

Survey of the UK veterinary profession: common species and conditions nominated by veterinarians in practice

T. D. Nielsen, R. S. Dean, N. J. Robinson, A. Massey, M. L. Brennan

The practice of evidence-based veterinary medicine involves the utilisation of scientific evidence for clinical decision making. To enable this, research topics pertinent to clinical practice need to be identified, and veterinary clinicians are best placed to do this. The main aim of this study was to describe the veterinary population, the common species and conditions veterinary clinicians nominated they saw in practice and how much information clinicians perceived was available in the literature for these. A questionnaire was distributed to all Royal College of Veterinary Surgeons registered veterinarians agreeing to be contacted for research purposes (n=14,532). A useable response rate of 33 per cent (4842/14,532) was achieved. The most commonly seen species reported by vets were dogs, cats and rabbits followed by equines and cattle. Overall, skin conditions were most commonly mentioned for small animals, musculoskeletal conditions for equines and reproduction conditions for production animals. Veterinary clinicians perceived there was a higher level of information available in the literature for conditions in dogs, cattle and equines and lower levels for rabbits and guinea pigs. The results from this study can be used to help define the research needs of the profession to aid the incorporation of evidence in veterinary practice.

Introduction

Evidence-based veterinary medicine (EVM) can be defined as ‘the use of current best evidence in making clinical decisions’ (Cockcroft and Holmes 2003). Additionally, when making evidence-based decisions, the circumstances of the patient alongside the circumstances and values of the owner must also be taken into consideration (CEVM 2013). Although EVM was first mentioned in 1998 (Malynicz 1998), it is less advanced than in the medical field in relation to the availability of synthesised evidence and the support available for the integration of evidence by clinicians into their practice (Everitt 2008). The first step in EVM is to identify relevant answerable questions (Vandeweerdt and others 2012), and veterinary clinicians have a crucial role in highlighting these (Rossdale and others 2003, Holmes and Cockcroft 2004). By identifying what common species and conditions clinicians experience in practice, researchers can prioritise studies so that a large proportion of the profession will gain from future studies.

To our knowledge, few published studies describe the entire veterinary population (including both practising and non-practising members) and what species and conditions practitioners commonly encounter. A comprehensive survey of veterinarians in the UK was conducted

by the Royal College of Veterinary Surgeons (RCVS) in 2010 where it was reported that the species veterinary clinicians mostly worked with were dogs, cats, horses, cattle and rabbits (Robertson-Smith and others 2010). Another study by Lumeij and others (1998) found that cats were more commonly seen than dogs in small and mixed animal practice in The Netherlands. Conditions seen in practice in the United States were investigated by Lund and others (1999) who found that the most common clinical finding was dental calculus followed by gingivitis from 120,000 consultations in cats and dogs. Loomans and others (2007) found that the majority of clinical time in equine practice was spent on lameness and reproduction in The Netherlands.

The aim of this study was to describe the UK veterinary population, and what species and conditions veterinary clinicians think they commonly encounter in practice. A second aim was to gather data relating to how much information veterinary clinicians perceived was available for these species.

Materials and methods

Population of interest

The target population was all members of the veterinary profession within the UK. The sampling frame was the RCVS register of members. All veterinary surgeons legally practicing in the UK must be registered with the RCVS. This register incorporates individuals, including non-practicing and retired individuals, who have consented for their details to be made available to external organisations for research or marketing purposes. A questionnaire was used to collect data from individuals on this register. As a census of all individuals on the list was conducted, a sample size calculation was not carried out.

Questionnaire structure

Several methods were employed to increase response rates, including a mixed-mode survey design (utilising both paper-based and online methods) (Edwards and others 2002, Sharp and others 2006, Dillman

Veterinary Record (2014)

doi: 10.1136/vr.101745

T. D. Nielsen, DVM PhD, DipECVPH,
R. S. Dean, BVMS PhD DSAM(fel)
MRCVS,
N. J. Robinson, BSc VetPath BVetMed
MRCVS,
A. Massey,
M. L. Brennan, BSc(VB) BVMS PGCHE
PhD MRCVS FHEA,
Centre for Evidence-based Veterinary
Medicine, School of Veterinary

Medicine and Science, The University of
Nottingham, Sutton Bonington Campus,
Loughborough LE12 5RD, UK

E-mail for correspondence:
marnie.brennan@nottingham.ac.uk

Provenance: Not commissioned;
externally peer reviewed

Accepted January 5, 2014

and others 2009). The questionnaire was made up of 36 questions and had four main sections; a copy of the questionnaire is available on request. The questions in the first section concerned the collection of demographic information about respondents. The second section was made up of open questions requiring clinicians to nominate up to four species they most frequently encountered, and the three main conditions or complaints they thought they saw most commonly in those species with associated perceived information levels (Fig 1). The other two sections are not discussed here and will appear in a separate manuscript. Questions were constructed using recommendations from several resources to optimise clarity, minimise ambiguity and to avoid leading terminology (Dohoo and others 2003, Holmes and Cockcroft 2003, Williams 2003, Hulley and others 2006, Ekman and others 2007, Thrusfield 2007, Bowling 2009, Dillman and others 2009).

