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The effects of road traffic accidents on domestic cats and their owners

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Abstract

Six veterinary practices participated in a study of cats involved in road accidents. Of 127 cats, 93 survived, of which 58 had moderate to very severe injuries. The mean period of hospitalisation was five days and the mean length of veterinary treatment was 23 days. The cost of treatment was less than £400 for 84% of cats. Owners of 51 surviving cats completed questionnaires within three to five months of the accident. The mean time it took for their cats to recover was 47 days (n = 41; range 1–150 days). Eight cats had not recovered within five months, four of which had had a limb amputated. The severity of the cats' injuries correlated positively with the cost of treatment, length of hospitalisation and treatment, and time to recovery ($r_s \geq 0.69$, $P < 0.001$). Behavioural changes were noted in 34 cats; 23 were described as being more nervous, going outdoors less, or being more fearful of cars, roads or going outdoors. Half of the owners treated their cat differently: 17 restricted the time their cat spent outdoors and 11 worried more about their cat. The effects of the accident on the owner's emotions and finances were measured using a scale from 1 (minimum) to 7 (maximum). Most owners registered a score of 5, 6 or 7 for effect on emotions and 1, 2 or 4 for effect on finances; the scores were not correlated. Road accidents are an important cause of poor welfare in cats and their owners.

Keywords: *animal welfare, behaviour, cat, pet ownership, road traffic accident, veterinary treatment*

Introduction

In a study of causes of death of domestic cats (*Felis catus*) in Britain, road traffic accidents (RTAs) were the fourth most common cause, and cats dying in RTAs were, on average, younger than those dying from other causes (Rochlitz *et al* 2001). Between 16% and 29% of cats presented as emergency cases to University Teaching Hospitals in the United States were involved in RTAs (Kolata *et al* 1974; Kolata 1980). Despite road accidents being such an important and common cause of death and injury in cats, there are few studies examining their effects on cats and their owners.

Aspects of RTAs in cats such as the length of hospitalisation required, the time to recovery and the cost of treatment, and correlations between these aspects and the severity of the cat's injuries, are presented in this paper. The effects of such accidents on the cat's behaviour, on the owner's behaviour towards their cat and on the owner's emotions and finances are also considered. Factors that may predispose domestic cats to RTAs are described in Rochlitz (2003a,b) and a clinical study of the injuries, treatment and outcome can be found in Rochlitz (2004).

Methods

Subjects

The period of data collection was March 2000 to February 2001 and six veterinary practices in or near Cambridge participated in the study. Practices recorded all cats presented to them following an RTA. Once or twice per month, the author visited the practice and collected information on the severity of the cat's injuries, the cost of treatment, the length of hospitalisation and the length of treatment (defined as the time between the first and last veterinary consultation relating to the cat's accident).

A method for rating injuries resulting from car accidents has been developed in human medicine (Committee on Medical Aspects of Automotive Safety 1971) and a modified version of this scale has been used in a study of patterns of trauma in dogs and cats (Kolata *et al* 1974). A similar scale for rating the severity of the injury was used by the author in the current study. Injuries were scored on a scale from 1 (none or very minor) to 5 (very severe, potentially life-threatening), with 2 defined as minor, 3 as moderate and 4 as severe. Cats that were dying, moribund or dead were scored as 6.

Questionnaires

Practices distributed questionnaires, together with a freepost-addressed envelope, to the owners of cats that had been involved in an RTA. In all cases, questionnaires were only sent to those owners whose cats survived their RTA. In this initial questionnaire, owners were asked about the circumstances of their cat's accident; the results of this survey are presented in Rochlitz (2003b). A follow-up questionnaire, sent three to five months after the first one, asked about the cat's time to recovery (defined as how long the owner thought it took the cat to recover from its accident), changes

Table 1 Cats in road traffic accidents: length of hospitalisation, length of treatment and time to recovery. Percentage (number) of cats.

