

Epilepsy in veterinary patients: perspectives of Dutch veterinarians in first-line practice

Koen Maurits Santifort ,^{1,2} Maud Hamers,³ Paul Mandigers^{1,3}

Abstract

Background This study aims to investigate the perspectives of veterinarians in first-line practice on confidence and satisfaction regarding several important aspects of the description, diagnosis and treatment of canine patients with epilepsy.

Methods A web-based questionnaire was used, focussing on general aspects of canine epilepsy, diagnostic tests, treatment and communication with owners.

Results One hundred and two questionnaires were evaluated. No less than 73 per cent of veterinarians had performed euthanasia on one or more patients with epilepsy as the main reason. First-line veterinarians scored confidence on general aspects of epilepsy as 6 or 7 out of 10. Confidence regarding communication with owners was scored 7 or 8 out of 10.

Conclusions This study provides insight into perspectives of Dutch veterinarians in first-line practice regarding canine epilepsy. Several results may provide reasons to adjust (pregraduate or postgraduate) education of veterinarians with regard to management of canine patients with epilepsy. Several factors (such as the importance of diagnostic imaging) may help specialists in the field communicate better with referring veterinarians so that first-line practitioners become better equipped in managing patients with epilepsy. These steps may then positively influence treatment results as well as care-giver burden for the first-line practitioner.

Introduction

Epilepsy is one of the most common neurological disorders in dogs and cats.^{1–3} In dogs, the prevalence in veterinary practice is estimated to be 0.6–0.75 per cent, though up to 5 per cent of specific canine breeds presented to clinicians are estimated to be afflicted with epilepsy.^{2,4–7} In 2015, the International Veterinary Epilepsy Task Force (IVETF) published several consensus reports on, among others, terminology, genetics, diagnostic approach and treatment of (idiopathic) epilepsy in dogs.^{1,2,8,9} Recently, a similar consensus

report on seizure management was published by the American College of Veterinary Internal Medicine.¹⁰

The consensus reports on terminology, classification and diagnosis enable us to perform comparative studies and extrapolate data, if all follow the consensus.¹ Also, first-line practitioners (FLPs) need clear guidelines as to when a dog is considered to have epilepsy, what aetiologies might underlie epilepsy in different types of patients and when and what treatment might be considered.

Epilepsy in pets can cause distress to their owners and influence their quality of life.^{8,11–14} It might also have an effect on the veterinarians who have to deal with these patients and their owners. When first diagnosed, it is important that veterinarians inform owners about the disease and its effects, when to start treatment and also about what they can expect from the treatment.^{8,15} It is usually a long-term commitment and includes responsibilities and costs for repeated visits to the veterinary practice and medication. The consensus reports that have been published might help veterinarians in first-line practices to achieve all of the goals pertaining to the owner of the patient with epilepsy. However, it is also important to know what

Veterinary Record (2020)

doi: 10.1136/vr.105806

¹Evidensia Small Animal Hospital Arnhem, Arnhem, The Netherlands

Sciences of Companion Animals, Universiteit Utrecht Faculteit

²Evidensia Small Animal Hospital 'Hart van Brabant', Waalwijk, The Netherlands

Diergeneeskunde, Utrecht, The Netherlands; P.J.J.Mandigers@uu.nl

³Department of Clinical Sciences of Companion Animals, Universiteit Utrecht Faculteit Diergeneeskunde, Utrecht, The Netherlands

Provenance and peer review Not commissioned; externally peer reviewed.

E-mail for correspondence: Dr Paul Mandigers, Department of Clinical

Received November 27, 2019

Revised April 27, 2020

Accepted June 19, 2020

subjects or factors need clarification for FLPs to be able to optimally guide patients with epilepsy and their owners. It is also important to know what the feelings of FLPs are with regard to confidence and satisfaction pertaining to several aspects of the clinical guidance of patients with epilepsy and their owners.

This questionnaire-based descriptive study aims to describe the perspectives of Dutch veterinarians in first-line practices on terminology, the diagnostic process and treatment of dogs with epilepsy as well as communication with owners of patients with epilepsy. The goal is to clarify if there are particular points of interest that need clarification for FLPs to ultimately be able to evaluate current needs for adaptation of pregraduate and postgraduate education and help specialists and FLPs to be able to communicate more efficiently and correctly.

