

Predictors of Opting for Advanced Medical Care versus Euthanasia for Companion Animals with Severe Cardiac Disease

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This study examined predictors of opting for advanced medical care versus euthanasia for a critically ill companion animal. These included holding an optimistic bias for poor prognostic information, level of attachment to one's companion animal, and satisfaction with one's veterinarian. Eighty owners of companion animals with a diagnosis of a severe cardiac disease were asked to indicate what they believed their companion animal's chance of survival and quality of life would be if they opted for intensive treatment. Participants showed an optimistic bias in their interpretation of the chance of survival (but not quality of life) of a companion animal with more severe prognoses, suggesting that this may serve as a self-protective strategy in the face of losing a beloved companion animal. Client satisfaction with communication and with the cost of care, but not attachment to one's companion animal, significantly increased the likelihood of approving the recommended course of hospitalization and intensive treatment. This is of particular importance in that, of those who did not approve the recommended treatment, the majority elected to take their companion animals home against medical advice, rather than opt for humane euthanasia, this likely resulted in undue suffering and an uncomfortable death. These findings support the need for training in communication in veterinary schools.

Key words: veterinarian communication, decision-making, end-of-life, euthanasia, attachment, companion animals

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The relationship between companion animal owners and their pets represents a unique type of dyad, making critical care and end-of-life decisions complex. This type of surrogate decision making is stressful when done on behalf of human loved ones (Nelson et al., 2017; Pignatiello et al., 2018). This strain can be exacerbated in veterinary contexts because companion animals cannot explicitly make their wishes known. Effective medical decision making by owners on behalf of companion animals and its psychological and social correlates are poorly understood and understudied, providing little guidance for veterinary medical professionals in their interactions with clients.

In general, surrogate decision makers for human patients, on whom the majority of research has been conducted, may have impaired reasoning and information processing abilities (Majesko et al., 2012; Netzer & Sullivan, 2014; Verceles et al., 2014) and may be, at times, unrealistically optimistic. Even when not under the duress associated with a role such as surrogate decision maker, people's level of optimism has been found to be unrealistic, with a tendency to underestimate the probability of negative outcomes while overestimating the probability of positive outcomes (Rothman et al., 1996; Shepperd et al., 2013; Shepperd et al., 2015; Waters et al., 2011; Weinstein, 1980). For instance, surrogate decision makers for critically-ill patients in the ICU showed an optimistic bias in interpreting hypothetical prognostic statements about a generic patient with a high but not a low risk of death (Zier et al., 2012). Similarly, an optimistic bias in response to poor prognoses, but not for better prognoses, was replicated among a sample of undergraduates who made interpretations of hypothetical prognoses for a parent or generic patient (Siess et al., 2014; Moyer et al., 2017) and for their dogs (Siess et al., 2018a; Siess et al., 2018b) and who were not under the duress of actually serving as a surrogate decision maker.

In both veterinary and human medical settings, an overly optimistic appraisal of poor prognoses that results in a greater likelihood of intensive, life-sustaining measures, has the potential to result in undue, prolonged suffering among patients. In addition, intensive measures in the veterinary setting are often financially burdensome, as the majority of owners of companion animals in the US do not have pet health insurance (American Veterinary Medical Association [AVMA], 2018; North American Pet Health Insurance Association [NAPHIA], 2021). Thus, it is increasingly important for veterinarians to have a better understanding of the tendency for distraught owners of critically-ill companion animals to have an overly optimistic appraisal of prognoses, outcomes of treatments, and a greater likelihood of electing intensive measures that may result in an extended poor quality of life of the animal and may have significant, detrimental financial burdens for the owner.

Animals provide companionship and social support and foster psychological well-being (McConnell et al., 2011; McNicholas et al., 2005; Peacock et al., 2012; Zasloff & Kidd, 1994). Owners of companion animals report seeking and benefiting from closeness to their pet (Hall et al., 2004; Kurdek, 2008; Prato-Previde et al., 2006) as well as receiving comfort, encouragement, support, and relief in stressful circumstances (Allen et al., 2002; Geisler, 2004; Kurdek, 2008; Odendaal & Meintjes, 2003). Owners also report using their companion animal as a secure base from which to explore new activities (Cusack, 1988; McNicholas & Collis, 1995). Moreover, loss of a companion animal is a source of significant grief (Bussolari et al., 2018; Eckerd et al., 2016; Lagoni et al., 1994; Lee, 2020; Park & Royal, 2020; Uccheddu et al., 2019). Although among adults, romantic partners are often the main source of a secure base figure (Hazan & Shaver, 1987), owners of companion animals have been shown to be attached to their pets in a similar manner (Zilcha-Mano et al., 2011).

Owners of companion animals are seeking more regular and advanced veterinary care (Lau, 2012). It is increasingly likely that owners of companion animals will find themselves serving as a surrogate decision maker under dire veterinary circumstances (Siess et al., 2015). To date, little attention has been paid to decision making in the context of veterinary medicine (Bley, 2017; Marchitelli et al., 2020; Matte et al., 2019; Siess et al., 2018a; Siess et al., 2018b; Spitznagel, et al., 2020). As such, the way in which owners of companion animals interpret prognoses given by veterinarians, the way in which available treatment options are explained, and the subsequent influences on decision making is unknown. Veterinarians report having difficulty with delivering poor prognoses (Butler & Degraff, 1996; Fogle & Abrahamson, 1990; Ptacek et al., 2004), which induces stress and anxiety (Ptacek & Eberhardt, 1996; Ptacek et al., 1999). Understanding the way in which owners of companion animals navigate their role as a surrogate decision maker in times of critical illness, such as the effect of caregiver burden (Spitznagel et al., 2019a; Spitznagel & Carlson, 2019; Spitznagel et al., 2019b; Spitznagel et al., 2020), has the potential to improve veterinarians' communication with their clients and subsequently reduce the burden of delivering and receiving poor prognoses.