Time (days)	Length of hospitalisation (n = 75)	Length of treatment (n = 92)	Time to recovery (n = 49)
1	14.5 (11)	12 (11)	
2–7	72 (54)	23 (21)	8 (4)
8–14	9.5 (7)	16 (15)	10 (5)
15–30	4 (3)	24 (22)	20 (10)
31–61		17.5 (16)	31 (15)
62–91		2 (2)	
92–120		5.5 (5)	10 (5)
121–150			4 (2)
> 150			16 (8)

in the cat's behaviour and in the owner's behaviour towards the cat, and the emotional and financial effects of the accident on the owner.

The effects of the RTA on the owner's emotions and finances were measured using a semantic differential scaling method (Bernard 1994, pp 289–309). Owners were asked to put a cross on a line, with the start of the line (on the left) representing a minimal effect and the end (on the right) a maximal effect. The line was then divided into a seven-point scale, with 1 being the minimum and 7 the maximum, and a score assigned according to the position of the cross. There was one line for effect on emotions and another for effect on finances.

Statistical analysis

Associations between the cat's injury score and the cost of treatment, length of hospitalisation, length of treatment, time to recovery, effect on owner's emotions and effect on owner's finances were examined using the Spearman rank-order correlation coefficient (Siegel & Castellan 1988, pp 235–244). Data were analysed using SPSS version 10 for the Macintosh (SPSS Inc).

Results

Injury scores, cost of treatment, and length of hospitalisation and treatment

Data were collected on 127 cats during the study. Sixteen cats (14 owned and two stray) were dead on arrival at the practices. A further eleven cats (10 owned and one stray) died, seven within one day, three after two days and one after five days of treatment. Seven cats (four owned and three stray) were euthanased, six within one day and one three days later. Of the owned cats, one (with an injury score of 5) was euthanased at the owner's request; she was found collapsed in the garden by her owner and the veterinary surgeon thought she had a ruptured bladder. One cat was euthanased after radiography revealed a transected spinal cord, and another after exploratory surgery revealed extensive damage to the kidneys indicating a hopeless prognosis. Another cat was moribund, with abdominal wounds that were infested with maggots, and was also euthanased on veterinary advice.

One stray cat was euthanased because its condition was deteriorating, and it had neurological deficits (inability to urinate) that indicated a poor prognosis. Another was euthanased because it had infected wounds and fractures of both hindlegs, as well as evidence of a previous limb fracture that had healed poorly. The impression was that it had sustained its injuries several days previously. The third stray that was euthanased had neurological symptoms indicating transection of the spinal cord.

For the remaining 93 cats, the most frequent injury score was 3 (33 cats), followed by 4 (20 cats), 2 (20 cats) and 1 (15 cats). The mean cost of veterinary treatment was £227.20 and the median £112.32 (data from 112 cats), with a range from zero to £1510. The cost of veterinary treatment was less than £400 for 84% of cats.

Seventy-five cats were hospitalised; the mean period of hospitalisation was five days (median three days, mode two days), with 72% of cats being hospitalised for between two and seven days (Table 1). One cat was hospitalised for 26 days; it had extensive soft tissue injuries to its forelimb and its elderly owner was unable to bring the cat to the practice every two to three days, as required, for dressing changes. Another cat with bladder and pelvic injuries was hospitalised for a long period because its owner was unable to administer treatment.

The mean length of treatment was 23 days (median 15 days, mode one day, n = 92). While 75% of cats required less than one month of treatment, five cats needed up to four months (Table 1). Three of these cats had extensive limb injuries. One of these was the cat with a forelimb injury, mentioned previously; in this case, after three months of conservative treatment aimed at preserving the limb, it had to be amputated. Another cat with a forelimb fracture developed nerve damage and had to be cage-rested for four months, and another was an old cat with a complex hindlimb fracture that took a long time to heal. Two cats had severe injuries to the face, which made it difficult for them to eat and groom themselves, so they required a long period of nursing care.