Materials and methods

Veterinarians, based in the Netherlands, either mixed or companion animal practitioners in first-line practice were asked to participate in a voluntary, open, IP-checked, web-based SurveyMonkey questionnaire with informed consent without any incentive. Veterinarians were approached using social media, direct emailing by means of using the complete database of the Dutch Veterinary Association (KNMvD) and indirectly by spreading the questionnaire online. The questionnaire (in Dutch) consisted of 24 questions in fixed order with one question per page with a fill-requirement and possibility of revising the earlier answered questions. The questions were based on earlier work focussing mainly on owners of canine patients with epilepsy and also on earlier work that focussed on preferences of veterinarians for certain antiepileptic drugs (AEDs).^{11–15} Some explanation was provided to the respondents on recently reported terminology and questions were formulated to be able to evaluate important aspects of categorisation of, for instance, types of epilepsy seizures (ie, generalised or focal epileptiform seizures) and epilepsy aetiology (ie, idiopathic, structural or reactive seizures) and diagnostic tests that FLPs employ.^{1,2,8–10} Most questions were multiple choice or based on an ordinal scale of 'satisfaction' regarding a specific subject (1–10, with 1 poor and 10 excellent).

Questions focussed on information on the practitioners themselves (FLP characteristics, 3q (ie, place of graduation, years since graduation and number of patients with epilepsy treated)), satisfaction regarding confidence on general aspects of canine epilepsy (4q), diagnostic tests and treatment (13q) and communication with owners (4q). Questions on general aspects of canine epilepsy were focussed on differentiating between epilepsy and other disorders, differentiating between idiopathic epilepsy and other aetiologies, differentiating between types of

seizures, specific factors important in differentiation of epileptiform seizures and owner-provided information. The category of diagnostic and treatment options was divided into factors with influence on determination of seizure type/aetiology of epilepsy, use of antiepileptic drugs (AEDs) in idiopathic canine patients with epilepsy, use of alternative treatment options, confidence of knowing when to start or adjust treatment, referral of cases to a specialist, euthanasia of patients with epilepsy, routine check-up appointments, satisfaction with regard to costs for the owner and satisfaction with outcome. The full questionnaire, in Dutch, is available on request. All questionnaires were collected with the online survey development software SurveyMonkey within a timeframe of two months (from the 10th of October 2016 to the 10th of December 2016). The questionnaire results were only available to the authors with password protection. Questionnaires were only analysed if the questionnaire was filled in completely. Descriptive statistics and Pearson correlation tests (reported as $r(df)=r$, P ($P<0.01$ were considered significant)) were performed to evaluate if there were indications of association between scores on several subjects and FLP characteristics using SPSS software (V.24). All results are presented as medians and ranges: median (range lowest–highest).

Results

In total, over 2400 practices/veterinarians were approached by email for this study. Only 129 questionnaires were submitted for review, 27 were not fully completed and therefore excluded. A total of 102 completed questionnaires could be evaluated (response rate=5 per cent).

FLP characteristics

Eighty-nine out of 102 (87 per cent) of respondents graduated from University of Utrecht, 11 (11 per cent) from the Ghent University and 2 (2 per cent) from the University of Leipzig. The median years after graduation at the moment of this survey was 16 years with a range of 1–42 years. During the last 12 months, the median of canine epilepsy cases seen was 6 patients with a range of 1–40.

Satisfaction regarding confidence on general aspects of epilepsy

Differentiation of epilepsy and other disorders

Differentiation of epilepsy versus other disorders: overall confidence in differentiating epilepsy from other seizure-like disorders was scored a median of 6 (range 1–10). There was a non-significant weak positive correlation with years after graduation ($r(102)=0.11$, $P=0.27$).

Classification of epilepsy by the FLP

Overall confidence in differentiating idiopathic epilepsy from structural epilepsy or reactive seizures was scored

a median of 6 (range 1–9). There was a non-significant weak positive correlation with years since graduation ($r(102)=0.16$, $P=0.11$) and non-significant negligible negative correlation with number of patients with epilepsy ($r(102)=-0.08$, $P=0.42$).

