

Development and evaluation of a questionnaire for assessment of health-related quality of life in cats with cardiac disease

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Objective—To develop, validate, and evaluate a questionnaire (Cats' Assessment Tool for Cardiac Health [CATCH] questionnaire) for assessing health-related quality of life in cats with cardiac disease.

Design—Prospective study.

Animals—275 cats with cardiac disease.

Procedures—The questionnaire was developed on the basis of clinical signs of cardiac disease in cats. A CATCH score was calculated by summing responses to questionnaire items; possible scores ranged from 0 to 80. For questionnaire validation, owners of 75 cats were asked to complete the questionnaire (10 owners completed the questionnaire twice). Disease severity was assessed with the International Small Animal Cardiac Health Council (ISACHC) classification for cardiac disease. Following validation, the final questionnaire was administered to owners of the remaining 200 cats.

Results—Internal consistency of the questionnaire was good, and the CATCH score was significantly correlated with ISACHC classification. For owners that completed the questionnaire twice, scores were significantly correlated. During the second phase of the study, the CATCH score ranged from 0 to 74 (median, 7) and was significantly correlated with ISACHC classification.

Conclusions and Clinical Relevance—Results suggested that the CATCH questionnaire is a valid and reliable method for assessing health-related quality of life in cats with cardiac disease. Further research is warranted to test the tool's sensitivity to changes in medical treatment and its potential role as a clinical and research tool. (*J Am Vet Med Assoc* 2012;240:1188–1193)

Compromised QOL is a common finding in human patients with heart failure and has been shown to be an independent predictor of survival.^{1–4} Health-related QOL is commonly measured in research studies of human patients because HRQOL may complement typical clinical measures of disease status and may help to optimize treatment regimens for individual patients by providing important information on the success of various medical treatments. In fact, HRQOL has be-

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ABBREVIATIONS

ARVC	Arrhythmogenic right ventricular cardiomyopathy
CATCH	Cats' Assessment Tool for Cardiac Health
DCM	Dilated cardiomyopathy
FETCH	Functional Evaluation of Canine Health
HCM	Hypertrophic cardiomyopathy
HRQOL	Health-related quality of life
QOL	Quality of life
RCM	Restrictive cardiomyopathy
UCM	Unclassified cardiomyopathy

come such an important measure of the outcome of various therapeutic interventions in clinical trials that it, in conjunction with mortality rate, is now considered one of the standard primary endpoints in human clinical trials and is preferred to surrogate endpoints.⁵ A number of tools have been developed and validated to measure HRQOL in people, including general assessment tools for patients with any disease and more specific assessment tools for patients with a particular disease. Of the many questionnaires designed specifically to assess HRQOL in people with heart failure, the Minnesota Living with Heart Failure Questionnaire⁶ is

one of the most widely used. This questionnaire has been well validated in people but has low applicability to cats because of the nature of the questions (eg, swelling in the legs and loss of self-control).

Heart disease is a common problem in dogs and cats, and many of the clinical signs seen in patients with congestive heart failure, such as dyspnea, anorexia, exercise intolerance, and syncope, may adversely affect QOL or the owners' perceptions of their pets' QOL. For dogs and cats in which euthanasia is an option, poor QOL may be important in an owner's decision for euthanasia. A study⁷ of dogs with congestive heart failure that had been euthanized found that 79% of dogs were considered by their owners to have had a fair or poor QOL in the 2 weeks prior to euthanasia. In addition, 13% of owners from that study reported poor QOL to be the single most important factor in their decision to have their dogs euthanized.⁷ Studies^{8,9} have shown that QOL is more important to owners of dogs and cats with cardiac disease than is longevity. Eighty-six percent of dog owners and 93% of cat owners responded that they would be willing to trade survival time for QOL for their cardiac disease-affected pets.^{8,9}

