initial pretest, an additional consultation type Admit/Discharge was added as these were a frequent occurrence but did not easily fit into any of the existing categories. The Ongoing consultation type was also split into Ongoing: acute and Ongoing: chronic, so that the consultation type would give some indication of the chronicity of the presenting problem. Following the pilot study, additions were made to the breed dictionaries to ensure they represented the population of patients seen in first opinion practice. For example, both Jack Russell Terrier and Lurcher were added to the dictionary of dog breeds. Discussion of between five and eight problems occurred during several consultations in the pilot study, and so the final version of the tool was adapted to allow recording of up to eight problems per patient.

Statistical analysis
Statistics were carried out using IBM SPSS 21. Cohen's κ was calculated to measure agreement between the two researchers during the inter-rater reliability study. κ takes a value from 0, which implies agreement no better than that expected by chance, to 1, which implies perfect agreement. κ values above 0.6 are considered substantial, while those above 0.8 are considered almost perfect (Petrie and Sabin 2009). Pivot tables were used to generate frequency data for categorical variables such as consultation type. Box and whisker plots and descriptive statistics (median and interquartile range (IQR)) were generated for continuous data such as age. Consultation types were further condensed into four categories for ease of analysis: First; Revisit; Preventive medicine; and Elective euthanasia (see online supplementary appendix 1). Where data were generated for individual species, only data for the three most frequently presented species are shown. The chi-squared test was used to compare neutering status between species. The Kruskal-Wallis test was used to compare numerical (non-parametric) and categorical variables, for example, age distribution between species. Where a significant difference was identified, the Dunn-Bonferroni post hoc method (IBM 2014) was then used to carry out pairwise comparisons with an adjusted p value generated to account for multiple comparisons. A Spearman's rank correlation coefficient was used to compare number of problems discussed and age of the patient, and 95 per cent CIs for Spearman's r were calculated manually (Petrie and Watson 2006). Statistical significance was set at the 0.05 level.

Ethical approval
Ethical 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 this data. The study complied with The University of Nottingham (2010) Code of Research Conduct and Research Ethics. Information sheets were distributed to clients prior to the consultation and posters were displayed in the waiting room explaining the purpose of the study, the type of data being collected and details of how the client could opt out. Personal data such as owner or patient name and costs were not collected so that all data were anonymised.

Results
Inter-rater reliability
During reliability testing, data were recorded from nine consultations involving nine patients, with all of the consultations conducted by the same veterinary surgeon. Agreement between the two observers was very high for all consultation and patient variables, with all κ values above 0.8 (Table 1). A total of 23 problems were recorded by the primary researcher with 24 problems recorded by the second observer (MB).

TABLE 1: Agreement in the data recorded between the two observers for each variable relating to consultation and patient recorded during reliability testing

Field	No. times recorded	No. agree	No. disagree	κ	P value
Consultation type	9	8	1	0.850	<0.001
Species	9	9	0	1.000	0.003
Breed (records)	9	8	1	0.877	<0.001
Age	9	8	1	0.877	<0.001
Sex/neutering	9	9	0	1.000	<0.001

Consultations

Data were gathered from 1720 consultations conducted by 62 veterinary surgeons involving 1901 patients. Over 16 weeks of collection, no clients opted their animal out of the study. Multiple patients were presented in 148 consultations (8.6 per cent) with the highest number of patients presented in a single consultation being seven. Revisits were the most common consultation type (n=727; 38.2 per cent) with recheck the most common type of revisit seen (n=365; 19.2 per cent) (Table 2). Preventive medicine accounted for around a third of consultations (n=660; 34.7 per cent), while first consultations accounted for around a quarter (n=485; 25.5 per cent) of visits.

Patients

Dogs (n=1235/1901; 65.0 per cent), cats (n=525/1901; 27.6 per cent) and rabbits (n=90/1901; 4.7 per cent) were the three most frequently presented species. In addition, 30 rodents (1.6 per cent), 12 birds (0.6 per cent), eight ferrets (0.4 per cent) and one reptile (0.1 per cent) were also presented.