Differentiation of types of epileptic seizures

Overall confidence in differentiating types of seizures (ie, generalised, focal or other) was scored a median of 6 (range 1–10). There was a non-significant weak positive correlation with years since graduation ($r(102)=0.10$, $P=0.42$) and a non-significant negligible negative correlation with number of patients ($r(102)=-0.05$, $P=0.62$).

Satisfaction regarding information provided by owners

Overall satisfaction regarding owner-provided information on seizures of the dog was scored a median of 7 (range 1–10). There was a non-significant weak positive correlation with years since graduation ($r(102)=0.22$, $P=0.03$) and a non-significant negligible negative correlation with number of patients ($r(102)=-0.05$, $P=0.62$).

Diagnostic and treatment options

Factors with influence on determination of seizure type/aetiology of epilepsy

The influence of eight factors was evaluated by having the respondents score the importance of those factors on the determination of seizure type/aetiology of epilepsy on a scale of 1–10. The scores are shown in [table 1](#).

Antiepileptic drug (AED) use

In [table 2](#), the drugs employed by veterinarians in FLP in this study are ranked.

One respondent mentioned not using any medication in some cases.

Use of alternative treatment options

Six per cent of respondents mentioned employing 'alternative treatment options' and were asked to elaborate and specify which were employed. The following options were mentioned:

1. Special diet (and medium chain triglyceride/omega-3-fatty acid supplements) (four respondents, 4 per cent).

2. Homeopathy or phytotherapy (three respondents, 3 per cent).
3. Acupuncture (two respondents, 2 per cent) and CBD oil (two respondents, 2 per cent).
4. One respondent mentioned 'Bach-therapy' and 'orthomolecular supplements' as alternative treatments.

Confidence in knowing when to start or adjust treatment

Overall confidence in knowing when to start treatment was scored medium of 7 (range 2–10). There was a non-significant weak positive correlation with years since graduation ($r(102)=0.22$, $P=0.04$) and a non-significant negligible positive correlation with number of patients ($r(102)=0.09$, $P=0.37$). Overall confidence in knowing when to adjust treatment was scored a medium of 6 (range 2–10). There was a non-significant weak positive correlation with years since graduation ($r(102)=0.24$, $P=0.02$) and a non-significant negligible positive correlation with number of patients ($r(102)=0.09$, $P=0.37$).

Referral of cases to a specialist

A median of 10 per cent (range 0–100 per cent) of patients with epilepsy are referred to a specialist by FLPs. Ninety-one per cent of all respondents referred at least one or more patients to a specialist, whereas 9 per cent of all respondents never referred patients with epilepsy. There was a non-significant negligible negative correlation with years since graduation ($r(102)=-0.03$, $P=0.76$) and a non-significant very weak negative correlation with number of patients ($r(102)=-0.13$, $P=0.19$).

Euthanasia of patients with epilepsy

A median of 10 per cent (range 0–75 per cent) of the patients with epilepsy seen by the FLP are euthanased with epilepsy as the main reason. Remarkably, 73 per cent of veterinarians admitted to use the option of euthanasia in some of their cases, whereas 27 per cent claimed never to euthanase patients with epilepsy. There was a non-significant very weak positive correlation with years since graduation ($r(102)=0.15$, $P=0.13$) and a non-significant negligible negative correlation with number of patients ($r(102)=-0.03$, $P=0.76$).

Routine check-up plans

The routine implementation of seven diagnostic tests was evaluated by having the respondents score their

Factor	Score (median)	Range
Anamnesis	8	3–10
Age	8	1–10
Breed	8	1–10
Clinical examination	7	1–10
Metabolic tests	7	1–10
Video of the seizure	8	2–10
MRI	5	1–10
CT	4	1–10

Age, age at onset of epileptic seizures.

AED	Percentage of FLPs reporting use of the AED
Phenobarbital	89
Imepitoin	75
Diazepam	39
Potassium bromide	36
Phenytoin	8
Gabapentin	3
Levetiracetam	1

AED, antiepileptic drug; FLP, first-line practitioner.

