

Retrospective analysis of necropsy reports suggestive of abuse in dogs and cats

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OBJECTIVE

To identify historical and necropsy findings suggestive of neglect or abuse of dogs and cats by retrospective analysis of necropsy reports from a veterinary diagnostic laboratory.

DESIGN

Retrospective cohort study.

SAMPLE

119 necropsy reports of dogs and cats.

PROCEDURES

Necropsy reports from February 2001 to May 2012 were electronically searched to identify potential animal abuse or neglect cases. Cases were selected and categorized according to a previously proposed method for classification of animal abuse. Inclusion criteria included signs of neglect, nonaccidental injury (NAI; blunt-force or sharp-force trauma, gunshot, burns, drowning, asphyxiation, and suspicious intoxications), and sexual abuse. Poor preservation of cadavers, age < 6 weeks, and signs of chronic illness (eg, cachexia) or injuries consistent with history indicating natural or accidental causes resulted in exclusion. Variables of interest were compared between identified cases and a reference population.

RESULTS

Prevalence of potential abuse cases, determined on the basis of all necropsies performed in the study period, was 73 of 8,417 (0.87%) in dogs and 46 of 4,905 (0.94%) in cats. Neglect and NAI were commonly identified in cats; NAI was most commonly found in dogs. Gunshot and blunt-force trauma were the most common NAIs in dogs and cats, respectively. Pit bull-type dogs (29/73 [40%]) were overrepresented in several abuse categories. Most cats (29/46 [63%]) were domestic shorthair, but no breed association was found. Most (41/71 [58%]) affected animals with age data available were ≤ 2 years old.

CONCLUSIONS AND CLINICAL RELEVANCE

Approximately 1% of dogs and cats necropsied in the study period had signs suggestive of abuse. Medical findings alone are not necessarily indicative of abuse, but some findings can increase the index of suspicion. (*J Am Vet Med Assoc* 2018;252:433–439)

The relationship between companion animals and people is most often beneficial, although instances of animals being subjected to violence or neglect are not uncommon. Animal abuse is a sensitive topic and represents a challenge for veterinarians; diagnosing injuries or disease stemming from abuse or neglect can be technically challenging, emotionally difficult, and surrounded by legal concerns.¹ As expressed by Arkow et al,² the recognition and documentation of abuse requires time, experience, emotional energy, sensitivity, tact, and courage. Veterinarians may be reluctant to inform animal welfare and other authori-

ties of suspected cases of animal maltreatment for various reasons. The prevalence of animal abuse in the United States is unknown because of the lack of information from a national database and underreporting; nevertheless, animal abuse is common and is gaining the attention of public officials.³ In early 2016, it was reported that the US FBI had begun collecting data on acts of animal cruelty, including gross neglect, torture, organized abuse, and sexual abuse, to include in the organization's National Incident-Based Reporting System.⁴

The AVMA's policy on animal abuse and neglect⁵ indicates that most practicing veterinarians encounter cases of animal abuse during their careers. The AAHA also states that veterinarians are likely to encounter many forms of abuse, ranging from neglect to intentional harm.⁶ These professional organizations support and recommend that veterinarians report cases of animal abuse to the proper authorities. The

ABBREVIATIONS

AAHA	American Animal Hospital Association
BFT	Blunt-force trauma
NAI	Nonaccidental injury
VDL	Veterinary Diagnostic Laboratory

AVMA considers this to be the veterinarian's responsibility, whether or not it is mandated by law.⁵ The AAHA supports the adoption of laws requiring veterinarians to report suspicions of animal abuse, provided such laws include provisions for immunity from legal liability when reporting in good faith.⁶ Currently, 15 states (Alabama, Arizona, California, Colorado, Illinois, Kansas, Maine, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, Oregon, West Virginia, and Wisconsin) require veterinarians to report known or suspected animal abuse.⁷

Obtaining a thorough history is important when trying to differentiate between accidental injuries and abuse, and suspicion of abuse is raised when physical examination findings do not match the history provided.^{1,8} Unfortunately, a comprehensive history is not always available or accurate because information on the circumstances of the injury may be unknown, fabricated, or withheld by the owner.⁹ Repeated injuries are a common feature of animal abuse.⁸

