Evaluation of a questionnaire for obtaining owner-perceived, weighted quality-of-life assessments for dogs with spinal cord injuries

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Objective—To evaluate a questionnaire for obtaining owner-perceived, weighted quality-of-life assessments for dogs with spinal cord injuries.

Design—Evaluation study.

Animals—100 dogs with spinal cord injuries and 48 healthy control dogs.

Procedures—The questionnaire was adapted from a questionnaire (the schedule for the evaluation of individual quality of life–direct weighting) used for human patients. Specifically, owners were asked to identify 5 areas or activities they believed had the most influence on their dogs' quality of life, assess their dogs' current status in each of those areas, and provide a weighting for the importance of each area. Results were used to construct a weighted quality-of-life score ranging from 0 to 100 for each dog. Owners were also asked to provide a quality-of-life score with a visual analog scale (VAS).

Results—A good correlation was found between weighted and VAS quality-of-life scores. Dogs with spinal cord injuries had weighted quality-of-life scores that were significantly lower than scores for control dogs. Quality-of-life areas and activities provided by owners of dogs with spinal cord injuries were similar to areas and activities provided by owners of healthy control dogs and could mostly be encompassed by 5 broader domains: mobility, play or mental stimulation, health, companionship, and other.

Conclusions and Clinical Relevance—Results suggested that the questionnaire could be used to obtain owner-perceived, weighted quality-of-life assessments for dogs with spinal cord injuries. Obtaining owner-perceived quality-of-life assessments for individual dogs should allow veterinarians to better address quality-of-life concerns and expectations of owners. (*J Am Vet Med Assoc* 2008;233:925–930)

Quality of life has become an important topic in companion animal practice in recent years as dogs and cats are living longer lives and increasingly being thought of as family members. However, there still remains much debate on what constitutes quality of life for companion animals. Some authors have equated quality of life with animal welfare,[1] but others have suggested that quality of life goes beyond welfare, with a need to focus on individual animal experiences.[2]

In recent years, various methods to assess and quantify quality of life in companion animals have been developed, including a structured questionnaire for assessing quality of life in dogs with chronic pain,[3] a quick-assessment quality-of-life questionnaire,[4] the functional evaluation of cardiac health questionnaire,[5] a Karnofsy score for cats,[6] and a questionnaire based on objective list theory, which is the belief that certain conditions are required for subjects to have optimal quality of life.[7,8]

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Abbreviation

VAS	Visual analog scale

These previous methods of assessing quality of life in companion animals have all relied on evaluations of specific areas or activities thought to be important to quality of life. In human medicine, however, there has been a growing understanding that areas or activities relevant to quality of life and the importance placed on those areas or activities may vary from one individual to the next. For this reason, methods for obtaining individualized quality-of-life assessments have become more common.[9–12]

One method for obtaining individualized quality-of-life assessments in human medicine is the schedule for the evaluation of individual quality of life–direct weighting.[9,13] This is a short questionnaire that allows patients to identify those areas of life or life activities they consider to be most important in terms of their own quality of life, rate their level of functioning or satisfaction with each area or activity, and indicate the relative importance of each area or activity as it relates to their overall quality of life.[9] We believe that with some slight modifications, a similar method may be useful in obtaining owner-perceived, weighted quality-of-life assessments in dogs. The purpose of the study reported

here therefore was to evaluate whether a questionnaire based on the schedule for the evaluation of individual quality of life–direct weighting could be used to obtain owner-perceived, weighted quality-of-life assessments for dogs with spinal cord injuries.

Materials and Methods

Study animals—Owners of dogs initially examined at the Texas A&M University Veterinary Medical Teaching Hospital between May 2006 and March 2007 because of a spinal cord injury (eg, disk herniation, fibrocartilaginous embolic myopathy, vertebral malformation, neoplasia, vertebral column fracture, atlantoaxial subluxation, meningomyelitis, diskospondyltis, cervical spondylomyelopathy, or unknown etiology) were invited to participate in the study. Owners of all dogs examined during this period were invited to participate regardless of whether dogs were examined on an emergency basis or because of a scheduled appointment and regardless of breed, age, or sex of the dog and type of spinal cord injury.

