

A survey of animal welfare experts and practicing veterinarians to identify and explore key factors thought to influence canine and feline welfare in relation to veterinary care

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Abstract

Veterinary care is important for maintaining companion animal health; however, it also has the potential to impact other aspects of patient welfare. To investigate factors related to veterinary care that are likely to influence canine and feline welfare, animal welfare researchers, veterinarians with an expertise in animal welfare, and Canadian and American companion and mixed animal veterinarians were invited to participate in a three-stage online survey. Participants were asked to do the following: i) identify factors related to the veterinary experience that impact patient welfare; ii) rate the relative impact of each factor; and iii) gauge the feasibility of measuring and improving each factor. Overall, 78 participants identified 85 factors that impact animal welfare in the clinic (eg restraint techniques) and home environment (eg advice regarding behaviour and training). Among factors, seven themes emerged: physical environment of the clinic; routine animal care provided by veterinary team members ('staff'); interactions between the patient, staff, and client; clinic management; medical and surgical procedures; staff attitudes and education; and communication between the veterinarian and client. Mean relative impact scores ranged from 1.0 to 3.8 on a five-point scale (0–4), with 70% of factors receiving a score greater than 3. Most participants (> 80%) agreed that 68% of the identified factors could be feasibly improved in an average veterinary clinic and that 43% of the factors could be feasibly measured during a welfare assessment. These results identify key areas where veterinary care may impact the welfare of canine and feline patients and highlight priority areas where assessment and improvement are possible.

Keywords: animal welfare, assessment, cat, companion animal, dog, veterinary practice

Introduction

Regular veterinary care is widely recognised as an integral part of ensuring the health of companion animals which, in turn, can positively impact their welfare through the prevention and treatment of injury and disease. In addition, veterinary care has the potential to positively impact other aspects of patients' overall welfare. For example, veterinarians are a reliable source of knowledge about animal care for owners, and often provide general advice about topics that are important to an animal's well-being, such as appropriate training, exercise, and nutrition. In fact, a survey of stakeholders in the education, industry, government, charity, and veterinary sectors in Great Britain revealed that out of the 31 factors suggested to positively enhance canine welfare, access to and quality of veterinary care was the most commonly cited factor (Buckland *et al* 2013).

Although veterinary care has obvious positive impacts on animal welfare, it can also have negative effects. Veterinary visits are often a stressful experience for dogs and cats; they usually involve entering a new environment, interacting with unfamiliar animals and people in unusual ways, and undergoing procedures that may be painful. These experi-

ences might even lead to the development of a conditioned avoidance response to the clinic environment (Vollmer 1977; Beaver 1999). Stanford (1981) noted that 70% of healthy dogs visiting a veterinary clinic for routine wellness examinations were reluctant to enter the clinic. Gardon *et al* (2010) observed that 37% of dogs and 42% of cats were generally categorised as reserved, fearful, or agitated during routine physical examinations. Döring *et al* (2009) reported that 78% of dogs undergoing a routine physical examination were considered to be fearful based on defined behavioural parameters, including lowered tail and body posture, trembling, fixated staring, and avoidance behaviours. Moreover, 80% of healthy dogs waiting to undergo a routine ovariohysterectomy exhibited signs of stress in their cage, such as panting and displacement behaviours (Väisänen *et al* 2005). Puppies between eight and 16 weeks of age showed similar signs of stress at the veterinary clinic, with 62% performing lip licking and 19% yawning while being examined on a table, and 24% panting during manipulations and restraint on the floor (Godbout *et al* 2007).

Beyond the effect on the patient, a negative experience at the veterinary clinic can also compromise the safety of all veteri-

nary team members ('staff'). When fear leads to aggression, staff members are at risk of being injured. For instance, Stanford (1981) found that 18% of the dogs in their population were 'fear-biters' which attempted to bite their examiners, and in a recent study assessing physical examinations, 16% of dogs and 13% of cats were reported to be aggressive or dangerous (Glardon *et al* 2010). Furthermore, Marcella (1983) found that 6% of dogs and 4% of cats in a single veterinary practice had a documented history of unprovoked and consistent aggression toward clinic staff members.

Both fear and aggression in animals have the potential to influence client satisfaction and willingness to seek further veterinary care. Even though the total number of pets owned in the United States is increasing, veterinary visits have shown a declining trend, with approximately 15% of dogs and 40% of cats not being brought to a veterinarian on a yearly basis (American Veterinary Medical Association 2007; Volk *et al* 2011). Rodan (2010) suggested that the handling and reaction of feline patients at the clinic might explain clients' reluctance to bring their cats to the veterinarian for regular wellness appointments. Indeed, stress associated with visiting the veterinary clinic, both for the animal and owner, is one of the three main client-driven factors that appears to be contributing to the decreasing use of veterinary care, particularly for felines; 58% of cat owners and 38% of dog owners agreed that their 'pet hates going to the vet', whereas 38% of cat owners and 26% of dog owners agreed that simply the idea of visiting the veterinarian is stressful (Volk *et al* 2011). This is unfortunate because, although the experience of visiting the clinic may be unpleasant, in addition to ensuring their patients' health, veterinarians are also in a strong position to influence their patients' welfare beyond the clinic environment.