Determining whether or not a certain situation is considered animal abuse can be complicated,¹ and veterinarians can be faced with conflicting professional, personal, and legal standards in these situations.² Recognizing animal abuse is not always straightforward; human actions or omissions toward animals can range from unintentional neglect to intentional cruel acts. Commonly used terms that encompass such behaviors include cruelty, abuse, and neglect. The definitions found in animal cruelty statutes vary, and even the definition of the term animal can differ among jurisdictions.²

In recent years, work has been done to assist veterinarians with clinical recognition of suspected animal abuse. To facilitate recognition, communication, and research, a method for classification of animal abuse has been proposed.¹ This classification scheme comprises 4 categories: physical abuse (also referred to as NAI), sexual abuse, emotional abuse, and neglect. More than one type of abuse can occur concurrently.^{1,8-10} Nonaccidental injuries include a bodily injury caused by a variety of actions such as kicking, punching, throwing, beating with an object, burning (eg, by thermal, electrical, or chemical means), drowning, stabbing, asphyxiation, shooting, or poisoning. In sexual abuse, the actions usually center on the sexual organs or anus and rectum and may include vaginal or anal penetration, wounds inflicted on or around the genitalia, or acts of abuse involving only the animal's mouth. Emotional abuse consists of constant threatening, shouting and angry gestures, and failure to provide psychological comfort, among other actions. Neglect is the failure to provide an animal with basic necessities of life such as food, water, and shelter; failure to seek veterinary care for injuries and naturally occurring disease; or abandonment.^{1,2,8,9}

The objective of the study reported here was to identify historical and necropsy findings suggestive of abuse or neglect of dogs and cats by retrospective

analysis of necropsy reports from the VDL of a veterinary teaching hospital.

Materials and Methods

Case selection criteria and medical records review

Necropsy reports of dogs and cats electronically archived at the University of Minnesota VDL from February 1, 2001, to May 31, 2012, were searched using the following keywords: trauma, legal, gun, stab, drown, suffocate, kick, burn, neglect, abuse, accident, cachexia, matted coat, embedded collar, starvation, emaciation, and hit. Keywords were used to search entire records; therefore, information contained in the history, necropsy findings, toxicology reports, diagnosis, and comments were searched and analyzed. Records prior to 2001 were not included because a searchable database was not available. Cases were selected and categorized as neglect, sexual abuse, or NAI according to previously described classification methods for animal abuse.¹ The study was limited to necropsy findings that, within the proper context, could be interpreted as signs of physical abuse or neglect; therefore, the category of emotional abuse could not be explored. One investigator reviewed all cases (DCA).

Inclusion criteria for neglect cases were information contained in the history and findings on the necropsy report that indicated failure to provide adequate food (signs of starvation), water (signs of dehydration), or shelter (determined on the basis of history); failure to seek veterinary care for injuries or wounds; ectoparasite and endoparasite infestation; and lack of adequate and routine husbandry. This category included all cases in which the diagnosis or comments section in the report included the terms cachexia or emaciation and in which preservation of the cadaver allowed the examiner to rule out other concurrent conditions or diseases (congenital, inflammatory, infectious, or neoplastic) that could be responsible for these findings. Animals known to be involved in cases of hoarding that met the criteria for neglect were also included in this category. Reports where findings included physical injuries such as BFT, gunshot wounds, burns, sharp-force trauma, or evidence of drowning, asphyxiation, or suspicious intoxications were included as potential cases of NAI. Cases involving gunshot wounds were further divided into NAI by gunshot and shot by police for analysis purposes. Physical injuries inflicted on sexual organs, the anus, or rectum were included as potential cases of sexual abuse.

Cases were excluded if they involved animals < 6 weeks of age (to avoid including young animals that failed to thrive), cachexia or emaciation with concurrent disease that could explain those findings, poor preservation of the cadaver and autolysis, history of a vehicular accident with expected injuries, other reportedly accidental injuries consistent with the history provided, and acute injuries or wounds of known causes unrelated to the cause of death.

For statistical purposes, variables of interest were compared between cases identified in the electronic records search and a reference population. The reference population was extracted from the University of Minnesota Veterinary Medical Center patient registry and included dogs and cats of any breed (including mixed breeds) or age and that had active records within the 3 years preceding data analysis (January 8, 2011, to January 7, 2014). The reference population was deemed a reasonable representation of the animal population of the area served by the VDL. Data collected from the reference population records for purposes of comparison were species, breed, age, and sex.