Dogs included in the study received routine care, with specific medical and surgical treatments administered on the basis of the underlying etiology and degree of neurologic dysfunction. As part of the routine neurologic examination, a modified Frankel score[14–16] ranging from 0 to 5 was assigned to dogs with a spinal cord injury. A score of 0 was assigned to dogs with paraplegia or tetraplegia with no deep nociception, a score of 1 was assigned to dogs with paraplegia or tetraplegia with no superficial nociception, a score of 2 was assigned to dogs with paraplegia or tetraplegia with nociception, a score of 3 was assigned to dogs with nonambulatory paraparesis or tetraparesis, a score of 4 was assigned to dogs with ambulatory paraparesis or tetraparesis and ataxia, and a score of 5 was assigned to dogs that only had spinal hyperesthesia. At the time of discharge, most owners were advised to adhere to a standardized protocol incorporating physical rehabilitation and exercise restriction and that consisted of controlled leash walks for 5 minutes 3 times a day for dogs that were able to ambulate, passive range of motion and active weight-bearing exercises for dogs that were not able to ambulate, and cage rest for 4 weeks following discharge for all dogs. Carts and other assistive devices were not typically part of the postdischarge protocol unless a dog had been nonambulatory for > 6 weeks. Information on the use of carts and other assistive devices was not collected for the present study; however, to the authors' knowledge, none of the dogs included in the study used carts or other assistive devices.

For comparison purposes, a control population consisting of healthy dogs owned by students, faculty, and staff of the Texas A&M University College of Veterinary Medicine and Biomedical Sciences and healthy dogs examined by the community practice service of the Texas A&M University Veterinary Medical Teaching Hospital was also included in the study. Dogs were considered for enrollment in the control group only if the dog was a personal pet and had lived with the present owner for at least 3 months and the owner reported that the dog had not had any signs of illness within the past 3 months.

Owners of all dogs enrolled in the study provided written consent. The study protocol was approved by the Texas A&M University Institutional Review Board and the College of Veterinary Medicine Clinical Research Review Committee.

Quality-of-life questionnaire—The questionnaire used in the study asked owners to provide information concerning how long they had owned the dog, when the spinal cord injury occurred, and whether they had any experience dealing with other animals with a spinal cord injury. Each owner was then requested to list the 5 areas of life or life activities that he or she believed had the biggest influence on the dog's quality of life. Quality of life was not defined for the owner, and no restraints were put on allowable responses. The owner was asked to rank these areas and activities from 1 to 5, with 1 being the most important and 5 being the least important, and to indicate on a 10-cm VAS labeled worst possible on 1 end and best possible on the other the dog's current status for each of the 5 areas and activities. The owner was then provided with a small laminated disk that contained 5 moveable slices (**Figure 1**) labeled with the 5 areas and activities. The owner was instructed to manipulate the disk so that the size of each slice represented the importance of each area and activity in relation to the other areas and activities, and the weighting for each slice was recorded as a percentage, with the sum of the weightings totaling 100%. Separately, the owner was asked to indicate on a 10-cm VAS labeled worst possible on 1 end and best possible on the other his or her perception of the dog's current overall quality of life. Finally, the owner was asked to indicate on a 10-cm VAS labeled poor on 1 end and excellent on the other how well he or she was coping with the dog's spinal cord injury (data on how well owners were coping with the dog's spinal cord injury are reported elsewhere[17]). Owners of dogs in the control population completed the same questionnaire, except that questions specific to spinal cord injury were excluded.