In the current study, we examined whether an optimistic bias specifically for poor prognostic information (less than a 50% chance of survival), previously found only in hypothetical scenarios, is also present in a real-life veterinary setting. We also examined whether one's level of optimistic bias, attachment to one's companion animal, and satisfaction with one's veterinarian relate to the likelihood of choosing a treatment plan that is more intensive in terms of attempting to extend the life of a critically-ill companion animal. We selected a diagnosis of severe cardiac disease as a clinical situation whereby decisions are potentially influenced by many contextual and psychosocial factors and multiple courses of action are considered medically and ethically appropriate.

Ten percent of dogs and 10-15% of cats presented to primary veterinarians are diagnosed with cardiac disease (Ferasin & DeFrancesco, 2015; Keene et al., 2019). Over time, they develop congestive heart failure, and have a very poor prognosis, with 80% dying within 2 years (Häggström et al., 2008; Keene et al., 2019; Uechi, 2012). The treatment for congestive heart failure, or, alternatively, euthanasia when necessary, is fairly standardized. Although it has a terminal prognosis, with treatment, dogs can have a good quality of life for a period of time (Atkins & Häggström, 2012; Ettinger et al., 2017; Keene et al., 2019). Treatment requires a significant commitment from the owner involving multiple daily medications, frequent veterinary visits and tests, and at-home monitoring. During acute congestive heart failure, an animal's quality of life is poor with clinical signs including dyspnea, lethargy, and inappetence (Ettinger et al., 2017; Keene et al., 2019). Given this lack of a clear medically or ethically preferable treatment path, and because there is a well-established protocol for treatment of acute congestive heart failure, it serves as a disease model amenable to research involving challenging treatment decisions.

Although there are many reasons for electing to decline intensive treatment or to euthanize a companion animal, poor quality of life is one of the most frequent reasons (Rollin, 2011). If an owner is unable to imagine their companion animal with an improved quality of life, treatment may be perceived as simply a means of prolonging suffering and may lead them to be more likely to decide to decline intensive measures. It is reasonable to acknowledge that the level of commitment required to extend the companion animal's lifespan may be too burdensome for many owners, particularly those with long work hours or other caregiving responsibilities (Spitznagel & Carlson, 2019) in addition to the financial burden associated with chronic

treatments.

Study Overview

Study Hypotheses

Hypothesis 1: Participants' ratings of their companion animals' chance of survival two years after treatment for severe cardiac disease would be more optimistic than their veterinarian's.

Rationale: Surrogates evaluating prognoses for hypothetical canine patients described in a vignette displayed a tendency for an optimistic bias for poor prognostic information (less than a 50% chance of survival) but not for less severe prognostic information (greater than a 50% chance of survival) about their dog even when not under the duress of actually being in a clinical treatment decision-making situation (Siess et al., 2018b). In the case of a diagnosis of severe cardiac disease, the prognosis is fatal without intensive treatment (Ettinger et al., 2017; Keene et al., 2019). Thus, it is likely that owners will have an even stronger tendency to employ an optimistic bias for poor prognostic information in the case when the threat of loss is imminent.

Hypothesis 2: Participants' ratings of their companion animals' perceived quality of life with treatment for severe cardiac disease would be more optimistic than their veterinarian's.

Rationale: Similar to the rationale for chance of survival, it is likely that the optimistic bias will also be reflected in perceived anticipated quality of life for their companion animal.

Hypothesis 3: The greater the amount of optimistic bias for poor prognostic information and quality of life (if identified in the analyses for hypotheses 1 and 2), greater levels of attachment indicated by the greater amount of comfort received from one's companion animal, and greater client satisfaction (general satisfaction, technical quality, interpersonal manner, communication, financial aspects, accessibility and convenience, and time spent with the veterinarian), the greater would be the likelihood of choosing a more intensive treatment plan for severe cardiac disease.

Rationale: Previous research has shown that a greater amount of optimistic bias for poor hypothetical prognoses predicts a greater likelihood of approving the continuation of life sustaining measures in the case of a hypothetical human patient (Siess et al., 2014; Moyer et al., 2017) and treatment for canine B-cell lymphoma in the case of a hypothetical canine patient (Siess et al., 2018a; Siess et al., 2018b). It is likely that the emotional gravity associated with the impending loss of their companion animal without immediate treatment will result in an optimistic bias for the chance of survival as well as for quality of life. Together, it is probable that a higher perceived chance for survival and quality of life will result in a higher rate of owners choosing to approve a treatment plan that is more intensive for their companion animal. Levels of attachment have been associated with levels of caregiving and attentiveness to pets (Coy & Green, 2018). In the seminal work in humans (Ainsworth et al., 2015) which has been extended into companion animals (Zilcha-Mano et al., 2011), one of the four main criteria for an attachment figure is the use of the attachment figure as a source of comfort, encouragement, support and stress relief. In our study we examined whether the more comfort an owner receives from their companion animal, the closer their relationship and attachment is and, the more likely it is that an owner will strive to extend their companion animal's life. Lower levels of owner satisfaction with communication and the overall experience with the veterinarian may be associated with a lower amount of trust in the veterinarian as well as willingness to adhere to a post-hospitalization medical management plan. Similarly, in human medicine, poor communication, low levels of trust, and unmet expectations have been associated with poor

