

Owners' perceptions of quality of life in geriatric horses: a cross-sectional study

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Abstract

Quality of life (QoL) is increasingly recognised as a more important measure of treatment success than prolongation of life. Assessment of QoL may aid decision-making for treatment or euthanasia. This study aimed to evaluate owners' perceptions of factors affecting their horse's QoL and those factors that may contribute to their decision-making process for treatment or euthanasia of geriatric horses. A cross-sectional study was conducted, surveying a randomly selected sample of veterinary registered owners ($n = 1,144$) with horses aged ≥ 15 years, using a self-administered postal questionnaire. A section of this questionnaire contained 16 mixed-mode questions about the horse's QoL and factors influencing decisions on treatment. Horses from the cross-sectional survey were enrolled in a longitudinal study and, for cases of euthanasia, a further telephone questionnaire was completed to investigate factors influencing the owner's decision. Owners reported that the majority of geriatric animals enjoyed a high QoL, with 95% of owners rating their horse's QoL as good or excellent on an average day. However, increasing age corresponded negatively with many of the health-related QoL factors. Owners considered long-term diseases that cause chronic pain to affect their animal's QoL more than a disease causing a single episode of acute pain. The most important factors influencing choice of treatment options for a severe illness or injury were QoL after procedure, life-threatening disorders, painful/stressful procedures and veterinary advice. In conclusion, owner ratings and perceptions of factors affecting QoL of geriatric horses may prove useful in the development of a QoL assessment tool for ageing horses.

Keywords: animal welfare, euthanasia, geriatric, horse, quality of life, survey

Introduction

'Quality of life' (QoL) is a term used extensively in the field of healthcare; however, there has been a lack of consistency in the human and veterinary literature and many publications fail to define what is meant by QoL (Gill & Feinstein 1994; McMillan 2000; Eiser & Morse 2001; Scott *et al* 2007). In its simplest view, QoL may be regarded as one's general enjoyment of life. The World Health Organisation (WHO) defines human quality of life as follows:

an individual's perception of their position in life in the context of culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept, incorporating in a complex way a person's physical health, psychological state, level of independence, social relationships, personal beliefs and relationship to salient features of the environment (Saxena & Orley 1997).

In veterinary medicine, QoL is often considered synonymously with welfare (Wojciechowska *et al* 2005; Broom

2007; Taylor & Mills 2007). However, others suggest that the concept of QoL appears to have a different emphasis to welfare, in both its focus on subjective assessments and the presence of positive experiences (Sandøe 1996). McMillan (2003) proposed that QoL in animals is a balance between pleasant and unpleasant feelings. The Farm Animal Welfare Council recommend the use of both qualitative and quantitative judgements in order to classify an animal's quality of life as a life not worth living, a life worth living or a good life, suggesting that this approach benefits from simplicity and encompasses both negative and positive experiences (Anon 2009).

A recent review proposed an alternative definition:

Quality of life is the state of an individual animal's life as perceived by them at any one point in time. It is experienced as a sense of well-being, which involves the balance between negative and positive affective states and any cognitive evaluation of these, where the animal has the capacity. To some extent, QoL can be

predicted by the fulfilment of basic and species-specific health, social and environmental needs (and individual preferences for these) and is reflected in the animal's health and behaviour (Taylor & Mills 2007).

QoL assessment is well established in human medicine, with numerous published methodologies and applications. Specific assessments have been validated for monitoring the effect of pain, chronic diseases and age-related changes on QoL (Schlenk *et al* 1998; Hyde *et al* 2003; Osbourne *et al* 2003), and may also be used to assess the success of medical treatment or other interventions (Skevington *et al* 2001). The veterinary profession is becoming more aware that determining the success of medical treatment by measuring prolongation of life carries the potential risk of neglecting the quality of the patient's life. In order to define and measure QoL in animals, researchers have drawn from analogy with human medicine, particularly health-related quality of life (HRQoL) (Taylor & Mills 2007). Prior research has informed welfare guidelines for production animals (Anon 1992) and disease-related QoL assessment instruments have been described in small animal medicine (Hartmann & Kuffer 1998; Wiseman-Orr *et al* 2004). Generic tools to assess QoL in a more general sense have to-date only been developed for use in dogs (Schneider 2005; Wojciechowska *et al* 2005; Mullan & Main 2007), although direct animal observations have been used in the development of a welfare assessment for dairy cattle (Whay *et al* 2003). However, there are many important differences between the welfare requirements and QoL of small animals and horses.

Accurately assessing QoL can be exceptionally difficult as measuring even a single component, such as pain, is problematic (Robertson 2002). Health status is often mistakenly equated with QoL, as it is the most extensively documented, best understood, and most widely accepted contributing factor (McMillan 2000), and ill health has been used as a proxy measure of QoL in human geriatric medicine (Bowling 2001). However, equating poor health with poor QoL neglects the ability of people to adapt their lives and overcome illness (Hyde *et al* 2003), and this may be an important consideration in geriatric horses with chronic health conditions. Hyde *et al* (2003) suggest that whilst health continues to be an important determinant of QoL in older age, it can no longer be considered a sufficient proxy in elderly human patients. In a study of elderly human outpatients with common chronic conditions, patients reported their QoL as slightly worse than "good, no major complaints" and factors contributing to QoL rating included the patients' perceptions of their health, interpersonal relationships, and finances (Pearlman & Uhlmann 1988). This suggests that in human geriatric medicine, health represents only one component of QoL, and suffering from chronic disease may not necessarily lead to poor QoL.

The gold standard for QoL assessment is use of a published instrument (questionnaire) that has well-established reliability and validity (Varricchio & Estwing Ferrans 2010) however there is no such tool available in equine medicine.