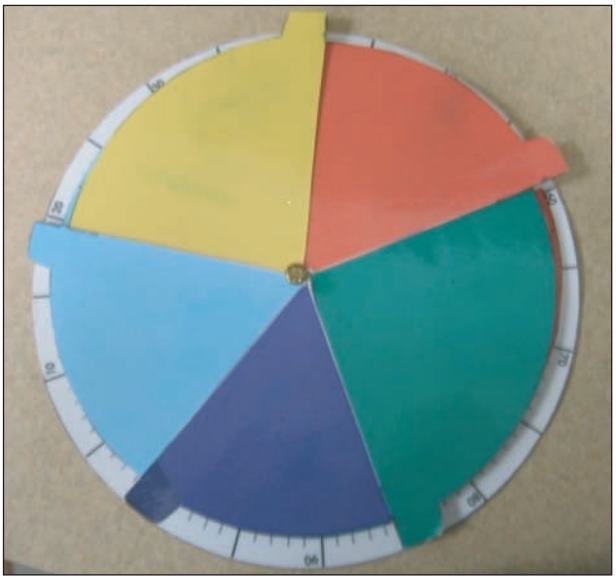

Figure 1—Laminated disk used by owners to indicate level of importance of 5 areas of life or life activities they have indicated as important to their dog's quality of life. Each moveable slice represents an area or activity designated as being important to the dog's quality of life.

For owners of dogs with spinal cord injuries, the questionnaire was administered at the time of initial evaluation by a veterinary technician or clinician who had been trained by a member of the research team in its use. The questionnaire was administered a second time when dogs were reexamined 4 to 6 weeks later at the Texas A&M University Veterinary Medical Teaching Hospital. Alternatively, if the dog was not returned to the teaching hospital for reexamination, the questionnaire was mailed to the owner, along with detailed instructions, 1 month after the initial appointment. Because it was not practical to mail a laminated disk to each owner, the written instructions reminded owners of the use of the disk at the time of the initial visit and asked them to apportion the importance of each of the 5 newly selected areas of life and life activities so that the total equaled 100%. Up to 2 reminder postcards were mailed in an attempt to maximize the response rate. For owners of control dogs, the questionnaire was administered a single time.

Data analysis—Results of the questionnaire were used to develop a quality-of-life profile for each dog on the basis of the 5 areas and activities selected by the owner and the owner-assigned VAS score for the dog's current status in each of those areas (**Figure 2**). An owner-perceived, weighted quality-of-life score was calculated for each dog by multiplying the VAS score for the dog's current status in each area (calculated on a basis from 0 to 100) by the corresponding weighting assigned to that area or activity and summing across all 5 areas and activities listed by the owner. Thus, weighted quality-of-life scores could potentially range from 0 to 100, with 0 being the worst possible and 100 being the best possible quality of life.

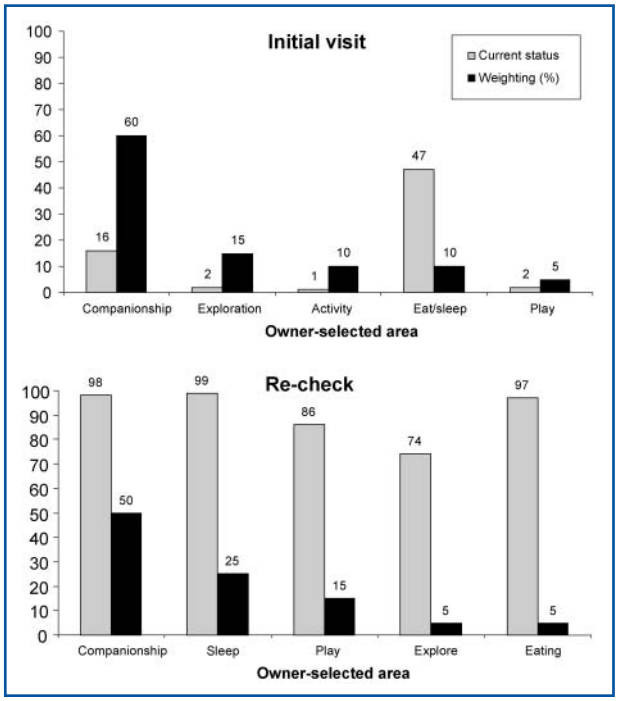

Figure 2—Examples of owner-designated quality-of-life profiles at the time of initial examination (weighted quality-of-life score = [16 × 0.6] + [2 × 0.15] + [1 × 0.10] + [47 × 0.10] + [2 × 0.05] = 14.8) and 6 weeks later (weighted quality-of-life score = 95.2) for a dog with a spinal cord injury. The owner was asked to indicate the 5 areas of life or life activities most important to the dog's quality of life, to indicate the dog's current status in each of those areas with a VAS from 0 to 100, and to assign weightings for the level of importance of each area.