patient satisfaction and subsequent adherence (Hillen et al., 2011; Jerant et al., 2014; Miaoulis et al., 2009; Schoenthaler et al., 2014; Spernak et al., 2007). Although little attention has been paid to the significance of communication in veterinary settings, communication has been implicated as an important factor in client satisfaction and adherence (Case, 1988; Coe et al., 2008). It is likely that the quality of interactions with the veterinarian, in terms of overall communication, time spent with the veterinarian, and interpersonal manner, in addition to satisfaction with technical quality and accessibility and convenience, may influence the extent to which owners feel comfortable going to greater lengths for potentially more costly and more extensive treatment for severe cardiac disease and will be more willing to elect for treatment and post-hospitalization medical management of the disease. Additionally, financial satisfaction plays a significant role in veterinary medicine as, as mentioned above, the majority of pet owners do not have health insurance coverage for their pets (AVMA, 2018; AVMA, 2021; NAPHI, 2021).

Method

Participants

An a-priori power analysis was conducted, using G*Power, to determine the sample size required to detect a moderate effect size (d) of 0.32, with an α error probability of 0.05, and a power ($1-\beta$) of 0.80 (Faul et al., 2007). The total sample size required was 79 and as such, 80 owners of companion animals receiving a diagnosis of severe cardiac disease were recruited from an emergency and multi-specialty referral veterinary hospital, over the course of 18 months, and received a \$25 coupon that could be redeemed for veterinary services. They were 51 females and 29 males with an average age of 53.00 years ($SD = 13.55$; range = 20.00 to 82.00). The companion animals comprised 65 dogs with a mean age of 9.89 years ($SD = 3.65$; range = 0.42 to 17.58) and 15 cats with a mean age of 9.77 years ($SD = 5.84$; range = 0.75 to 19.83). Although the age ranges include ages less than 1 year of age, it should be noted that only 2 dogs and 1 cat were under the age of 1 year and only 13 dogs and 4 cats were under the age of 7 years. The study was approved, to be in compliance with ethical guidelines, by the institutional review board (IRB) at Stony Brook University.

Measures

Optimistic bias for prognostic information

The participant and the veterinarian independently indicated what they believed would be the dog or cat's chance of surviving for two years after intensive treatment is on a scale from 0% to 100% chance of surviving. The level of optimistic bias for prognostic information in terms of chance of survival was calculated as the difference in the perceived likelihood of survival indicated by the participant and by the veterinarian (based on clinical expertise as board certified small animal cardiologists). Positive values indicated that participants showed an optimistic bias and negative values indicated that they showed a pessimistic bias.

Optimistic bias for perceived quality of life

The participant and the veterinarian independently indicated what they believed the dog or cat's expected quality of life with intensive treatment would be on a 5-point Likert-type scale ranging from *very poor* to *very good*. The level of optimistic bias in terms of quality of life was calculated as the difference in the perceived quality of life as a result of the proposed treatment indicated by the participant and by the veterinarian.

Treatment plan decision

The medical record was reviewed to determine the treatment decision, and for those owners who decided to treat, the days of hospitalization and the outcome (survival versus death) as well as the age, breed of the dog or cat, and any other relevant medical history. For participants deciding to euthanize their dog or cat, the reason expressed for doing so was recorded.

Attachment

In accordance with our conception of attachment as related to having a figure that serves as a secure-base (Zilcha-Mano et al., 2011), attachment to one's dog or cat was measured with the Comfort from Companion Animals Scale (Zasloff, 1996). It consists of 11 items rated on a 4-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. It includes items such as "My pet provides me with companionship," "My pet is a source of constancy in my life," "I get comfort from touching my pet," and "My pet makes me feel safe." The internal consistency in this sample was $\alpha = 0.98$.

Client Satisfaction

Client satisfaction was measured by a veterinary adaptation of The Patient Satisfaction Questionnaire Short-Form that included an additional question about financial aspects (PSQ-18; Marshall & Hays, 1994). The scale consists of 18 items rated on a 5-point Likert-type scale ranging from *strongly agree* to *strongly disagree*. Subscales include general satisfaction, technical quality, interpersonal manner, communication, financial aspects, accessibility and convenience, and the time spent with the veterinarian. The internal consistency in this sample was $\alpha = 0.83$.

Procedures

Participants were invited to participate in a study to examine client-veterinarian communication and interactions with staff members. Upon gaining informed consent, the cardiology veterinary technician administered the survey packet after the cardiologist spoke with participants about their dog or cat's diagnosis and recommended treatment plan. After the consultation, the veterinarian indicated in the medical record what they believed the numerical likelihood of survival two years after treatment was as well as what the dog or cat's quality of life would be with the recommended treatment. After completion of the survey packet, the technician reviewed the financial estimate for treatment, and the participant made their treatment decision. There were no alterations made to the natural flow of the consultations or treatment decision making process, as such, there was no risk to the safety of the companion animals in the study. Participants were sent a thank you note with information about the purpose of the study after the completion of all data collection.