Time to recovery, changes in behaviour, and emotional and financial effects

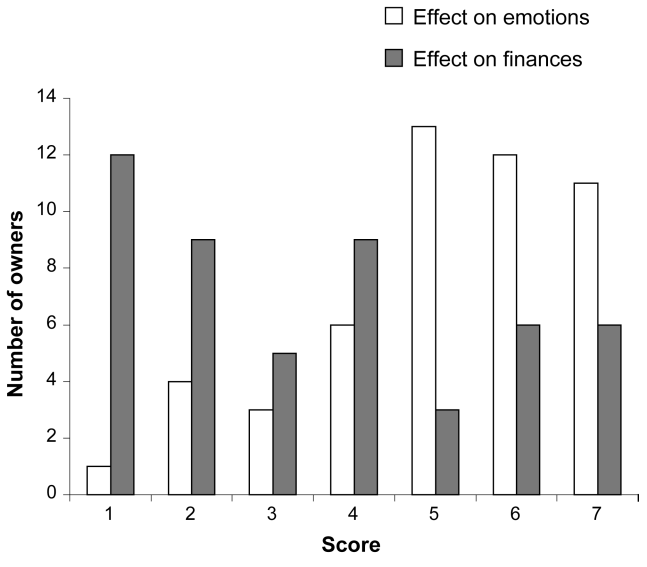
Fifty-one owners completed the follow-up questionnaire. According to their owners, 41 cats (84%, n = 49) had recovered. The mean time to recovery was 47 days (median 45 days, mode 60 days). Nineteen cats had recovered within one month and 15 within two months; seven cats needed up to five months to recover from their accident (Table 1).

Owners of eight cats said that their cats had not recovered from their injuries within five months of the accident. Four of these cats had had a limb amputated, one had ongoing bladder and bowel problems, three cats had pelvic injuries and one a ruptured diaphragm as well as pelvic injuries. Two cats with pelvic injuries still required cage-rest at home, in order to restrict their movement and promote healing. Owners of cats that had lost a limb commented on the disability this presented to the cat, for example causing difficulty in jumping and grooming. Another cat had recovered from its limb amputation within 45 days (eight cats in the study had had a limb amputated, and questionnaires were received for five of them).

Two-thirds of owners said that their cat's behaviour had changed in the five months following the accident. Twelve cats were described as being more nervous, 11 as more affectionate, eight cats went outdoors less, and eight were described as being more fearful of cars, roads or going outside (some cats showed more than one behavioural change).

Half of the owners said that, following the accident, they treated their cat differently. Eleven cats were now kept in at night, four were kept indoors more, and two were no longer allowed outdoors. Four owners said that they paid more attention to their cat, and 11 worried more about their cat. Other comments from owners included: they found it distressing to see their cat in pain; they found it difficult to maintain long-term cage rest for their cat; and their cat attempted to hide whenever they had to medicate it. Using the semantic differential scale, most owners registered a score of 5 (26%), 6 (24%) or 7 (22%) for effect on emotions, and a score of 1 (24%), 2 (18%) or 4 (18%) for effect on finances (Figure 1).

Figure 1 Cats involved in road traffic accidents: the effects of the accident on the owners' emotions and finances. 1 = minimum, 7 = maximum score (n = 50).



Correlations between injury scores and other measurements

As follow-up questionnaires were received only from owners of cats that had survived their accident, the injury scores for these cats were on a scale from 1 to 5. There were strong correlations, with correlation coefficients of 0.7–0.89 (Fowler & Cohen 1995, pp 80–86), between the injury score and cost of treatment, length of hospitalisation and length of treatment, and between cost and length of hospitalisation and length of treatment. There was no correlation between the effect of the accident on the owner's emotions and the effect on their finances (data not shown).

