

Evaluation of Quality of Life in Dogs with Idiopathic Epilepsy

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Background: The impact of epilepsy and its treatment on the quality of life (QoL) is considered an important part of treatment supervision in human epilepsy.

Objectives: To develop a list of key questions evaluating QoL in dogs with idiopathic epilepsy (IE) and their carers.

Animals: One hundred fifty-nine dogs with IE.

Methods: Cross-sectional study. An online project questionnaire was developed containing 90 QoL-associated questions that were initially allocated to 14 themes representing specific areas associated with the treatment and care of an epileptic dog. Principal component analysis was applied with the aim of refining the questionnaire to the least number of questions representing useful themes without loss of descriptive value. Carers were recruited by paper mail, primary practices, and canine epilepsy websites. Data were acquired from January to November 2011.

Results: Principal component analysis removed 54 questions, leaving 7 themes with 36 questions with a minimum Cronbach's alpha value of 0.7 indicating a good internal consistency: "Seizure severity and frequency", "Adverse effects of antiepileptic drug (AED)", "Restrictions on the carer's life", "Frustrations over caring for a dog with IE", "Carer distaste of AED adverse effects", "Carer anxiety around the seizure event", "Perceptions on rectal diazepam use".

Conclusions and Clinical Importance: Principal component analysis successfully reduced the number of questions without loss in descriptive value. The remaining questions correlate well with each other in capturing valuable details about aspects of QoL and represent valuable key questions (EpiQoL) in the assessment of QoL for the carers of dogs with IE.

Key words: Comorbidity; Seizures; Welfare.

The World Health Organization (WHO) has defined health-related quality of life (QoL) as encompassing physical, social, and neurobehavioral domains of health as perceived by the patient¹ and the QoL aspect is considered an important aspect of the success of treatment and supervision in humans.^{2,3} The physical and behavioral impacts of idiopathic epilepsy (IE) and its treatment on dogs are well established,^{4,5} yet its impact on the perceived QoL is unclear. Studies of epilepsy in dogs have indicated that the QoL of their pet was an important aspect of treatment success for carers and moreover, that epilepsy in dogs affects the carer's and the dog's QoL.⁴ Similar to studies of human epilepsy, a recent study of IE in dogs included a QoL questionnaire in the assessment of treatment success of an antiepileptic drug (AED) and identified AED-dependent QoL scores.⁵

The aim of this prospective study was to develop a disease-specific QoL list of key questions (EpiQoL) for the carers of dogs with IE based on the multidimensional aspects of QoL as defined by the WHO into physical, social, and neurobehavioral domain adapted

Abbreviations:

AED	antiepileptic drug
EpiQoL	epilepsy disease-specific quality of life list of key questions
IE	idiopathic epilepsy
PCA	principal component analysis
QoL	quality of life
WHO	World Health Organization

for IE in dogs. A project questionnaire was designed to enquire into a broad range of aspects affected by IE with a variety of questions, and the study analyzed the response with the aim of reducing the question number through principal component analysis (PCA) to achieve a reliable and easy-to-use list of key questions to recommend for future use.

Material and Methods

Project Questionnaire Design

A trial questionnaire was designed with questions that were considered relevant for carers of dogs with IE. Questions were created based on the experience of veterinary specialists, published questionnaires for dogs⁴ and from adults and adolescents with epilepsy (http://www.epilepsy.com/pdfs/qolie_ad_48.pdf; http://professionals.epilepsy.com/pdfs/qolie_31.pdf). The trial questionnaire was evaluated by 2 panels, initially by 9 informed veterinary surgeons, and subsequently by 8 informed carers of epileptic dogs. Feedback about the appropriateness of the questions was used to modify the project questionnaire.

Project Questionnaire Description

The first section consisted of 90 close-ended QoL-associated questions that targeted specific QoL areas potentially affected by IE in dogs. All questions used an interval rating (Likert-type scale, 1–5 [n = 88], 1–7 [n = 2]). The second section included 29

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close-ended questions concerning factual data such as diagnosis, seizure onset, seizure description, and seizure management including AED and adverse effects. The third section included 14 close-ended questions enquiring about general factual details of the dog and the carer.