Questionnaire development and distribution

Pretesting of the survey questions was carried out by researchers within the Centre for Evidence-based Veterinary Medicine (CEVM). Piloting of the survey was carried out three times (24 and 25 people, respectively, for paper version and once transferred to the online format, 8 people for online version) with a combination of private veterinarians, academic veterinarians, veterinary specialists and government veterinarians. Formatting of the questionnaire was carried out using TeleForm V.10.5.2 (Verity Inc. 2010), an automated content capture system. This programme enables scanning of completed questionnaires to facilitate entry of closed question data (open question data was manually entered) into a Microsoft Office Access V.14.0.6 (2010 Microsoft Corporation) database automatically. The software of Cvent (2011 Cvent Inc.), an online survey company, was used to construct the online version of the finalised paper questionnaire.

The questionnaires were printed on magnolia coloured paper to make them easily identifiable against white paper. White envelopes were printed with the CEVM logo and the words 'THIS IS A SCIENTIFIC RESEARCH STUDY. THIS IS NOT JUNK MAIL, AN APPEAL FOR DONATIONS OR MARKET RESEARCH' to make it distinguishable from marketing mailings. A pen, chocolate and a return postage paid envelope were included and a prize incentive was offered (£500 towards the continuing professional development course/s of choice). If participants filled in the online version, they had an extra chance of winning £50 worth of department store vouchers.

The RCVS mailing list was obtained in October 2010. An initial mailing was posted to all individuals on this list between 1st and 5th November 2010; a link to Cvent was included allowing participants to choose to complete either an online or paper version of the questionnaire. A first reminder was sent six weeks later to non-responders followed by a second copy of the questionnaire 10 weeks later for those still not responding.

Data entry

Returned paper-based questionnaires were scanned using Teleform, with the system set to check 10 per cent of questionnaires to enable the detection of scanning errors. Questionnaires were accepted from respondents until scanning was completed (November 2011); coding of the common conditions and complaints was completed in May 2012. Responses received electronically were downloaded into a Microsoft Excel V.14.0.6 (2010 Microsoft Corporation) document from Cvent and integrated into a Microsoft Access V.14.0.6 (2010 Microsoft Corporation) database with the paper responses.

Data coding

Data relating to the common conditions or complaints nominated by veterinary clinicians were classified according to species and type of condition. Classification definitions were primarily based on those created by N. J. Robinson (2014), with some modifications for suitability across all species. Species were coded according to animal or production type (see online supplementary Appendix 1). The type of condition or complaint was coded according to the category it was most relevant to in relation to either body system (eg, musculoskeletal) or topic (eg, behaviour) (see online supplementary Appendix 2). This was further broken down to another level of classification which more specifically described the nature of the problem (see online supplementary Appendix 3), resulting in two levels of classification for each condition or complaint (eg, Musculoskeletal-ligament). Additionally, the condition or complaint was coded into a 'type' according to whether it was a disease, a clinical sign the animal might be presented for, or was deemed unclassifiable (see online supplementary Appendix 4).

One researcher (MLB) coded all conditions. If conditions were unknown to the coder or required clarification, the online resource Merck Veterinary Manual (Merck & Co. 2011) was used. A second veterinary resource (eg, textbook, online veterinary resource, colleagues, Google 2012) was used if the condition was not found in the first resource. A Microsoft Excel V.14.0.6 (2010 Microsoft Corporation) spreadsheet of coding was created to maintain consistency for the same complaints or conditions. At the end of the coding process, a second researcher (TDN) identified any discrepancies between similar conditions, and conferred with the first researcher (MLB).

Data management and analysis

The dataset was transferred to a Microsoft Excel V.14.0.6 (2010 Microsoft Corporation) document for data management. Frequency tables and graphs were generated in Excel and RStudio (R Core Team 2011). A posthoc sample size analysis was performed using Raosoft (www.raosoft.com/samplesize.html). There was a high degree of correlation between observations for perceived information level within clinician and species. In order to account for this clustering, the median perceived information level within species for each veterinarian was calculated. A χ^2 test (excluding 'don't know' observations) was then used to determine if perceived information level was different between species. The level of statistical significance was set at $P < 0.05$. Some questions were left unanswered by participants, therefore, the number of responses per question could be less than the total number of respondents; the number of respondents per question is identified where appropriate.

This project received ethical approval from the ethics research committee at the School of Veterinary Medicine and Science at The University of Nottingham.

Results

Response rate

Of the 14,532 questionnaires distributed, 5407 (37 per cent) were returned. Of these: 259 were return to sender, 230 were retired veterinarians, 72 were returned blank, 3 stated that the veterinarian was deceased and 1 was blank except for one comment box. Therefore, 4842 responses (33%; CI 32% to 35%) could be used in the analysis.

Animal species you mostly work with	3 conditions or complaints you see commonly or frequently in this species	In your opinion, how much published veterinary information do you think is available for each condition? (Please mark <u>one</u> box <u>only</u> for each complaint)
Species 2:		None <input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot <input type="checkbox"/> Don't know <input type="checkbox"/>
		None <input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot <input type="checkbox"/> Don't know <input type="checkbox"/>
		None <input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot <input type="checkbox"/> Don't know <input type="checkbox"/>

FIG 1: Question used to gather information on common conditions seen by veterinary clinicians

Posthoc analysis revealed with a population size of 14,532, working on a margin of error of 2 per cent and a confidence level of 99 per cent (with a response distribution of 50 per cent), the sample size required in order to draw meaningful conclusions from the data was 3227. The majority of responses were returned in the form of paper-based questionnaires (3775/4842; 78 per cent).