Analytic Strategy

All analyses were conducted using IBM SPSS Statistics 24 for windows (IBM Corp, 2016). To test the first and second hypotheses, a univariate ANOVA was conducted to determine if there was a difference in the amount of optimistic bias for the chance of survival and quality of life reported by owners based on the severity of the veterinarians' prognoses. Based on the consistent results from prior studies, prognoses were split into two categories: more severe prognoses and less severe prognoses. More severe prognoses were considered to be less than a 50% chance of two-year survival with intensive treatment and less severe prognoses were

considered to be a 50% or greater chance of two-year survival with intensive treatment. To test the third hypothesis, a hierarchical logistic regression yielding a Wald statistic was performed on the decision to approve versus not approve the recommended hospitalization treatment plan with ten predictors. The first step of the model included predictors involving client satisfaction, including general satisfaction, and satisfaction with the technical quality of care, the interpersonal manner of the veterinarian, communication with the veterinarian, time spent with the veterinarian, financial aspects of care, and clinic accessibility and convenience. The second step of the model included comfort received from the companion animal. The third step of the model included the level of optimistic bias for chance of two year survival and an interaction between the amount of optimistic bias for chance of two year survival and the severity of the prognoses indicated by the veterinarian.

Results

Descriptive Statistics

Prior to conducting statistical analyses, data were cleaned, missing values were replaced by the sample mean ($n = 7$ instances across 4 subjects), and variables were tested for skewness and kurtosis. The data were examined for outliers, defined by more than three standard deviations away from the mean. One outlier was detected for a subject's indication of their animal's chance of 2-year survival. It was retained in the data because it seemed like an authentic response, based on interactions with the technician who collected the data.

Descriptive statistics and correlations between variables can be found in Table 1. Overall, the sample was highly attached to their companion animals, with an average score (M) on the comfort from companion animals scale of 41.33 ($SD = 6.77$) for owners of dogs and 42.77 ($SD = 1.82$) for owners of cats, out of a possible 44.00. Satisfaction with the provider was high for the subscales of general satisfaction for owners of dogs and cats, respectively ($M = 4.29$; $SD = .62$; $M = 4.35$; $SD = .46$), technical quality satisfaction ($M = 4.10$; $SD = .48$; $M = 4.32$, $SD = .32$), interpersonal manner satisfaction ($M = 4.42$; $SD = .51$; $M = 4.62$; $SD = .49$), communication satisfaction ($M = 4.36$; $SD = .44$; $M = 4.51$; $SD = .42$), accessibility and convenience satisfaction ($M = 4.31$; $SD = .56$; $M = 4.33$; $SD = .50$), and time spent with the veterinarian satisfaction ($M = 4.25$; $SD = .54$; $M = 4.01$; $SD = .54$), out of a maximum value of 5.00. Average financial satisfaction was lower, at 2.61 ($SD = .94$) for owners of dogs and 2.46 ($SD = .89$) for owners of cats. Of the 80 owners, 56 approved the recommended treatment for hospitalization and 24 did not approve the recommended treatment. Of those who did not approve the recommended treatment, 5 elected euthanasia and 19 took their companion animal home against medical advice (AMA).

Hypothesis 1: Examining the Presence of an Optimistic Bias for the Chance of two-year Survival for Severe Prognoses.

The largest proportion of participants, 52.50%, interpreted their dog or cat's prognosis in terms of chance of two-year survival more optimistically than the veterinarian's interpretation; 36.25% of participants interpreted the prognosis less optimistically; and 11.25% interpreted it similarly. For more severe prognoses of less than a 50% chance of survival, participants rated the likelihood of two-year survival on average 16.92% ($SD = 26.03$) above the estimate that the veterinarian made, indicating an optimistic bias. This was significantly different, $F(1,78) = 25.05$, $p < .001$, for less severe prognoses of 50% or greater chance of survival, which were rated on average 12.94% ($SD = 25.93$) below the estimate that the veterinarian made.

Table 1
 Descriptive Statistics and Correlations Among Study Variables (N = 80).

Variables	OCS	OQL	P	CCA	GS	TQS	IMS	CS	FS	ACS	TSV
Optimism Chance of Survival (OCS)	1	.54***	-.50 ***	.09	-.01	.10	.03	.09	.09	.03	.06
Optimism Quality of Life (OQL)		1	-.04	.20	.14	.45***	.25*	.20	.17	.24*	.11
Prognoses (P)			1	.01	.02	.00	.05	-.10	.10	-.04	-.13
Comfort from Companion Animals (CCA)				1	.07	.25*	.01	.17	-.03	-.01	-.01
General Satisfaction (GS)					1	.59***	.40***	.70***	.10	.47***	.50***
Technical Quality Satisfaction (TQS)						1	.47***	.54***	.13	.50***	.39***
Interpersonal Manner Satisfaction (IMS)							1	.51***	.07	.42***	.52***
Communication Satisfaction (CS)								1	.22*	.48***	.51***
Financial Satisfaction (FS)									1	.03	.27*
Accessibility/Convenience Satisfaction (ACS)										1	.50***
Time Spent with Veterinarian Satisfaction (TSV)											1
Means	5.35	-.33	39.30	41.60	4.31	4.15	4.46	4.39	2.58	4.31	4.21
Standard Deviations	29.68	.90	28.06	6.17	.59	.46	.51	.44	.93	.55	.54
Range	-75 – 80	-2 – 2	0 - 90	11 - 44	2.5 - 5	3 - 5	3 - 5	3.5 - 5	1 – 4.67	2.5 - 5	3 - 5
Minimum and Maximum Possible Scores	-100 - 100	-4 - 4	0 - 100	1-44	1 – 5	1 -5	1 – 5	1 – 5	1 – 5	1 – 5	1 - 5

Note. Statistical Significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Hypothesis 2: Examining the Presence of an Optimistic Bias for Perceived Quality of Life with Intensive Treatment for Severe Prognoses

The largest proportion of participants, 43.75%, perceived their dog or cat's quality of life to be the same as the veterinarians did; 42.50% perceived it more pessimistically and 13.75% perceived it more optimistically. For more severe prognoses of less than a 50% chance of survival, participants rated the expected quality of life -0.34 ($SD = 0.91$) *below* the estimate the veterinarian made. This was not significantly different for less severe prognoses of a 50% or greater chance of survival, which were rated -0.31 ($SD = 0.90$) *below* the estimate the veterinarian made, $F(1, 78) = 0.02$, $p = .89$. Also, the average expected quality of life for owners and veterinarians was similar, 3.35 ($SD = 0.74$) and 3.67 ($SD = 0.67$), on a 5-point scale, respectively.