Areas of life and life activities volunteered by the participating owners were evaluated and grouped into broader domains by the first author (CMB). If there was a question as to which domain a particular response should be assigned to or whether a particular response should be excluded from all major domains, the response was carefully reviewed by 2 additional researchers (MRS, JML) until a unanimous decision was made.

Questionnaire validation—Face validity, which is the degree to which the questionnaire appears to assess the desired qualities, was established through informal discussions with clinicians and colleagues and through client feedback. Because no gold standard measure for quality of life in companion animals was available, criterion validity was not determined. Construct validity was examined by comparing weighted quality-of-life scores with the single owner-assigned VAS score for overall quality of life. Extreme group validity was assessed by comparing weighted quality-of-life scores obtained at the time of initial examination for dogs with spinal cord injuries with scores obtained for the healthy control dogs. Because of the short interval that would have been required for individual owners to reassess their dogs' quality of life before a substantial change in the dogs' clinical condition had occurred, test-retest reliability was not assessed.

Statistical analysis—The Shapiro-Wilk test was used to determine whether data were normally distributed. The Spearman rank correlation method was used to test for correlations between initial weighted quality-of-life scores and initial VAS quality-of-life scores for dogs with spinal cord injuries, weighted and VAS quality-of-life scores for control dogs, and initial VAS quality-of-life scores and 4- to 6-week recheck scores for dogs with spinal cord injuries. The Wilcoxon-Mann-Whitney test for independent observations was used to compare initial weighted and initial VAS quality-of-life scores for dogs with spinal cord injuries with weighted and VAS quality-of-life scores for control dogs, and the Wilcoxon signed rank test was used to compare initial weighted quality-of-life scores for dogs with spinal cord injuries with weighted quality-of-life scores for the same dogs 4 to 6 weeks after the initial examination. All tests were performed as 2-sided tests with standard software.[a] Values of $P < 0.05$ were considered significant.

Results

One hundred dogs examined because of a spinal cord injury during the study period were enrolled in the study. There were 54 Dachshunds, 11 mixed-breed dogs, 5 German Shepherd Dogs, 3 Pekingese, 2 Boxers, 2 Chihuahuas, 2 Jack Russell Terriers, and 2 Labrador Retrievers. The remaining 19 dogs represented 19 other breeds. Median age at the time of initial examination for the spinal cord injury was 6.1 years (range, 0.33 to 17 years). Information on duration of ownership at the

time of initial examination was available for 96 dogs, and median duration was 6.0 years (range, 0.25 to 17 years).

Forty-eight healthy control dogs were also enrolled in the study. There were 24 mixed-breed dogs, 3 Dachshunds, 3 Labrador Retrievers, 2 Boxers, 2 Chihuahuas, 2 Pugs, and 2 Border Collies. The remaining 10 dogs represented 10 other breeds. Median age of the dogs at the time the questionnaire was completed was 3.5 years (range, 0.50 to 13 years). Median duration of dog ownership at the time the questionnaire was completed was 3.0 years (range, 0.33 to 13 years).

