Evaluation of the Impacts of Epilepsy in Dogs on Their Caregivers

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ABSTRACT

Epilepsy is a common problem in dogs, and management of this chronic disorder requires a substantial commitment on the part of the pet owner. The aim of this study was to evaluate the impact of epilepsy in dogs on their owners, utilizing an online survey tool. A questionnaire was developed to explore a variety of factors, including seizure history, treatment, outcome, quality of life, costs associated with therapy, and sources of support. A total of 225 responses were obtained. The majority of respondents reported positive scores for overall quality of life, although scores were significantly lower for dogs with poorly controlled epilepsy and medication-related adverse effects. The median monthly expenditure for antiepileptic medication was $51–75. Despite the considerable financial burden placed on the dog owner, monthly medication cost was not associated with quality of life score. Few published reports follow dogs with epilepsy after diagnosis, and there is a growing need to understand the issues associated with long-term management of this population. The results of this study provide useful information that can help veterinary professionals educate owners and set expectations regarding treatment of seizures and quality of life for dogs with epilepsy. (*J Am Anim Hosp Assoc* 2017; 53:000–000. DOI 10.5326/JAAHA-MS-6537)

Introduction

Epilepsy is the most common chronic neurological disorder of dogs, with an estimated prevalence of 0.62–0.75% in the general dog population.[1–3] Management of the disorder requires continuing medical care to help prevent complications and ensure a good quality of life (QOL) for both the dog and owner. As owner involvement is vital to a successful outcome, owners should be educated on the responsibilities of managing a dog with epilepsy, including close observation for seizure activity, daily administration of medications, monitoring for adverse effects of the medication, and committing financially to the cost of medication as well as regular veterinary evaluations. However, there are few published reports evaluating these factors involved in the long-term management of epilepsy in dogs.[4,5]

The purpose of the current study was to expand the information available to veterinary professionals and the companion animal industry by surveying owners of dogs affected by seizures regarding their experiences, practices, and satisfaction in treating a pet with epilepsy. In particular, the authors sought to determine the number and types of treatments administered, owner and pet response to therapies, costs associated with treatment, reported QOL, owner lifestyle changes resulting from caring for a pet with seizures, and sources of information utilized by owners.

Materials and Methods

An online survey was created by the authors[a]. The survey was made available via a link on the authors' Canine Epilepsy research website (cvm.ncsu.edu/research/labs/clinical-sciences/companion-animal-epilepsy/). The survey was also publicized through websites related to canine epilepsy, including Epil-K9 (www.canine-epilepsy.com), Toby's Foundation (www.tobysfoundation.org), and Epi-Guardian Angels (www.canine-epilepsy-guardian-angels.com). All participants voluntarily answered the survey. The survey was approved

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QOL (quality of life)

for distribution by the North Carolina State University Institutional Review Board.

Survey forms were developed using traditional survey design techniques and were adapted for online use. Owners were asked to respond to 59 questions that included a combination of short answer, multiple choice, and Likert-scale responses. The range of questions included general demographic data, seizure information, and medication history as well as questions designed to assess QOL (Appendix 1). The survey program was such that it was not possible to force an answer for every question; consequently, respondents could successfully submit the survey with questions left unanswered. The survey instrument was available online from July 2011 through August 2012.

Statistical Analysis

All statistical analyses were performed using statistical analysis software[b]. Summary statistics (means and standard errors, ranges, and frequencies and proportions) were calculated for responses to all questions. Chi-squared tests were used to test for an association between presence of specific side effects and the use of particular drugs. Quality of life before and after the onset of seizures was compared using a paired t-test. Other QOL comparisons were performed using analysis of variance, with least-squares means and posthoc testing used to determine the size and direction of any statistically significant ($p < .05$) effect. Tukey's adjustment for multiple comparisons was used for all posthoc testing.

Results

Demographics

A total of 228 participants completed the survey, including 225 dog owners (99%) and 3 cat owners (1%). The majority of participants (199) resided in the United States, although responses were obtained from individuals in six other countries, including Canada (n = 13), Australia (n = 5), United Kingdom (n = 4), Norway (n = 4), Germany (n = 1), and Ireland (n = 1), with one participant not providing country information. Because of the low number of responses from cat owners, further evaluation of the data was performed on the responses from dog owners only.