The 90 QoL-associated questions in the first section were allocated to 14 themes. Four questions represented more than 1 theme and these questions (Table S1) were repeated in a second theme for the statistical evaluation. A total of 90 questions plus 4 repeated questions were allocated to the following themes: (1) "Seizure severity and frequency" (5 questions), (2) "Adverse effects of AED" (12 questions), (3) "Positive items" observations indicating a positive influence on the carer of being responsible for a dog with IE (3 questions), (4) "Behavioral changes in the dog associated with the onset of the epilepsy" (7 questions), (5) "Organizational aspects of seizure management" (6 questions), (6) "Restrictions on the carer's life" (10 questions), (7) "Importance of support from other people" (3 questions), (8) "Frustrations over caring for a dog with IE" (11 questions), (9) "Carer distaste of AED adverse effects" (13 questions), (10) "Carer anxiety around the seizure event" (7 questions), (11) "Carer concerns around seizure management" (4 questions), (12) "Perceptions on rectal diazepam use" (4 questions), (13) "Financial implications of caring for a dog with IE" (3 questions), and (14) "Impact on carer's QoL through caring for a dog with IE" (6 questions).

Physical, Social, and Neurobehavioral Domains

The themes of the project questionnaire were further allocated to physical, social, and neurobehavioral domains of the dog and the carer, adapted from human epilepsy research.² Themes 1 and 2 were considered to affect the physical domain of the epileptic dog, themes 3 and 4 the social domain, and theme 4 the neurobehavioral domain as assessed by the carer. The physical domain of a carer was considered not to be affected by IE in dogs. Themes 3–8 were considered to affect the social domain, and themes 1 and 7–14 were considered to affect the neurobehavioral domain of a carer responsible for an epileptic dog.

Recruitment of Responders

The project questionnaire was presented online via the online survey software and questionnaire tool SurveyMonkey (<http://www.surveymonkey.com>). The opportunity to take part in the survey was announced through email contact via 800 primary practices and by canine epilepsy websites. Carers of dogs diagnosed with IE at the authors' institutions (UGVS, RVC) were invited by paper mail publicizing a link to the online project questionnaire. A UK canine epilepsy website (<http://www.caninepilepsy.co.uk>) publicized the online study. Data were acquired from January to November 2011. The principal investigators had access to all data with client details removed for further statistical analysis. Ethics approval was granted by the University of Glasgow Faculty of Veterinary Medicine ethics committee and by the Royal Veterinary College ethics committee (ethical approval number URN 2010 1077).

Response Inclusion Criteria

Responses were included if they referred to dogs with recurrent seizures (>2) which were either presumptively diagnosed with IE following substantial investigation, including normal brain imaging (MRI or CT) and cerebrospinal fluid analysis independent of the age of onset or strongly suspected to have IE with seizures for more than 1 year and an age of onset between

6 months and 6 years. Responses were excluded if the dogs referred to were not alive at the time of completion of the project questionnaire or if other diseases that required ongoing veterinary treatment or attention were identified (eg, arthritis), to limit other factors potentially affecting assessment of the dog's QoL.

Statistical Analysis

Principal component analysis was used to examine the interrelations among the questions within each theme and to maximize the internal consistency (reliability) within each theme by reducing the number of questions to a minimum representing the same theme.³ PCA plots were examined to identify questions that were most likely to be related. Item analysis was conducted to calculate Cronbach's alpha values to identify the degree of agreement between questions within a theme.^{3,6} A cutoff value of 0.7 or higher was used in this study, as this is generally believed to be an acceptable reliability coefficient for questionnaire-based studies.⁶ PCA was performed on each theme and questions were removed until the highest possible Cronbach's alpha value or at least a value of 0.7 was achieved and these questions were included in the EpiQoL. Statistical analysis was performed by the statistical software package Minitab 16.^a

Results

Descriptive Data

Three hundred eighty-one carers participated in the study. The responses described 159 affected dogs meeting the inclusion criteria distributed over 50 breeds but including 30 crossbreed dogs; mean age of 5.8 years (median 5.2 years, range 0.7–12.5 years), 66 female (52 neutered) and 93 male dogs (67 neutered). Two hundred twenty-two dogs were excluded because of not fulfilling the criteria of suspected to have IE (121), diagnosis other than IE (18), death (17), and treatment for other diseases (66) such as arthritis, pancreatitis, or liver dysfunction.

The mean age of onset was 2.7 years (median 2 years, range 0.3–9 years). Seizure frequency was stated as "more often than every week" in 5%, "every week" in 5%, "every 2 weeks" 15%, "every month" in 29%, "every 2 months" in 11%, "every 3–6 months" in 16%, and "less than 1 seizure every 6 months" in 19% of dogs.