Hypothesis 3: Predictors of Treatment Decision

Table 2 shows regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the ten predictors. According to the Wald criterion, client satisfaction with communication and financial aspects significantly predicted the decision to approve the recommended treatment plan, $\chi^2(1, N = 80) = 5.17$, $p = .02$, $\chi^2(1, N = 80) = 5.26$, $p = .02$, respectively. Optimistic bias for prognoses, the interactive effects of the optimistic bias for prognoses with severity of prognoses, comfort received from companion animals, general patient satisfaction, satisfaction with the technical quality of care, interpersonal manner of the veterinarian, time spent with the veterinarian, and clinic accessibility and convenience did not contribute significantly to the model. The odds of approving the recommended treatment plan increased 9.18 times for every 1 unit increase in satisfaction with communication with the veterinarian and increased 2.18 times for every 1 unit increase in satisfaction with financial aspects.

Discussion

This study aimed to first determine whether the previously found optimistic bias for poor prognostic information for companion animals in hypothetical surrogate decision making scenarios was also present in a real life clinical veterinary setting. As hypothesized, more severe prognoses were associated with higher levels of optimistic bias in interpreting companion animals' likelihood of two-year survival following intensive treatment, with less severe prognoses with a 50% or more likelihood showing a reversal of this effect. This pattern of bias in interpretation of prognoses is in line with previous laboratory work on hypothetical surrogate decision makers for human patients (Siess et al., 2014; Moyer et al., 2017) and for canine patients (Siess et al., 2018a; Siess et al., 2018b). This is the first study to demonstrate this effect of an optimistic appraisal of more severe prognoses in a clinical setting with actual decisions.

Table 2

Hierarchical Logistic Regression Analysis of Owners of Companion Animals with Severe Cardiac Disease’s Decision to Approve the Recommended Treatment for Intensive Hospitalization as a Function of Patient Satisfaction, Comfort Received from the Companion Animal, Optimistic Bias for the Chance of Two Year Survival, and the Interactive Effects of the Optimistic Bias for the Chance of Two-Year Survival with Severity of Prognoses.

Variables	B	Wald Chi-Square	Odds Ratio	95% Confidence Interval for Odds Ratio	
				Lower	Upper
Step 1					
General Satisfaction	-.25	.14	.78	.21	2.87
Technical Quality	-.15	.04	.86	.18	4.19
Interpersonal Manner	.01	.00	1.01	.25	4.14
Communication	2.21	5.17*	9.11	1.36	61.19
Financial Aspects	.82	5.26*	2.28	1.13	4.60
Time Spent with Veterinarian	-.10	0.02	.91	.23	3.67
Accessibility/Convenience	-.07	.01	.93	.24	3.67
Step 2					
Comfort from Companion Animals	-.02	.17	.98	.89	1.08
Step 3					
Optimism Chance of Survival	-.00	.00	1.00	.97	1.03
Optimism Chance of Survival X Severity of Prognoses	.00	.07	1.00	1.00	1.00
Model		17.84			
(Constant)	-7.95	3.78			

* $p < .05$

For human patients, in response to hypothetical numerical prognostic statements about either a parent or a generic patient, participants demonstrated an optimistic bias for those indicating a high risk of death (less than a 50% chance of survival) but not a low risk of death (greater than a 50% chance of survival; Siess et al., 2014). Participants also demonstrated this pattern in response to hypothetical non-numerical prognostic statements such as “[They] probably will not survive” and “[They] probably will survive” (Moyer et al., 2017). Additionally, the amount of optimistic bias for poor prognostic information was greater when the patient was described as a close other (parent) than a generic patient. Furthermore, when the prognoses were framed in a more threatening manner, that is, in terms of the chance of dying as opposed to the chance of surviving, the amount of optimistic bias increased. A follow-up study among a sample of owners of healthy dogs found the same pattern of an optimistic bias for poor quantitative prognoses with a high risk of death but not for prognoses with a lower risk of death (Siess et al.,

2018a) as well as for poor non-numerical prognoses (Siess et al., 2018b).

Unrealistic optimism has been well documented in many situations, indicating that individuals have a tendency to be overly optimistic about the probability of negative outcomes happening to them (Shepperd et al., 2013; Weinstein, 1980). Unrealistic absolute optimism is caused by a belief that one's personal outcomes will be more favorable than outcomes predicted by a quantitative standard. Unrealistic comparative optimism is caused by a belief that one's personal outcomes will be more favorable than outcomes of others (Shepperd et al., 2015). Reasons for unrealistic optimism have been theorized to be a result of motivation to believe the probability of an unfavorable outcome is less likely to occur (Tyler & Rosier, 2009), individuals having more information about themselves than others (Shepperd et al., 2015), and the representative heuristic in which individuals consider how closely they match the stereotype of individuals who typically experience an unfavorable outcome when making predictions about their own likelihood (Tversky, 1977).