Table 3 Frequency of implementation of diagnostic tests in routine check-up plans scored on a scale of 1–10 by FLPs

Factor	Score (median)	Range
Clinical examination	8	1–10
AED serum level determination	7	1–10
Biochemistry, hepatic	6	1–10
Biochemistry, renal	7	1–10
Abdominal ultrasound	1	1–6
MRI	1	1–4
CT	1	1–4

AED, antiepileptic drug; FLP, first-line practitioner.

frequency of implementation on a scale of 1–10. The scores are shown in [table 3](#).

Satisfaction with regard to costs of treatment for the owner

Respondents were asked to score on a scale of 1–10 their feelings with regard to ‘satisfaction’ of the costs that are associated with treatment of patients with epilepsy.

Overall satisfaction with regard to costs for the owner was scored with a median of 8 (range 4–10).

Satisfaction with outcome

Overall satisfaction with regard to seizure frequency and intensity (‘earnestness’) in patients with epilepsy was scored a median of 7 (range 1–10). Overall satisfaction with regard to adverse effects of AEDs in patients with epilepsy was also scored a median of 7 (range 1–10). Non-significant weak positive correlations for years since graduation and number of patients were found ($r(102) < 0.25$, $P = 0.011$).

Communication with owners

Confidence in being able to comfort owners

Overall confidence in being able to comfort or calm down owners when their dog has had a seizure was scored a median of 7 (range 3–10). There was a significant moderate positive correlation with years since graduation ($r(102) = 0.33$, $P < 0.01$) and no correlation with number of patients ($r = 0.00$).

Confidence in being able to explain epilepsy to owners

Overall confidence in being able to explain to owners what idiopathic epilepsy is was scored a median of 8 (range 2–10) and what phases characterise epileptic seizures was also scored a median of 8 (range 3–10). Both had non-significant weak positive correlations with years since graduation ($r(102) = 0.12$, $P = 0.23$ and $r(102) = 0.22$, $P = 0.03$) and non-significant very weak positive correlations with number of patients ($r(102) = 0.10$, $P = 0.32$ and $r(102) = 0.13$, $P = 0.19$).

Confidence in being able to explain to owners that seizures will probably recur despite treatment

Overall confidence in being able to explain to owners that seizures will probably recur despite treatment was scored a median of 8 (range 4–10). There was a non-significant weak positive correlation with years since

graduation ($r(102) = 0.23$, $P = 0.02$) and a non-significant very weak positive correlation with number of patients ($r(102) = 0.06$, $P = 0.55$).

Discussion

This questionnaire-based descriptive study aimed to describe the perspectives of Dutch veterinarians in first-line practices on terminology, the diagnostic process and treatment of veterinary canine patients with epilepsy as well as communication with owners of canine patients with epilepsy. All results are presented as medians and ranges. Reporting of the median was chosen over the reporting of the mean since the mean is more affected by outliers and scores of 1 and 10 would affect the mean more than the median, which might affect overall perception and misconstrue interpretation.

Satisfaction regarding confidence on general aspects of epilepsy

FLPs were not very confident in being able to differentiate epilepsy from other paroxysmal disorders, being able to differentiate between epilepsy types and being able to differentiate epileptic seizure types; all medians were 6. This may suggest that the (pregraduate and postgraduate) education of veterinarians needs to be updated or elaborated on the subject of epilepsy, to provide them with more background information and latest consensus on differentiation of these diseases and types of epilepsy and epileptic seizures. They were fairly satisfied (7 out of 10) with the information provided by owners often accompanied by video material. Owners often search on the internet (‘home research’) to clarify what they think is happening to their animal. The information that owners themselves provide through home research together with the video material they provide contributes to the diagnostic process.¹⁶