Survey responses regarding the breed of dog affected with epilepsy revealed a list of more than 33 breeds, with mixed-breed dogs (n = 49, 22%), Labrador retrievers (n = 11, 5%), Australian shepherds (n = 40, 17%), border collies (n = 11, 5%), and German shepherd dogs (n = 11, 5%) most commonly represented. Gender distribution included 120 males (53%; 109 neutered, 11 intact) and 105 females (47%; 98 neutered, 7 intact). At the time of the survey, 193 (86%) of the dogs were alive and 32 (14%) were deceased. Dogs that were alive at the time of survey completion had a mean age of 75.5 mo, with a range of 12–180 mo. Of the dogs that were no longer alive at the time of the survey, 4 dogs (12.5%) were reported to have died due to complications associated with their epilepsy, 16 dogs (50.0%) were euthanized due to the severity of their epilepsy, and the remaining 12 dogs (37.5%) died or were euthanized due to other medical causes.

The mean age at onset of seizures was 30.2 mo (range 0.15–120 mo). Forty-five dogs (20%) were reported to have isolated seizures, 58 (26%) had cluster seizures, 108 (48%) had episodes of both isolated and cluster seizures, and the remaining 14 dogs (6%) were reported to have partial seizures or other non-classified types of behavior. Owners were asked their pet's average seizure frequency for the 6 mo prior to the survey. Of the 213 respondents who answered this question, reported average seizure frequency was less than 1 seizure per mo in 69 dogs (32%), 1–4 seizures per mo in 77 dogs (36%), 5–9 seizures per mo in 22 dogs (10%), and 10 or more seizures per mo in 17 dogs (8%). Twenty-eight dogs (13%) were reported to be free of seizures over the previous 6 mo. Sixty dogs (21%) had required hospitalization to control seizure activity on at least one occasion.

Diagnostic Testing

Owners were asked to provide information on the type of diagnostic testing that was performed on their dog to attempt to determine a cause for the seizures. Of the 98 owners who responded to this question, 74 (76%) reported having routine bloodwork performed, 30 (31%) had MRI of the brain, 17 (17%) had computed tomography of the brain, and 22 dogs (23%) had abdominal ultrasound to evaluate for systemic disease. Owners of 82 dogs reported that their veterinarian had determined a cause for their seizures. Of these dogs, four (5%) were determined to have a metabolic cause for their seizures, four (5%) were diagnosed with encephalitis, one (1%) had posttraumatic seizures, and nine (11.0%) had a confirmed genetic predisposition to epilepsy. In the remaining 64 dogs (78%), a genetic basis for disease was presumed but not confirmed.

Environmental Factors

One hundred sixty-seven survey respondents reported that they identified one or more triggers for their pet's seizure activity. Of these, stressful events such as veterinary visits were the most common trigger and were identified by 60 respondents. Other events identified as triggers included boarding or care by someone other than the primary caregiver (n = 13); lunar phase (n = 35); weather and barometric changes (n = 33); visitors in the home (n = 21); increase in exercise or stimulation (n = 15); sensory stimuli,

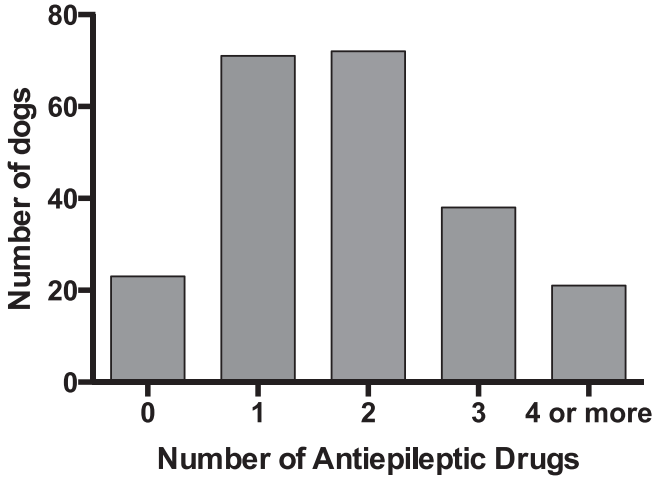

FIGURE 1 *Distribution of number of daily antiepileptic drugs administered to dogs in the study.*

such as sound, light, or odor (n = 6); topical or oral parasitic treatments (n = 10); and changes in diet (n = 9).