The ideal way to obtain information about an individual's perspective or subjective feelings is to gather input directly from that individual, for example using patient self-assessment questionnaires. In veterinary medicine, such information must necessarily be obtained from human observers. Whay (2007) suggests that animal-based observations provide the most direct insight into how animals are coping with their environment. Judgements of QoL rely on our perception and interpretation, and are vulnerable to various forms of personal bias; therefore, they are easily regarded as merely somebody's personal view (Wemelsfelder 2007). Reliance on owner- or caregiver-reported information may introduce errors, as owners must be able to recognise factors affecting QoL correctly and interpret the effect these factors have on their animal's well-being, without superimposing their own feelings (Bradshaw & Casey 2007). Alternatively, QoL assessment may be performed by a veterinary surgeon, which may often prove more practical. For human patients, clinician-based observation typically requires much less time and effort to complete compared to patient interviews or questionnaire completion (Aaronson 1989). However, one study of elderly human patients found physician ratings were generally worse than patient ratings, and only weakly associated with the patients' ratings of QoL, suggesting physicians may misunderstand patients' perceptions of their QoL (Pearlman & Uhlmann 1988). Moreover, studies investigating health performance status measures in human patients have reported low levels of inter-physician reliability and low levels of agreement between ratings provided by physicians and those of patients (Hutchinson *et al* 1979; Schag *et al* 1984). This effect may be even greater in equine practice, where a veterinary examination is unlikely to result in a complete, reliable assessment of the animal's QoL in its normal environment, performing a full range of activities.

Geriatric horses and ponies (aged 15 years or above) represent between 25–29% of the equine population (Mellor *et al* 1999; Hotchkiss *et al* 2007; Ireland *et al* 2011a). With increasing age, geriatric horses are more likely to suffer from chronic disorders and less likely to receive routine veterinary attention and preventive healthcare measures (McGowan *et al* 2010b; Ireland *et al* 2011b). Therefore, it is possible that compared to younger animals, geriatric horses have different welfare issues, and factors influencing their quality of life may differ.

The Equine Health and Welfare Strategy for Great Britain (Anon 2005) states that it is the owner's or keeper's responsibility to be able to recognise ill health and seek veterinary assistance as required and to recognise when quality of life deteriorates, seek veterinary advice if necessary and arrange euthanasia when appropriate. QoL assessment may also be important in informing euthanasia decisions, as perceived poor quality of life is a primary reason for euthanasia. Owners of geriatric horses will have probably considered the prospect of euthanasia in the future, and a structured method for measuring QoL in horses would aid both owners and veterinary surgeons in that difficult decision. Owners often rely on opinions and advice from their veterinary

surgeon when faced with this decision. Rollins (2006) recommends that veterinary surgeons are proactive in discussing QoL with owners, perhaps even drawing up a personalised list of what areas of life the animal enjoys most, ensuring the owner is better prepared for making the decision to euthanase when the time comes.

Information regarding QoL assessment in horses is scarce and, to the authors' knowledge, this has not previously been available for the UK geriatric equine population. The results of this study provide a detailed description of owner perceptions of factors that may affect quality of life and the decision for euthanasia in geriatric horses in the north west and Midlands regions of England and north Wales.

Materials and methods

Selection of study sample

The study population included horses registered with veterinary practices in the north west and Midlands areas of England and north Wales. The methodology of the questionnaire survey is described in detail elsewhere (Ireland *et al* 2011a). In brief, a random sample of 7,350 horse-owning clients was selected from the client lists of 20 veterinary practices using randomly generated numbers, sampling a constant proportion (23.15%) of clients from each practice. Owners were mailed postcards to provide number and age ranges of horses they owned or had on loan. Based on previously reported demographic age data for the UK equine population (Mellor *et al* 1999; Hotchkiss 2004), horses and ponies aged 15 years or above were classified as geriatric. All owners of horses aged 15 years or over ($n = 1,144$) were identified and enrolled in a cross-sectional postal questionnaire survey and subsequent longitudinal study involving regular telephone questionnaires over an 18-month period. Owners of more than one eligible horse were asked to complete the questionnaire for the horse with the name that came first in alphabetical order.

Questionnaire design

The self-administered postal questionnaire was an A4, 12-page booklet, containing six sections, concerning the horse or pony (questionnaire available by request from the corresponding author). These included management practices, feeding, preventive healthcare measures, and disease.

The final section of this questionnaire contained 16 questions about the horse's quality of life and factors influencing decisions on treatment. To assess current quality of life, questions based on aspects of the Five Freedoms, as described by the Farm Animal Welfare Council (Anon 1992), utilised a five-point Likert-type scale or categorical responses. Freedom to express normal behaviours was measured indirectly by assessing interaction with other horses, and level of activity during field turnout and questions relating to ability to lie down and stand again identified freedom from discomfort and to express normal behaviour. Appetite and ability to eat were used as proxy measures to assess freedom from hunger.

Open-ended questions were employed to gather information on the factors which owners considered important to their

horse's quality of life with increasing age, as employed by Mullan and Main (2007), and to state the most important change or improvement that they felt would improve their animal's quality of life. Owners were asked to indicate how they would expect disease to affect their horse's quality of life; for diseases causing no pain, chronic or recurrent pain or a single episode of acute or severe pain, owners indicated effect on quality of life using a scale of 0–5, where 0 represented no effect and 5 a major effect. In the final question, owners were asked to rate the importance of factors which might influence their decisions for treatment of a severe illness or injury. Provided with a list of ten factors, owners were asked to rank these factors from most important (1) to least important (10).