Diagnostic and treatment options

Age at onset of epileptic seizures and breed are important aspects in the determination of seizure type/aetiology of epilepsy (epileptiform or not and what type of epileptic seizure), as reported in recent consensus reports.^{2,8} This is, apparently, recognised by FLPs, as they scored an 8 out of 10 for these factors. The same goes for information gathered from the anamnesis and video files, since these are crucial to determine the nature of a seizure.⁸ Clinical examination and metabolic tests were also scored relatively high (7 out of 10). Advanced imaging modalities, such as MRI and CT, were scored much lower: 5 and 4, respectively. Clinical examination and metabolic tests are part of the tier 1 confidence level to diagnose idiopathic epilepsy in dogs.⁸ It may be that this is the reason for the median of 7 given by the FLPs to these factors, but it may also be the easy availability that triggers FLPs to perform these investigations. The low scores for MRI and CT might be explained by the relative difficulty (logistically or financially) for FLPs to be able to have these studies

performed. It must be stressed that, especially MRI, is a test included in the recent consensus report to reach in the tier 2 level of confidence in establishing the diagnosis of idiopathic epilepsy.⁸

Phenobarbital was the drug of choice for most FLPs in this study. This is in agreement with a previous survey among Australian veterinarians.¹⁵ However, imepitoin was the second most selected AED among veterinarians in this study. As this relatively new drug has only been registered for use in treatment of canine epilepsy in the European Union since 2013, it was not reported in the study by Kluger and others.¹⁵ According to the recent consensus report by the IVETF, imepitoin is a first-choice drug alongside phenobarbital for dogs with idiopathic epilepsy that have not suffered/do not suffer from cluster seizures or status epilepticus.⁹ This, along with properties of imepitoin such as quickly reaching effective serum levels, might have influenced FLPs to choose this drug. Also, marketing strategies by suppliers and pharmaceutical companies are to be expected to play an important role. Recent studies have, however, reported several adverse effects, increased appearance of cluster seizures in dogs treated with imepitoin and disappointing clinical effectiveness of imepitoin in canine patients.^{17–18} These relatively new insights may not be common knowledge to FLPs, which might influence their decision-making. Diazepam was included in the list of AEDs and 39 per cent of the FLPs responded that they use this drug in the treatment of patients with epilepsy. However, several comments were made by respondents, that they use this drug in emergency situations and not as oral maintenance drug. Use of diazepam was not reported by Kluger and others.¹⁵ Recent studies suggest that other AEDs are more effective than diazepam in emergency situations.^{19–20} If the authors disregard diazepam, potassium bromide was the third drug of choice, employed by 36 per cent of FLPs. This is in contrast with the results of Kluger and others¹⁵ who reported 80 per cent of respondents using this salt for canine patients with epilepsy. This may reflect geographical/cultural/educational differences in drug preference/experience. Potassium bromide is the add-on drug of choice and sometimes suitable as a monotherapeuticum in canine patients with idiopathic epilepsy according to the recent consensus report.⁹ Other AEDs (phenytoin, gabapentin and levetiracetam) were mentioned by only a few FLPs. Since many (>90 per cent) FLPs refer patients, it might be that if a patient is unresponsive to the more commonly used AEDs they are referred and that may be one of the explanations why FLPs rarely use these other AEDs.

Only six (6 per cent) of the respondents employ alternative treatment options in canine patients with epilepsy. This is a somewhat surprising result, as recent studies have made it clear that owners frequently employ alternative treatment options.²¹ In some cases, additional support with for instance a medium chain

fatty acid supplements may support the efficacy of the antiepileptic treatment.²²

FLPs are fairly confident (median 7) with regard to knowing when to start or adjust treatment. However, whether these treatment decisions would be in accordance with the consensus statements is not clear.⁹ Of interest is that 91 per cent of the respondents used referral as a treatment option, but, surprisingly, 9 per cent did not. As referral of patients to a specialty clinic or small animal hospital becomes more commonplace in the Netherlands, this is in line with overall trends, based on clinical experience of the authors. The reason for the 9 per cent of respondents to not refer patients is unclear. The authors would recommend to always consider referral for patients with epilepsy, as epilepsy, more often than not, requires lifelong attention as has a great impact on quality of life of owner as well as patients themselves.^{11–14} However, some patients in practice may be well-controlled after initiation of first-line treatment, experience only very few seizures and/or they may have owners who do not wish to be referred for various reasons.