General respondent information

Of the respondents, 59 per cent (2856/4828) were female. The median age of all respondents was 37 years; for female respondents median age was 33 years (IQR 29–42), and for males it was 46 years (IQR 34–56). Approximately 78 per cent of respondents graduated in the UK (3759/4797; Table 1) with 22 per cent (1038/4797) graduating abroad. Of the 1038 overseas graduates, the largest groups graduated in Ireland (154; 15 per cent) and Australia (114; 11 per cent).

In total, 1914 (40 per cent of 4835) of the respondents declared that they had one or more postgraduate qualification. The highest proportion (778; 16 per cent) had an academic degree (eg, BSc, MSc, PhD). Furthermore, 738 (15 per cent) had a RCVS certificate, a General Practitioner certificate or fellowship; 271 (6 per cent) had a Master of Business and 270 (6 per cent) had a diploma (either RCVS or European). The majority of respondents undertook clinical work (3982/4835; 82 per cent) with 76 per cent (3674/4835) of respondents working in private practice (Table 2). Most veterinary clinicians reported they worked with small animals, with the second largest group working with small animals, equine and production animals (Table 3).

Common species and conditions or complaints

Overall, 36,504 conditions or complaints were mentioned by 3982 respondents undertaking clinical work. Conditions in dogs and cats were most frequently mentioned (Fig 2). Skin was a commonly mentioned body system, as well as the gastrointestinal and musculoskeletal systems (Table 4).

The most commonly mentioned body systems or topics for the most frequently mentioned species were analysed further (Fig 3a,b). The 'Skin-skin' category for dogs and cats contained responses such as 'dermatitis' and 'pruritus'; for dogs it also commonly contained 'atopy', and for cats, 'cat bite abscess'. The 'Skin-non-specific' category for both species included responses such as 'skin disease', 'skin problems' or just 'skin'. The 'Dental-dental' category for rabbits commonly included the responses 'dental disease' and 'dental malocclusion', the 'Dental-non-specific' category included 'teeth' or 'dental problems' and 'Dental-oral' included 'oral' or 'mouth disease'. The 'Skin-non-specific' category in guinea pigs commonly contained responses such as 'skin disease', 'skin problems' and 'skin'. The 'Skin-skin' category in guinea pigs contained more specific responses such as 'pruritus', 'dermatitis' and 'abscesses'. For cattle, the response 'mastitis' relating to the category 'Reproduction-mammary' was the most commonly nominated for reproductive conditions. 'Reproduction-non-specific' in cattle included responses such as 'fertility problems' and 'infertility'; 'Reproduction-reproduction' contained complaints such as 'dystocia' and 'calvings'. In sheep, the category 'Reproduction-reproduction' incorporated responses such as 'lambling', 'dystocia', 'abortion' and 'twin lamb disease'. The 'Reproduction-non-specific' sheep category contained less specific terms such as 'obstetrics', 'fertility' and 'parturition problems'. For equines, most responses were classified into 'Musculoskeletal-musculoskeletal', and were exclusively related to 'lameness'; the 'Musculoskeletal-non-specific' category contained responses such as 'foot abscess' or hoof abscess', 'orthopaedics' and 'back pain'.

TABLE 1: Distribution of respondents graduating from UK vet schools and those training overseas (n=4797)

Vet school	Bristol	Cambridge	Edinburgh	Glasgow	Liverpool	London	Overseas
Number	582	499	626	583	608	861	1038
%	12	10	13	12	13	18	22

TABLE 2: Type of workplace for respondents (n=4835 respondents)*

Type of workplace	Number	Per cent
Private practice	3674	76
University practice or education	277	6
Government (including Veterinary Laboratories Agency and Animal Health)	248	5
Charity	221	5
Research (university or institute)	171	4
Career break	153	3
Other	147	3
Meat inspection	139	3
Outside profession	117	2
Industry (eg, pharmaceutical or feed company)	91	2
Pathology/clinical pathology laboratory	70	1
Army	15	<1

*Respondents could nominate more than one category

Type of common condition or complaint

Cats had a higher proportion of responses classified as 'Disease' (eg, hypothyroidism; 20 per cent), but a lower proportion of conditions classified as 'Clinical sign' (eg, weight loss) when compared with other species (Fig 4). Sheep had the highest proportion of conditions classified as 'Clinical sign' (eg, lameness; 51 per cent) while equines had the highest proportion of observations in the 'Both' category (30 per cent), which relates to conditions that could be considered a clinical sign but are used as a disease description (eg, colic). A high proportion of responses regarding dental issues in rabbits and the respiratory system in equines and cattle were classified as 'Unclassifiable'. This category was for those conditions that could not be classified (eg, zoonoses) or if the terminology was too vague to be considered either a clinical sign or a specific disease (eg, production diseases). Overall, a higher proportion of conditions in rabbits (eg, skin; 53 per cent) and guinea pigs (eg, lumps; 57 per cent) were classified into the 'Unclassifiable' group than the average for all species (41 per cent).