A questionnaire (FETCH questionnaire) has been developed and validated for assessing HRQOL in dogs with cardiac disease.¹⁰ This questionnaire has good validity¹⁰ and has been used in clinical trials of dogs with cardiac disease.^{11,12} A similar questionnaire would be useful in cats with cardiac disease for both clinical and research purposes. However, some clinical signs in cats with cardiac disease and owners' perceptions of these clinical signs may be different from those in dogs, so use of the FETCH questionnaire in cats is likely invalid. For example, the FETCH questionnaire includes questions on exercise restriction and coughing, both of which are issues more likely to be of concern in dogs with cardiac disease. Therefore, the purpose of the study reported here was to develop and evaluate a questionnaire for assessing HRQOL specifically for cats with cardiac disease.

Materials and Methods

Questionnaire development—An HRQOL questionnaire patterned after the Minnesota Living with Heart Failure Questionnaire⁶ and the FETCH questionnaire for dogs¹⁰ was developed for the study. A series of items related to the clinical signs of cardiac disease in cats (eg, dyspnea and alterations in appetite and sleep habits) was generated. These items were obtained from the authors' clinical experience, interviews with owners of cats with cardiac disease, and the veterinary literature.^{13–18} Seventeen items were identified that could be used to assess an owner's perception of the degree to which clinical signs of cardiac disease had affected the cat's comfort or sociability during the preceding 7 days (eg, by making breathing difficult, causing syncope or collapsing episodes, or making the cat eat less than normal). For each item, the owner graded severity on a scale from 0 to 5, where 0 = not at all, 1 = very little, and 5 = very much. Responses for each of the items were summed to obtain an overall score. Thus, possible scores ranged from 0 to 85, with higher scores indicating poorer HRQOL. The questionnaire was designated the CATCH questionnaire.^a

Readability of the CATCH questionnaire was determined with the Flesch-Kincaid method, an algorithm designed to estimate the grade level needed to comprehend written text; standard software^b was also used. Results indicated a grade level of 6.1, which was interpreted to suggest that individuals with a sixth-grade reading level would be able to comprehend the questionnaire and that the questionnaire would be easy to read for 74% of the readers at this level. The questionnaire was also pretested on 4 owners of cats with heart disease for readability and clarity of the questions.

Questionnaire validation—The CATCH questionnaire was administered to owners of cats with cardiac disease examined at the Foster Hospital for Small Animals at Tufts University, University of Pennsylvania, and the VCA Animal Care Center of Sonoma County between June and September 2009. Most cats were being reevaluated for their heart disease, but in some cats, cardiac disease was diagnosed for the first time at the time of enrollment in the study. Owners completed the questionnaire while in the waiting room before their appointment. The International Small Animal Cardiac Health Council classification of heart failure,¹³ which ranges from 1a to 3b, with 3b representing the most severely impaired, was used to classify disease severity for each cat by the attending veterinary cardiologist. In addition to completing the questionnaire, owners were asked to assess their perception of the cats' overall QOL on a scale from 1 to 5, where 1 = excellent and 5 = very poor. During this same time period, a subpopulation of owners who had completed the questionnaire (and whose cat's cardiac disease remained stable) were contacted by telephone 1 to 3 weeks later and asked to complete the questionnaire a second time.

Internal consistency of the questionnaire was assessed by calculating Cronbach's alpha. Test-retest reliability was evaluated by means of Spearman rank correlation analysis. Face validity, the degree to which the questionnaire, on its face, seemed to reflect what it was designed to measure, was established through informal conversations with colleagues and feedback from owners of cats with cardiac disease who had completed the questionnaire. Score for individual items was compared with the owner-reported overall QOL score by means of Spearman rank correlation analysis. Criterion-related validity was assessed by comparing the CATCH score with the International Small Animal Cardiac Health Council classification of disease severity by means of Spearman rank correlation analysis. Standard statistical software was used for all analyses.^c