Statistical analysis

Data for dogs and cats were analyzed separately. For each species, the Fisher exact test was used to assess whether group (case group vs reference group) was significantly associated with age (≤ 2 vs > 2 years), sex (male vs female), or breed (dogs or cats of a specific breed vs all dogs or cats other than that breed). The age cutoff of 2 years was selected on the basis of another study¹¹ to allow for comparison of the study findings with published results. When the data were analyzed, animals reported as being puppies or kittens without a specific age recorded were categorized as ≤ 2 years old. For analysis of associations with breed, only breeds represented by > 100 individuals in the reference group were evaluated. Analyses were performed for the case group as a whole (ie, all dogs or cats with evidence of abuse) and for various subpopulations of the case group (ie, animals with findings suggestive of neglect, animals with findings suggestive of sexual abuse, animals with findings suggestive of any NAI, and animals with findings suggestive of specific types of NAI [BFT, gunshot, shot by police, sharp-force trauma, drowning, asphyxiation, suspicious intoxications, or burns]). Analyses were performed with statistical software.^a Values of $P < 0.05$ were considered significant.

Results

There were 13,322 necropsies of dogs and cats (8,417 [63%] and 4,905 [37%], respectively) during the study period. The keyword search identified 904 records; of these, 119 fulfilled the inclusion criteria. The overall prevalence of suspected abuse of dogs and cats was 119 of 13,322 (0.89%) necropsy cases. Of the 119 cases that met inclusion criteria, 73 (61.3%) were dogs and 46 (38.7%) were cats. The prevalence of suspected abuse did not differ significantly ($P = 0.75$) between dogs (73/8,417 [0.87%]) and cats (46/4,905 [0.94%]). Sex was recorded in 107 cases (65 [60.7%] males and 42 [39.3%] females). Age was recorded for 71 animals, with a median of 1.5 years (range, 6 weeks to 13 years); 41 (58%) were known to be ≤ 2 years old. The reference population included 21,280 dogs and 5,469 cats.

History or signs (or both) consistent with neglect were identified in 62 of 119 (52.1%) cases (35 dogs and 27 cats). These findings included evidence of starvation (emaciation, substantial loss of muscle mass, and

little to no adipose tissue; 34 dogs and 19 cats), pica (8 dogs), dehydration (5 dogs and 6 cats), exposure to freezing weather ($< 0^{\circ}\text{C}$ [32°F] on the basis of history; 1 dog and 1 cat), abandonment in empty houses (3 dogs), ectoparasite (3 cats) and endoparasite (1 dog) infestation, and lack of general care or medical care (eg, chronic untreated injuries; 5 dogs and 4 cats). Ten (16.1%) cases involving cats in which neglect was suspected were known cases of hoarding.

Lesions suggestive of NAI were recorded in 71 of 119 (59.7%) cases. Findings included BFT (18 dogs and 10 cats), gunshot wounds (21 dogs and 5 cats), suspicious intoxications (4 dogs and 5 cats), drowning (1 cat), burns (1 dog and 3 cats), and strangulation or asphyxiation (1 dog and 2 cats). Sexual abuse was suspected in 1 of 119 (0.84%) cases. Seven cases included data indicating > 1 type of abuse (neglect and BFT [$n = 3$], neglect and suspicious intoxication [2], and neglect and gunshot [2]). Seven cases included > 1 subtype of NAI (BFT and asphyxiation [$n = 1$]; BFT and suspicious intoxication [3]; BFT, asphyxiation, and burns [1]; gunshot and burns [1]; and suspicious intoxication and burns [1]). In 4 cases, signs of repeated trauma were seen in the form of callus formation from previous rib fractures.

Of 73 dogs included in the study, 29 (40%) were American Staffordshire Terriers and dogs identified as pit bulls or pit bull crosses (ie, pit bull-type dogs); 9 (12%) were Labrador Retrievers, and 8 (11%) were mixed-breed dogs other than pit bull-type. The remaining dogs were of other breeds, each representing $< 3\%$ of the total, including Golden Retriever ($n = 2$), Siberian Husky (2), and 1 each of Akita, Belgian Tervuren, Boxer, Bulldog (not further specified), Bull Terrier, Chihuahua, Cocker Spaniel, Dachshund, Doberman Pinscher, German Shepherd Dog, German Shorthair Pointer, Great Dane, Jack Russell Terrier, Mastiff, Pomeranian, Poodle, Silky Terrier, Spitz, and Vizsla. Breed was unspecified for 4 dogs. Forty-two of 68 (62%) dogs with sex recorded were males and 26 (38%) were females. The median age of 43 dogs with data available was 2.5 years (range, 6 weeks to 13 years). Signs of neglect were identified in 35 of 73 (48%) cases, and lesions suggestive of NAI were found in 45 (62%) cases.