Of the 1213/1235 (98.2 per cent) dogs with listed breeds recorded, 959 were pedigree (79.1 per cent) and the remaining 254 (20.9 per cent) were crossbreed. In total, 98 different pedigree breeds were presented with the Labrador Retriever (n=116) being the most frequently encountered followed by Cocker Spaniel (n=59) and then Jack Russell Terrier (n=57) (additional breed data are presented in online supplementary appendix 2). Of the 510/525 (97.1 per cent) cats with listed breeds recorded, the most frequently presented breed was the Domestic Short Hair (n=382; 74.9 per cent) followed by the Domestic Long Hair (n=46; 9.0 per cent). A further 79 cats (15.5 per cent) were pedigree breeds with Burmese (n=13), British Short Hair (n=12) and Persian (n=12) being the most frequently encountered. Of the 67/90 (74.4 per cent) rabbits with listed breeds recorded, the most common breed presented was Lop (n=24; 35.8 per cent) followed by Dwarf Lop (n=14; 20.9 per cent) and then Lionhead (n=11; 16.4 per cent).

Age

Age was listed in the clinical records for 1173 dogs (95.0 per cent), 486 cats (92.6 per cent) and 79 rabbits (87.8 per cent). Patients under one year of age were the most frequently presented group for all three species. While dogs and rabbits appear to show a gradual decline in number of patients presented with age, cats showed a second peak in number of patients presented at around 14 years of age. The population of cats (median age 7.6 years; IQR 2.7–13.3 years) presented appeared to be older than dogs (median age 5.5 years; IQR 2.2–9.6 years), while both were older than the population of rabbits presented (median age 2.3 years; IQR 0.7–4.0 years) (Fig 1). Pairwise comparisons revealed a significant difference in age distribution between dogs and cats (P<0.001), dogs and rabbits (P<0.001) and cats and rabbits (P<0.001).

TABLE 2: The distribution of type of consultation amongst the 1901 patients presented during direct observation of consultations

Type of consultation*	n	Per cent
First consultation	485	25.5
Revisit	727	38.2
Recheck	365	19.2
Ongoing: acute	93	4.9
Ongoing: chronic	34	1.8
Recurrent	80	4.2
Monitoring	63	3.3
Admit/discharge	90	4.7
2nd opinion	2	0.1
Preventive medicine	660	34.7
Elective euthanasia	29	1.5
Total	*1901*	*100.0*

Figures are shown for both the original consultation type selected and the condensed categories used during analysis
*For information on definitions of consultation type, please see online supplementary appendix 1
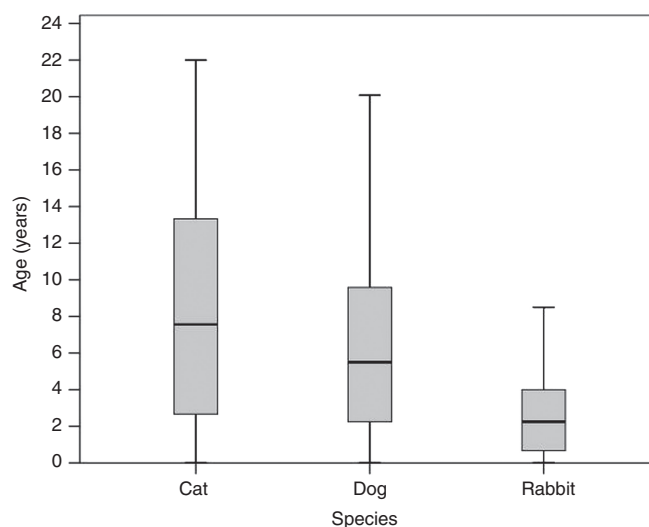
FIG 1: The age distribution of dogs, cats and rabbits presented for consultation. Outer limits of the box represent the interquartile range, while the outer limits of the whiskers represent the range. The central line in each box represents the median age

Sex and neutering status

Sex and neutering status were listed in the clinical records of 1811 patients (95.3 per cent). Of these, 901 were female (49.8 per cent), while 910 were male (50.2 per cent). In total, 803 patients were entire (44.3 per cent), while 1008 were neutered (55.7 per cent). Cats were the most frequently neutered species (n=371; 74.2 per cent), whilst rabbits were the least frequently neutered (n=24; 30.0 per cent) (Table 3). Cats were significantly more likely to be neutered than both dogs (P<0.001) and rabbits (P<0.001), and dogs were significantly more likely to be neutered than rabbits (P<0.001).