Euthanasia is an important cause of death in canine patients with epilepsy.^{9,23} FLPs reported a range of 0–75 per cent of patients with epilepsy being euthanased with epilepsy as the main reason. Earlier studies have reported euthanasia rates of up to 70 per cent in certain breeds of dogs with epilepsy.^{24–26} The euthanasia rate quite realistically depends on many factors, such as treatment options employed, communication between veterinarian and owner, etc. It is difficult therefore to draw conclusions on whether or not the median of 10 per cent is a relevant percentage. It is interesting to note that no less than 73 per cent of the respondents considered euthanasia in their epilepsy cases but surprisingly 27 per cent reported that this was not an employed option. As euthanasia is not uncommon in veterinary practice, the possibility exists that these respondents refer these patients to a specialist for additional treatment.

Regarding employment of diagnostic tests for follow-up, clinical examination, AED level determination and biochemistry tests (renal and hepatic) were scored the highest and may be interpreted to be considered most important by FLPs in routine check-up plans for patients with epilepsy and are completely in line with the IVETF consensus reports.^{8,9,23}

FLPs are satisfied with regard to costs for the owner in the treatment of patients with epilepsy (median of 8). This question was considered important, as costs may influence decisions of both owners and veterinarians. However, in a another study by the authors' group, owners reported costs to be one of the least important factors when dealing with a pet with epilepsy.²⁷

FLPs were fairly satisfied with regard to seizure frequency and intensity ('earnestness') after/during treatment and with regard to adverse effects of AEDs in patients with epilepsy (median of 7). In the other study by the authors' group, owners scored lower on this

point.²⁷ This is interesting, because if the owner is less satisfied than the FLP, this might result in discrepancies regarding 'treatment success'.

Communication with owners

FLPs were fairly confident in being able to comfort owners when their dog has had a seizure (median of 7). Caregiver burden can be high in owners that care for dogs with epilepsy.^{28–30} This 'burden' may be transferred to the professional care-giver in some degree, as discussed in recent literature.^{29,30} Not being able to comfort an owner may result in stress for the FLP and contribute to psychological problems, unfortunately often reported in the veterinary profession.³¹ Communication skills are necessary to be able to cope with these stressors. Confidence in being able to comfort owners was investigated in this study, to get some idea on whether veterinarians can be expected to be 'at risk' of stress relating to this matter. A median of 7 might signify that there is room for improvement and it is indeed important to focus attention of FLPs on this subject for their own health, as well as that of their patients and clients.^{29,30}

FLPs were confident in being able to explain epilepsy to owners and in being able to explain to owners that seizures will probably recur despite treatment (median of 8). This is important to know, because understanding what epilepsy is, is vital for owners to adequately take on their roles in the treatment of epilepsy.^{8,9,23,29,30} And it can be expected to increase quality of life for owners and pets (through better treatment results and lowering stress for the owner/veterinarian).^{11,29,30}

The results of this study did not point to clear correlations between year of graduation or number of patients treated in the last 12 months and the scores given by respondents regarding several subjects. Only non-significant weak, very weak or negligible correlations were encountered, except for one. There was a significant moderate positive correlation with years since graduation and the score given by respondents on confidence in being able to comfort or calm down owners when their dog has had a seizure ($r(102)=0.33$, $P<0.01$). Overall, this was scored with a median of 7 (range 3–10) by FLPs. In other words, veterinarians with more years after graduation have more confidence in being able to comfort or calm down owners when their dog has had a seizure. The correlation is, however, moderate at best, so one must be cautious in drawing conclusions on this note. A possible conclusion could be that more clinical experience (or simply age) results in a moderately higher confidence on this matter. Several other factors might contribute to this finding as well, such as types of patients that were treated by these veterinarians, types of owners and general psychological characteristics of the respondents. Of note, the P value for significance was set at 0.01 in this study.³² Some correlations that were weak to negligible had a $P<0.05$ but >0.01 . Still, the reader is advised to

keep in mind that significance of correlation does not imply that the correlation is significant in the true sense of the word as those correlations were all weak to negligible. Furthermore, it does not necessarily imply a causal relationship between the two variables.