The type of classification was compared with the three most common body system or topic groups for each species (using the categories in Table 4). Very few conditions could be classified into the 'Disease' category. Musculoskeletal conditions in sheep (eg, lameness) were almost exclusively classified as 'Clinical sign' (Fig 5). Dental conditions in guinea pigs (eg, teeth problems) and rabbits (eg, dental disease) and respiratory conditions in cattle (eg, respiratory) had the highest proportion of 'Unclassifiable' conditions.

Perceived information level for conditions or complaints

Generally, respondents thought that there was a lot of information about approximately 60 per cent of the nominated conditions for cattle, equines and dogs, in contrast with rabbits and guinea pigs at 18 per cent and 5 per cent, respectively (Fig 6). After investigating if the perceived information level was similar for the different species, there was significantly less perceived information available for guinea pigs and rabbits, and more for dogs, cattle and equines, and to some extent, cats ($P<0.0001$; data not shown).

TABLE 3: Type of animal practice undertaken by veterinary clinicians (n=3921 respondents*)

Species	Number	Per cent
Small animal (including rabbits and exotics)	2266	58
Small animal and production animal† and equine	507	13
Equine	311	8
Small animal or production animal† or equine and laboratory animal or zoo animal or other	290	7
Production animal†	178	5
Small animal and production animal†	172	4
Small animal and equine	90	2
Equine and production animal†	64	2
Laboratory animal or zoo animal or other	43	1

*Only 3921/3982 respondents who did clinical work stated what type of animal practice they undertook

†Ruminants/pigs/poultry

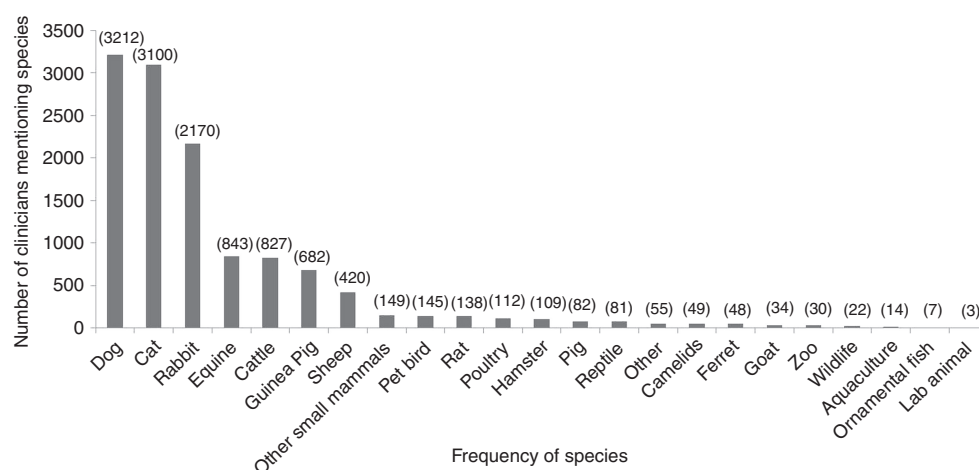


FIG 2: Species nominated as most commonly seen in practice by veterinary clinicians performing clinical work (n=3982). Respondents were asked to mention up to four species they worked with

Discussion

Our findings of the species and conditions reported to be commonly seen in veterinary practice were similar to previous reports (Lumeij and others 1998, Lund and others 1999, Hill and others 2006, Robinson 2014) as dental conditions in rabbits and guinea pigs and skin conditions in small animal practice were highlighted in these studies. However, some studies have shown that the most common presentation in small animal practice is for preventive medicine (Hill and others 2006) which was not found in the current study. This difference could be due to the fact that preventive medicine may not be seen by veterinary clinicians as a condition or complaint, which was how these questions were phrased. Reproductive conditions, particularly mastitis in cattle, were most frequently mentioned for sheep and cattle, which is similar to results found from a Swedish study using information from a cattle database (Mörk and others 2009).

Conditions relating to the musculoskeletal body system in equines have also been commonly found in a study by Loomans and others (2007). The minor differences in species and conditions in this study compared to earlier studies, could be due to different data collection methods. Results in this study are based on which species and conditions or complaints veterinary clinicians nominated as seeing commonly in practice. This could result in conditions recently encountered or those that are difficult to deal with being reported rather than what is actually seen commonly. However, the previous studies highlight similar results, suggesting that clinicians are likely to be acutely aware of the caseload they see, and therefore, are well placed to highlight areas for further research that would be of benefit to the profession.

Classification of common conditions with regards to disease versus clinical sign appeared to be species and body system

TABLE 4: The seven most common species and the three main body systems or topics mentioned by veterinary clinicians performing clinical work (n=3982)*

Species	Per cent of veterinary clinicians (3982)	Number of conditions per species	Body system/Topic	Number of conditions per body system	Per cent of conditions per species
Dog	81	9606	Skin	3064	32
			Gastrointestinal	2735	28
			Musculoskeletal	1742	18
Cat	78	9251	Skin	2467	27
			Non-specific	1272	14
			Urinary	1123	12
Rabbit	54	6410	Dental	1918	30
			Skin	1619	25
			Gastrointestinal	974	15
Equine	21	2498	Musculoskeletal	899	36
			Gastrointestinal	512	20
			Respiratory	336	13
Cattle	21	2463	Reproduction	1085	44
			Respiratory	379	15
			Non-specific	344	14
Guinea pig	17	1974	Skin	743	38
			Non-specific	365	18
			Dental	346	18
Sheep	11	1228	Reproduction	360	29
			Non-specific	282	23
			Musculoskeletal	229	19