Treatment

Data on number of daily antiepileptic drugs administered to dogs is summarized in **Figure 1**. The most common anticonvulsant being administered was phenobarbital, which was given to 86% of dogs, followed by bromide (52%), levetiracetam (29%), zonisamide (22%), and gabapentin (6%). One hundred sixty-five dogs (81%) were reported to have adverse effects associated with administration of antiepileptic medication. Commonly reported adverse effects included increased thirst (93%), ataxia (51%), lethargy (45%), and increased appetite (43%). Statistical analyses were performed to identify any association between drug administered and these adverse effects. Associations were noted between phenobarbital and increased appetite ($p = .019$), ataxia ($p = .0047$), and lethargy ($p = .011$). Lethargy was also associated with the administration of bromide ($p = .0003$), levetiracetam ($p = .026$), and zonisamide ($p = .0071$). Other reported adverse effects included anxiousness, panting, increased urination, increased liver enzymes, and cognitive changes. Additional antiepileptic medication was administered to 59% of dogs at the time of seizures, including additional doses of oral maintenance medication and/or benzodiazepines, such as diazepam or midazolam, administered rectally or intranasally.

Respondents were asked to estimate their average monthly cost for antiepileptic medication. Of the 217 owners who answered this question, the median monthly expenditure was $51–75, with a range of $0 to greater than $200. Ten percent of owners reported spending over $200/mo on antiepileptic medication. The financial breakdown is depicted in **Table 1**.

TABLE 1

Owner-Reported Average Monthly Expense for Antiepileptic Medication

Average Monthly Expense	Frequency (Number of Owners Reporting)
$0–10	12% (27)
$11–25	17% (36)
$26–50	20% (44)
$51–75	17% (36)
$76–100	9% (20)
$101–125	5% (11)
$126–150	5% (11)
$151–175	3% (7)
$176–200	2% (4)
Greater than $200	10% (21)

Sources of Support

Owners were asked if they received support from veterinary professionals in the management of their dog's long-term care. Eighty percent (181) reported receiving veterinary support, 11% (24) responded that they did not receive ongoing veterinary support, and 9% were not sure. Sources of veterinary support included the veterinarian (reported by 89% of owners), online educational materials (26%), veterinary technician (24%), printed educational materials (10%), and client-to-client interactions (8%). One hundred fifty-four owners also reported subscribing to online support groups for owners of pets with epilepsy, such as Epil-K9, Epi Guardian Angels, and Toby's Foundation.

Quality of Life

Quality of life was assessed by evaluating responses to eight questions with a bipolar response scale of 1 (strongly agree) to 5 (strongly disagree) (Appendix 1, questions 36–43). Questions were worded such that a better QOL corresponded to a response of 1 in some instances and a response of 5 in others. For the analyses, scales from all questions were standardized such that a high response to any question was positive. Respondents reported a significant decrease in overall QOL after the onset of seizures but before starting antiepileptic medication in their dog, compared to before seizures began ($p < .001$) (**Figure 2**).

An overall, composite QOL score was computed by compiling responses to questions, with a possible score of between 8 and 40 and a higher overall score indicating a better QOL. The mean QOL score was 29.3, with a range of 15–40. Overall QOL was significantly associated with seizure type, with a higher QOL reported in dogs that experienced isolated seizures rather than

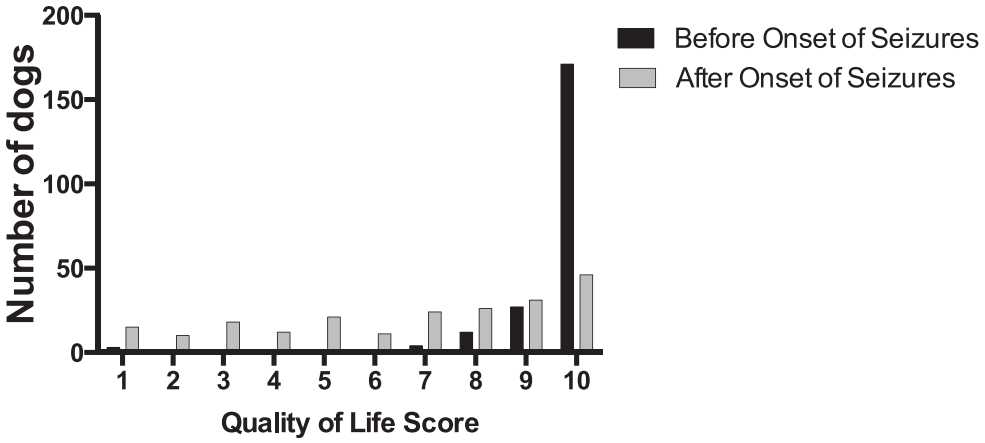

FIGURE 2 *Owner reported quality of life score for dogs with epilepsy before the onset of seizures compared to that after the onset of seizures but before initiating antiepileptic drug therapy.*

clusters ($p = .043$), had a lower average monthly seizure frequency ($p = .0041$), did not experience side effects from the antiepileptic medication ($p < .0001$), and were not given additional medication during episodes of seizures ($p = .031$). Quality of life was not found to be associated with the number of antiepileptic medications being administered or the average monthly cost of the medication.