In cases of mortality identified from the longitudinal study, additional telephone questionnaires were used to obtain data on cause of death or euthanasia. Where euthanasia was performed, owners were asked to provide information regarding who carried out the procedure and the factors involved in making the decision to euthanase.

Statistical analysis

Statistical analyses were performed using commercial statistical software (PASW version 17, SPSS Inc, Chicago, Illinois, USA). Responses to open-ended questions were categorised manually (by JI and LP). Data from the questionnaire responses are described as proportions with 95% confidence intervals (CI) for categorical data. Where appropriate, Pearson Chi-squared tests were used to assess associations between categorical variables. Kruskal-Wallis and Mann-Whitney *U* tests were used to test the statistical significance of differences between categorical and continuous variables and the effect of age, as a continuous variable from 15 years upwards, on factors affecting quality of life. The critical probability for all analyses was set at 0.05.

Results

Results of survey and description of study population

For the postal questionnaires, a useable response rate of 80.2% ($n = 918/1,144$) was achieved. For individual questions, there were small amounts of missing data; therefore the denominator for all results was 918 unless otherwise stated. Details of response rates, demographic characteristics and management practices are described in detail in Ireland *et al* (2011a). The median age of the sample population of horses was 20 years (IQ 17–24 years), with 5.2% over the age of 30 years. The median duration of ownership was 11.25 years (IQ 6–17 years). Twenty-six percent were reported to be companion animals or retired. Almost one-third (30.7%) of owners reported that their horse currently suffered from a known disease or disorder (KDoD) and the age of these horses was significantly greater than the age of horses without reported current conditions ($P = 0.02$). Overall, 16.4% of horses received some form of regular or long-term medication. Further detailed description of preventive healthcare and owner-reported disease is reported in Ireland *et al* (2011b).

Table 1 Owner responses to Likert-type questions for health, QoL and activities of daily living in geriatric horses (aged ≥ 15 years).

		Frequency	Percent	Median age (years)	P-value ¹
How satisfied are you with horse's general health? (n = 913)	Very dissatisfied	7	0.8	21.0	0.007
	Dissatisfied	21	2.3	21.0	
	Neither	23	2.5	21.0	
	Satisfied	372	40.7	20.2	
How would you rate quality of life? (n = 913)	Very satisfied	490	53.7	19.1	< 0.001
	Very poor	0	0.0	n/a	
	Poor	1	0.1	18.00	
	Average	41	4.5	21.1	
	Good	385	42.2	20.7	
	Excellent	486	53.2	19.0	
To what extent does age limit normal daily activities? (n = 914)	Not at all	507	55.5	18.1	< 0.001
	A little	233	25.5	21.1	
	Moderately	138	15.1	24.0	
	Very much	31	3.4	26.6	
	An extreme amount	5	0.5	27.2	
To what extent does pain limit daily activities? (n = 909)	Not at all	620	68.2	19.1	< 0.001
	A little	193	21.2	21.2	
	Moderately	69	7.6	22.4	
	Very much	22	2.4	23.0	
To what extent does horse interact with people? (n = 911)	An extreme amount	5	0.6	18.1	0.04
	Not at all	4	0.4	18.00	
	A little	24	2.6	24.50	
	Quite often	76	8.3	20.12	
	Very often	210	23.1	20.00	
To what extent does horse interact with other horses? (n = 913)	Always	597	65.5	20.00	0.034
	Not at all	7	0.8	20.08	
	A little	66	7.2	21.00	
	Quite often	84	9.2	20.17	
	Very often	185	20.3	19.00	
	Always	553	60.6	20.00	
How active/mobile is horse when turned out? (n = 914)	No contact with horses	18	2.0	24.17	< 0.001
	Not at all	0	0	n/a	
	A little	30	3.3	21.12	
	Moderately	291	31.8	21.08	
	Very	402	44.0	19.92	
When stabled or resting, how often does horse lie down? (n = 914)	Extremely	191	20.9	18.08	0.001
	Never	25	2.7	22.00	
	Occasionally	452	49.5	20.00	
	Frequently	366	40.0	19.58	
Has lying down changed with ageing? (n = 904)	Don't know	71	7.8	18.17	< 0.001
	No change	633	70.0	19.08	
	Lies down more frequently	66	7.3	23.00	
	Lies down less frequently	57	6.3	27.00	
Is horse able to lie down and get up again easily? (n = 906)	Don't know	148	16.4	19.71	< 0.001
	Yes	834	90.8	19.33	
	No, has difficulty	51	5.6	25.04	
	Doesn't lie down	8	0.9	21.04	
How would you rate horse's appetite? (n = 917)	Don't know	13	1.4	22.00	< 0.001
	Very poor	7	0.8	17.17	
	Poor	5	0.5	22.00	
	Moderate	48	5.2	23.50	
	Good	303	33.0	21.00	
Does horse have difficulty eating? (n = 909)	Excellent	554	60.4	19.08	< 0.001
	Yes, struggles with forage	45	5.0	29.25	
	Yes, struggles with all feed	12	1.3	24.45	
	Yes, struggles with hard feed	16	1.8	21.50	
	No	836	92.0	19.25	

¹ Kruskal Wallis test P-value for difference in median age of horse.

Owner assessment of quality of life

Table 1 shows the responses to the Likert-type questions and how these varied with the age of the horse owned. Overall, 95.4% of owners considered their horse's quality of life to be good or excellent on an average day. The median age of horses reported to have an excellent quality of life was significantly lower than those reported to have average or good quality of life.