Non-specific body systems or topics related to conditions that were either too general to belong to one category (eg, nutrition problems) or could fit into more than one category (eg, bacterial infection)

*Veterinary clinicians were asked to mention up to four species that they worked with and three conditions for each species. See online supplementary Appendices 1, 2 and 3 for further details on condition classification

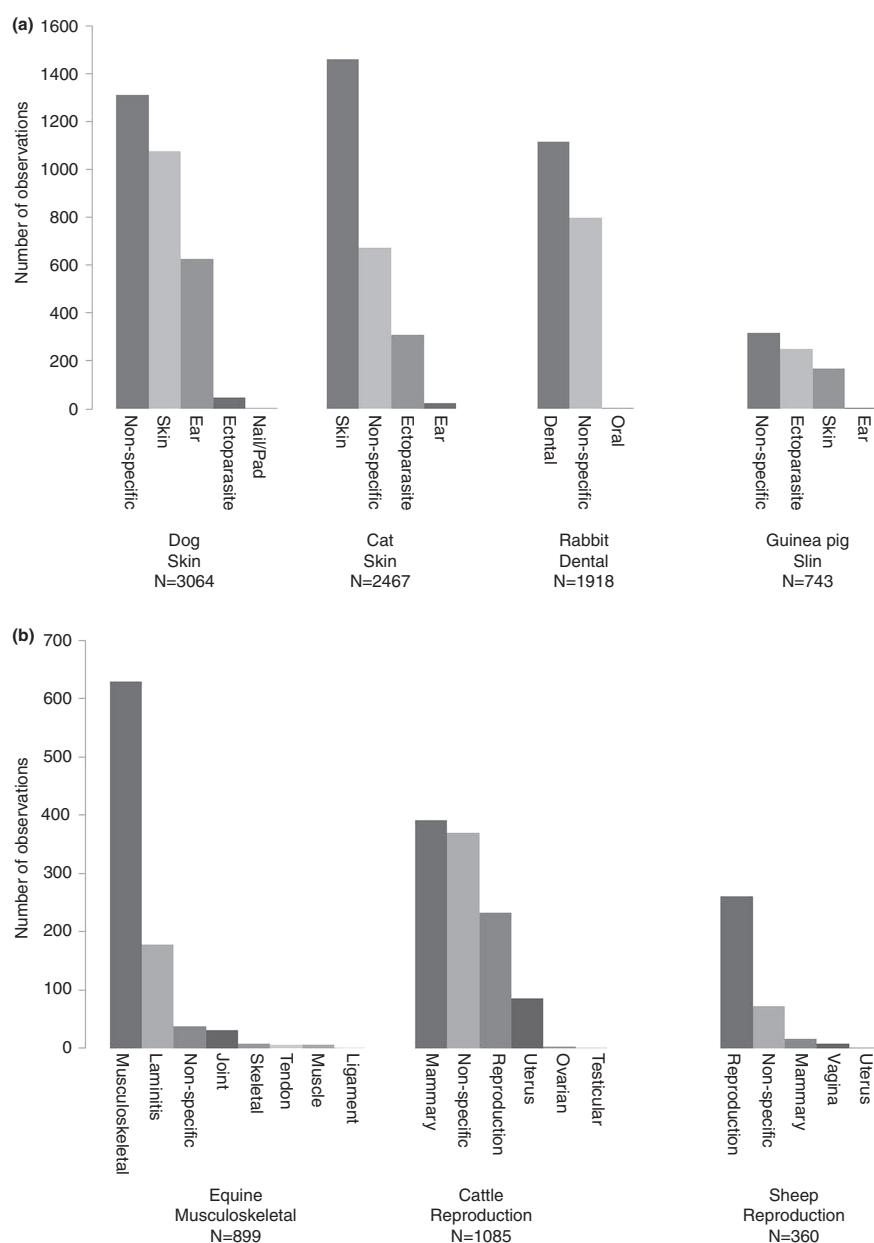


FIG 3: Details of the most commonly nominated conditions for the most commonly nominated small animal (a) and large animal (b) species as outlined by 3982 veterinary clinicians. Respondents were asked to name three conditions for up to four species they worked with. See online supplementary Appendix 3 for further information about coding of conditions

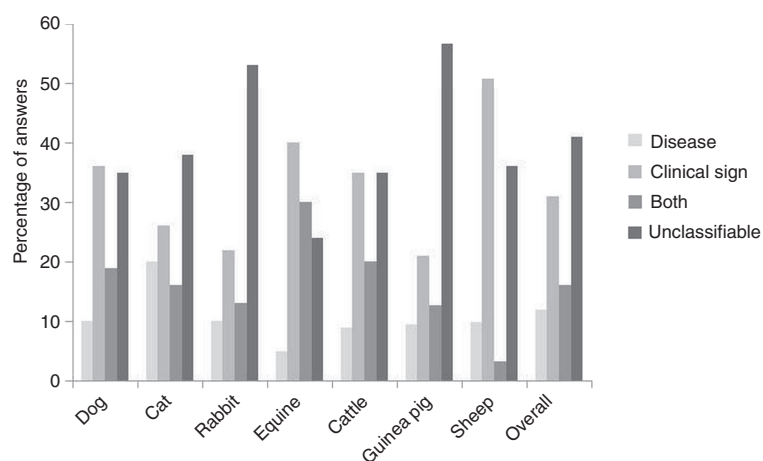


FIG 4: Classification of the common conditions most frequently mentioned by 3982 veterinary clinicians according to species and type of condition. Respondents were asked to name three conditions for up to four species each. See online supplementary Appendix 4 for further information about these classifications