Unrealistic optimism has been implicated in predictions about outcomes for oneself and others, whereby individuals rated their own and others' risk of unfavorable outcomes lower than the actual risk. After making judgments about the likelihood of unfavorable outcomes occurring to themselves or others, individuals displayed an optimistic learning bias when told the actual likelihood of the event occurring was higher than expected, by discounting the additional risk optimistically (Kappes et al., 2018). Given that individuals employ unrealistic optimism about the probability of unfavorable outcomes happening, it is not surprising that when faced with the distressing threat of loss of a beloved companion animal, the tendency to employ an optimistic bias occurs. This is supported by previous research in which individuals who reported a higher amount of comfort received from their dog, therefore a higher level of attachment, employed a greater amount of optimistic bias for hypothetical poor prognostic information (Siess et al., 2018a; Siess et al., 2018b), similar to the way biases were exacerbated in prior research when judgments were made regarding someone who was described as a close other (Siess et al., 2014; Moyer et al., 2017).

The reversal observed, which was also found in previous studies examining hypothetical scenarios involving a parent or generic patient (Siess et al., 2014; Moyer et al., 2017) or a dog (Siess et al., 2018a; Siess et al., 2018b) indicating a pessimistic bias for less severe prognoses, may be explained by defensive pessimism in which individuals cope by preparing for the worst (Norem & Cantor, 1986). By preparing for the possibility that, despite intensive treatment in the hospital and adherence with follow-up care, their animal may not survive, it is possible that owners may believe they are protecting themselves from disappointment and painful emotions should that occur. This speculation is supported by evidence that in preparation for negative outcomes, individuals may proactively attempt to reduce negative emotions if the event occurs (Sweeny & Shepperd, 2007).

Although it is not the veterinarian's responsibility to make difficult decisions on behalf of their clients, a greater understanding of the psychological processes influencing end-of-life decisions may allow for improved communication (Lummis et al., 2020; Spitznagel et al., 2020). This may result in clients having a better understanding of their animal's situation and feeling more comfortable with the difficult decision to euthanize when the odds of a successful procedure are low or the patient's quality of life may be poor. Many factors play a role in owners' end-of-life decision making, especially when quality of life with the recommended treatment is poor or uncertain (Bley, 2017; Siess et al., 2015). Better communication from a veterinarian has the potential to help to alleviate these factors surrounding decisions (Marchitelli et al., 2020).

The second aim of the study was to determine the extent to which an optimistic bias for

poor prognostic information relates to an optimistically biased prediction of perceived quality of life for treatment of severe cardiac disease. It was hypothesized that participants' optimistic bias for severe prognoses would extend to an optimistic bias for the interpretation of perceived quality of life. In contrast to the hypothesis, the optimistic bias for the chance of two-year survival with the recommended treatment plan for intensive hospitalization did not appear to extend to an optimistic bias for perceived quality of life. Previous research has shown that the optimistic appraisal of poor prognostic statements is elevated when they are framed in a more threatening manner (in terms of likelihood of "dying" versus "surviving") and when one is emotionally closer to the patient for hypothetical human patients (Siess et al., 2014) and for hypothetical canine patients (Siess et al., 2018b). This defensive processing has been shown also in response to less precise, non-numerical prognostic statements such as, "I think it is unlikely [he] will survive" is more likely to be interpreted in an optimistically-biased manner than "I think it is likely [he] will survive" (Moyer et al., 2017; Siess et al., 2018a). Perhaps the optimistic bias employed in the face of prognoses with a high threat of death is motivated primarily by self-protection from the threat of loss of the patient and is thus less likely to be activated in judgments related to quality of life. The sample of owners reported very high levels of attachment to their companion animal. Although the typical attachment figure for adults are family members, particularly spouses and parents, companion animals can serve as a secure attachment figure as well (Milberg & Friedrichsen, 2017). The four main criteria for an attachment figure are proximity maintenance during times of stress; use of the attachment figure as a source of comfort, encouragement, support and stress relief; use of the attachment figure as a secure base from which to explore; and finally, temporary or permanent separation from the attachment figure results in distress (Ainsworth et al., 2015). It is not unlikely that among the sample of owners who reported very high levels of comfort received from their companion animal, many consider their animal to be an attachment figure. In that capacity, it is highly probable that owners who received a more severe prognosis for their companion animals' chance of survival experienced distress at the thought of being permanently separated from them, in line with the last criterion for an attachment figure (Ainsworth et al., 2015). This may account for the optimistic bias employed for more severe prognoses about the chance of survival but not for the interpretation of quality of life as quality of life does not involve permanent separation from the attachment figure (companion animal). In a sample of family members of terminally-ill patients in palliative care, the threat of losing the attachment figure (patient) with the worsening of symptoms activated the attachment system, resulting in family members feeling less secure and seeking proximity to the patient (Milberg & Friedrichsen, 2017).

The third aim of the study was to determine whether one's level of optimistic bias related to the likelihood of approving a treatment plan for intensive hospitalization. It was hypothesized that the greater the amount of optimistic bias for poor prognostic information and quality of life, the greater the likelihood of choosing to approve a treatment plan with intensive hospitalization would be. The amount of optimistic bias did not significantly predict the decision to approve a treatment plan with intensive hospitalization. This result is not in line with previous findings in which the greater the amount of optimistic bias in interpreting prognoses about a hypothetical patient, the greater the likelihood was of approving more intensive life-sustaining measures over a transition to comfort care (Siess et al., 2014; Moyer et al., 2017). Similarly, individuals who employed a greater amount of optimistic bias for hypothetical poor prognostic information about their dog, the greater the likelihood was of the owners endorsing that they would approve life-prolonging treatments for canine B-cell lymphoma instead of euthanasia (Siess et al., 2018a; Siess et al., 2018b). This discrepancy is perhaps due to several factors. First, the sample of owners