Study limitations

There are limitations to this study. There is, of course, the very real possibility of bias when performing questionnaire-based studies. One paper discusses 48 types of bias in questionnaires.³³ It is virtually impossible to prevent all types of bias, and as such several of these can be recognised in this study. One example can be found in the population of FLPs that responded: all respondents claimed to see epilepsy cases which might suggest that especially those veterinarians that actually see canine patients with epilepsy filled in the questionnaire. Therefore, the study population might not be representative of all Dutch FLPs. Another limitation can be found in the response rate. Although the request for information was sent by email to approximately 2400 FLPs, either mixed or companion animals, the response rate of 5 per cent is low.

Conclusion

In conclusion, this study provides recent information on the perspectives of veterinarian in FLP regarding canine epilepsy. Several results may provide reasons to adjust (pregraduate or postgraduate) education of veterinarians with regard to the subject of epilepsy in veterinary patients. More than 90 per cent of FLPs in this study refer patients to specialist. Therefore, they would be expected to have contact with specialists about those cases. The importance of diagnostic imaging in the diagnosis of idiopathic epilepsy in canines, the specific AED recommended in specific patients with epilepsy, options left to explore before euthanasia would be performed and mentioning points to clarify to owners specifically may be highlighted by specialists in the field when communicating with FLPs so that FLPs become better equipped to treat their own patients. These steps may then positively influence treatment results as well as care-giver burden and stress for the FLP.

Acknowledgements The authors are grateful for the cooperation of all participating veterinarians in first-line practice.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Data availability statement Data are available upon request. The original Dutch questionnaire is also available upon request.

© British Veterinary Association 2020. No commercial re-use. See rights and permissions. Published by BMJ.

ORCID iD

Koen Maurits Santifort <http://orcid.org/0000-0001-7552-216X>

References

- 1 Berendt M, Farquhar RG, Mandigers PJJ, *et al.* International veterinary epilepsy Task force consensus report on epilepsy definition, classification and terminology in companion animals. *BMC Vet Res* 2015;11:182.