Statistical Analysis

The 14 themes of the first section of the project questionnaire underwent PCA. A model was created with 7 themes (1, 2, 6, 8, 9, 10, 12) comprising 36 questions included in the EpiQoL which achieved a minimum Cronbach's alpha value of 0.7 ranging from 0.77 to 0.93 (median 0.79) (Table 1). For 7 themes, the Cronbach's alpha values were <0.7 (3, 4, 5, 7, 11, 13, 14) and those themes were excluded from the EpiQoL.

Physical, Social, and Neurobehavioral Domains

The themes remaining following PCA were themes 1 and 2 characterizing the physical domain of an

Table 1. Final QoL-associated questionnaire showing 7 themes with Cronbach's alpha values above 0.7 indicating a good internal consistency and reliability.

QoL-Associated Questionnaire Themes and Questions	Cronbach's Alpha per Theme (scale dimension per question)
1. Seizure severity and frequency	CA: 0.85
1. In the last 3 months, the frequency of the fits in my dog was acceptable	1–5 (strongly agree–strongly disagree)
2. In the last 3 months, the severity of the fits in my dog was acceptable	
3. In the last 3 months, overall, the fits in my dog are managed successfully	
4. Overall, how severe were your dog's fits in the past 3 months?	1–7 (very mild–very severe)
2. Adverse effects of AED	CA: 0.77
1. In the past 3 months, the adverse effects of the medication to control the fits in my dog were acceptable	1–5 (strongly agree–strongly disagree)
In the past 3 months, how severe was the following adverse effect:	
2. Eating more/would like to eat more	1–5 ^a (very mild–very severe)
3. Gaining weight	
4. Drinking more	
5. Urinating more	
6. Sleeping more than before	
7. Wobbly/not coordinated when walking	
8. Restlessness/pacing	
9. Itchiness or skin rash	
10. Vomiting	
11. Diarrhea	
12. Coughing	
6. Restrictions on the carer's life (related to caring for a dog with IE)	CA: 0.71
1. In the past 3 months, how often did you feel that your dog's epilepsy caused conflict with your work, education, or day-to-day activities?	1–5 (never–very often)
2. In the past 3 months, how often did you feel that your dog's epilepsy limited your social life?	
3. In the past 3 months, how often did you feel that your dog's epilepsy limited your independence?	
8. Frustrations over caring for a dog with IE	CA: 0.93
1. My limitations in work, education or day-to-day activities because of my dog's fits	1–5 (not at all bothersome–extremely bothersome)
2. My social limitations because of my dog's fits	
3. Overall, the limitations on my life caring for my epileptic dog	
9. Owner distaste of AED adverse effects	CA: 0.79
1. How bothersome are the physical effects of the medication on my dog?	1–5 ^b (not at all bothersome–extremely bothersome)
2. How bothersome are the mental effects of the medication on my dog?	
In the past 3 months, how much did you dislike the following adverse effects:	
3. Eating more/would like to eat more	1–5 ^a (not at all–a lot)
4. Gaining weight	
5. Drinking more	
6. Urinating more	
7. Sleeping more than before	
8. Wobbly/not coordinated when walking	
9. Restlessness/pacing	
10. Coughing	
10. Carer anxiety around the seizure event (and its effects on the dog)	CA: 0.89
1. In the last 3 months, I worried about the frequency of the fits in my dog	1–5 (strongly disagree–strongly agree)
2. In the last 3 months, I worried about the severity of the fits in my dog	
12. Perceptions of rectal diazepam use	CA: 0.78
1. Have you ever been uncertain when to give rectal diazepam?	1–5 ^b (never–always)
2. Have you ever been worried how much or how often you are supposed to give rectal diazepam	

CA, Cronbach's alpha; IE, idiopathic epilepsy.

^aAdditional tick box: adverse effect not present.^bAdditional tick box: not applicable.

epileptic dog, themes 6 and 8 characterizing the social domain of a carer, and themes 8–10, and 12 characterizing the neurobehavioral domain of the carer responsible for an epileptic dog.

Discussion

This study has developed a disease-specific carer-based list of key questions for collecting data on a

wide spectrum of different aspects of IE in dogs concentrating on the QoL assessment on the individual carer's perception, as is emphasized in people.^{3,7} In childhood epilepsy, the patients cannot undertake the assessment for themselves. Therefore, the carer (mostly the parent) performs successfully the assessment of the QoL of an epileptic child. Similarly, the assessment is performed by the carer in an epileptic dog and this is believed to deliver meaningful results.⁸

Statistical modeling using PCA successfully reduced the number of questions without loss in descriptive value. A cutoff value of 0.7 or higher is generally believed to represent an acceptable reliability coefficient⁶ and as a criterion for question retention successfully excluded 7 themes from the EpiQoL. The remaining 7 themes were included in the EpiQoL and are "Seizure severity and frequency", "Adverse effects of AED", "Restrictions on the carer's life", "Frustrations over caring for a dog with IE", "Carer distaste of AED adverse effects", "Carer anxiety around the seizure event", and "Perceptions on rectal diazepam use." The mean Cronbach's alpha value of 0.82 exhibited good internal consistency indicating good face validity, suggesting appropriate grouping of questions and indicating that these themes can be reliably and easily assessed with the EpiQoL.