For dogs, significant associations were found between group (case group vs reference group) and age (≤ 2 years vs > 2 years). Dogs with evidence of abuse of any kind ($P < 0.001$), neglect ($P < 0.001$), any NAI ($P < 0.001$), or BFT ($P < 0.001$) and dogs shot by police ($P = 0.020$) were more likely to be ≤ 2 years old than were dogs in the reference group (**Table 1**). Significant associations were also found between group (case group vs reference group) and breed (pit bull-type vs all other breeds and mixed-breed dogs [other than pit bull-type] vs all other breeds) but not sex. Dogs with evidence of abuse of any kind ($P < 0.001$), neglect ($P < 0.001$), any NAI ($P < 0.001$), gunshot dogs ($P < 0.001$), and dogs shot by police ($P < 0.001$) were more likely to be pit bull-type dogs than were dogs in the reference

Table 1—Variables significantly ($P < 0.05$) associated with signs suggestive of abuse or neglect of dogs in a retrospective analysis of necropsy reports from the University of Minnesota VDL from February 1, 2001, to May 31, 2012.

Variable	Reference population (No. of dogs)	Case dogs (No. [%])					
		Abuse (any)	Neglect	NAI (any)	BFT	Gunshot	Shot by police
Age							
≤ 2	1,091	21 (1.9)	11 (1.0)	9 (0.8)	7 (0.6)	—	2 (0.2)
> 2	20,089	22 (0.11)	6 (0.03)	15 (0.07)	8 (0.04)	—	3 (0.01)
Pit bull-type breed*							
Yes	442	29 (6.5)	21 (4.8)	10 (2.3)	—	7 (1.6)	4 (0.9)
No	20,838	44 (0.21)	14 (0.07)	25 (0.12)	—	7 (0.03)	3 (0.01)
Mixed breed†							
Yes	563	10 (1.8)	3 (0.5)	4 (0.7)	4 (0.7)	—	2 (0.35)
No	20,717	63 (0.3)	32 (0.15)	31 (0.15)	14 (0.07)	—	5 (0.02)

Within a row, percentages represent the number of case dogs in the category shown divided by the number of dogs with that same characteristic in the reference population. The reference population included 21,280 dogs with active records in the University of Minnesota Veterinary Medical Center patient registry within the 3 years prior to the analysis. Seventy-three dogs with signs suggestive of abuse were included in the study; not all dogs had all demographic data available. In the statistical analysis, dogs described as puppies were categorized as ≤ 2 years old.

*American Staffordshire Terriers and dogs identified as pit bulls or pit bull crosses. †Mixed breeds other than pit bull-type. — = Differences between groups (case dogs vs reference population) were nonsignificant for this category.

Table 2—Variables significantly ($P < 0.05$) associated with signs suggestive of abuse or neglect of cats in a retrospective analysis of necropsy reports from the University of Minnesota VDL from February 1, 2001, to May 31, 2012.

Variable	Reference population (No. of cats)	Case cats (No. [%])					
		Abuse (any)	Neglect	NAI (any)	BFT	Suspicious intoxication	Burns
Age							
≤ 2	262	26 (10.0)	19 (7.3)	7 (2.7)	5 (1.9)	3 (1.15)	2 (0.76)
> 2	5,159	9 (0.17)	3 (0.06)	7 (0.14)	3 (0.06)	2 (0.04)	0 (0)

Within a row, percentages represent the number of case cats in the category shown divided by the number of cats with that same characteristic in the reference population. The reference population included 5,469 cats with active records in the University of Minnesota Veterinary Medical Center patient registry within the 3 years prior to the analysis. Forty-six cats with signs suggestive of abuse were included in the study; not all cats had age data available. In the statistical analysis, cats reported as kittens were categorized as ≤ 2 years old.

population. Similarly, dogs with evidence of abuse of any kind ($P < 0.001$), neglect ($P = 0.014$), any NAI ($P = 0.014$), or BFT ($P = 0.001$) and dogs shot by police ($P = 0.014$) were more likely to be mixed-breed dogs than were dogs in the reference population.