Evaluation of clinical cases—After the validation phase was completed, the questionnaire was administered to owners of cats with cardiac disease examined at each of the authors' hospitals between October 1, 2009, and August 1, 2010 (ie, Cummings School of Veterinary Medicine, Tufts University; School of Veterinary Medicine, University of Pennsylvania; VCA Animal Care Center of Sonoma County, College of Veterinary Medicine, Oregon State University; Massachusetts Veterinary Referral Hospital; and Angell Animal Medical Center). The questionnaire was completed while the owners were in the waiting room be-

fore their appointment. Most cats were being reevaluated for their heart disease, but in some cats, cardiac disease was diagnosed for the first time at the time of enrollment in the study. The CATCH score was compared with the International Small Animal Cardiac Health Council classification of disease severity via the Spearman rank correlation analysis. The median CATCH score was compared among cats with different underlying diseases (ie, ARVC, DCM, HCM, RCM, and UCM) via the Kruskal-Wallis 1-way ANOVA by ranks, with post hoc comparison between pairs performed with the Wilcoxon rank sum test (adjusted α level, $P = 0.0125$). Multivariate analysis was performed to determine confounding effects of underlying disease and International Small Animal Cardiac Health Council class on CATCH score.

The Tufts University Health Sciences Institutional Review Board exempted this research study from review. At other sites, the protocol was reviewed by an institutional review board or institutional animal care and use committee or, at private practices, by the section head or hospital director.

Results

Questionnaire validation—During the validation phase, the CATCH questionnaire was completed by 75 owners of cats with cardiac disease (Cummings School of Veterinary Medicine, Tufts University [$n = 36$]; VCA Animal Care Center of Sonoma County [26]; and School of Veterinary Medicine, University of Pennsylvania [13]). There were no differences in signalment, underlying disease, or other factors between cats at the 3 sites, so results were pooled. Median age of the cats was 9.3 years (range, 0.5 to 21.1 years). There were 51 male cats (45 castrated) and 24 female cats (23 spayed). The most common breeds were domestic shorthair ($n = 46$) and longhair (11) cats, but several other breeds were also represented: Siamese or Siamese cross (4), Maine Coon (3), Bengal (3), and British shorthair, Burmese, Havana Brown, Himalayan cross, Manx, Persian, Ragdoll, and Sphinx (1 each). The most common primary underlying diseases were HCM (55 [73%] cats), congenital diseases (10 [13%]), and UCM (6 [8%]). Other underlying cardiac diseases included RCM ($n = 2$), DCM (1), and ARVC (1). Disease severity, as determined by the International Small Animal Cardiac Health Council classification, included 1a ($n = 3$), 1b (33), 2 (27), 3a (9), and 3b (3).

Correlation coefficients for comparisons between score for individual questions and owner-assigned overall QOL score ranged from 0.06 to 0.61. The question with the lowest correlation coefficient asked whether the cat's vomiting affected his or her QOL. Because of low correlation with overall QOL and with the low scores on this individual question (only 5 owners gave a score > 1), this question was removed from the questionnaire and further validation was performed without it. When only the remaining 16 questions were included, the CATCH score ranged from 0 to 51 (median, 7). Cronbach's alpha was 0.90, indicating high internal consistency. There was a significant ($P < 0.001$) correlation between the International Small Animal Cardiac Health Council classification and CATCH score

($r = 0.43$), suggesting moderate criterion validity. Ten owners completed the questionnaire twice to assess the test-retest reliability; CATCH scores on the 2 tests were significantly ($P = 0.001$) correlated ($r = 0.94$).