The themes were allocated to physical, social, and neurobehavioral domains focusing on the dog's and carer's QoL. This approach was adapted from research on humans^{1,2} and it is recommended that measures of QoL should consider the impact of a condition and its treatment on these domains (physical, social, and neurobehavioral).² Disease-specific measures are the most appropriate measures for assessing treatment effects in clinical trials because elements within each domain might vary between different disorders and occasionally elements relate to more than one domain.³ For example, outcome of measures such as seizure severity and frequency can not only have a physical effect but the occurrence itself or the expectations of treatment also have an impact on the perceived QoL.³ Only the physical domain affecting the epileptic dog reached good internal consistency, whereas 5 themes of the social and neurobehavioral domains affecting the carer caring for an epileptic dog remained in the EpiQoL. Likewise, it is well known that childhood epilepsy not only affects the QoL of the affected child but also of the carer.⁹ The factors correlated with carer QoL in childhood epilepsy are seizure control; the incidence of status epilepticus; AED adverse effects; the manifestation of anxiety and depression in an affected child.⁹ The effect of IE in dogs on the carer's QoL is also reported in veterinary medicine⁴ but the importance is unknown. It is likely that the impact of caring for a dog with IE on the carer's QoL influences decisions they make regarding treatment or euthanasia and thus requires consideration when treatment options are discussed.

Quality of life in epileptic persons is assessed with subjective and objective outcome measures.⁷ Engel

proposed a postoperative classification system for epileptic human patients and introduced a seizure frequency score using objective and subjective terminology.⁷ Subjective vocabulary such as "worthwhile improvement" made comparison of studies challenging. Thus, Wieser suggested that seizure outcome classification and QoL classification should be separately assessed.⁷ Moreover, as epilepsy might change during time and QoL can be variably annual QoL assessment is recommended. This study addresses the subjective assessment of QoL in epilepsy in dogs. Therefore, the EpiQoL could be used for subjective assessment of QoL in future studies of epilepsy in dogs and be part of comprehensive QoL assessment if combined with objective outcome measures. When the goal is to measure QoL, it should be used on a year-by-year basis as epilepsy might change during time, and QoL can be variably.

A limitation of this study is that the influence individual factors have on the QoL in dogs are not well understood and therefore were extrapolated from research in human epilepsy and the experience of experienced clinicians dealing with epilepsy in dogs. It is possible that how carers feel about their dog's epilepsy, the perception of their own QoL, and also the carers' social education and geographical differences (eg, rural/urban, different countries) are correlated with the assessment of the dog's QoL. Additionally, PCA identified critical and noncritical questions to identify the minimum number of questions necessary to evaluate the internal consistency of a theme and did not assess the loading, a factor might have on the QoL. Ideally, a validation of the key questions is performed in comparison with a gold standard. However, a gold standard assessment of QoL in IE in dogs is not available. Thus, we relied on construct validity, which is based on predictions about how the result of the questionnaire should correlate with other related or nonrelated measures. The results confirmed the relations, which therefore support construct validity. Construct validity is the main requirement of any measuring tool and can neither be proved nor disproved on the basis of a single study.⁸

Studies investigating the QoL in IE in dogs used QoL questionnaires, uniquely developed for each study,⁵ making it difficult to compare the QoL assessment between studies. The final questionnaire of this study provides future studies with a limited number of key questions assessing QoL in IE in dogs without loss in value evaluating a wide variety of topics associated with IE in dogs. The final aim was to develop a gold standard assessing the QoL in IE in dogs and the here presented questionnaire provides a set of key questions investigating the QoL in IE in dogs for future studies. Further studies are necessary to assess the loading of the items and based on this to finally develop a scoring system that enables evaluating outcome and comparing QoL between patients and between studies. Thus, future studies using the EpiQoL are needed to assess the usefulness in QoL assessment in epilepsy in dogs.

Footnote

^a Minitab Ltd, Coventry, UK

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Conflict of Interest Declaration: The authors disclose no conflict of interest.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Questionnaire items investigating the perception of the participant on aspects affected by epilepsy in dogs.