Ninety-four percent of owners were satisfied or very satisfied with their horse's general health, and the median age of horses was greater where owners were less satisfied with health ($P = 0.007$). Unsurprisingly, increasing age was significantly associated with increased age-associated limitations on daily activity ($P < 0.001$). Additionally, the median age of horses was greater where pain was reported to limit daily activities ($P < 0.001$). Decreased activity during field turnout, altered frequency of lying down and difficulty in lying down or rising afterwards were also reported in older horses. The median age of horses reported to have difficulty eating was also greater than those without such difficulty (Table 1).

The median Likert-scale rank for quality of life was significantly lower for horses with a KDoD and for those receiving long-term medication (both $P < 0.001$). Further, there was a significant association between reduced owner satisfaction regarding health and the presence of a KDoD, or where long-term medication was administered (both $P < 0.001$). In horses with a KDoD pain was felt to significantly limit daily activities ($P < 0.001$) and they were also described as being less active when turned out ($P = 0.001$). Further, a greater proportion of horses with KDoD were reported to have difficulty getting up after lying down or rolling ($P = 0.05$), and to lie down more frequently or less frequently (both $P < 0.001$).

Owner-reported factors influencing quality of life

A total of 849 owners (92.5%) volunteered a description of factors which they believed to be important to their horse's quality of life as it got older (described in Table 2), with a median of five factors listed per respondent (IQ 3–5 factors, range 1–9). The median age of horses was significantly greater where owners considered nutrition ($P = 0.006$); grooming ($P = 0.01$); comfort and being pain-free (both $P = 0.03$) to be important factors. Conversely, the median age of horses was significantly lower where owners reported exercise ($P < 0.001$) as a key factor influencing their animal's quality of life. Owners of horses suffering from a KDoD were significantly more likely to consider being pain-free as an important influence on QoL ($P < 0.001$). Owners keeping their horse at home were more likely to consider regular turnout was an important factor in their horse's quality of life, while company of other horses was considered a significant factor by owners whose horses were kept at other premises (both $P = 0.03$).

The majority of owners (75.6%, $n = 693$) provided information on the single most important change or improvement that would increase their horse's quality of life. Of these

Table 2 Volunteered owner ($n = 849$) reported factors important in the QoL of geriatric horses (aged ≥ 15 years).

Factor important to quality of life	Frequency	Percent
Nutrition/diet	501	59.0
Comfort (ie, stabling, shelter, rugs)	431	50.8
Company of other horses	423	49.8
Exercise regime	360	42.4
Regular field turnout	280	33.0
Human contact	266	31.3
Good health	221	26.0
Routine healthcare	178	21.0
Regular routine	174	20.5
Being free of pain	147	17.3
Maintaining good mobility	114	13.4
Good grazing	109	12.8
Improved owner care/management	80	9.4
Happiness	78	9.2
Grooming	73	8.6
Being able to express normal behaviours	67	7.9
Maintaining correct body condition	56	6.6
Improved environment/general management	53	6.2
Provision of water	47	5.5
Appropriate companions/herd	41	4.8
Freedom from stress	38	4.5
Mental stimulation	36	4.2
Other factors ¹	36	4.2
Improved owner knowledge awareness	34	4.0
Improving/treatment chronic disease	18	2.1

Median of 5 factors provided per respondent. ¹ Other factors included freedom ($n = 7$) and having a foal or continued use at stud ($n = 6$).

owners, almost one-third (29.3%, $n = 203$) stated no changes or improvements were required as their horse already enjoyed an excellent quality of life (Table 3). Owners of older horses suggested that improved health or treatment/improvement of a chronic disease ($P < 0.001$) would improve quality of life. There was also a significant association between the presence of a KDoD and owners indicating that treatment/improvement of a chronic disease would improve their animal's QoL ($P = 0.004$). Owners whose horses were not kept on their own premises were more likely to consider that providing field turnout (or extending duration of turnout) during winter months would improve their animal's quality of life ($P = 0.02$) and that changes to aspects of stable management would be a beneficial change ($P = 0.05$).

Factors affecting decisions for treatment

Table 4 shows owner ratings of the effect of disease on their horse's QoL, on a scale of 0–5. Owners of horses with a KDoD gave a lower rating for diseases causing no

Table 3 Owner-reported single most important change/improvement to improve QoL volunteered by 693 owners of geriatric horses (aged ≥ 15 years).

Factor	Frequency	Percent
No changes required	203	29.3
Improve health/chronic disease	127	18.3
Change in exercise	91	13.1
Change to pasture/turnout routine	72	10.4
Change to stable management	54	7.8
Provision of or increased winter turnout	40	5.8
Equine companions	39	5.6
More time spent with owner	30	4.3
Other factors	30	4.3
Change of diet	20	2.9
Increased variety/stimulation	20	2.9
Improved/well maintained body condition	18	2.6
Better weather	11	1.6

pain ($P = 0.02$) and for long-term diseases causing chronic or recurrent pain ($P < 0.001$) compared to those whose horse did not currently suffer from any reported disease. While there was no significant association between age of horse and owner-perceived effect of long-term chronic or recurrent disease or single episodes of severe disease, owners of younger horses perceived a greater effect on quality of life from diseases that would not cause pain ($P < 0.001$).

All participants provided some response to the final question, ranking the importance of ten factors in their decision regarding treatment of a severe illness or injury. However, only 361 owners (39.3%) completed the question correctly, therefore only these responses were analysed. The proportion of owners ranking each factor as the most important, and the overall sum ranking of each factor were calculated (Table 5).

Factors influencing decision for euthanasia

A total of 130 cases of mortality were reported during the 18-month follow-up period. In one case, the owner was too distressed to answer any further questions, therefore this was not included in further analyses. Seven horses (5.4%) had died, while the remaining 94.6% were euthanased. The majority of owners (85.1%) used their veterinary surgeon for euthanasia, and the most common reasons for euthanasia were colic (20%), lameness (20%) and chronic disease (19.2%). Factors involved in the owner's decision to euthanase are described in Table 6.