Despite the link between veterinary care and companion animal welfare, both within and beyond the hospital environment, this area of research has received only minimal attention. To date, most welfare-related veterinary research on companion animals has focused on the development of new treatments and procedures. The outcomes for these new treatments and procedures tend to be evaluated using health-based assessments and laboratory parameters. In addition, this type of welfare evaluation is usually more disease-specific rather than a holistic evaluation of the patient's welfare (Christiansen & Forkman 2007). For instance, researchers have developed tools to assess the impacts of cardiac disease (Freeman *et al* 2005), pain resulting from cancer (Yazbek & Fantoni 2005), and chronic pain (Wiseman-Orr *et al* 2004) on the health-related quality of life of canine patients. Although these tools attempt to assess quality of life, they offer little guidance or advice with regard to evaluating the overall influence of veterinary care on the well-being of patients. As such, there is a gap in knowledge with regard to the impact of veterinary care on overall welfare, taking a holistic view and encompassing more than physical health.

Through multiple rounds of expert consultation, this study aims to identify aspects of veterinary care that impact companion animal welfare, both in the veterinary clinic and

home environment. The study also explores the extent to which these factors impact animal welfare and the feasibility of improving and measuring each factor in a typical companion animal veterinary clinic.

Materials and methods

Online surveys were created and run with LimeSurvey (version 1.91+), and hosted on the University of Guelph online server. The survey period was from June 2012 to November 2012, with each of the three stages of the survey kept open for four weeks. For each stage, reminder emails were sent to non-responders one and three weeks after the initial invitation. Invitations to participate in each stage were sent regardless of participation in the previous stage(s). For Stages II and III, the threshold for inclusion of a participant's response was completion of at least 80% of all questions in which factors were asked to be rated (68/85 and 136/170 questions, respectively). This study was approved by the Research Ethics Board at the University of Guelph (REB # 12JA032).

Invited participants

A total of 990 electronic invitations, each with a unique token for secure access to the online survey site, were sent to three categories of experts: animal welfare researchers; veterinarians with expertise in animal welfare; and practicing companion or mixed animal veterinarians. These three groups were included to take advantage of their various areas of expertise; animal welfare researchers have the theoretical knowledge to identify factors that may impact welfare and comment on those suitable for assessment, while veterinarians have the practical experience to assess the practicality of improvement. Animal welfare researchers ($n = 43$) were selected through literature searches and online searches of faculty webpages using inclusion criteria based on the animal welfare subject area of their current and/or published research and the possession of a doctorate degree. Animal welfare researchers may have had a veterinary background; however, their current focus was research rather than veterinary practice. Invitations were sent to animal welfare researchers in the following countries: Canada, the United States, the United Kingdom, Germany, Denmark, the Netherlands, Australia and New Zealand. Veterinarians with an expertise in animal welfare ($n = 72$), who were not researchers, were selected based on their membership on veterinary association animal welfare committees in Canada or the United States: Canadian Veterinary Medical Association Animal Welfare Committee ($n = 10$); American Veterinary Medical Association Animal Welfare Committee ($n = 26$); American Association of Feline Practitioners Feline Welfare Committee ($n = 13$); and provincial or state veterinary association welfare committees ($n = 23$). Canadian and American veterinarians currently in practice were randomly selected from publically available provincial and state veterinary association membership listings ($n = 875$). For this last category, only veterinarians not currently affiliated with a teaching hospital or veterinary college were eligible to participate. In instances where electronic contact information was not listed, information was

derived from clinic websites whenever possible. If no electronic contact information could be found, the veterinarian was excluded from participation and another veterinarian was randomly selected in their place. Our intent was to invite ten companion animal and five mixed (companion animal and any other species group) animal practitioners from each Canadian province (ten) and American state (51); however, numbers were lower for certain areas due to small population sizes and/or a lack of available electronic contact information. When mixed animal practitioners were limited, additional companion animal practitioners were invited to participate to ensure adequate geographical representation for each province and state.

Survey development

The survey was pilot-tested on a small group of veterinarians ($n = 2$ clinicians and 3 graduate students) at the Ontario Veterinary College to ensure that questions would be properly interpreted by survey participants and yield relevant responses. The survey did not require modification after the pilot test.

Stage I — Determination of ‘What veterinary care-related factors impact welfare?’

Participants were asked to provide basic demographic information: gender; place of residence; educational and veterinary background; involvement with research; and degree of involvement in animal welfare organisations, projects, and causes. A definition of animal welfare incorporating the ‘three-aspects’ approach (biological health and functioning; feelings or affective state; and natural living and behaviour [Fraser *et al* 1997]) was provided, and participants were asked which aspect(s) of this definition they incorporate into their own personal definition; this was the only question in which participants were permitted to select more than one response. Year of graduation from veterinary school, graduate training, involvement in animal welfare organisations and personal welfare definitions were compared across participant category using Chi-squared tests.