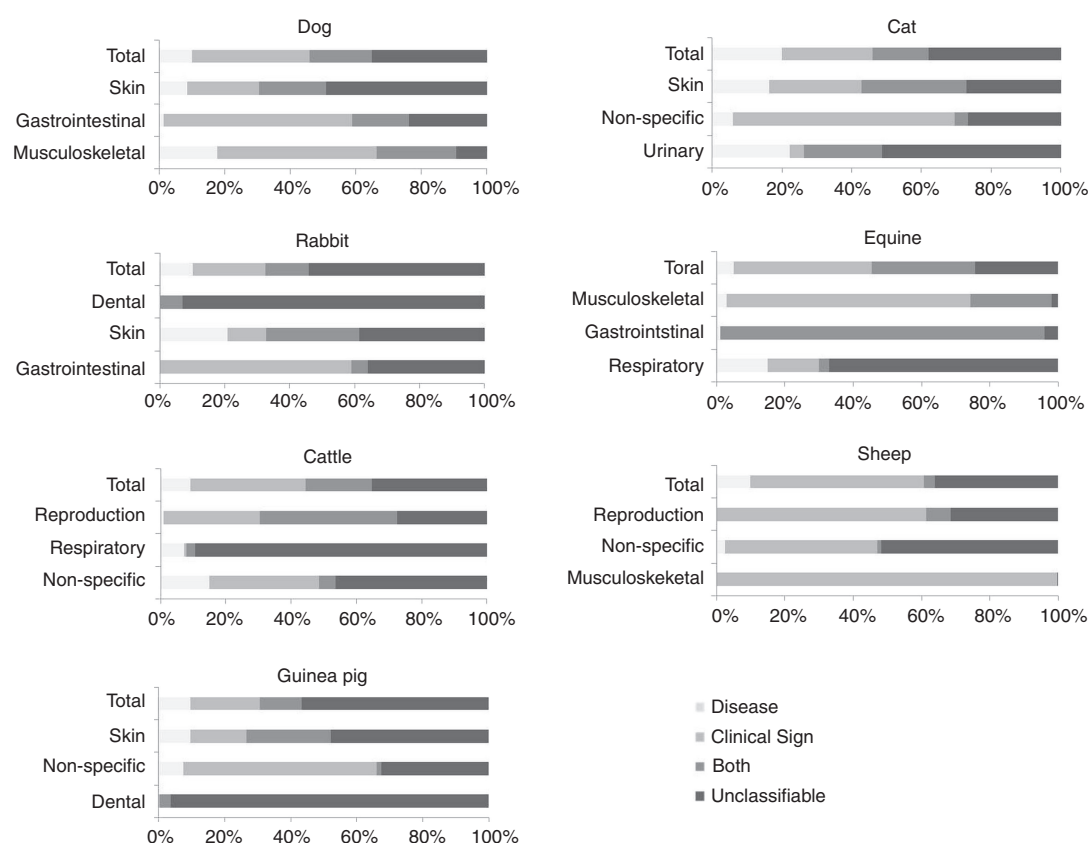


FIG 5: Classification of the three most common body systems in each of the seven most frequently mentioned species groups from conditions nominated by 3982 veterinary clinicians. These have been structured according to type of condition or complaint. Respondents were asked to name up to three conditions for up to four species. See further classification details in online supplementary Appendix 4

dependent. It is unclear why this is the case, and requires further investigation; it is possible this could be partially explained by the variability in how different types of client present their animals (eg, pet owner versus farmer). Species and body systems with high percentages of conditions in the 'unclassifiable' category could represent a number of things. It could be a reflection of the complexities of certain conditions, for example, respiratory disease complex in cattle, or could be an indication of a lack of evidence behind certain conditions in certain species, for example, dental disease in guinea pigs. It could also identify areas where least specific terminology is being used and may indicate areas of uncertainty for clinicians, potentially highlighting areas where further research is required.

The perception by individual veterinary clinicians of the available levels of information available for the nominated common

conditions was found to be similar within species. This suggests that some vets may be more aware of the existing evidence than others. Overall, there was perceived to be a lower amount of information available for guinea pigs and rabbits compared with other species. This could be due to a lack of access to information, lack of familiarity with the information available, or an actual lack of published information about these species. Further work is needed to quantify the amount and quality of information available for each species which is accessible to veterinarians to determine the reason for this result.