Discussion

Of 127 cats in the study, 16 cats were dead at presentation. Owners brought these cats to the practice so that a professional person could confirm the cat's death and arrange for disposal of the animal. Of 111 cats alive at presentation, 93 (84%) survived their accident despite 25 (23%) having severe to very severe injuries. It is possible that cats with minor injuries are not brought in for veterinary attention, because their owners do not think it is necessary or are unaware that their cat has been injured, and cats with severe injuries may die before they reach the practice.

This study did not investigate how the owners and veterinary surgeons decided whether to treat the injured cat or to opt for euthanasia. This process is influenced by many factors, such as the severity of the injuries, the length and nature of the treatment required, the age of the cat, pre-existing medical conditions, the likely outcome, the owner's feelings and the cost of treatment. In this study, all seven cats that were euthanased had very severe injuries, most of them indicating a hopeless prognosis, so these cats were euthanased on humane grounds. The practices were well-served by local animal charities, such as The Royal Society for the Prevention of Cruelty to Animals (RSPCA) and The Blue Cross. Three cats were referred to the local RSPCA clinic after receiving initial treatment at the practices, as their owners were concerned about the cost of treatment, and one owner received financial aid from two animal charities.

The cost of veterinary treatment depends on many factors, including the treatment required, the facilities of the practice, the standard of care offered and the expectations of the owner. While it is not possible to comment on the cost of treatment directly, 35 out of 50 owners assigned a score of 4 or less (out of 7) when assessing the impact of the accident on their finances. This suggests that the cost of the accident did not represent a major outlay for these owners, although one owner commented on the high cost of veterinary fees and three said that they had had difficulty in meeting the costs. Six cats were insured (one of which required treatment costing £1510), and the owner of another cat insured it after the accident.

Most cats were hospitalised for one week or less and required up to one month of veterinary treatment. While data on the length of time for which cats are hospitalised and treated for various conditions are lacking, the impression is that these periods are relatively short, despite the severity of the injuries sustained. In veterinary medicine,

cats are often regarded as animals with remarkable healing abilities that recover rapidly, and usually uneventfully, from injuries. However, information from the follow-up questionnaires suggests that this may not always be the case, as the time to recovery, determined by the owner, was on average twice as long as the length of veterinary treatment. While it is difficult to generalise, it appears that injuries to the face, pelvis and limbs required prolonged periods of treatment, and cats with injuries to the pelvis and limbs took a long time to recover. This should be taken into consideration when the owner and veterinarian decide whether to embark on treatment of an injured cat. It is impossible, however, to know at the beginning whether the course of treatment will be uneventful or whether complications will develop.

Half of the cats that had not recovered within five months of their RTA had had a limb amputation. The decision whether to attempt complex orthopaedic surgery in order the salvage the limb, or to opt for amputation, is a difficult one. Several operations may be needed to repair the limb, the cat may be in discomfort for some time, there is no guarantee of success and the financial costs may be considerable. Indeed, of eight cats in the study that had a limb amputated, initial orthopaedic surgery was attempted in three but was unsuccessful. Amputation is usually a straightforward procedure, surgical complications are uncommon and the cost is moderate. Owners may therefore opt for amputation rather than for a complex and costly operation that may not succeed. In a study using telephone interviews of owners, 41 of 44 dogs recovered well following the amputation of a limb, and most had adapted within one month of the surgery (Kirpensteijn *et al* 1999). In veterinary practice it is generally assumed that cats adjust well and rapidly to the loss of a limb. While the purpose of the current study was not specifically to examine this aspect, the owners' reports suggest that recovery following limb amputation in cats may be slow. Cats are agile animals that move rapidly and like to climb and jump, so the loss of a limb is a significant disability. An objective method of assessing recovery following limb amputation would be useful. In the dog study (Kirpensteijn *et al* 1999), it appeared that some owners were contacted a considerable time after their dog's amputation, whereas in the current study owners were questioned within five months of their cat's amputation; this difference may have influenced the responses.