To gauge opinion regarding veterinary-related factors that potentially impact welfare, the following open-ended questions were asked:

- i) Considering the effect of veterinary care on animal welfare, which factors do you think impact the welfare of companion animals (dogs and cats) while they are at the veterinary clinic?
- ii) Considering the effect of veterinary care on animal welfare, which factors do you think impact the welfare of companion animals (dogs and cats) within the animals’ home?

Participants were provided with a free-text box and had an unlimited amount of space in which to respond.

To analyse the veterinary care-related factors, thematic analysis was performed. In short, it is a type of qualitative analysis used to identify and describe patterns within data; responses are reviewed to create codes, codes are collapsed into themes, and all data are reviewed to ensure that all information is represented and captured (Braun & Clarke 2006). Frequencies with which each factor was suggested,

both in terms of raw counts and as a proportion of the total number of factors suggested for each location (veterinary clinic or home environment), were calculated for all participants and then for each category of participant. Exact confidence intervals at the 95% level using Sterne limits were calculated for each proportion.

Stage II — Determination of ‘What is the relative impact of these factors on the animal’s welfare?’

All factors from Stage I were included in Stage II. Factors were organised first by thematic category (eg physical environment, routine animal care, veterinarian-client communication) and then by the location in which they impact welfare. In addition to the factors identified by the participants, factors that were identified through a review of the scientific literature or from existing welfare assessment systems for other animal species were added to these lists. Four versions of the Stage II survey were created, each with thematic categories presented in a different order. In addition, for each participant’s survey, the order of factors within each category was randomised. This was done to reduce any bias that may result from the order in which factors were presented. The welfare definition used in Stage I was provided again, to serve as a reminder to participants and to allow for additional comments regarding this definition. Participants were then asked to rate the relative impact of each factor on animal welfare using a five-point ordinal scale with labelled end-points (0 = no impact; 4 = high impact). Space was provided to add any additional factors or other comments that may arise from reading other participants’ responses from the previous round (Stage I).

To analyse the relative impact of these factors on the animal’s welfare, mean impact scores were calculated for each individual factor, compiled across all participants. Responses were included when participants completed at least 80% of the questions. Thus, the number of responses on which scores were based varied from factor-to-factor.

Mean scores were presented to broadly characterise the data. In addition, non-parametric statistical tests were performed because responses used a five-point ordinal scale and, thus, did not meet the assumptions of parametric statistics. To investigate the effect of participant category on the impact scores assigned to each factor, a Kruskal-Wallis one-way ANOVA using Monte Carlo (exact) *P*-value estimation (100,000 permutations) was performed in SAS 9.2 (SAS Institute Inc, Cary, NC, USA). *Post hoc* analysis involving multiple comparisons using Monte Carlo (exact) methods of *P*-value estimation (100,000 permutations) were performed to determine significant differences between pair-wise comparisons.

Stage III — Determination of ‘Is it practical to improve and measure each factor?’

Participants were presented with the same list of factors as in Stage II. Similar to Stage II, different versions of the survey were created, such that the order in which questions were presented varied for each participant. Participants

were asked to evaluate each factor in terms of whether it could be practically improved in an everyday clinic setting (Yes, No, Don't know) and whether it would be feasible to measure in the context of a welfare assessment scheme (Yes, No, Don't know). Additional space was provided at the bottom of each page for comments.

For each factor, improvability and measurability scores were calculated by determining the percentage of participants who answered positively ('Yes') as a function of all participants who answered the question for that factor. Exact confidence intervals at the 95% level using Sterne limits were calculated for each proportion. Responses from all participants who completed at least 80% of questions were included in the calculations.

Results

The overall response rate was 7.9%, with a total of 78 individuals participating in the survey: 38 (3.8%) completed one stage; 13 (1.3%) completed two stages; and 27 (2.7%) completed all three stages. For Stages II and III, responses from 14 of 78 participants (17.9%) were excluded from analysis because they completed less than 80% of all questions in which factors were asked to be rated. Response rates amongst animal welfare researchers, veterinarians with an expertise in animal welfare, and practicing veterinarians were 25.6, 37.5 and 4.6%, respectively.

Participant demographics

Of the 78 participants, 11 (14%) were animal welfare researchers, 27 (35%) were veterinarians with an expertise in animal welfare, and 40 (51%) were practicing veterinarians. Women accounted for 65% of all participants, men accounted for 33%, and 2% declined to answer. Participants resided in Canada (31%), the United States (54%), and the United Kingdom (9%); 5% declined to answer. As stated previously, all of the veterinarians with an expertise in animal welfare and all of the practicing veterinarians who were surveyed resided in Canada or the United States, whereas many (64%) of the animal welfare researchers resided in the United Kingdom.