Veterinary advice was the most frequently reported factor involved in reaching the decision to euthanase. Sixty-four owners reported that their horse suffered from additional health problems at the time of euthanasia and, of these, 25 (39.1%) reported that these additional diseases influenced their decision for euthanasia. Where euthanasia was

performed due to colic or laminitis the most frequently considered factor was severe or uncontrollable pain (64%, $n = 16$ and 66.7%, $n = 8$, respectively). Veterinary advice and hopeless prognosis were influential in the decision to euthanase cases of colic and other acute illnesses. Poor quality of life was an important factor in the decision to euthanase cases with chronic disease or lameness. In cases with chronic diseases or lameness, the fact that the condition was a long-term problem was considered important in the decision to perform euthanasia.

Discussion

The vast majority of the animals (95%) in this study were considered by their owners to enjoy a good or excellent quality of life. However, increasing age of horse corresponded negatively with many of the health-related QoL factors investigated. Owner satisfaction with general health decreased with increasing age of horse and, predictably, the presence of a known disease or disorder was associated with reduced owner satisfaction regarding health. Owner-assessed quality of life was also adversely affected where the horse suffered from a known disease or disorder. Although 31% of owners reported that their horse currently suffered from a known disease, the vast majority (94%) were satisfied or very satisfied with their horse's general health. Where long-term medication was administered, owner's rating of QoL and satisfaction with their horse's general health were significantly lower.

Measuring QoL is a useful tool in decision-making, which may inform choice of veterinary treatment. In a busy clinical setting, a small series of single-item questions may provide valid assessment of QoL and identify individuals with low QoL requiring further evaluation (Varricchio & Estwing Ferrans 2010). Yeates and Main (2009) suggest that formal QoL assessment may provide an opportunity to assess client perceptions of illness and treatment, and to increase customer involvement and satisfaction. QoL assessment can be used to identify concerns that have not been apparent to the owner, and may be a useful way to encourage owners to consider geriatric health concerns, parasite control, weight management and provision of analgesia (Yeates & Main 2009). It may also provide an opportunity to assess client perceptions of illness and treatment, and to increase owner awareness of issues affecting QoL (Yeates & Main 2009).

McMillan (2003) describes social relationships, mental stimulation, health, food consumption, stress and control as the major contributing factors to QoL in animals. In addition to collecting information regarding management, healthcare and disease, the questionnaire used in this study was designed to investigate many of the domains commonly utilised in QoL assessment (reviewed by McMillan 2000; Taylor & Mills 2007). In human medicine, there has been a growing understanding of the importance of obtaining individualised QoL assessments. This involves asking patients to identify those areas of life or life activities they consider most important in terms of their own QoL and indicate the relative importance of each area or activity as it relates to

Table 4 Owner perceptions of the effect of disease on QoL in geriatric horses (aged ≥ 15 years).

	Score 0-5 (0 = no effect, 5 = major effect on QoL)	Frequency	Percent	P-value ¹
A disease which does not cause pain (n = 888)	0	479	53.9	0.001
	1	213	24.0	
	2	102	11.5	
	3	70	7.9	
	4	9	1.0	
	5	15	1.7	
A long-term disease which causes chronic or recurrent pain (n = 894)	0	7	0.8	0.247
	1	13	1.5	
	2	33	3.7	
	3	108	12.1	
	4	205	22.9	
	5	528	59.1	
A single episode of a disease which causes acute or severe pain (n = 888)	0	43	4.8	0.248
	1	39	4.4	
	2	101	11.4	
	3	261	29.4	
	4	161	18.1	
	5	283	31.9	

¹ Kruskal-Wallis test P-value for difference in median age.

their overall quality of life. Budke *et al* (2008) have proposed a modified method using owner-perceived assessment for use in dogs. The questionnaire utilised in this current survey obtained owner-reported individualised assessments by providing opportunities for them to describe the factors they consider important, and what changes they would make to improve their horse's QoL. Questions relating to QoL were contained in the final section of the questionnaire, following sections regarding healthcare and disease. Bowling and Windsor (2008) found that subjective assessment of health status was influenced by question order. Human patients with longstanding illnesses were significantly more likely than patients without such conditions to rate their health more favourably after completing a health status questionnaire. It is possible the design of the questionnaire employed in this current study influenced owners' responses with respect to their horse's health and QoL.

The median duration of ownership for horses in this study was 11.25 years, considerably longer than the median of 4.9 years reported for the general equine population (Hotchkiss *et al* 2007). Longer duration of ownership of geriatric horses may encourage the formation of a strong owner-pet bond, which has been reported to affect owner's decision to seek veterinary attention (Anon 2007), and may influence their perceptions regarding QoL. The duration and intensity of the relationship between owner and horse has also been associated with the severity of the owner's response to the death of their horse (Robinson 1999). Interestingly, a study of QoL in pet dogs reported a negative association between QoL and both the dog's age and length of the dog-owner relationship (Marinelli *et al* 2007). Increasing dog age and

Table 5 Importance of factors influencing owners' decisions (n = 361) regarding treatment options for a severe illness or injury in geriatric horses (aged ≥ 15 years).

Ranked importance ¹	Factor	% rating as most important factor ²
1	Quality of life after procedure	40.4
2	Life-threatening disorder	19.4
3	Painful or stressful procedure	6.9
4	Veterinary advice	18.6
5	Age of horse/pony	5.3
6	Period of recovery	3.0
7	Hospitalisation required	0.6
8	Cost of treatment	0.6
9	Travel required for treatment	1.9
10	Cost covered by insurance	3.0

¹ Ranked importance from summation of ratings from all respondents.