The 46 cats included 29 (63%) domestic short-hair, 5 (11%) domestic medium hair, and 2 (4%) domestic long hair cats; 4 (9%) were of other breeds and 6 did not have breed specified. Twenty-three of 39 (59%) cats with sex recorded were males and 16 (41%) were females. Age data were available for 28 cats, with a median age of 0.7 years (range, 6 weeks to 6 years), and 20 (71%) were ≤ 2 years of age. Among cats, significant associations were found between group (case group vs reference group) and age (≤ 2 years vs > 2 years). Cats with evidence of abuse of any kind ($P < 0.001$), neglect ($P < 0.001$), any NAI ($P < 0.001$), BFT ($P < 0.001$), suspicious intoxications ($P = 0.001$), and burns ($P = 0.002$) were more likely to be ≤ 2 years old than were cats in the reference population (**Table 2**). There was no significant association between group and sex or breed for this species.

Of the 119 cases, 51 (42.9%) were submitted by a veterinarian or the pet owner, 30 (25.2%) were sub-

mitted by animal control personnel, 22 (18.5%) were received from humane societies and rescue organizations, and 16 (13.4%) were received from law enforcement agencies.

Discussion

To the authors' knowledge, the study reported here was the first to evaluate the frequency of dogs and cats with signs suggestive of animal abuse submitted to a VDL in the United States. The prevalence of cases involving suspected abuse was 119 of 13,322 (0.89%) necropsies. The most frequent type of suspected abuse in the population investigated was classified as NAI (71/119 [59.7%]), followed by neglect (62 [52.1%]). Signs suggestive of sexual abuse were identified in only 1 case. The most common type of suspected abuse in dogs was NAI (45/73 [62%]); in cats, neglect and NAI were identified with nearly the same frequency (27/46 [59%] and 26/46 [57%], respectively). Most cases involved dogs (73/119 [61.3%]), although the prevalence of suspected cases of abuse in cats (46/4,905 [0.94%]) was similar to that of dogs (73/8,417 [0.87%]) on the basis of the total number of necropsies.

Seven cases included evidence of > 1 type of abuse, and 7 indicated > 1 type of NAI. Neglect was interpreted as cases where basic necessities of life (food, water, and shelter) or appropriate veterinary care were not provided, leading to chronic injuries, debilitation, or death. Emaciation, when diagnosed as the cause of death and if not accompanied by an inflammatory, infectious, neoplastic, or congenital condition, was attributed to starvation and thus a possible case of neglect. All cases of pica were associated with emaciation, indicating that, in these cases, the indiscriminate ingestion of nonfood items, such as plastic, rocks, dirt, and wood, was attributable to starvation.⁸

A reported feature of abuse in animals is repeated injuries.⁸ In 4 cases in our study population, signs of repeated trauma were identified, increasing the index of suspicion for abuse. All of these cases involved NAIs, including 1 in which evidence consistent with sexual abuse was identified. Rib fractures with callus formation were seen in all of these cases, indicating a previous event where the animal was subjected to BFT.

There were 4 cases in which animals were burned; all cases appeared to have been thermal burns caused by fire. Injuries caused by fire include burns and smoke inhalation. Death in smoke inhalation victims can be caused by carbon monoxide poisoning, smoke toxicosis, thermal damage to the airways or the body, or a combination of these factors.⁸ There was 1 case among the reports evaluated where the body was found at the scene of an arson investigation. The animal had external burns but the cause of death was determined to be most likely related to smoke inhalation.

Three cases of possible strangulation or asphyxiation were reported. In 1 case, there were circulatory changes of the neck and head involving the subcutaneous tissue, musculature, airway, and esophagus as well as disruption of thyrohyoid-thyroid cartilage junctions, which was highly suggestive of strangulation. In a different case, the record specified that the animal had been hit by a falling object and was subsequently choked (reportedly to end its suffering); the necropsy findings supported the occurrence of BFT to the head, and although there was no clear evidence of strangulation, it could not be ruled out as a contributing cause of death. In the third case, the report indicated that an aggressive dog had reportedly been stunned with a stun gun and its head was secured with a noose pole, at which point it died. Ecchymotic hemorrhage was observed at the bases or angles of the left and right mandibles, salivary glands, and subcutaneous tissues adjacent to these locations. There was also a 10- to 15-cm region of hemorrhage along the border of connective tissue joining the trachea and esophagus, immediately distal to the epiglottis.