Study limitations

As veterinarians can opt out of being contacted by third-party organisations, our sample did not include all RCVS registered veterinarians. It is unknown whether the non-responders possess particular

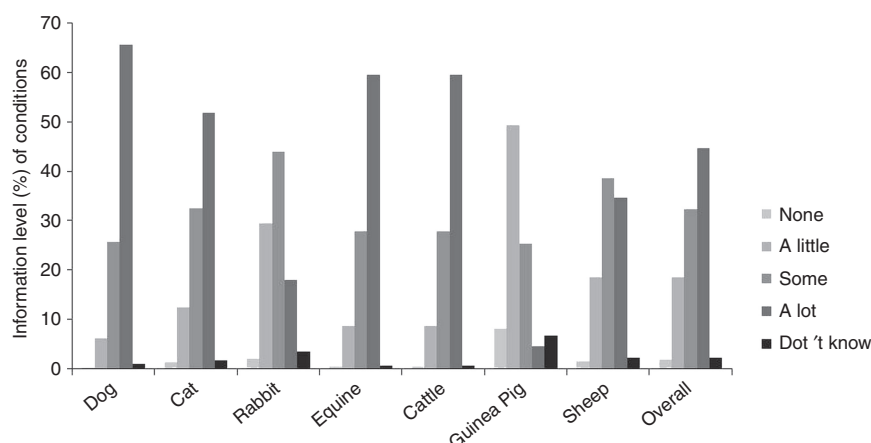


FIG 6: Perceived level of information about common conditions for the seven most common mentioned species from 3982 veterinary clinicians. Respondents were asked to name three conditions for up to four species each

characteristics which are different to the responders (non-responders were not followed up due to feasibility restrictions). Additional information would need to be gathered to assess the bias that may have occurred by the self-selection of respondents (eg, individuals interested in EVM may be more likely to reply) (Templeton and others 1997, Werner and others 2007, Kypri and others 2011). However, responses were received from individuals from a variety of different age groups and occupations, and the distribution of work places and proportion of women (once retirees were excluded) was similar to that found by the RCVS (Robertson-Smith and others 2010). Similar response rates have been reported in other studies (Baruch 1999, Cummings and others 2001, Young and others 2010), although it has been recommended that care be taken when interpreting results with response rates less than 70 per cent (Thrusfield 2007). The posthoc calculation (and CI) indicated that the sample size obtained was likely to be adequate to draw meaningful conclusions about the data; however this calculation may not be appropriate for all questions. Clinicians were asked what percentage of their working time was spent on 1st opinion, 2nd opinion and referral cases. Because of the design of the question, it was not possible to distinguish clearly between clinicians working with 2nd opinion and referral cases. However, very few respondents stated that they spent a considerable percentage of their working time with these types of cases, therefore, the vast majority of responses were from 1st opinion clinicians. We requested that participants only nominated up to four species they most frequently saw, and three conditions per species. It is possible that if more than this number had been requested the results may have appeared differently though it is likely that the main species and conditions have been captured. The way the nominated conditions were coded could have influenced the results found here. However, attempts were made to improve consistency and repeatability as outlined. No attempt was made to define what was meant by 'published veterinary information' which could also have resulted in varying interpretations by respondents, particularly as evidence quality was not assessed as part of this study.

Conclusion

This study highlights specific areas in which research could be pertinent for veterinarians in the UK; skin conditions were mentioned frequently in small animals, and reproductive conditions and musculoskeletal conditions in cattle and sheep, and equines, respectively. There is a perception that little information exists for certain species; further research is required to identify whether this information exists and if it is accessible to veterinarians to aid decision making in practice.

Acknowledgements

The authors wish to thank the veterinarians who participated in the survey. The Centre for Evidence-based Veterinary Medicine is supported by an unrestricted grant from The University of Nottingham and Novartis Animal Health.

- Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/vr-2013-101745>)

Correction notice This article has been corrected since it was published Online First. The first sentence of the discussion was amended for clarity.

Open Access This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 3.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/3.0/>