² Proportion of respondents rating factor as top most important.

Table 6 Factors influencing owner (n = 130) decision-making for euthanasia of geriatric horses (aged ≥ 15 years).

Factor in decision to euthanase	Frequency	Percent
Veterinary advice	60	46.2
Hopeless prognosis	59	45.4
Poor quality of life	39	30.0
Long-term problem	38	29.2
Severe/uncontrollable pain	33	25.4
Presence of additional health problems	25	19.2
Other factor	26	20.0
Cost of further treatment	2	1.5

duration of ownership were also associated with reduced care (including provision of veterinary care, preventive healthcare measures, exercise and grooming) and reduced physical condition (assessed by veterinary examination of ears and nutritional status). Older dogs were reported to receive less veterinary assistance, and with increased duration of ownership, owner attention to the dog's needs decreased while the dog's attachment to the owner became stronger. The study recruited volunteers from staff at the institution conducting the study, therefore it is possible considerable responder bias was introduced.

Although the effect of increased duration of ownership has not been assessed, routine preventive healthcare and veterinary attention is reported to decrease with increasing age of horse in the equine population, both in the UK and overseas (Mellor *et al* 2001; McGowan *et al* 2010a; Ireland *et al* 2011b). Reduced provision of routine healthcare measures may predispose the older horse or pony to disease and reduced frequency of veterinary attention may reduce early disease detection. In elderly human patients there is some evidence to suggest that regular health checks may improve QoL (Byles *et al* 2004). However, despite a reduction in veterinary care with increasing age in horses, there is evidence from the USA that geriatric horses are receiving more veterinary care now than in the past, suggesting an increased willingness of owners to seek and finance veterinary services. In one veterinary referral hospital, admissions of horses ≥ 20 years rose from 2.2 to 12.5% between 1989–1999, representing an almost six-fold increase within this 10-year period (Brosnahan & Paradis 2003a).

The study population in this study was comprised of horses belonging to owners registered with at least one veterinary practice, which may represent a source of bias. Questionnaire-based research has an inherent risk of error introduced by responder bias, however it is probable that the high useable response rate achieved in this study will have reduced this effect. Owners with high standards of management or concerns about the health of their geriatric horse may have been more likely to respond to both the initial postcard mailing and subsequent questionnaire survey, than owners less concerned regarding their horse's health and this may have affected responses to the QoL questions. Additionally, owner responses to QoL questions, particularly those involving health-related QoL factors, may be influenced by the presence of a known health problem or a concern regarding their horse's general health.

It is possible that owner's perceptions of QoL and factors influencing it are affected by anthropomorphism or anthropocentrism (Bradshaw & Casey 2007). However, compared to veterinary surgeons, owners have more experience of the individual animal (McMillan 2003). Meagher (2009) reviews the use of observer ratings in animal welfare research, concluding that qualitative observer ratings can be a legitimate and very useful scientific tool. In human medicine, reviews of proxy-patient agreement tend to report moderate to high agreement for physical domains (physical activity and symptoms) but slightly lower agreement for

psychological domains (emotional and social functioning). Further, while proxies may underestimate pain (Sprangers & Aaronson 1992), there is a tendency towards them underestimating QoL overall. Yeates and Main (2009) emphasise the owner's greater knowledge of the animal's history and normal daily activities, allowing them more objective knowledge of the animal's external parameters and more awareness of how these matter from the individual animal's point of view. Although clinicians may be more valid assessors of health, owners may be in a better position to assess mental well-being and experience, because they are more familiar with the animal's character, behaviour and daily routine (Wojciechowska & Hewson 2005). Owner assessment of their horse's QoL may increase their level of reflection, allowing them to identify problems or possible improvements (Yeates & Main 2009).

Wemelsfelder (2007) has described qualitative assessment, observing animals and the quality of their expressions in order to develop greater insight into their welfare and QoL. The author suggests animal caretakers should be well placed to use qualitative terminologies to address their animals' QoL, though suggests that this skill requires practice, experience and training. Furthermore, Wemelsfelder (2007) states that knowledge of species-specific behavioural repertoires, and extensive experience in observing and interacting with individuals in different contexts, is required to accurately judge the meaning of animal body language.

Horses suffering from current health conditions (KDoD) were reported to be less active during field turnout and a greater proportion had difficulty getting up after lying down or rolling. Furthermore, a greater proportion of horses with KDoD were reported to lie down more or less frequently when stabled or resting. The median age was significantly greater for horses reported never to lie down when stabled or resting, those with difficulty rising and of those reported to lie down less frequently, compared to horses with no stated difficulties. Disturbed sleep patterns are commonly reported in human patients (Skevington *et al* 2001) and dogs (Wiseman-Orr *et al* 2004) suffering from chronic pain. In a small study of dogs with chronic degenerative joint disease, more than half of owners reported increased daytime sleeping or resting (Wiseman-Orr *et al* 2004), and it is possible that horses suffering from osteoarthritis may lie down more frequently. Alternatively, horses with musculoskeletal pain or those with a history of difficulties lying or rising may elect to lie down less frequently. The extent to which owners considered pain to limit their animal's normal daily activities was greater in horses with KDoD. A large proportion of owner-reported known disorders were musculoskeletal in nature, with osteoarthritis the most frequently reported condition (Ireland *et al* 2011b), which may go some way to explaining these findings, as these disorders are likely to be associated with chronic pain and to impact on activity. In human patients, rheumatoid arthritis/other joint problems and back pain had a major negative effect on patient-reported physical functioning, role limitations (physical) and bodily pain (Lamé *et al* 2005).