Although 100 dogs with spinal cord injuries were enrolled in the study, not all owners completed the questionnaire or provided a VAS score for overall quality of life at the time of the initial examination and 4 to 6 weeks later. Specifically, weighted and VAS quality-of-life scores assigned by owners at the time of initial examination were available for only 67 of the 100 dogs, weighted quality-of-life scores alone were available for 3, VAS quality-of-life scores alone were available for 23, and neither a weighted nor a VAS quality-of-life score was available for 7. Similarly, weighted and VAS quality-of-life scores assigned by owners 4 to 6 weeks after the initial examination were available for only 29 of the 100 dogs, a weighted quality-of-life score alone was available for 1, VAS quality-of-life scores alone were available for 21, and neither a weighted nor a VAS quality-of-life score was available for 49. Overall, weighted quality-of-life scores assigned both at the time of initial examination and 4 to 6 weeks later were available for 24 dogs, VAS quality-of-life scores assigned both at the time of initial examination and 4 to 6 weeks later were available for 45 dogs, and both weighted and VAS quality-of-life scores assigned at the time of initial examination and 4 to 6 weeks later were available for 21 dogs. Weighted and VAS quality-of-life scores were available for all 48 control dogs.

For 92 of the 100 dogs with a spinal cord injury, a modified Frankel score assigned at the time of initial examination was available. Median score was 3 (range, 0 to 5).

For dogs with a spinal cord injury, median weighted quality-of-life score assigned by owners at the time of initial examination was 42.8 (range, 2.20 to 100; n = 70), and median VAS quality-of-life score was 3.3 (range, 0 to 10; 90). There was a significant ($\rho = 0.62$; $P < 0.001$; n = 67) positive correlation between weighted and VAS quality-of-life scores assigned at the time of initial examination. Median weighted quality-of-life score for control dogs was 86.3 (range, 38.8 to 100; n = 48), and median VAS quality-of-life score was 9.1 (range, 3.8 to 10). There was a significant ($\rho = 0.66$; $P < 0.001$) positive correlation between weighted and VAS quality-of-life scores for control dogs. Weighted ($P < 0.001$) and VAS ($P = 0.02$) quality-of-life scores for control dogs were significantly higher than scores assigned at the time of initial examination for dogs with a spinal cord injury.

Median weighted quality-of-life score assigned by owners of dogs with spinal cord injuries 4 to 6 weeks after the initial examination was 84.1 (range, 26.4 to 100; n = 30), and weighted quality-of-life scores at this time were significantly ($P < 0.001$; n = 24) higher than scores assigned at the time of initial examination. Median VAS quality-of-life score assigned by owners 4 to 6 weeks after the initial examination was 8.1 (range, 2.8 to 10; n = 50), and there was a significant ($\rho = 0.92$; $P < 0.001$; n = 29) positive correlation between weighted and VAS quality-of-life scores assigned 4 to 6 weeks after the initial examination.

Evaluation of open-ended responses provided when owners were asked to indicate the 5 areas of life or life activities they believed had the biggest influence on their dogs' quality of life revealed that responses could be grouped into the following 5 domains: mobility, play or mental stimulation, health, companionship, and other. The mobility domain encompassed activities such as walking, exercise, jumping, and running. The play domain included activities such as "playing with toys," "chasing salamanders," and "harassing the folks next door." The health domain included references to the dog's physical state and physical functions such as being able to urinate and defecate and willingness to eat and drink. The companionship domain encompassed responses such as love, companionship, petting, and affection. Most responses fit into a single domain; however, some responses were less defined. For example, "exploring the backyard" was considered to have a substantial mobility component, although it was considered a better overall fit for the play and mental stimulation domain. Examples of responses included in the other domain included "living environment" and "leading a normal life."

For analyses of domains, all dogs for which areas and activities were provided were included, regardless of whether the owner provided a weighting for each area. At the time of initial examination, the domain ranked as most important by the largest number of owners of dogs with spinal cord injuries was companionship (36/93 [39%]), followed by health (26/93 [28%]), mobility (19/93 [20%]), and play and mental stimulation (12/93 [13%]). A total of 451 areas and activities were provided by owners at the time of initial examination, of which 121 (27%) fit into the companionship domain, 123 (27%) fit into the health domain, 112 (25%) fit into the play and mental stimulation domain, 89 (20%) fit into the mobility domain, and 6 (1%) fit into the other domain. By comparison, domains ranked as most important by owners of the control dogs were health (16/48 [33%]), companionship (14/48 [29%]), play and mental stimulation (11/48 [23%]), and mobility (7/48 [15%]). Of the 239 areas and activities provided by owners of control dogs, 78 (32%) fit into the health domain, 57 (24%) fit into the companionship domain, 52 (22%) fit into the play and mental stimulation domain, and 52 (22%) fit into the mobility domain.