Evaluation of clinical cases—The CATCH questionnaire was completed by 200 additional owners of cats with cardiac disease, excluding the 75 cats included in the validation phase of the study: Tufts Cummings School of Veterinary Medicine ($n = 97$), Massachusetts Veterinary Referral Hospital (38), VCA-Animal Care Center of Sonoma County (27), Angell Animal Medical Center (16), University of Pennsylvania School of Veterinary Medicine (15), and Oregon State University College of Veterinary Medicine (7). There were no differences in signalment, underlying disease, or other factors between cats at the 6 sites; therefore, results were pooled. Median age of the cats was 10.0 years (range, 0.5 to 22.5 years). There were 136 male cats (131 castrated) and 64 female cats (57 spayed). The most common breeds were Domestic shorthair ($n = 129$) and longhair (34) cats, but several breeds also were represented: Maine Coon or Maine Coon cross (11), Persian (7), Ragdoll (4), Siamese or Siamese cross (2), Bengal (2), and Birman, British shorthair, Burmese, Havana Brown, Oriental shorthair, Peterbald, Russian Blue, Savannah, and Snowshoe (1 each). The primary underlying diseases were HCM ($n = 150$ [75%]), UCM (26 [13%]), RCM (11 [6%]) congenital (9 [5%]), DCM (3 [2%]), and ARVC (1). Disease severity included 1a ($n = 19$), 1b (88), 2 (56), 3a (32), and 3b (5).

The CATCH score ranged from 0 to 74 (median, 7; Figure 1), and there was a significant ($P < 0.001$) correlation between International Small Animal Cardiac Health Council classification and CATCH score ($r = 0.63$; Figure 2). Cats with HCM had a significantly lower CATCH score, compared with cats that had RCM ($P = 0.008$) or UCM ($P < 0.001$). However,

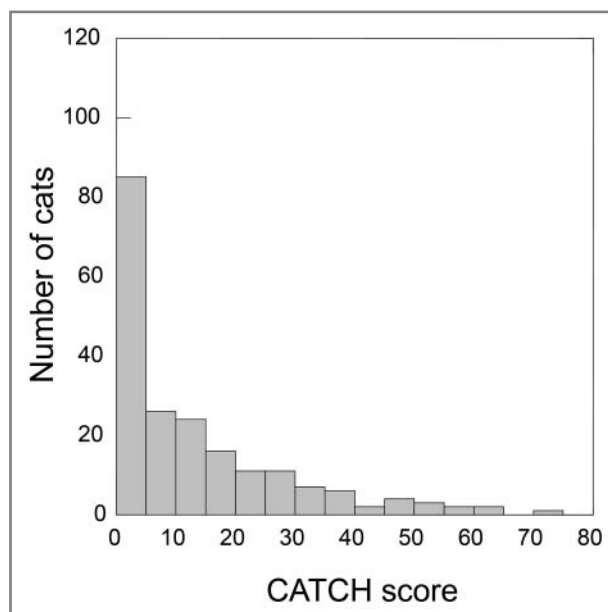


Figure 1—Distribution of scores for the CATCH questionnaire for 200 cats with cardiac disease. Possible scores ranged from 0 to 80, with higher scores indicating poorer HRQOL.

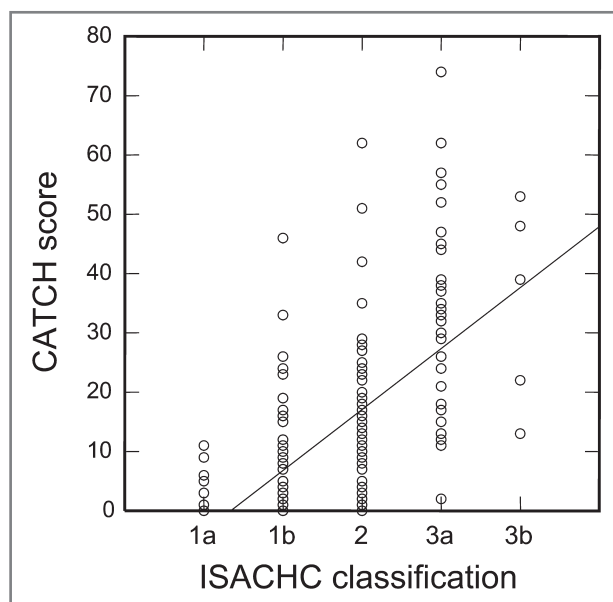


Figure 2—Comparison between CATCH score and International Small Animal Cardiac Health Council (ISACHC) classification for 200 cats with cardiac disease. The solid line represents the correlation between these 2 variables ($r = 0.63$; $P < 0.001$).

cats with RCM and UCM also had a significantly ($P < 0.05$) higher median International Small Animal Cardiac Health Council classification, compared with the other 2 groups. In multivariate analysis, International Small Animal Cardiac Health Council classification ($P < 0.001$), but not underlying disease ($P = 0.14$), was significantly related to the CATCH score.