scored on average very high on the measure of attachment. Second, our sample was comprised of owners who were optimistic enough to agree to schedule a consultation with a board-certified veterinary cardiologist after referral from their primary veterinarian or by an emergency veterinarian. Based on the common prevalence of cardiac disease in dogs and cats in the population (Ferasin & DeFrancesco, 2015; Keene et al., 2019), it is likely that there were a number of owners who received a referral and elected to euthanize, rather than have a consultation with a cardiologist, and thus would not have been captured in our sample. Certainly, some would have made a decision based on finances, however, it is possible that some elected euthanasia because they were either less attached to their companion animal or did not employ a strong optimistic bias. It is conceivable that the optimistic bias for severe prognoses was not a significant predictor of the decision to approve the recommended treatment plan for hospitalization as a result of this.

Further, it is important to note that of those who did not approve the recommended treatment, only 5 elected for euthanasia while 19 took their companion animal home AMA. This suggests that the majority of owners who declined the suggested treatment for intensive hospitalization may not have had a realistic understanding of their companion animal's condition in that their disease was so severe that they would likely not survive at home without treatment. When in congestive heart failure, animals exhibit distressing clinical signs that are visible and apparent to the non-professional's eye such as dyspnea (Ettinger et al., 2017; Keene et al., 2019). To decide to take such an animal home AMA is perhaps suggestive of an even stronger optimistic bias resulting in an unrealistically optimistic view of their companion animal's chance of survival. Individuals who are highly attached, have an optimistic bias for poor prognoses and approve the recommended treatment for intensive hospitalization, may in fact be the most realistic in recognizing that in the short term their animal will not survive or live comfortably without intensive treatment (Ettinger et al., 2017; Keene et al., 2019) as indicated by the veterinarian.

This issue is particularly important in terms of consequences for the animal, the owner, as well as for the veterinarian. First, the animal's recommended treatment plan for intensive hospitalization was given by the veterinarian because without it they would likely suffer and continue to decline without treatment. Therefore, it is the unfortunate reality that the majority, if not all, of the animals that went home AMA experienced some level of suffering and likely died a gruesome death at home. This decline in clinical state in the form of visible suffering, including gasping for air, likely caused significant distress for the owners who witnessed this (Ettinger et al., 2017; Keene et al., 2019). Further, owners who elected to take their animal home, are likely at a high risk of decisional regret and the development of psychiatric symptoms, that surrogate decision makers are already at risk for (Abou-Mrad et al., 2012; Corrigan et al., 2007; Jones et al., 2004; Kross et al., 2011; Nelson et al., 2017; Pignatiello et al., 2018; Wendler & Rid, 2011) because of the inevitable suffering and decline of their pet following their decision to leave the hospital against medical advice.

In addition to the impact that taking an animal home AMA has on the animal and for the owner, it is likely to have a negative impact on the veterinarian and veterinary staff involved. The veterinarian's goal is to treat patients when it is humane and can be beneficial and to end their suffering if that is not possible. Previous research has shown that when veterinarians believe they were able to achieve a 'good death' for patients, via humane euthanasia, they reported improved personal wellbeing. When unable to achieve a 'good death', they reported increased emotional strain, reduced wellbeing and job satisfaction, with detrimental effects on owners (Matte et al., 2019). Ultimately, an owner's decision to take their animal home is something the veterinarian

cannot do anything about other than attempt to change their mind. When these attempts fail, and the veterinarian observes an animal leaving the hospital to go home to suffer, this likely results in moral distress and contributes to the high rates of burnout in the veterinary profession (Siess et al., 2015).

A further aim of the study was to determine whether attachment to the companion animal, as measured by the amount of comfort received from the companion animal, was related to the likelihood of approving a treatment plan for intensive hospitalization. It was hypothesized that the greater the attachment and therefore the greater the amount of comfort received from one's companion animal, the greater the likelihood of choosing to approve a treatment plan with intensive hospitalization would be. The amount of comfort received from the companion animal did not significantly predict the likelihood of approving the recommended treatment plan for hospitalization. This is likely due to the high skew in the scores ($M = 41.60$, Median = 44.00, $SD = 6.17$) towards the maximum possible score of 44. The owners in the sample were highly attached to their companion animal, therefore it is likely that the lack of variation in attachment resulted in the null result.

An additional aim of the study was to determine whether client satisfaction with the veterinary team is related to the likelihood of approving a treatment plan for intensive hospitalization. It was hypothesized that greater client satisfaction would result in a greater likelihood of choosing to approve a treatment plan with intensive hospitalization. As expected, greater client satisfaction with communication with the veterinarian significantly predicted a greater likelihood of approving the recommended treatment. Poor communication from health care providers has been reported as a common stressor among surrogate decision makers for human patients associated with low levels of confidence in the role (Braun et al., 2008; Hickman et al., 2012; Majesko et al., 2012; Torke et al., 2012).