Number of problems discussed

A total of 4486 problems were discussed for the 1901 patients presented, with a median of two problems per patient. Overall, 71.5 per cent (n=3206) of problems discussed were specific health problems and 28.5 per cent (n=1280) were about preventive medicine. More than one problem was discussed for almost two-thirds of the 1901 patients presented (65.4 per cent; n=1243). One problem only was discussed in 28 of the 29 elective euthanasia consultations, with four problems discussed in one elective euthanasia consultation. Up to eight problems were discussed in other types of consultation (Fig 2). There was a significant difference in the number of problems discussed between consultation types (P<0.001). Pairwise comparisons revealed significantly fewer problems discussed in elective euthanasia consultations compared with first consultations (P<0.001), revisits (P<0.001) or preventive medicine consultations (P<0.001). There was no significant difference in the number of problems discussed between first consultations and revisits (P=1.000). However, significantly more problems were discussed during preventive medicine consultations than during first consultations (P<0.001) or revisits (P<0.001).

There was a significant difference in the total number of problems discussed between species (P=0.002) (Fig 3). Pairwise comparisons revealed there was no significant difference in the total number of problems discussed between cats and dogs (P>0.999). However, significantly fewer problems were discussed for rabbits than for dogs (P=0.004) or cats (P=0.001).

The median age of the patient presented gradually increased as the number of problems discussed increased, and all patients presenting with seven or eight problems were four years of age or older. There was only a weak positive correlation between age and total number of problems discussed (Spearman's correlation coefficient 0.137 (95 per cent CI 0.091 to 0.182); P<0.001). However, when analysing the data by type of problem, there was a stronger positive correlation between age and number of specific health problems (Spearman's correlation coefficient 0.378 (95 per cent CI 0.338 to 0.417); P<0.001) and a negative correlation between age and number
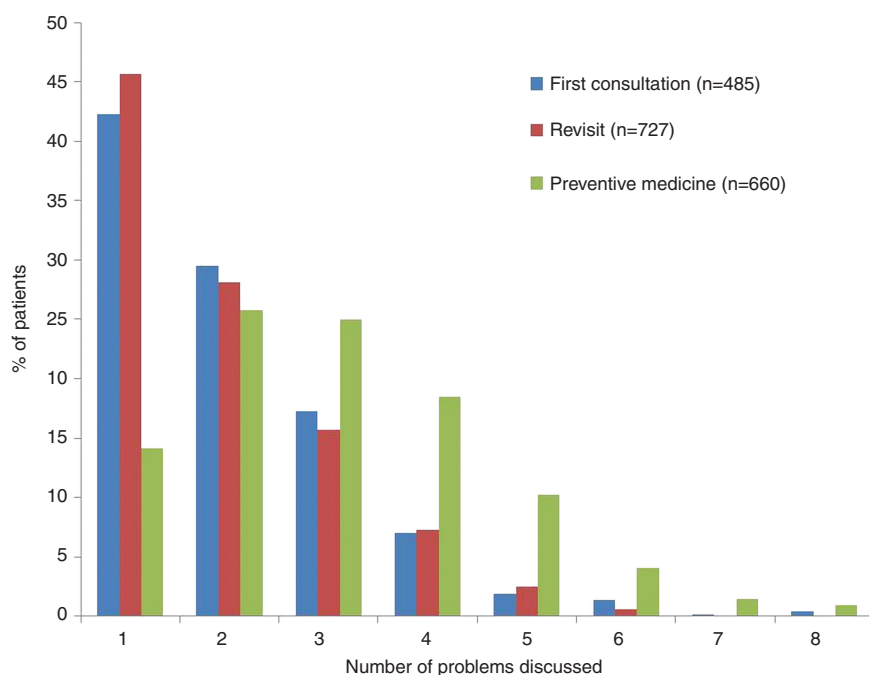
FIG 2: The frequency with which multiple problems were discussed in different consultation types during direct observation of small animal consultations

of preventive medicine problems discussed (Spearman's correlation coefficient –0.270 (95 per cent CI –0.312 to –0.227); P<0.001).