Most participants (89%) were veterinarians, 6% were not veterinarians, and 5% declined to answer. Amongst veterinarians across all participant groups, 68% focused on companion animal medicine, 13% on mixed animals, and 19% were currently focused on some other form of veterinary medicine (not companion or mixed animal medicine). Amongst veterinarians, the year of graduation from veterinary school ranged from 1962 to 2007: 4% in the 1960s, 7% in the 1970s, 26% in the 1980s, 29% in the 1990s, 22% in the 2000s, and 12% that did not indicate a specific year. The distribution of decade of graduation from veterinary school was different across participant category ($\chi^2 = 25.04$; $P = 0.002$), with practicing veterinarians being more recent graduates (1977–2007), and veterinarians with an expertise in animal welfare and veterinarians who are animal welfare researchers showing a wider distribution (1962–2004 and 1960–2000, respectively; bell-shaped curve).

In terms of graduate training, 32% of all participants held a graduate degree (master's or doctorate). All

(100%) animal welfare researchers, 48% of veterinarians with an expertise in animal welfare, and 5% of practicing veterinarians completed graduate training. This characteristic was a requirement for the selection of animal welfare researchers and, as such, completion of graduate training was different across participant category ($\chi^2 = 39.12$; $P < 0.001$), with practicing veterinarians less likely to have a graduate degree.

In terms of involvement in animal welfare organisations, projects, and causes, 12% responded that they were not at all involved, 27% were minorly involved (ie interested, yet rarely actively involved), 15% were involved (ie, organisation membership), and 41% were very involved (ie, attendance at talks, active involvement). Level of involvement differed by participant category ($\chi^2 = 29.57$; $P < 0.001$), with animal welfare researchers and veterinarians with an expertise in animal welfare more likely to consider themselves involved or very involved compared to practicing veterinarians, who largely considered themselves minorly or not involved.

In their personal definition of animal welfare, 90% of participants included biological health and functioning, 88% included feelings or affective state, and 83% included natural living and behaviour. The inclusion of these different aspects of animal welfare into participant's personal definitions did not differ by participant category (all $P > 0.05$).

Stage I — What impacts welfare?

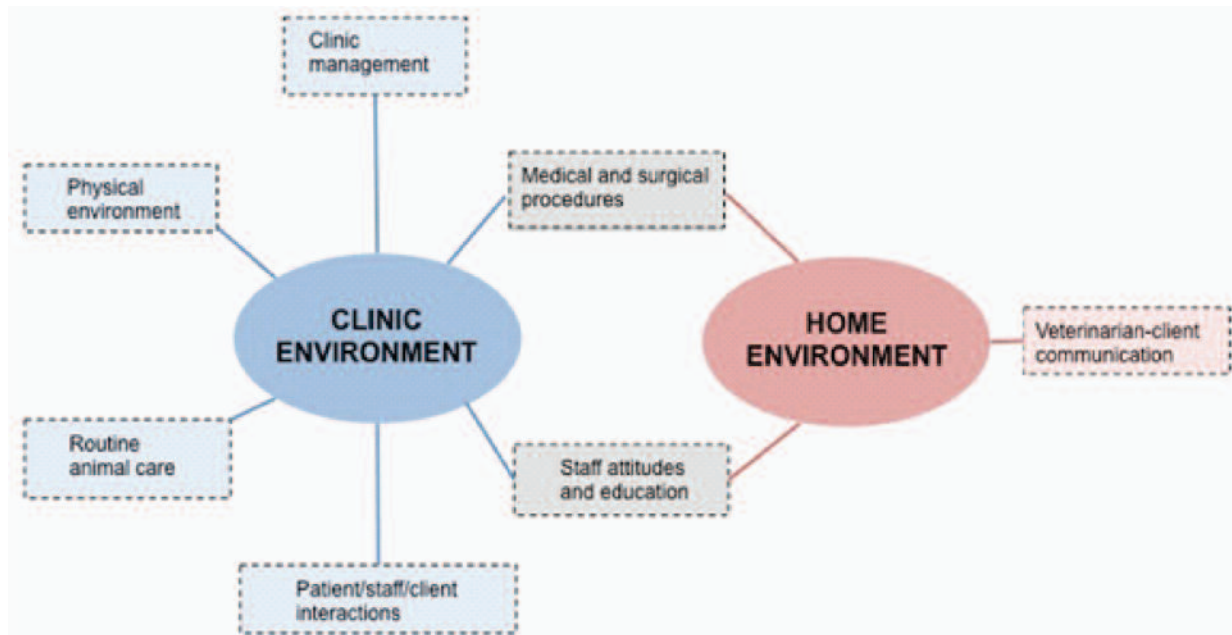
A total of 47 individuals participated in Stage I (response rate = 4.7%). Response rates for the three categories of participants were animal welfare researchers at 23.3% ($n = 10$), veterinarians with an expertise in animal welfare at 30.6% ($n = 22$), and practicing veterinarians at 1.7% ($n = 15$).