Results indicating that higher levels of satisfaction with communication from the veterinarian predicted a greater likelihood of approving the recommended treatment plan for hospitalization suggest that improved communication with the veterinarian may result in the owners feeling more confident in their role, specifically in their ability to make the "right" decision with regard to approving the recommended treatment plan, which many owners of companion animals with life threatening conditions struggle with (Bley, 2017). The significant majority of owners who did not approve the recommended treatment plan for hospitalization elected to take their animals home AMA and may have experienced distress decisional regret when their animal declined, placing them at higher risk for the development of negative psychological outcomes such as depression, anxiety, and PTSD (Abou-Mrad et al., 2012; Corrigan et al., 2007; Jones et al., 2004; Kross et al., 2011; Nelson et al., 2017; Pignatiello et al., 2018; Wendler & Rid, 2011). This finding is important in that poor communication from health care providers is a source of distress that surrogates report as a hindrance to their ability to make end-of-life decisions (Braun et al., 2008; Hickman et al., 2012; Majesko et al., 2012; Torke et al., 2012). This further suggests that interventions designed to improve communication by health care providers are worthwhile. Further supporting the need for greater training in communication in veterinary schools as veterinarians' abilities to have successful communications with owners of critically-ill companion animals will likely ease the burden of being a surrogate decision maker but may also result in better treatment of patients as well as reduced stressors on veterinarians.

Additionally, greater client satisfaction with their financial ability to pay for the recommended treatment significantly predicted a greater likelihood of approving the recommended treatment for intensive hospitalization. This result is not surprising as finances play a major role in veterinary medicine as the majority of pets are uninsured, requiring the vast

majority of owners of companion animals to be able to pay a large amount of money on the spot (AVMA, 2018; NAPHI, 2021). In addition to the hurdle of being able to pay the large fee for hospitalization, all of the animals would need to be on several medications regularly and would need to have regular recheck examinations from the veterinary cardiologist. Additionally, the conditions experienced by the companion animals are chronic and terminal and, as such, the need for future hospitalization is inevitable (Fuentes et al., 2020; Keene et al., 2019). Recently, the American Veterinary Medical Association endorsed the active encouragement of owners of companion animals to obtain pet health insurance to help defray veterinary medical care costs in order to be able to provide high quality veterinary medical care (AVMA, 2021).

General satisfaction, satisfaction with technical quality, interpersonal manner, time spent with the veterinarian, and accessibility and convenience did not significantly predict the decision to approve the recommended treatment. This is likely due to them all being highly rated with average scores of 4.31, 4.15, 4.46, 4.21, and 4.31 out of a maximum score of 5.00, respectively. The high ratings are not surprising as the hospital is a 24-hour multi-specialty and referral hospital and as such the equipment available is of high standard and the veterinarians were board-certified cardiologists with significant expertise. Consultations with the veterinary cardiologists are typically longer than a consultation with a primary veterinarian, it is likely that the consultations the owners had were longer than most appointments they have had with their primary veterinarians. The nature of the hospital being available 24-hours a day and 7 days a week likely explains the high rating for accessibility and convenience.

Limitations

The current study has potential limitations in that the sample consisted of owners of companion animals who were referred to see a veterinary cardiologist by their primary veterinarian, or by an emergency veterinarian, and agreed to a consultation. Owners of companion animals who declined to seek a consultation from a veterinary cardiologist or who euthanized prior to a consultation, were not captured. Additionally, the mean score for the Comfort from Companion Animals scale was very high, much higher than a previous sample of dog owners (Siess et al., 2018b). This lack of variability likely affected its ability to serve as a predictor of the decision to treat the animal. Moreover, while our sample consisted of owners who reported nearly identical levels of attachment for dogs and cats, there may be differences in the typical levels of attachment to dogs and cats that would be captured in a more generalizable sample. Likewise, the age of companion animals may impact medical decisions, but was not a focus of the current study due to the nature of the disease processes in the sample. Additionally, the lack of variability in general satisfaction, technical quality, interpersonal manner, time spent with the veterinarian, and accessibility and convenience are likely why they were not significant predictors of decision to approve the recommended treatment. A replication of the study in a general veterinary practice setting may include more variability in the owners of companion animals in all respects and as such may result in significant differences in those components of patient satisfaction. Additionally, socioeconomic status and ethnicity were not included in the demographic variables measured limiting the generalizability of the results. Another potential limitation is that there was no data collected on past experiences with critically-ill companion animals which may impact the way in which owners of companion animals make end-of-life decisions for their current companion animals. Further, as this was the first study to examine these effects, we did not experimentally control for the ways in which prognoses and quality of life were presented to owners, which can have an impact on owners' perception of prognoses.

Conclusion

With the continued advancement of veterinary medicine and the inherent role of owners of companion animals as surrogate decision makers, more people will find themselves in the position of difficult decision making situations that are compounded with the threat of loss of a beloved companion animal. A more comprehensive understanding of the way in which owners of companion animals perceive high risk prognostic information about their companion animal, the role of attachment, and how factors such as optimism and quality of life factor into one's decision to pursue diagnostics, treat chronic diseases, or elect for euthanasia is crucial.

It is important to note that owners of companion animals, employ an optimistic bias for their animals' chance of survival when it is low as indicated by a veterinarian. This strongly supports findings that surrogates have a tendency to have an inaccurate understanding of their animals' risk of death when it is high. This is likely due to the strong attachment between an owner and a companion animal and likely arises as a form of self-protection from the threat of imminent loss. It is important to note that these individuals are likely at greater risk of experiencing high levels of distress in the event of the animals' death. Having established local referral locations for psychological counseling and support groups that can easily be provided at the time of diagnosis, may help to mitigate the distress that these individuals experience. The optimistic bias did not extend to the evaluation of the companion animals' quality of life, further suggesting the optimistic bias is likely in response to the threat of loss. The findings provide evidence for the notion that improved communication from veterinarians is necessary to reduce the burden on owners in their role as surrogate decision makers as well as for the treatment of their animals. Future research should be conducted to examine the specific aspects of communication that are most effective in improving owner satisfaction with communication.

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