Discussion

The CATCH questionnaire developed, validated, and evaluated in the present study for assessing HRQOL in cats with cardiac disease appears to be a valid and reliable method for assessing HRQOL in cats with cardiac disease. The questionnaire showed good criterion-related validity and internal consistency in this population of 275 cats with cardiac disease. These findings are similar to those obtained with the Minnesota Living with Heart Failure Questionnaire in people⁶ and the FETCH questionnaire in dogs.¹⁰ Internal consistency (Cronbach's alpha) coefficients ≥ 0.70 are considered adequate for group comparisons, and coefficients ≥ 0.90 are suggested for use at the patient level.¹⁹

Correlation coefficients assessing a correlation between individual questionnaire item score and owners' overall QOL score in clinical cases ranged from 0.16 to 0.61 in the present study. One of the initial questionnaire items included in the validation phase of the study asked the owner how vomiting affected their cat's QOL. The correlation coefficient for this item was the lowest of any question at 0.06. Because of the low correlation with overall QOL and the low scores on this individual question (only 5 owners gave a score > 1), the question was removed from the questionnaire and further validation was performed without it. One other item ("...causing fainting or collapsing episodes") had a correlation coefficient < 0.25 ($r = 0.16$). Although this

is below the generally accepted cutoff of 0.25 for an acceptable degree of internal consistency, we elected to leave it in the questionnaire because for cats with syncope, owners gave very high scores and the score on this question was highly related to overall QOL. In addition, a low correlation does not indicate that the factor is not contributing to QOL because of limitations in our understanding of how factors influence QOL. Another important limitation to the present study was the comparison of the individual questionnaire item scores with the owners' overall QOL assessment. For any individual owner, the cat's overall QOL may encompass factors other than those related to cardiac disease that would not be assessed in the questionnaire.

In the second phase of this study, which evaluated 200 additional clinical cases with the validated questionnaire, the CATCH score was significantly correlated with the International Small Animal Cardiac Health Council classification. This suggests that the CATCH score may be useful as an additional aid in evaluating cats with cardiac disease and as a means of assessing outcome in research studies. The International Small Animal Cardiac Health Council classification provides information on the severity of cardiac disease, whereas the CATCH questionnaire describes how cardiac disease is affecting the cat's QOL. For example, 2 cats both classified in the same International Small Animal Cardiac Health Council category may have markedly different CATCH scores on the basis of the degree to which their disease or their medications are affecting their appetite, activity, sleep habits, and interactions. Therefore, assessment of the owners' perceptions of their cats' HRQOL may provide additional information on which to base treatment decisions or monitor efficacy of treatment. Our results showed differences between certain underlying types of cardiac disease: cats with HCM had a lower median CATCH score, compared with cats that had all other forms of disease. However, this appeared to be a result of the finding that cats with HCM had less severe disease (ie, lower International Small Animal Cardiac Health Council classification), compared with cats with the other diseases. Therefore, the CATCH score is likely to be useful for cats with all types of cardiac disease.

The CATCH questionnaire was designed to assess HRQOL of cats during the preceding 7 days. Not all HRQOL instruments designed for people specify a time period, although the Minnesota Living with Heart Failure Questionnaire specifies that the patient should think about the past month when answering questions, whereas the Kansas City Cardiomyopathy Questionnaire focuses on the past 2 weeks.^{6,20} For the CATCH questionnaire, a period of 7 days was selected to enhance detection of short-term changes in HRQOL that might result from treatment. In addition, since clinical and biochemical testing for reevaluation of cats is often performed 7 to 10 days after initiating or changing medications, the use of a 7-day period for the CATCH questionnaire allows follow-up administration of the questionnaire to be coordinated with these reevaluations.