In 7 of 26 cases involving gunshot, the shooting of dogs was reportedly done by law enforcement officers. The history in those cases was not always complete. Some animals were shot when police entered a residence; others were reportedly shot because of aggressive behavior, and one, reportedly, had been

roaming in its yard. Given the limited history and unknown reliability of the information provided in cases where the animals were not submitted by the law enforcement agencies or officers as well as a lack of information on the crime scene, these cases were included in the study. The destruction or killing of an animal can have several consequences, and failure to do so humanely may lead to allegations of animal cruelty.⁹ There are many states that have approved emergency euthanasia laws permitting law enforcement officers, animal control agents, and others to euthanize or shoot an animal in an emergency if the animal is considered dangerous, injured, or sick beyond treatment. Minnesota statutes do not have such a provision for dogs. Minnesota statutes regulate that the destruction of an animal shall be done in a humane manner but not before the owner has had the opportunity for a hearing before an impartial decision maker.¹²

Three records evaluated in the study had aspects of case history that raised concerns about the possibility of acts committed in the context of interpersonal violence (child abuse, domestic violence, or elder abuse). More specifically, 1 case included mention of a domestic issue in the history; another indicated that the owner and her children reported seeing the suspect beat the dog (which was found dead from BFT) on 2 other occasions. One case history indicated that the dog had been mistreated during an altercation. Animals are sometimes used by violent and abusive people to control or intimidate their human victims.¹³ Another concern is that people with a history of violence toward animals have been found to be at higher risk of being violent to other people.¹⁴ Domestic violence can be a physical or psychological harm experienced by one person caused by another with whom an intimate relationship is shared; there is increased recognition that this violence can include the emotional and physical abuse of household pets. The effects of domestic violence are greater when there is animal abuse, particularly if it happens in front of children.¹⁵

Nine cases of suspicious intoxications were included in the study according to the limited history provided. It is necessary to consider that intentional poisoning may be mistakenly assumed when in fact the animals are exposed to toxic agents in the environment; by definition, intentional poisonings include malicious intent or misuse of a toxic substance.⁸ Of the 9 cases, 4 involved ethylene glycol toxicosis, 2 involved rodenticide toxicosis, and 1 each involved strychnine intoxication, lead intoxication, and smoke inhalation.

In the 1 suspected drowning case identified, the cat was in good body condition with a diffusely wet coat and no evidence of any traumatic injury. Examination of the thoracic cavity revealed a fair amount of clear fluid and diffusely wet and heavy lungs; abundant amounts of clear foamy liquid were present in the tracheobronchial tree and pulmonary parenchyma, all of which could support that death occurred by drowning.

Only 1 case was classified as sexual abuse. This involved a dog with NAI affecting the anus and rectum. The low incidence might be attributable to the fact that animal sexual abuse is a sensitive and uncomfortable issue and it usually ends in silence and inaction; although recognized, it is rarely documented.¹⁶

Twenty-two dog breeds were represented in our study, as well as mixed-breed dogs. Pit bull-type dogs, including American Staffordshire Terriers and dogs identified as pit bulls or pit bull crosses, were most frequently included ($n = 29$) in potential abuse cases, followed by Labrador Retrievers (9) and mixed-breed dogs (other than pit bull-type; 8). Other investigators found that, in the United Kingdom, miscellaneous crossbred dogs, Staffordshire Bull Terriers and their crosses, and English Bull Terriers were at higher risk of injuries suspicious for abuse than were other dog breeds; however, they also found that Labrador Retrievers had a significantly lower risk for this finding than other breeds.¹¹ Cats in the present study were largely represented by the domestic shorthair breed ($n = 29$), and this was consistent with findings in the aforementioned study.¹¹

Although the proportions of male dogs (42/68 [62%]) and cats (23/39 [59%]) in the present study and of males overall (65/107 [60.7%]) were somewhat higher than those of females, for both dogs and cats, sex was not significantly associated with any type of abuse or neglect. The previously described study¹¹ in the United Kingdom found 136 of 194 (70%) dogs and 64 of 122 (52%) cats to be males; also, the proportion of potentially abused animals < 2 years of age was 125 of 199 (63%) for dogs and 93 of 132 (70%) for cats.¹¹ In our study, 41 of 71 (58%) case animals were ≤ 2 years of age. Analyzed separately, 21 of 43 (49%) dogs and 20 of 28 (71%) cats were ≤ 2 years of age.