Clinic environment

In Stage I, a total of 51 factors believed to impact welfare within the veterinary clinic were listed by 36 participants. Factors could be grouped into six themes: physical environment (ten factors); medical and surgical procedures (five factors); routine animal care (four factors); interactions between patients, staff, and clients (13 factors); staff attitudes and education (four factors); and clinic management (six factors). An additional nine factors could not be categorised (Figure 1, Table 1; see supplementary material to papers published in *Animal Welfare* on the UFAW website: <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>).

Despite the open-ended nature of the questions, multiple participants suggested the same factors, thus, in Stage II, only a few additional factors were added and no additional factors were added in Stage III. Auditory stimulation (eg noise levels, potentially disturbing noises from other animals) was the most frequently suggested factor, mentioned by 52.8% (19/36) of all participants, followed by olfactory stimulation (44.4%; 16/36). Although each category of participants mentioned these factors, some categories suggested additional factors at a higher frequency (Table 2).

Figure 1



Concept map outlining themes from Stage I of consultation regarding veterinary-related factors believed to impact companion animal welfare.

Table 2 Veterinary clinic environment: most frequently suggested factors from Stage I that are believed to impact companion animal welfare (in descending order) within the clinic environment according to participant type.

| All participants (n = 36) | AWR (n = 7) | VE (n = 15) | V (n = 14) |
|---|---|--|--|
| Auditory stimulation 19/36 = 52.8% (35.9–68.3%) | Olfactory stimulation 5/7 = 71.4% (34.1–94.7%) | Auditory stimulation 8/15 = 53.3% (29.4–77.8%) | Physical restraint 8/14 = 57.1% (31.7–79.4%) |
| Olfactory stimulation 16/36 = 44.4% (29.0–61.2%) | Separation from owner, other conspecifics 5/7 = 71.4% (34.1–94.7%) | Optimisation of analgesic regimes 6/15 = 40% (19.1–66.8%) | Auditory stimulation 7/14 = 50.0% (23.8–76.2%) |
| Optimisation of analgesic regimes 12/36 = 33.3% (19.0–50.0%) | Novel space 5/7 = 71.4% (34.1–94.7%) | Physical, visual and/or temporal separation of patients 5/15 = 33.3% (14.2–60.3%) | Olfactory stimulation 7/14 = 50.0% (23.8–76.2%) |
| Patient-patient interactions 12/36 = 33.3% (19.0–50.0%) | | | |

Exact confidence intervals (95%) for each proportion are presented in brackets.

AWR: animal welfare researcher; VE: veterinarian with an expertise in animal welfare; V: veterinarian.

Home environment

For the home environment, 38 participants suggested 26 veterinary-related factors that they thought impacted welfare. Three themes emerged: medical and surgical procedures (seven factors), veterinarian-client communication (12 factors), and staff attitudes and education (three factors); four factors could not be categorised (see Figure 1 for themes and Table 3 [supplementary material to papers published in *Animal Welfare* on the UFAW website: <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>] for complete list of home environment factors).

The three most commonly cited factors were veterinarian-client communication concerning basic animal needs (52.6%; 20/38), preventive care (44.7%; 17/38), and socialisation, training and handling (39.5%; 15/38). When divided

by participant category, veterinarians and veterinarians with an expertise in animal welfare were consistent in their responses, while animal welfare researchers, on the other hand, suggested a wide variety of factors (see Table 4).

Stage II — Relative impact on welfare

Upon completion of the analysis of the Stage I responses, six additional factors pertaining to welfare in the clinic environment and two additional factors related to the home environment were added to the list based on a review of the scientific literature or from existing welfare assessment systems for other species (identified by asterisks in Table 1; <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>). Thus, 57 factors related to the clinic and 28 to the home environment were used in Stage II and Stage III.

Table 4 Home environment: most frequently suggested veterinary-related factors from Stage I that are believed to impact companion animal welfare within the home environment according to participant type.

| All participants (n = 38) | AWR (n = 7) | VE (n = 15) | V (n = 16) |
|--|--|---|---|
| Communication: basic animal needs 20/38 = 52.6% (36.7–68.7%) | Communication: basic animal needs 2/7 = 28.6% (5.3–65.9%) | Communication: basic animal needs 7/15 = 46.7% (22.2–70.6%) | Communication: basic animal needs 11/16 = 68.8% (43.6–86.8%) |
| Communication: preventive care 17/38 = 44.7% (29.6–60.6%) | Individualised recommendations 2/7 = 28.6% (5.3–65.9%) | Communication: preventive care 6/15 = 40.0% (19.1–66.8%) | Communication: preventive care 10/16 = 62.5% (37.2–82.2%) |
| Communication: socialisation, training, handling 15/38 = 39.5% (24.7–55.7%) | Distress associated with medicating 2/7 = 28.6% (5.3–65.9%) Post-operative movement restrictions 2/7 = 28.6% (5.3–65.9%) Client compliance with veterinarian's advice 2/7 = 28.6% (5.3–65.9%) | Communication: socialisation, training, handling 6/15 = 40.0% (19.1–66.8%) | Communication: socialisation, training, handling 8/16 = 50.0% (27.2–72.8%) |

Exact confidence intervals (95%) for each proportion are presented in brackets.