Discussion

A direct observation method was found to be useful where the collection of detailed data from veterinary consultations was required. The high level of agreement during reliability testing and the wealth of data collected suggest that the data collection tool is well suited to gathering this type of information. Only one client opted out of the pilot study (for reasons unknown) with no clients opting out of the main study, suggesting the clients involved had no major concerns surrounding the data collection. Consultations appear to be complex, often involving discussion of more than one problem. This may have implications for future research, particularly when considering the

most appropriate method of collecting caseload data from first opinion practice.

Patients were presented for a wide variety of different types of consultation with consultations for preventive medicine, first consultations and revisits each accounting for a substantial proportion of the caseload. Species, breed, age, sex and neutering status data were consistent with the findings of previous studies reporting the signalment of patients presented to veterinary practice (Lund and others 1999, Robotham and Green 2004, Hill and others 2006). The peak in cats presented around 14 years of age during the current study has not previously been reported and may represent a particular group of diseases unique to senior cats.

Multiple problems were frequently discussed for a single patient, which is consistent with findings by Everitt and others (2013).
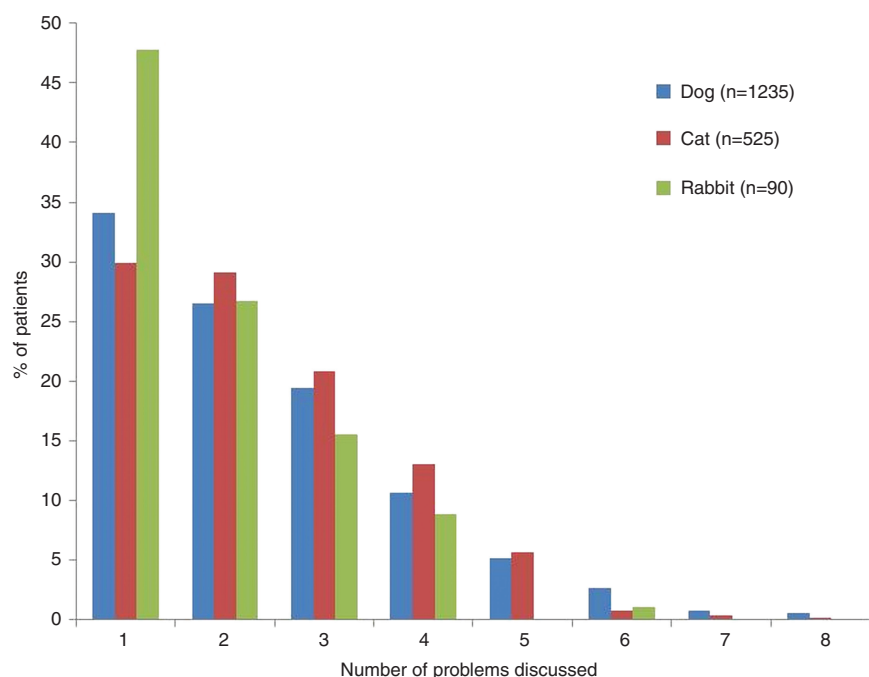

FIG 3: The frequency with which multiple problems were discussed for the three most frequently presented species during direct observation of small animal consultations

TABLE 3: Distribution of sex/neutering status among the three most commonly presented species during direct observation of consultations

Species	Sex	n	Per cent*	Neutering status	n	Per cent*
Dog	Female	607	51.2	Entire	299	49.3
				Neutered	308	50.7
				Total	**607**	**100.0**
	Male	578	48.8	Entire	280	48.4
				Neutered	298	51.6
	Total	**1185**	**100.0**	**Total**	**578**	**100.0**
Cat	Female	235	47.0	Entire	70	29.8
				Neutered	165	70.2
				Total	**235**	**100.0**
	Male	265	53.0	Entire	59	22.3
				Neutered	206	77.7
	Total	**500**	**100.0**	**Total**	**265**	**100.0**
Rabbit	Female	39	48.8	Entire	29	74.4
				Neutered	10	12.5
				Total	**39**	**100.0**
	Male	41	51.3	Entire	27	65.9
				Neutered	14	34.1
	Total	**80**	**100.0**	**Total**	**41**	**100.0**