Discussion

The primary objective of this study was to provide insight into owner's attitudes and perceptions regarding the management of a dog with epilepsy. Such information is important as we seek to enhance support for pets facing long-term care needs within the veterinary profession. Epilepsy has a significant impact on caregivers, and increasing our understanding of the depth and breadth of this impact will ultimately allow for more effective management of pets with epilepsy. In particular, the availability of caregiver-derived data can prove valuable in the education of owners of pets with new onset seizures by providing first-hand information on the impact the disorder may have on them.

The long-term care model is well established for several chronic medical conditions affecting human patients and focuses on patient and caregiver education regarding disease-related factors as well as caregiver burden and QOL issues. Studies on human epilepsy have demonstrated that the provision of information at the onset of the disorder results in caregivers having greater levels of confidence and competence in managing the disease as well as increased levels of understanding from the patient themselves.[6] Similar factors appear to play a role in the management of canine epilepsy. A long-term, prospective, longitudinal study of canine epilepsy determined that the large majority of owners reported that support from, regular contact with, and easy access to the veterinarian was important in reducing their anxiety associated with their dog's epilepsy.[5] This support included provision of information on epilepsy in general as well as instructions on handling the animal during a seizure and therapeutic regimen. Thus, dog owners who have greater levels of support may be better equipped to provide the long-term care required for their pet.

Demographic data obtained from this study is similar to that previously reported for dogs with epilepsy. Dogs in this study had a mean onset of seizures at 2.5 yr of age, and it is generally accepted that dogs with idiopathic epilepsy have an age of seizure onset of 6 mo to 6 yr. Although a specific cause for seizures was not a prerequisite for survey completion, 89% of dogs in this study were reported to have presumed or confirmed idiopathic epilepsy. Similarly, the breeds most commonly represented in the survey, namely, the Labrador retriever, border collie, Australian shepherd, and German shepherd dog, have all been reported to have an increased prevalence of epilepsy (Jaggy et al. 1999, Hulsmeyer et al. 2010, Weissel et al. 2012, Kearsley-Fleet et al. 2013).[2,7–9] However Australian shepherds and border collies have been reported to have a severe form of epilepsy, and it is possible that owners of these dogs may consequently be more willing to complete a survey related to epilepsy.[8,9] In addition, these breed groups may already have a higher level of owner-to-owner interaction related to epilepsy and may have publicized the study to a greater extent compared to other breed groups.

Forty-five percent of respondents reported good control of their dog's seizures, with an average seizure frequency of less than 1 a mo. This included 12% of dogs that were reported to be free of seizures in the 6 mo prior to survey completion. Although remission from seizures is typically reserved for dogs that have been seizure free for a year or longer, this number is comparable to the 15% remission rate previously reported for dogs.[5]

Survey respondents reported that 62.5% of dogs either died or were euthanized due to their epilepsy. Previous studies have reported that 50–74% of all deaths with idiopathic epilepsy can be

attributed to this disorder.[5,8,10] The death rate includes dogs that succumb during seizures or from seizure complications as well as dogs that are euthanized due to seizure complications, treatment related adverse effects, or poor seizure control.

The authors were particularly interested in assessing QOL in this study, as this is often one of the most frequently asked questions by both owners and veterinary professionals in developing a treatment plan that supports the needs of the pet while considering the factors involved in owner's decisions regarding long-term care. Not surprisingly, owners reported that their dogs' QOL worsened after being diagnosed with epilepsy compared to before the onset of seizures. This likely reflects the perceived negative effects of seizures on the dogs' physical well-being as well as the realization that epilepsy frequently necessitates alterations in lifestyle and lifelong medical management. However, the composite QOL score that took into account factors related to both the dog's and the owner's well-being over the long-term provided a positive rating, with a mean score of 29 on a composite scale of 8–40, suggesting that most owners are comfortable with the level of care involved and the impact of the disease on their pet. Furthermore, an inverse association was identified between QOL score and monthly seizure frequency, presence of cluster seizures, and the administration of additional medications during a seizure, all of which are indicators of severe or poorly controlled epilepsy. One would expect poorly controlled epilepsy to have a negative impact on QOL for both the dog and owner.