AWR: animal welfare researcher; VE: veterinarian with an expertise in animal welfare; V: veterinarian.

A total of 52 individuals (5.3% overall response rate) participated in Stage II of consultation; 31 of these had completed the previous stage and 21 were new participants, thus 66% of Stage I participants completed Stage II. Response rates according to participant category were: 18.6% for animal welfare researchers (n = 8); 33.3% for veterinarians with an expertise in animal welfare (n = 24); and 2.3% for veterinarians (n = 20).

Clinic environment

Mean relative impact scores (RIS) for factors associated with the clinic environment ranged from 1.0 to 3.8 (on a five-point scale: 0–4), where a higher score indicates a perceived higher impact (see Table 1; <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>). Approximately 65% (37/57) of factors were assigned a score of 3 or higher, with ten factors allotted an average RIS of 3.5 or greater. The ability to recognise, evaluate and interpret species-specific animal behaviours and the optimisation of analgesic regimes were deemed to have the largest impact on companion animal welfare in the clinic setting. Conversely, restricted ability to reproduce during the time spent in clinic and the use of alternative medicine and alternative medical diagnosis were deemed to have the lowest impact, each receiving a mean RIS below 2. For a number of factors, impact scores differed by participant category. Animal welfare researchers rated ventilation and air quality as having a significantly lower impact on animal welfare (mean = 2.38) than veterinarians (mean = 3.30; $P = 0.026$) and veterinarians with an expertise in animal welfare (mean = 3.38; $P = 0.011$). Similarly, animal welfare researchers rated client emotion as having a significantly lower impact on patient welfare (mean = 2.50) than did veterinarians (mean = 3.26; $P = 0.014$) and veterinarians with an expertise in animal welfare (mean = 3.25; $P = 0.017$). Veterinarians rated separation from owner and other conspecifics (mean = 2.50) lower than veterinarians with an expertise in animal welfare

(mean = 3.00; $P = 0.033$) and animal welfare experts (mean = 3.50; $P = 0.006$). Veterinarians also rated the animal's lack of sense of control as having a significantly lower impact (mean = 2.40) than veterinarians with an expertise in animal welfare (mean = 3.25; $P = 0.001$) and animal welfare researchers (mean = 3.25; $P = 0.020$). For all other factors, impact scores did not differ significantly (all $P > 0.05$) according to the category of participant.

Home environment

The range in RIS for veterinary-related factors that are thought to affect welfare in the home environment was smaller than that for the clinic environment, ranging from 2.4 to 3.8. Only five factors (18%) were assigned a score below 3, with the availability of pre-breeding counselling, the personification of animals, and reintroduction to the home after a clinic visit considered to have the lowest relative impact on welfare, whereas ten factors (36%) scored above 3.5 (see Table 3; <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>). Post-surgical and chronic pain control, communication regarding appropriate socialisation, handling and training, and communication with clients regarding their animal's basic needs (eg exercise requirements) were thought to most greatly impact the welfare of companion animals in their home environment.

Animal welfare researchers rated the communication of information regarding basic animal behaviour (mean = 2.88) lower than both veterinarians (mean = 3.70; $P = 0.004$) and veterinarians with an expertise in animal welfare (mean = 3.58; $P = 0.023$). With reference to the impact of communicating information regarding veterinary preventive care, veterinarians (mean = 3.75) rated its impact on animal welfare as higher than animal welfare researchers (mean = 3.00; $P = 0.007$). Finally, veterinarians assigned a lower impact score (mean = 3.16) for the veterinary clinic staff's ability and willingness to answer questions than did veterinarians with an expertise in animal welfare (mean = 3.67; $P = 0.015$).

Stage III — Improvability and measurability of factors affecting welfare

With 44 participants, the overall response rate for Stage III was 4.4%; ten of these participants had not completed the previous stages, thus 77% had participated in at least one previous stage and 62% of those who participated in Stage II completed this stage. Response rates were highest amongst veterinarians with an expertise in animal welfare (23.4%, 19 participants), followed by animal welfare researchers (11.6%, five participants), and veterinarians (2.3%; 20 participants).