Basic and instrumental activities of daily living (ADL, IADL, respectively) are key components in QoL assessment in human geriatric patients (Urciuoli *et al* 1998). Owners of older horses considered normal daily activities were limited to a greater degree, by both age and pain. Older animals may be expected to endure some age-related pain and some owners may therefore not recognise it as pain. It is possible that owners of older horses may misinterpret clinical signs as benign signs of ageing, rather than attributing them to a disease process (McGowan *et al* 2010b; Ireland *et al* 2011b).

In geriatric horses, owners frequently observe increased stiffness or a lack of joint flexibility as a sign of ageing, yet report a much lower prevalence of lameness (McGowan *et al* 2010b; Ireland *et al* 2011b). This suggests that owners may interpret lameness or reduced mobility in geriatric equines as benign 'stiffness' associated with ageing, and as these animals are often retired it is possible that chronic lameness is under recognised. Although age may certainly have a negative effect on the ability to perform daily activities, it is possible that owners will in part ascribe certain activity limitation to age in an older horse, whereas in a younger animal this may be interpreted as a sign of illness or pain.

A non-health-related factor of quality of life that may be important in a prey animal that naturally lives in small social groups, such as the horse, is companionship. Assessing interaction with other horses and level of activity during field turnout was used as a proxy measure for evaluating the freedom to express normal behaviours (Anon 1992). The majority of horses (81%) in this study were reported to interact frequently with other horses, and with human contacts, while only 2% had no opportunity for contact with other horses. The median age was greater for horses with no direct equine contact, which may reflect separation of older horses during field turnout to avoid the risk of bullying, or possibly that older horses are more likely to be kept on single-horse premises.

Half of the respondents (49.8%) considered that the company of other horses was a key aspect in their horse's QoL. Additionally, owners that did not keep their horse on their own premises were more likely to volunteer equine companionship as an essential factor. Company of other horses was considered important by owners keeping their animals on multi-horse premises such as livery yards, or other shared premises. These owners may have a greater awareness of the importance of equine companionship by keeping their animal on yards with a greater number of other horses. Alternatively, considering companionship of other horses important to QoL may be influential in the owner's choice of premises. Owners who did not include any non-health-related, psychologically relevant QoL factors in their responses may not regard these factors as a priority. However, as open-ended questions were utilised, failure to volunteer significant QoL factors does not necessarily imply that owners fail to recognise the importance of these factors.

Appetite is particularly important in 'trickle-feeder' herbivores such as the horse and is frequently utilised by owners as an indicator of underlying disease (eg dental or

gastrointestinal disorders). Only a small proportion of horses were considered to have sub-optimal appetite and the median age of horses with poor or moderate appetites was significantly greater than those reported to have a good or excellent appetite. However, 8% of horses were reported to have some degree of difficulty eating which may indicate the presence of dental pathology. Dental disease is the main oral disorder of horses, and may be under diagnosed, as many horses will suffer dental disease without showing any obvious clinical signs.

Factors which owners considered influential in their horse's quality of life varied widely. Nearly one-third of owners felt no changes were either possible or required to improve their horse's quality of life. It is interesting that several aspects of management, such as nutrition, comfort and company of other horses, were volunteered as important factors in QoL by a greater proportion of owners than health-related factors such as routine preventive healthcare and pain control. However, when considering the most important change that would improve their horse's QoL, owners most frequently reported improved health or successful management/treatment of a chronic disease.

More than half of the respondents (59%) considered nutrition or diet to be an important factor in the QoL of geriatric horses. This may reflect the fact that owners are able to exert control over their horse's diet and to make changes based on dental problems or other disorders, which they perceive to improve QoL. There is widespread use of commercial veteran/senior diets in older horses (Brosnahan & Paradis 2003b; McGowan *et al* 2010a; Ireland *et al* 2011a), and owners frequently make major alterations to their horse's diet with increasing age (Ireland *et al* 2011a). However, only 2.9% of responders felt a change of diet would improve their horse's current QoL.

Forty-two percent of owners felt factors relating to exercise regime (including regular exercise routine; frequency, intensity and variety of exercise; and sympathetic riding) were important in maintaining QoL, and the median age of horses owned by these respondents was significantly lower. In this study, 26% of horses were retired or kept as companions, and retirement was significantly associated with increasing age (Ireland *et al* 2011a). This may explain why exercise regime was considered a more important factor influencing quality of life by owners of younger horses. Additionally, exercise is considered a pleasurable experience which has a positive effect on QoL in dogs (Wiseman *et al* 2001, 2004; Wojciechowska *et al* 2005), and it is feasible owners may perceive this in an analogous manner for horses.

Seventeen percent of owners considered being pain-free was a major aspect of their horse's quality of life, and the median age of horses owned by these respondents was greater. Katz (2002) describes pain as involving cognitive, motivational, affective, behavioural, and physical components, therefore it is likely that pain will have a detrimental effect on all aspects of QoL when not effectively relieved. In human medicine, according to a study by the World Health Organisation, individuals who live with persistent

pain are four times more likely to suffer from depression and anxiety and more than twice as likely to have difficulty working than those without pain (Gureje *et al* 1998). Eighteen percent of human patients who rated their pain as severe or unbearable had not visited any healthcare professional, as they did not think anyone could relieve their suffering (Sternbach 1986). If horse owners felt no treatment would be available to improve their animals' condition, they may be less likely to seek veterinary attention, which may negatively impact upon QoL.