Discussion

Results of the present study suggested that a modification of the schedule for the evaluation of individual quality of life–direct weighting, which is used to obtain individualized scores for quality of life in human patients, can be used to obtain weighted quality-of-life scores for dogs with spinal cord injuries. Weighted scores obtained with this method correlated well with

owner-assigned VAS scores for overall quality of life, and weighted scores for dogs with spinal cord injuries were significantly lower than scores for a control group of healthy dogs. In addition, weighted scores obtained 4 to 6 weeks after initial examination, at a time when most dogs would likely have been improved clinically, were significantly higher than weighted scores assigned at the time of initial examination. However, because information was not available for dogs whose owners did not complete the questionnaire 4 to 6 weeks after the initial examination, responder bias may have been a factor. Additional information on outcome of dogs with spinal cord injuries is published elsewhere.[17]

The major difference between the method for obtaining quality-of-life assessments described in the present report and previously published quality-of-life questionnaires[3–8] was that with the present method, each owner was allowed to indicate those areas of life and life activities that he or she perceived as being most important to the dog's quality of life. Because the questionnaire focused on owner perceptions of those factors most important to their dogs' quality of life, it could potentially be modified for use in evaluating quality of life associated with a wide variety of conditions beyond spinal cord injury. In human medicine, the schedule for the evaluation of individual quality of life–direct weighting has been used to obtain individualized quality-of-life assessments in numerous patient populations, including individuals with AIDS or diabetes mellitus and individuals with malignant cord compressions.[9–11,18] However, even though similar assessment tools are becoming more widely used in human medicine, they are by no means accepted by all researchers as the most appropriate measures of quality of life in all populations. Some authors have even argued against marketing the schedule for the evaluation of individual quality of life–direct weighting as a valid tool for measuring quality of life, stating that what it truly assesses are the determinants that contribute to an individual's quality of life.[19] In addition, the idea of using weighted measures in quality-of-life assessment is not universally accepted by all authors.[20] Such concerns become even more important when applying these assessment tools in veterinary populations, given that defining quality of life in animals is even more difficult than defining it in people. Nevertheless, we believe that treating dogs as individuals when assessing quality of life is so important that we felt it was necessary to make a first attempt at using a modified version of the schedule for the evaluation of individual quality of life–direct weighting in companion animal medicine.

In the present study, only 70 of 100 owners completed the questionnaire sufficiently at the time of initial examination to allow us to calculate a weighted quality-of-life score. This completion rate was similar to the completion rate reported in a study[18] involving human patients with newly diagnosed malignant cord compression, in which only 70% of consenting patients successfully completed the questionnaire. Subjectively, it appeared that most owners included in the present study did not have any difficulties using the laminated disk to assign weightings to areas and activities they had identified. However, some individuals did become confused with the difference between assigning a degree of importance to each designated area or activity and assigning a score for the dog's current status in each area or activity. Therefore, in using this method in the future, it will be vital to take the time to ensure that individual owners understand what is being asked of them. Also, because of their highly charged emotional state, individuals who had brought a dog to the hospital for treatment of a spinal cord injury understandably often found it difficult to focus on the task at hand. Finally, although clinicians and staff made every effort to have owners complete the questionnaire in full, this was often difficult, especially with owners of dogs seen on an emergency basis.