Improvability

Improvability scores ranged from 14 to 100%; however, the median improvability scores for factors within the clinic (90%) and home (90%) environments were towards the upper end of the range (Table 1; <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>). All participants agreed that six in-clinic factors could be improved: i) ability to recognise, evaluate and interpret species-specific animal behaviours (eg pain, fear); ii) knowledge, understanding and use of positive reinforcement, pre-training, food rewards/treats, and species-specific handling techniques; iii) ongoing staff training and continuing education; iv) explanation of actions and procedures throughout exams; v) the provision of easily accessible necessities in housing units; and vi) surface traction. Additionally, with respect to welfare in the home environment, 100% of participants thought that clinic staff's ability and willingness to answer questions and provide information could be improved. Overall, at least 80% of participants thought a total of 57 factors (67%) were improvable, including 36 (63%) in-clinic factors and 21 (75%) home factors. Sixty per cent of participants thought that almost all of the factors (79 factors; 93%) were improvable.

Measurability

Measurability scores ranged from 21 to 95% across all factors, whereas the medians for both clinic factors (71%) and home environment factors (63%) were towards the upper end of the range (Table 1; <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>). No factors were considered measurable by all the participants; however, 23 (27%) factors were considered measurable by at least 80% of participants and 57 (67%) were considered measurable by at least 60%. As a whole, factors related to the clinic environment were generally thought to be more easily measured ($n = 19$; 33% with at least 80% of participants in agreement) than veterinary-related factors in the home environment ($n = 4$ factors; 14% with > 80% agreement).

Discussion

Through a multi-stage survey, a total of 85 veterinary care-related factors were suggested to impact canine and feline welfare. Thus, there is a general opinion that many aspects of veterinary care impact patient welfare. These responses encompass a variety of themes and relate both to short-term effects, while the animal is in the veterinary clinic, and long-term consequences after the animal leaves the clinic and returns home with its owner. The majority of these factors received an average impact score of at least three out of a maximum score of four, suggesting that most factors are believed to have a moderate to high impact on animal welfare. Factors considered to have the highest impact across both the clinic and home environment were post-surgical and chronic pain control, the optimisation of analgesic regimes within the clinic, and the veterinary staff members' ability to recognise and interpret species-specific animal behaviours.

Although the overall range in scores related to the potential for improvement of each factor was large, medians for both the clinic and home environments were in the high end of the range (90% for both), with 93% of all factors considered to be improvable by at least 60% of participants. Thus, most factors were widely considered to be practical to improve. In terms of their ability to be measured, more than half (67%) of the factors were considered to be measurable by at least 60% of participants. Factors related to the home environment were generally thought to be less measurable than those in the clinic environment. This is likely due to the more abstract nature of the home factors and the greater practicality of assessing the clinic factors. For instance, the methodology required to measure factors related to the physical environment, such as whether hospitalised patients are provided with necessities like food and water, may be more obvious than that which would be required to measure the communication of various topics related to home care or the attitudes of staff members.

The type of participant appears to have affected responses. In Stage I, many factors were suggested at a high overall frequency, such as auditory and olfactory stimulation. When the category of participant was considered; however, the most commonly suggested factors differed. For example, many veterinarians mentioned physical restraint whereas animal welfare researchers more frequently suggested theoretical concepts, such as patient separation from its owner and other conspecifics and the clinic as a novel space. In Stage II, significant differences in the average perceived impact of several factors also occurred according to participant type. Welfare researchers focused on more abstract concepts, such as animal separation from owner and a lack of a sense of control, whereas veterinarians considered more tangible aspects such as client

emotional state and communication of information regarding veterinary preventive care to have a higher impact on patient welfare. Overall, differences in responses are likely due to differences in the current career focus of the participants in each category. Veterinarians and veterinarians with an expertise in animal welfare answered the questions from a veterinary practice viewpoint. These individuals recognised patient welfare issues that they encounter on a daily basis. These participants may have also focused on factors that they believed they had control over in the clinic setting. Moreover, restraint and handling have become increasingly important topics within the veterinary community. For instance, the American Association of Feline Practitioners has published cat-friendly handling guidelines (Rodan *et al* 2011) whereas others have written about low-stress handling techniques (Yin 2009). Although many animal welfare researchers had a veterinary background, their current primary focus was research. These individuals may not be aware of practical everyday challenges in the clinic, possibly resulting in the researchers taking a more theoretical stance when ranking the importance of different factors. Animal welfare researchers were also mostly located in the United Kingdom, where welfare legislation is more extensive and animal welfare may be perceived differently than in Canada and the United States.

In Stages II and III, scores for relative impact, improvability and measurability tended to be high for most factors. As an example, in Stage II, only 25 factors (29% of 85 factors) were thought to have an impact below three out of a maximum score of four. Similarly, in Stage III, median improvability scores and measurability scores were towards the higher end of the range. Despite this, certain factors consistently received low scores (eg limited reproduction while in the clinic was considered to have a low impact and the lack of sense of control was deemed impractical to measure). Because all factors were presented in random order within each theme, the scores corresponding to these 'outlier' factors serve as a quality control. Thus, the fact that these factors consistently scored lower validates that participants were thinking critically about individual factors rather than simply selecting all responses within a particular column.