References

- BARUCH, Y. (1999) Response rate in academic studies: a comparative analysis. *Human Relations* **52**, 421–438
- BOWLING, A. (2009) *Research Methods in Health*. Maidenhead, England: Open University Press
- CEVM (2013) What is evidence-based veterinary medicine? www.nottingham.ac.uk/cevm/whatis-evidence-based-veterinary-medicine/whatis-evidence-based-veterinary-medicine.aspx. Accessed July 2, 2013
- COCKCROFT, P. D. & HOLMES, M. A. (2003) *Handbook of Evidence-Based Veterinary Medicine*. Oxford, England: Blackwell Publishing Ltd
- CUMMINGS, S. M., SAVITZ, L. A. & KONRAD, T. R. (2001) Reported response rates to mailed physician questionnaires. *Health Services Research* **35**, 1347
- DILLMAN, D. A., SMYTH, J. D. & CHRISTIAN, L. M. (2009) *Mail and Internet Surveys: The Tailored Design Method*. New Jersey, USA: John Wiley & Sons
- DOHOO, I. R., MARTIN, W. & STRYHN, H. (2003) Questionnaire design. In *Veterinary Epidemiologic Research*. Cheltenham, Canada: AVC Incorporated, 53–64
- EDWARDS, P., ROBERTS, I., CLARKE, M., DIGUISEPPI, C., PRATA, S., WENTZ, R. & KWAN, I. (2002) Increasing response rates to postal questionnaires: systematic review. *British Medical Journal* **324**, 1183
- EKMAN, A., KLINT, Å., DICKMAN, P. W., ADAMI, H. O. & LITTON, J. E. (2007) Optimizing the design of web-based questionnaires—experience from a population-based study among 50,000 women. *European Journal of Epidemiology* **22**, 293–300
- EVERITT, S. (2008) Applying evidence-based veterinary medicine. In *Practice* **30**, 526–528
- HILL, P. B., LO, A., EDEN, C. A. N., HUNTLEY, S., MOREY, V., RAMSEY, S., RICHARDSON, C., SMITH, D. J., SUTTON, C., TAYLOR, M. D., THORPE, E., TIDMARSH, R. & WILLIAMS, V. (2006) Survey of the prevalence, diagnosis and treatment of dermatological conditions in small animals in general practice. *The Veterinary Record* **158**, 533–539
- HOLMES, M. & COCKCROFT, P. (2004) Evidence-based veterinary medicine 1. Why is it important and what skills are needed? In *Practice* **26**, 28–33
- HOLMES, M. A. & COCKCROFT, P. D. (2003) Designing questionnaires. In *Handbook of Veterinary Clinical Research*. Oxford, UK: Blackwell Publishers Inc., 135–146
- HULLEY, S. B., CUMMINGS, S. R., BROWNER, W. S., GRADY, D. G. & NEWMAN, T. B. (2006) Designing questionnaires and interviews. In *Designing Clinical Research*. 3rd edn. Philadelphia, USA: Lippincott Williams & Wilkins, 241–255
- KYPRI, K., SAMARANAYAKA, A., CONNOR, J., LANGLEY, J. D. & MACLENNAN, B. (2011) Non-response bias in a web-based health behaviour survey of New Zealand tertiary students. *Preventive Medicine* **53**, 274–277
- LOOMANS, J. B. A., STOLK, P. W. T., WEEREN, P. R. V., VAARKAMP, H. & BARNEVELD, A. (2007) A survey of the workload and clinical skills in current equine practices in The Netherlands. *Equine Veterinary Education* **19**, 162–168
- LUMEIJ, J., ENDENBURG, N. & LUYTEN, B. (1998) The percentage of feline, canine, avian and exotic animal consultations in veterinary practice in the Netherlands in 1994 and suggested consequences for the veterinary curriculum and residency programs. *Veterinary Quarterly* **20**, 35–37
- LUND, E. M., ARMSTRONG, P. J., KIRK, C. A., KOLAR, L. M. & KLAUSNOR, J. (1999) Health status and population characteristics of dogs and cats examined at private veterinary practices in the United States. *Journal of the American Veterinary Medical Association* **214**, 1336–1341
- MAJNICK, G. (1998) Evidence-based medicine. *The Veterinary Record* **143**, 619
- MERCK & CO. (2011) The Merck Veterinary Manual. <http://www.merckmanuals.com/vet/index.html>. Accessed July 2, 2013
- MÖRK, M., LINDBERG, A., ALENUS, S., VÅGSHOLM, I. & EGENVALL, A. (2009) Comparison between dairy cow disease incidence in data registered by farmers and in data from a disease-recording system based on veterinary reporting. *Preventive Veterinary Medicine* **88**, 298–307
- R CORE TEAM (2012) R: A Language and Environment for Statistical Computing. www.R-project.org. Accessed July 2, 2013
- ROBERTSON-SMITH, G., ROBINSON, D., HICKS, B., KHAMBHAITA, P. & HAYDAY, S. (2010) The 2010 RCVS Survey of the UK Veterinary and Veterinary Nursing Professions. Brighton, UK: Institute for Employment Studies
- ROBINSON, N. J. (2014) Use of sentinel practices to obtain data regarding common clinical conditions and presentations in small animal consultations. PhD thesis, University of Nottingham
- ROSSDALE, P. D., JEFFCOTT, L. B. & HOLMES, M. A. (2003) Clinical evidence: an avenue to evidence-based medicine (Ed.). *Equine Veterinary Journal* **35**, 634–635
- SHARP, L., COCHRAN, C., COTTON, S. C., GRAY, N. M. & GALLACHER, M. E. (2006) Enclosing a pen with a postal questionnaire can significantly increase the response rate. *Journal of Clinical Epidemiology* **59**, 747–754
- TEMPLETON, L., DEEHAN, A., TAYLOR, C., DRUMMOND, C. & STRANG, J. (1997) Surveying general practitioners: does a low response rate matter? *The British Journal of General Practice* **47**, 91
- THRUSFIELD, M. (2007) Data collection and management. In *Veterinary Epidemiology*. 3rd edn. Oxford, UK: Blackwell Science Ltd, 188–213.
- VANDEWEERD, J. M., KIRSCHVINK, N., CLEGG, P., VANDENPUT, S., GUSTIN, P. & SAEGEMAN, C. (2012) Is evidence-based medicine so evident in veterinary research and practice? History, obstacles and perspectives. *Veterinary Journal* **191**, 28–34
- WERNER, S., PRAXEDES, M. & KIM, H. G. (2007) The reporting of nonresponse analyses in survey research. *Organizational Research Methods* **10**, 287–295
- WILLIAMS, A. (2003) How to... write and analyse a questionnaire. *Journal of Orthodontics* **30**, 245–252
- YOUNG, I., HENDRICK, S., PARKER, S., RAJIĆ, A., MCCLURE, J., SANCHEZ, J. & MCEWEN, S. (2010) Knowledge and attitudes towards food safety among Canadian dairy producers. *Preventive Veterinary Medicine* **94**, 65–76