The presence of medication-related adverse effects was also shown to be associated with a poor QOL. Adverse effects of antiepileptic medications are fairly common and are of considerable concern to owners of pets that require chronic therapy. Over 80% of dogs in the present study were reported to have adverse effects associated with drug administration. A significant association was noted between the presence of lethargy as an adverse effect and the four most common antiepileptic drugs administered: phenobarbital, bromide, zonisamide, and levetiracetam. It is not surprising that antiepileptic drugs, which act by suppressing brain excitability, would cause lethargy or sedation. An association between phenobarbital administration and both ataxia and increased appetite were also demonstrated in this study. These side effects have been commonly reported in dogs administered phenobarbital.[11,12]

Published information on owner-perceived QOL in the long-term management of dogs with epilepsy is limited. A 1999 study involving 19 owners who had participated in a 2 yr prospective, longitudinal clinical study with dogs that were being administered phenobarbital for chronic seizures demonstrated positive ratings similar to those in the present study.[5] Owners in this prior study reported a willingness to maintain their dog on long-term therapy for epilepsy, with 95% disagreeing that their dog was leading a poor QOL since beginning treatment. Furthermore, all owners reported that the work necessary to maintain their epileptic pet was not a burden or detriment to their own QOL. However, another prospective, longitudinal study of 63 dogs diagnosed with epilepsy that were followed up until death, euthanasia, or a maximum of 12 yr described 60% of owners reporting that having a dog with epilepsy had a negative influence on their daily life.[4] These differing results may be due to the broader study population and a longer, defined follow-up period utilized in the latter study. Additional research is needed in this area to better characterize the QOL issues that are important in the long-term management of dogs with epilepsy.

A survey instrument was recently developed and validated for owners of dogs with epilepsy that aims to provide disease-specific questions for the pet owner relating to physical, social, and neurobehavioral aspects of QOL for both the pet and caregiver.[13] Although this instrument was not available at the time of our study, our survey incorporates some of the same themes, including seizure frequency, adverse effects of antiepileptic drugs, and restrictions on the owners' life related to caring for a dog with epilepsy. The development of a validated survey reinforces the importance of assessing QOL in the long-term management of dogs with this disorder and will serve as a useful tool in further research into this aspect of canine epilepsy.

One facet of long-term care that has not been addressed in previous studies is the financial burden associated with the management of a dog with epilepsy. Respondents in our survey spent a median of $50–75 each mo on antiepileptic medication. This did not include additional expenses associated with the dog's care, including regular veterinary visits and hospitalization as needed for management of cluster seizures or status epilepticus. Thus, the long-term management of a dog with epilepsy can necessitate a substantial financial commitment on the part of the owner.[14] Interestingly, QOL was not associated with the number or cost of the antiepileptic medications being administered, reflecting the commitment of these owners to their dogs. It is possible that the data is biased in this regard, as owners that demonstrate strong commitment to their dogs and epilepsy may have been more likely to complete this voluntary survey.

Aside from the potential for bias with respect to the population of dog owners surveyed, other limitations of the study require mention. These limitations include respondent bias, based on the self-reporting nature of the survey responses and their susceptibility to recall bias. In addition, there is potential for bias in the survey instrument itself, particularly since our survey was not validated. Finally, the survey program utilized did not require respondents to answer all questions, resulting in incomplete data for some questions.

Conclusion

This survey provides information on owners' perspective regarding the long-term management of a dog with epilepsy. Overall, owners of dogs with epilepsy reported positive scores for QOL, although QOL scores were lower for owners of dogs with severe or poorly controlled epilepsy and medication-related adverse effects. Despite the financial burden involved in managing a dog with epilepsy, monthly medication cost was not associated with QOL score. Such information should prove useful to veterinary professionals by providing them with a better understanding of the needs of dogs with epilepsy and the support that their owners seek as well as in the education of owners related to the care and treatment of a dog recently diagnosed with epilepsy. In addition, these results can be used as a framework for future studies on canine epilepsy to better characterize the long-term care requirement of this population with the goal of improving overall outcomes for both pets and their owners.