Initial response rates for Stage I were low (4.4%); however, 66% of those who participated in Stage I also responded in Stage II and 77% of the Stage III participants had previously responded to either I or II or both. Animal welfare researchers responded at between 12 and 23% across all three stages, whereas veterinarians with an expertise in animal welfare responded at approximately 30%. These rates are in line with similar previous multi-stage survey studies; for example, Whay *et al* (2003) noted a response rate of 22% in their two-stage consultation with experts to investigate measures appropriate for the assessment of the welfare of agricultural animals. Response rates amongst veterinarians, on the other hand, were around 2% across all stages. Unlike the situation for the other participant groups, personal email addresses were not available for many

veterinarians and invitations were often sent to clinic email addresses. As such, it is unclear what proportion of these invitations actually reached their intended recipient, and this may have contributed to the lower levels of participation amongst this group. Retention of veterinarians from Stage I to II was 33%; having completed the initial stage, these individuals certainly received our invitations and retention rate may thus be a less-biased figure than overall response rate. Veterinarians were also selected at random from the whole population of publically listed veterinarians in Canada and the United States and thus the response rate was expected to be low.

This study may have been subject to particular biases because of the methods used. Only electronic invitations were sent, thus individuals who do not have an electronic mailing address or for which an electronic mailing address could not be found did not have the opportunity to participate. Similarly, only an electronic version of the survey was made available to participants. Moreover, animal welfare researchers and veterinarians with an expertise in animal welfare were identified based on their interest and expertise in animal welfare. In contrast, veterinarian sampling was random and thus veterinarians who were not interested in animal welfare may have felt less inclined to participate. This possibility is somewhat reflected in participants' self-rated degree of involvement in animal welfare organisations, projects and causes, although 39% of all participants and 72% of veterinarians considered themselves to be only minorly or not involved.

This study was explorative and aimed to gauge opinions from a diverse group of individuals, representing an assortment of backgrounds and current occupations, with the objective of investigating welfare issues related to veterinary care. Although volunteer bias is often a limitation in survey-based research, and response rates were low overall, demographic information suggests that participants ranged widely in terms of clinical and research experience, veterinary specialisation and advanced education, geographical representation, age, and involvement in animal welfare causes and organisations. Although participants may not be entirely representative of the larger study population's opinions, responses from Stage I ceased to yield novel information, suggesting that theoretical saturation may have been reached nonetheless. For Stages II and III, however, rankings are likely not representative of all practicing veterinarians.

When assessing welfare, it is important to consider a balance between the strength of impact and the practicality of improvement. High impact factors may not all be easily improved, (eg examining an animal out of their familiar environment at the veterinary clinic) yet it may be relatively easy to change lower ranked factors. With a goal of continuous improvement, there is still a benefit to improving these lower ranked factors. Additionally, as a prerequisite to quantifying improvement, factors should also be practical to measure. As a whole, most factors identified here could lend themselves to one of the three types of measures typically seen when assessing animal welfare: resource-based

measures (eg cage furnishings), management-based measures (eg ongoing staff training and continuing education), and animal-based measures (eg post-surgical and chronic pain control; Johnsen *et al* 2001). For instance, Welfare Quality® uses primarily animal-based measures such as body condition scoring and approach avoidance testing to assess the welfare of pigs, cattle and poultry, whereas the Animal Needs Index (TGI-35L) in Austria mainly focuses on resource-based measures, such as floor condition and space allocation to assess welfare on the same species (Bartussek 1999; Blokhuis *et al* 2010). Because factors suggested here are translatable into the types of measures currently used in welfare assessment systems for other species, these results have the potential to act as the foundation of a similar assessment system for the veterinary clinic environment. For instance, aspects of the physical environment, such as the provision of necessities in cages and surface traction throughout the clinic could be assessed by performing a site tour, and veterinarian-client communication of welfare-related topics could be assessed by reviewing written brochures available to clients and video recording appointments for discussion analysis.

This research is a first step towards understanding the veterinary care-related factors that may influence the welfare of companion animals; however, further studies are required to confirm the validity of individual factors. Specifically, it is important to scientifically assess whether each factor has a quantifiable impact on welfare. Nevertheless, participants included individuals who work closely with animals in a veterinary care capacity and/or have a strong background in animal welfare and are thus authorities in the subject matter. Many factors were also repeatedly listed by multiple participants even though the survey was independently completed, suggesting a degree of consensus.

Animal welfare implications

Overall, the current results identify numerous factors that have the potential to influence the welfare of companion animals in relation to veterinary care. This provides a framework for determining appropriate areas for future research, with information regarding perceived impact and the practicality of improvement and measurement highlighting specific areas deserving priority investigation. For example, the ability to recognise species-specific behaviours such as fear and pain, as well as the optimisation of pain control for both acute and chronic pain were considered to have the largest impact on animal welfare, and should thus be an area of focus for future research. Results may also have an application as the basis for the development of a welfare assessment tool for companion animals in the veterinary clinic environment, similar to those that have been extensively developed for agricultural species in farm settings.

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