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

There may be some similarities with human healthcare, where this is also a frequent occurrence (Flocke and others 2001, Beasley and others 2004). Significantly more problems were discussed in animals presented for preventive medicine than for animals presenting for a specific health problem, which supports findings by Shaw and others (2008) that the content of these two types of consultation is vastly different. Shaw and others (2008) also found preventive medicine consultations were described as less hurried, so it may be that the routine nature of these consultations allows aspects of health which have not previously been prioritised to be discussed. The differences between preventive medicine consultations and those for a specific health problem shall be considered in more depth in a separate paper. Significantly fewer problems were discussed in rabbit consultations than in cat or dog consultations, which could be due to fewer concurrent problems in rabbits. This finding may be more likely to be due to less familiarity of both the owner and veterinary surgeon with rabbit diseases. Nielsen and others (2014) found veterinary surgeons perceived there to be less information available for rabbits than for dogs, and to some extent cats. As a result, concurrent disease and clinical examination abnormalities may not be detected in rabbits with the same frequency as other species. Increasing age tended to be associated with discussion of more specific health problems, though this correlation was moderate, suggesting that comorbidity occurs to some extent in patients of all ages. This is consistent with previous findings that in cats and dogs underlying disease is common in patients of all ages, but the prevalence of underlying disease tends to increase with age (Banyard 1998).

In this study, a convenience sample of sentinel practices was used and it is unclear how representative of UK first opinion veterinary practices this network is. The number of sentinel practices recruited to the study was relatively small; however, given that the focus of the study was to gather detailed data about the complexity of small animal consultations, it would not have been practical to conduct with a larger network of practices. In terms of signalment, the sample of patients in the current study is similar to the patients in other UK practice-based studies (Robotham and Green 2004, Hill and others 2006). Another potential limitation of the study is known as demand characteristics, where participants' knowledge of the purpose or hypothesis of the research may unconsciously change their behaviour (McCambridge and others 2012). This could apply to both the veterinary surgeon and the owner, and could potentially be exacerbated by using the direct observation method where there is increased contact between the participants and the researcher. However, there is currently little evidence that demand characteristics present a problem during research conducted in a non-laboratory setting (McCambridge and others 2012).

The findings have implications for future research as many previous studies investigating veterinary therapeutic interventions have excluded patients with comorbidity. The current study suggests that comorbidity is common, so patients included in some intervention studies are unlikely to reflect the population of patients in first opinion practice, particularly for conditions affecting dogs, cats and older patients. The direct observation method developed will also be useful in harnessing research data from practice in the future. For some purposes, such as disease surveillance, gathering data from a large number of consultations may be more vital than collecting detailed data from each individual consultation. However, for other research topics, capturing the complexity of the consultation could be of great importance. One such example is research into veterinary decision-making, particularly in relation to treatment and prescribing, as concerns about drug interactions and contraindications may heavily influence the decision-making process in patients with comorbidities. It is currently unclear whether other methods of data capture, such as use of electronic patient records or questionnaires, are effective in recording these comorbidities. The direct observation method used in this study has the advantage of allowing detailed data to be gathered with no additional work required by the consulting veterinary surgeon. However, the method is also labour intensive, and depending on the research question, unlikely to be realistic for large-scale data collection.

The findings could be useful in directing veterinary curricula, highlighting the importance of dealing with comorbidities, prioritising health problems and handling complex consultations to ensure graduates are prepared for the realities of first opinion practice. Similarly, the results could be used by providers of postgraduate education and continuing professional development to ensure courses assist practitioners in dealing with the complex cases they are likely to see on a daily basis. The results also have application in veterinary practice, perhaps being used for consultation scheduling. Designated geriatric clinics with longer appointments could be implemented for older patients to ensure the higher number of health problems discussed in these patients can be effectively dealt with. Such a change could also allow more discussion around preventive medicine for these patients to ensure this aspect of veterinary care is not neglected. Longer appointment times may also be warranted in preventive medicine consultations to allow all problems discussed to be adequately addressed. In human healthcare, previous research has suggested that each additional problem discussed increases the length of the consultation by 2.5 minutes on average (Flocke and others 2001). However, is it unclear whether a similar pattern is seen in veterinary medicine; this shall be considered in more depth in a separate paper.

▶ Additional material is published online only. To view please visit the journal (http://dx.doi.org/10.1136/vr.102548)

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