A number of behavioural changes were noted in cats following their accident. Of 34 cats showing a change, 23 were described as being more nervous, going outdoors less, or being more fearful of cars, roads or going outside. This change in behaviour would be the appropriate adaptive response following a road accident; how long this response persists and how effective it is were not examined. In a questionnaire-based study of 66 cats that had been involved in RTAs, 12% had been in at least one road accident previously (Rochlitz 2003b).

Eleven cats were described as being more affectionate, 17 owners restricted their cat's access to the outdoors and 11 worried more about their cat. Affection and unconditional love from pet cats are reported to be among the primary benefits of the human–cat relationship (Zasloff & Kidd 1994), and in situations where prolonged nursing is required, strong bonds will develop between the owner and pet (Stewart 1999, pp 3–17). In a study of the effects of quarantine, cats were described by their owners as being more friendly, affectionate and timid at release, and three months later as more affectionate, nervous and vocal than before quarantine (Rochlitz *et al* 1998). Traumatic events, such as injury or prolonged separation, may cause both cats and their owners to modify their behaviour. Whether changes described by owners reflect true changes in the cat's temperament or personality, and whether such changes are long-lasting, require further research.

Some owners treated their cat differently following the accident, either no longer allowing their cat outdoors or restricting the time it spent outdoors, in particular at night. No longer allowing cats outdoors may be an appropriate decision for cats that have lost a leg or an eye, but not for those that have recovered from their accident and have always been used to having outdoor access, as they may have difficulty adapting to an entirely indoor existence (Hubrecht & Turner 1998). Rochlitz (2003a) compared a population of cats that had been involved in an RTA with a control population that had never been involved in such an accident, and found that for every one-year increase in age, the likelihood of a road accident decreased by 16%. Those cats that had been involved in an accident spent more time outdoors than the controls, but they were younger and age correlated positively with time spent outdoors. Once corrected for differences in age, there was no difference between the two populations in the time they spent outdoors (Rochlitz 2003b).

What may be more helpful is to examine whether restricting outdoor access at particular times of the day leads to a reduction in the incidence of road accidents. Rochlitz (2003b) found that there was a trend for more road accidents to happen at night than during the day. Night time was defined as between 1800h and 0600h; it may have been more useful to examine periods of dawn and dusk, when cats are thought to be most active. However, whether domestic cats are crepuscular, nocturnal or diurnal is currently a matter of debate (Fitzgerald & Turner 2000). Despite this uncertainty, it may still be worth keeping cats in at night, as when accidents happen at night there are fewer people around to see that the cat has been injured and needs veterinary attention. Animals will receive veterinary treatment more quickly in the daytime than at night, when surgeries are usually closed and there may be some delay until the veterinary surgeon on call is summoned, or until the animal is taken to an emergency clinic.

The correlations between the injury score and measurements such as cost of treatment, length of hospitalisation and length of treatment are expected as these parameters are interrelated (the more severe the injury, the greater the requirement for veterinary care). The effect of their cat's road accident on owners' emotions was greater than the effect on their finances, and the two effects were not correlated. This

suggests that the degree to which the owner was emotionally affected by the cat's accident was not directly influenced by how much the cat's treatment cost the owner. The effect on emotions is a subjective assessment made by the owner, and will be influenced by many factors such as the owner's veterinary knowledge, previous experiences, the human–cat relationship and whether the owner was present at the time of the cat's road accident.

Conclusions

RTAs are an important cause of poor welfare in cats. They cause severe injuries, and euthanasia may be indicated on humane grounds. Veterinary surgeons should be aware that the time taken for a cat to recover from its accident may be considerably longer than the period during which it receives veterinary treatment, and that owners may need support during this period. The consequences of limb amputation may not be as benign as is generally assumed in the cat.

Road accidents may cause changes in the cat's and the owner's behaviour and have a marked effect on the owner's emotions. Further studies are required, not only to find ways of reducing the incidence of RTAs, for example by restricting the cat's access to the outdoors at particular times, but also to examine their long-term impact on the welfare of cats and their owners.

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