When asked to indicate to what degree they would expect disease to affect their horse's quality of life on scales of 0–5, the majority of owners considered a disease that did not cause pain (such as a heart murmur or benign skin mass) would have minimal or no effect on QoL (grades 0 or 1). However, owners of younger horses believed diseases that did not cause pain would have a greater effect on QoL, compared to the responses from those owning older animals. It is possible these horses are more likely to participate in athletic activities and may be used for competition purposes, where diseases such as heart murmurs may affect the horse's performance. The majority of owners (82%) felt that a long-term disease causing chronic or recurrent pain (such as laminitis or arthritis) would have a major effect on their horse's QoL (grades 4 or 5). Owners of horses with an existing KDoD rated the effect on QoL of diseases causing no pain or those causing chronic or recurrent pain significantly lower compared to those whose horse did not currently suffer from any reported disease. These owners may have experience of managing long-term health problems and may not consider this to compromise their animal's QoL, whereas those owners whose horses do not have disease perceive a greater effect. This effect may be similar to the 'disability paradox' observed in human studies. Patients who clearly have significant health and functional problems or intrusive symptoms do not necessarily have quality of life scores that seem commensurate with their health (Carr & Higginson 2001). Owners of horses with chronic conditions may recognise the importance of other aspects of QoL that may improve QoL despite health problems or functional impairments.

Unfortunately, there was a poor rate of successful completion of the final question (39.3%), designed to investigate the degree to which various factors would influence owner's decisions on treatment options should their horse suffer a severe illness or injury. The majority of respondents in the survey failed to rank a list of ten factors from most important (1) to least important (10), therefore some degree of responder bias is likely to have been introduced to the results of this item. This was particularly disappointing as no issues with completion of this question were detected during the piloting phase of questionnaire design. Utilising linear (visual) analogue scales to assess the importance of these factors may have improved the successful completion of this question; however this method has practical limitations (Aaronson 1989).

Quality of life following the procedure or treatment was considered the most important factor affecting an owner's decision on treatment by the greatest proportion of respondents (40%), and was ranked highest overall. A life-threatening disorder was ranked as the second most important factor, with 19% of respondents considering this to be the most important factor. Despite a much smaller proportion of owners considering it the most important aspect, a painful or stressful procedure was assigned greater importance by owners of older horses and was ranked above veterinary advice overall. Insurance policies covering the cost of veterinary fees was ranked as the least important overall, though owners of younger horses tended to rank this higher than those with older animals. This probably reflects that fact that younger horses are more likely to have comprehensive insurance policies, including cover for veterinary fees. Owners will obviously consider this factor to have low importance where their horse has limited or no insurance cover. Although many insurance companies in the UK are extending the cover provided for older horses, there is still a limited range of insurance options for horses over 20 years of age.

Veterinary surgeons performed euthanasia in most cases, and veterinary advice was the most frequently reported factor involved in the owner's decision to euthanase. Unsurprisingly, factors influencing owner decision-making varied depending on the cause of euthanasia and the duration of illness. For acute, severe conditions the most frequently reported influential factors were severe or uncontrollable pain, veterinary advice and hopeless prognosis. Thirty percent of owners felt that a poor QoL contributed to the decision to euthanase their horse, and this was particularly significant in cases of chronic disease and lameness. QoL has been reported as an important factor contributing to the decision for euthanasia in cats (Slater *et al* 1996) and dogs (Watson & Herrtage 1998; Mallery *et al* 1999). In chronic conditions, veterinary advice was less frequently identified as influential in the decision-making process. Data from the USA suggest more than two-thirds of deaths in horses aged 20 years or above were attributed to 'old age' (Anon 1998), however age of horse was not considered to be a major factor in euthanasia decisions in this current study. Almost half of the cases of mortality were reported to be suffering from additional health problems at the time of death, though these conditions influenced the owner's decision in only 39% of cases, particularly where an acute condition was the cause of death. Only two owners (1.5%) reported that financial factors were considered in their decision to euthanase.

In an unpublished study (Haydon-Williams 2001) 26.8% of equine euthanasias were performed due to a combination of old age and illness, 8.4% were because of old age difficulties and 4.2% were a result of a combination of old age and accident. This suggests that age may have a significant influence on an owner's decision regarding treatment options for their older horses. Cost of maintaining a retired geriatric horse or concurrent disease may make an owner more likely to opt for euthanasia than to embark on expensive or

prolonged treatment for an acute injury or disease, however the results of this current study do not support this.

QoL scores obtained by whatever method decided upon will usually be in a continuous form and a major issue for clinicians is how to interpret the QoL scores. In order to be of use to clinicians for patient care, logically determined cut-off points will need to be developed that declare QoL scores as positive or negative, or within normal or abnormal ranges. Once these cut-off points are established, clinical protocols should be devised that advise on the recommended actions for that particular QoL score range (McHorney 2003).

Animal welfare implications and conclusion

With an apparent increase in life expectancy, geriatric horses now represent a considerable proportion of our equine population. In the current study, most owners considered that the geriatric animals enjoyed a high QoL but horse age corresponded negatively with many of the health-related QoL factors. QoL assessment in veterinary practice may be particularly useful as a component of routine geriatric healthcare and the process of QoL assessment may have beneficial effects on the patient.

There seems little doubt that there is a huge need for a reliable, practical tool for veterinary surgeons to assess the QoL of horses. Focusing future research on QoL domains that owners and veterinary surgeons consider to be important in ageing horses will allow single-item questions to facilitate the development of tailored geriatric-horse QoL assessment. This would improve the ability of both owners and veterinary surgeons to rate and monitor QoL as horses age and to direct care in clinical cases. Furthermore, as this study has identified a potential requirement for increased veterinary involvement in euthanasia decisions, veterinary surgeons may feel more confident in advising owners where they have a measurable way of demonstrating compromised QoL. This may also help reduce owner feelings of guilt surrounding this difficult decision.

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