FOOTNOTES

[a] Survey Builder; the College of Agriculture and Life Sciences, North Carolina State University, Raleigh, North Carolina

[b] SAS software Version 9.4; SAS, Cary, North Carolina

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APPENDIX 1

Questions included in survey

1. Date of survey completion
2. Owner first name
3. Owner last name
4. Owner email
5. Owner street address
6. Owner city
7. Owner state
8. Owner zip code
9. Owner phone number
10. Name of pet with epilepsy
11. Species of pet with epilepsy (multiple choice—dog, cat, horse)
12. Breed of pet
13. Gender of pet (multiple choice—m/n, m/i, f/s, F/i)
14. Birthdate of pet
15. Is birthdate actual or estimated?
16. Is the pet currently alive or deceased?
17. If the pet is deceased, please indicate cause of death (if known, multiple choice)
18. How old was your pet when the seizures started?
19. Has a veterinarian determined a cause for your pet's seizures? (multiple choice)
20. Has your pet ever had any of the following tests to determine the cause of seizures? (multiple choice)
21. If a veterinarian has determined a cause for your pet's seizures, please select from the following list (multiple choice)
22. What type of seizures does your pet have?
23. Has your pet ever required hospitalization because of his/her seizures?
24. Over the last 6 mo, how many seizures has your pet had each mo on average?

25. If your pet has less than 1 seizure per mo on average, what is the average time interval (e.g., in wk or mo) between seizures?
26. Do any or all of the following events seem to trigger seizures in your pet? (multiple choice)
27. What oral medications is your pet currently receiving for his/her seizures? (check all that apply)
28. How many medications does your pet currently take for his/her seizures? (check all that apply)
29. Does your pet have any side effects from his/her epilepsy medication? (yes/no)
30. If your pet does experience side effects as a result of his/her medications, please indicate all that apply.
31. Do you administer additional medications at the time of seizures (yes/no)
32. If you do administer additional medications at times of seizures, please indicate the type of medication given (check all that apply)
33. How much on average do you spend each mo on anticonvulsant (seizure) medication? (multiple choice)
34. Do you currently support (or have tried in the past) any holistic types of therapies? (check all that apply)
35. What is your pet's typical diet? (multiple choice)
36. The work (commitment) associated with a dog with epilepsy is difficult for me and my family (likert scale)
37. My pet's quality of life is as good as it was before starting medication for his/her seizures (likert scale)
38. My pet appears greatly depressed since starting medications to control his/her seizures (likert scale)
39. My pet's activity level is much lower than it was before starting medication to control his/her seizures (likert scale)
40. The benefits of caring for a pet with epilepsy far outweigh the costs (likert scale)
41. Owning a pet with epilepsy has helped me to grow as a person (likert scale)
42. The work (commitment) associated with living with a pet with epilepsy is worth the effort (likert scale)
43. The benefits of maintaining a pet with epilepsy far outweigh the costs (likert scale)
44. Patients with epilepsy require long-term care. As a primary caregiver for your pet, do you routinely incorporate any of the following to help you maintain personal balance? (check all that apply)
45. How much more time per day (on average) do you spend caring for your pet with epilepsy than for other pets without epilepsy? (multiple choice)
46. Please rate your pet's quality of life before he/she started having seizures (likert scale)
47. What was your pet's quality of life when he/she started having seizures, but before starting medication to control the seizures (likert scale)
48. Do you have other pets without epilepsy (yes/no)
49. If you answered yes to the above question, how are your other pets (without epilepsy) affected by your pet's epilepsy (comment)
50. Do you subscribe to any of the following support groups for owners of pets with epilepsy (check all that apply)
51. Do you receive ongoing support from your veterinary professionals to help you manage your pet's long-term care (yes/no)
52. If you do receive ongoing support, what types of support do you receive (check all that apply)
53. Do you feel that outreach programs for educating the public about pets with epilepsy would help you manage the disease in your own pet? (yes/no/maybe)
54. If you feel that outreach events would be beneficial for both clinical trial fundraising and educations, please list ideas that you may have for these events (comment)
55. Have you ever participated in any clinical research on epilepsy in pets (yes/no)
56. If you do take part in clinical studies for epilepsy in pets, what are some of your primary motivators for doing so (check all that apply)
57. Do you have any ideas for clinical trials related to epilepsy that you would like to have explored (comment)
58. Please add any additional comments that you would like to add below (comment).

Thank you for completing this study.