- 2 Hülsmeier V-I, Fischer A, Mandigers PJJ, *et al.* International veterinary epilepsy Task force's current understanding of idiopathic epilepsy of genetic or suspected genetic origin in purebred dogs. *BMC Vet Res* 2015;11:175.
- 3 Heller HB. Feline epilepsy. *Veterinary Clinics: Small Animal Practice* 2018;48:31–43.
- 4 Heske L, Nødtvedt A, Jäderlund KH, *et al.* A cohort study of epilepsy among 665,000 insured dogs: incidence, mortality and survival after diagnosis. *Vet J* 2014;202:471–6.
- 5 Kearsley-Fleet L, O'Neill DG, Volk HA, *et al.* Prevalence and risk factors for canine epilepsy of unknown origin in the UK. *Vet Rec* 2013;172:338.
- 6 Podell M, Fenner WR, Powers JD. Seizure classification in dogs from a nonreferral-based population. *J Am Vet Med Assoc* 1995;206:1721–8.
- 7 Fluehmann G, Doherr MG, Jaggy A. Canine neurological diseases in a referral hospital population between 1989 and 2000 in Switzerland. *J Small Anim Pract* 2006;47:582–7.
- 8 De Risio L, Bhatti S, Muñana K, *et al.* International veterinary epilepsy Task force consensus proposal: diagnostic approach to epilepsy in dogs. *BMC Vet Res* 2015;11:148.
- 9 Bhatti SFM, De Risio L, Muñana K, *et al.* International veterinary epilepsy Task force consensus proposal: medical treatment of canine epilepsy in Europe. *BMC Vet Res* 2015;11:176.
- 10 Podell M, Volk HA, Berendt M, *et al.* 2015 ACVIM small animal consensus statement on seizure management in dogs. *J Vet Intern Med* 2016;30:477–90.
- 11 Wessmann A. Effects of idiopathic epilepsy on the quality of life of dogs and their owners. *Vet Rec* 2011;168:310.
- 12 Lord LK, Podell M. Owner perception of the care of long-term phenobarbital-treated epileptic dogs. *J Small Anim Pract* 1999;40:11–15.
- 13 Chang Y, Mellor DJ, Anderson TJ. Idiopathic epilepsy in dogs: owners' perspectives on management with phenobarbitone and/or potassium bromide. *J Small Anim Pract* 2006;47:574–81.
- 14 Wessmann A, Volk HA, Parkin T, *et al.* Evaluation of quality of life in dogs with idiopathic epilepsy. *J Vet Intern Med* 2014;28:510–4.
- 15 Kluger EK, Malik R, Govendir M. Veterinarians' preferences for anticonvulsant drugs for treating seizure disorders in dogs and cats. *Aust Vet J* 2009;87:445–9.
- 16 Packer RMA, Berendt M, Bhatti S, *et al.* Inter-Observer agreement of canine and feline paroxysmal event semiology and classification by veterinary neurology specialists and non-specialists. *BMC Vet Res* 2015;11:39.
- 17 Stabile F, van Dijk J, Barnett CR, *et al.* Epileptic seizure frequency and semiology in dogs with idiopathic epilepsy after initiation of imepitoin or phenobarbital monotherapy. *Vet J* 2019;249:53–7.
- 18 Stee K, Martlé V, Broeckx BJG, *et al.* Imepitoin withdrawal in dogs with idiopathic epilepsy well-controlled with imepitoin and phenobarbital and/or potassium bromide does not increase seizure frequency. *Vet J* 2017;230:1–5.
- 19 Charalambous M, Bhatti SFM, Van Ham L, *et al.* Intranasal midazolam versus rectal diazepam for the management of canine status epilepticus: a multicenter randomized parallel-group clinical trial. *J Vet Intern Med* 2017;31:1149–58.
- 20 Cagnotti G, Odore R, Bertone I, *et al.* Open-Label clinical trial of rectally administered levetiracetam as supplemental treatment in dogs with cluster seizures. *J Vet Intern Med* 2019;33:1714–8.
- 21 Berk BA, Packer RMA, Law TH, *et al.* Investigating owner use of dietary supplements in dogs with idiopathic epilepsy. *Res Vet Sci* 2018;119:276–84.
- 22 Law TH, Davies ESS, Pan Y, *et al.* A randomised trial of a medium-chain tag diet as treatment for dogs with idiopathic epilepsy. *Br J Nutr* 2015;114:1438–47.
- 23 Potschka H, Fischer A, Löscher W, *et al.* International veterinary epilepsy Task force consensus proposal: outcome of therapeutic interventions in canine and feline epilepsy. *BMC Vet Res* 2015;11:177.
- 24 Berendt M, Gredal H, Ersbøll AK, *et al.* Premature death, risk factors, and life patterns in dogs with epilepsy. *J Vet Intern Med* 2007;21:754–9.
- 25 Hülsmeier V, Zimmermann R, Brauer C, *et al.* Epilepsy in border Collies: clinical manifestation, outcome, and mode of inheritance. *J Vet Intern Med* 2010;24:171–8.
- 26 Gulløv CH, Toft N, Berendt M. A longitudinal study of survival in Belgian Shepherds with genetic epilepsy. *J Vet Intern Med* 2012;26:1115–20.
- 27 Hamers MF. Canine epilepsy: a survey on the owners' perspective of quality of life. Proceedings of the 2017 European Veterinary Conference Voorjaarsdagen, The Hague, The Netherlands, 2017.
- 28 Nettifee JA, Munana KR, Griffith EH. Evaluation of the impacts of epilepsy in dogs on their caregivers. *J Am Anim Hosp Assoc* 2017;53:143–9.
- 29 Ducoté JM. Common neurologic problems: impact on patient welfare, caregiver burden and veterinarian wellbeing. *Vet Clin North Am Small Anim Pract* 2019;49:463–76.
- 30 Spitznagel MB, Carlson MD. Caregiver burden and veterinary client well-being. *Vet Clin North Am Small Anim Pract* 2019;49:431–44.
- 31 Lovell BL, Lee RT. Burnout and health promotion in veterinary medicine. *Can Vet J* 2013;54:790.
- 32 Colquhoun D. An investigation of the false discovery rate and the misinterpretation of p-values. *R Soc Open Sci* 2014;1:140216.
- 33 Choi BCK, Pak AWP. A catalog of biases in questionnaires. *Prev Chronic Dis* 2005;2:A13.