Although most health-care professionals have been trained to focus on the physical aspects associated with quality of life, findings of the present study suggested that dog owners often placed a greater emphasis on companionship and other nonphysical parameters. Owners of healthy animals actually placed a higher importance on health, compared with owners of dogs with a spinal cord injury. However, companionship and health were the top overall domains by owners of dogs in both groups. Our findings have also reinforced the idea that owners of dogs with similar physical conditions may have very different perceptions as to those factors important for a good quality of life. Although weighted quality-of-life scores for dogs in the control group were significantly higher than scores for dogs with spinal cord injuries, there were a few dogs in the control group that had low weighted and VAS quality-of-life scores. The owner of 1 such dog volunteered the following areas or activities as being most important with regard to the dog's quality of life: playing with other dogs, car rides, swimming, playing fetch, and going for walks. For each of these areas except playing with other dogs, the owner assigned a score < 4 on a scale from 0 to 10 for current status of the dog. Because the dog was apparently healthy and thus likely able to perform these tasks, the low scores may have been due to the owner's perceived inability to meet these needs. For example, the owner may have felt that he or she was not taking the dog on walks or swimming as frequently as he or she would have liked. Theoretically, the quality-of-life profile for this dog could be used by a veterinarian to discuss the exercise needs of the dog and suggest ways that the owner might be able to better meet these needs while faced with a busy schedule.

Unlike many quality-of-life evaluation methods, the method used in the present study allowed for the possibility that factors contributing to quality of life might not remain static over time, in that the areas and activities designated by respondents as being important to their dogs' quality of life could be different each time they completed the questionnaire. For example, being able to chase toys may be important to a dog's quality of life when the dog is young but become less important as the dog grows older. Thus, this method may be more useful in identifying those factors perceived as contributing to an individual dog's quality of life rather than in providing a measure of overall quality of life that can be compared among groups. One of the advantages of this method is that it can be used as a tool to address and

discuss client expectations and concerns about an individual dog's health and well-being. However, although quality-of-life assessments are important, they should not be viewed as being separate from the veterinary clinical examination and consultation and are simply another tool to help veterinarians better attend to each individual animal's physical and mental needs and better address owner concerns. Importantly, veterinarians will need to recognize that quality-of-life profiles obtained with this questionnaire will be influenced by the owner's state of mind and his or her interpretation of the dog's environment and needs at the time the questionnaire is completed. Having owners elect new areas and activities and new weightings for those areas and activities each time they complete the questionnaire allows it to be more sensitive to perceived changing needs of the dog and the importance placed on these needs by the owner over time.

The present study represented the first attempt to evaluate use of this questionnaire to obtain owner-perceived, weighted quality-of-life assessments for dogs with a particular condition. Our findings suggested that it may be useful in this regard. However, additional studies are needed to better evaluate the reliability of the questionnaire and to evaluate its validity when applied to different populations and to populations with different conditions.

a. Intercooled Stata, version 9.2, Stata Corp, College Station, Tex.

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Correction: Anesthesia Case of the Month

In the Anesthesia Case of the Month article published in the May 1, 2008, issue (*J Am Vet Med Assoc* 2008;232:1298–1300), the dose of mannitol in the third paragraph is incorrect. The correct dose is 0.9 g/kg (0.41 g/lb). In addition, the values for end-tidal partial pressure of CO_2 and arterial partial pressure of CO_2 were transposed in the first paragraph of the Answer section and the fourth paragraph of the Discussion section. The sentences should read as follows:

> Anesthetic management consisted of increasing the ventilation rate to reduce P_{ETCO_2} to 30 mm Hg, with the aim of decreasing Pa_{CO_2} to 34 to 35 mm Hg. An arterial blood sample was obtained and submitted for blood gas analysis to ensure adequate arterial oxygen content and to determine the gradient between P_{ETCO_2} and Pa_{CO_2}. At this time, P_{ETCO_2} was 30 mm Hg, Pa_{CO_2} was 34 mm Hg, Pa_{O_2} was 498.3 mm Hg, bicarbonate concentration was 18.7 mmol/L, base excess was –4.0 mmol/L, and arterial oxygen saturation was 99.9%.
>
> Therefore, in emergency situations, a target Pa_{CO_2} of 35 mm Hg or a target P_{ETCO_2} of 30 mm Hg should be used.