There are a number of limitations to the present study. There appeared to be more variability in responses for certain questions in cats, compared with results from the FETCH questionnaire for dogs. For example,

some owners had great difficulty administering medications to their cats and gave a high score on the item assessing how much of an effect medications had on their cat's HRQOL. However, other owners, even some of those administering multiple medications, responded that medication administration had no effect on their cat's HRQOL. This may be related to individual owner or cat personalities or owner skill at administering medications. However, the owner's perception of the effect of these factors on his or her cat's HRQOL is likely still important to assess because it may influence the decision for euthanasia or medication adherence. Assessment of HRQOL may also provide support for the use of other medications, techniques to reduce the frequency of medication administration, nutritional strategies that could improve appetite, or other factors that could enhance the cat's HRQOL. Another limitation is that the CATCH questionnaire or any similar owner-derived assessment of a cat's HRQOL is, by definition, a proxy measure of the cat's true HRQOL. This is a similar issue in human pediatric medicine in which parents of infants and very young children typically provide information used to assess HRQOL. In veterinary medicine, the pet owner is usually selected to provide this proxy information,^{21–24} although further study of the relationship between owner-reported (proxy) HRQOL assessment and true HRQOL is warranted. Another limitation is that, whereas the majority of cats included in the present study were being reevaluated for their cardiac disease, not all owners were aware of the severity of their cats' cardiac disease at the time of completing the questionnaire, and this may have affected the results. One of the ultimate goals of the CATCH questionnaire is to be able to evaluate a cat's HRQOL before and after an intervention (either for clinical trials or clinical treatment of individual patients), in which case owners would know that their cat had cardiac disease before completing the questionnaire. This is an important area for future research and continued refinement of HRQOL assessment of cats.

A test-retest correlation coefficient > 0.80 is considered desirable, so the test-retest correlation coefficient of 0.94 for CATCH scores during the validation phase of the present study suggests that the questionnaire had good test-retest reliability. However, further research is needed to determine the CATCH score's responsiveness or sensitivity to changes associated with medical treatment. This information is important to establish the questionnaire's usefulness as an endpoint in clinical trials, as is the case with the Minnesota Living with Heart Failure Questionnaire, which has been shown to be responsive to high-intensity medical and surgical interventions.^{25–28}

Further studies are needed to judge the usefulness of this questionnaire in randomized controlled trials of treatment of cats with cardiac disease. However, data from the present study suggest that the CATCH questionnaire is easily self-administered by cat owners, has good validity and reliability, and may provide a promising new tool for assessing HRQOL in cats with cardiac disease.

a. Questionnaire available upon request from the corresponding author.

- b. Microsoft Word 2007, Microsoft Corp, Bellevue, Wash.
c. SPSS, version 16.0, SPSS, Chicago, Ill.

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New Veterinary Biologic Products

Product name	Species and indications for use	Route of administration	Remarks
Cyprinid Herpesvirus Type 3 Vaccine, Modified Live Virus (Novartis Animal Health US, Inc, Larchwood, Iowa, US Permit 303B)	For vaccination of healthy <i>Cyprinus carpio</i> (koi and common carp) weighing 100 g or more, as an aid in prevention of disease caused by Cyprinid Herpesvirus Type 3	Immersion	USDA licensed 2/3/12
Canine Heartworm Antigen-Anaplasma Phagocytophilum-Platys-Borrelia Burgdorferi-Ehrlichia Canis-Ewingii Antibody Test Kit	For detection of <i>Dirofilaria immitis</i> (heartworm) antigen and antibody to <i>Anaplasma phagocytophilum</i> , <i>A platys</i> , <i>Borrelia burgdorferi</i> , <i>Ehrlichia canis</i> , and <i>E ewingii</i> in canine serum, plasma, and whole blood	In vitro diagnostic	USDA licensed 3/26/12