The number of cases in the present study that were part of legal investigations was unclear because many of the reports did not include background information that would allow such analysis. Additionally, veterinary pathologists might not be informed when legal action is taken, and the VDL where the study was performed did not have records indicating whether pathologists were subpoenaed.

Several limitations were identified in the present study. Owing to the lack of standardization in nomenclature and a nonexhaustive list of keywords used in the records search, it was likely that not all cases of animals with possible signs of abuse were identified. Many of the reports that met the inclusion criteria were missing important demographic information such as breed and age of animals. A few reports included multiple animals in a single necropsy report, with findings reported to be the same for all of them; each of those records was counted as representing a single animal to avoid overestimating the prevalence of abuse. A lack of recognition of indicators of abuse could also have resulted in cases that could not be retrieved with the search criteria used. Additionally, the search criteria could have been too broad, which might have resulted in the inclusion

of accidental injuries that were erroneously classified as NAI, or similarly, chronic cases of natural disease could have been erroneously classified as neglect. The reference population used in the present study might not have been an accurate representation of the dog and cat population of the area, as it was extracted from the patient database of a large but tertiary referral hospital.

Successful prosecution of animal cruelty is still a challenge; one of the barriers to that success is the lack of sufficient scientific evidence. Inconsistent definitions of terms also represent a challenge in animal cruelty cases; legally, for animal cruelty statute purposes, the definition of the terms commonly used to define abuse, cruelty, neglect, and even what is considered an animal varies among different jurisdictions. The requirement for reporting evidence of potential animal abuse to authorities also varies from state to state. Mandatory or discretionary reporting may or may not be accompanied by absolute or relative immunity from civil and criminal liability for an individual making the report in good faith. States that do not offer immunity may inadvertently discourage the reporting of animal abuse by veterinary professionals.

Veterinary professionals have an undoubtedly crucial role in the investigation and prosecution of crimes against animals. They are in a position to recognize and report suspected cases of abuse, can provide medical expertise during investigations, and may be called on to serve as expert witnesses in a trial.³ The importance of this role goes beyond the successful prosecution of an individual perpetrator; veterinarians are among the professionals who can come into contact with this societal issue, and as such, have a responsibility to help prevent violence against animals and humans.

Problems associated with reporting acts or evidence of violence against animals include inability or unwillingness to identify the problem because of concerns about lawsuits and criminal prosecution. The issues in question may be addressed in different ways; some can be ameliorated by training and continuing education, whereas others require changes in statutes to provide guarantees to those who report cases of suspected abuse in good faith. Recognition by professional associations and regulatory bodies that veterinarians are instrumental in efforts to better address issues of violence against animals and interpersonal violence led to the establishment of rules and guidelines regarding the reporting of such crimes by veterinarians to appropriate authorities. In the United States, the AAHA and the AVMA have positioned themselves in support of reporting animal abuse to the authorities.^{5,6}

Veterinarians should be aware that it is not their responsibility to prove abuse, but to provide relevant veterinary evidence.¹ Veterinarians are not responsible for diagnosing abuse, but they are responsible for sharing their concerns appropriately; once a report of suspected abuse has been made, the investigating agency may request the veterinarian's assistance.²

The findings of this retrospective study, because it was solely based on necropsy data and limited history in the records, should be viewed from the perspective of identifying lesions that could be found in potential animal abuse cases. Medical findings are not in and of themselves indicative of animal abuse; there can be a number of explanations for clinical signs and examination findings, and various combinations of these factors increase the index of suspicion for abuse.^{1,2} The recognition of these cases may help to fulfill not only a professional requirement but also a new and important societal role of veterinarians.

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Footnotes

- a. R: a language and environment for statistical computing, version 3.3.1, R Foundation for Statistical Computing, Vienna, Austria. Available at: www.r-project.org/. Accessed Jun 1 2016.

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