Undesirable behaviours in young dogs in England commonly result in mortality

Paul McGreevy

Sydney School of Veterinary Science, University of Sydney, NSW, Australia

THE UNIVERSITY OF
SYDNEY

› Software patch in Practice Management Software (PMS)

› Effortless reporting

› Sustainable

vetcompass.com.au

THE UNIVERSITY OF SYDNEY

› HREC approval to collect and interrogate data

› Opt-out for clients

› From over 200 clinics

› records of **dogs**, **cats** and **horses**

› **patient demographics**: species, breed, colour, date of birth, sex, neuter status, microchip number, insurance status, bodyweight measurements and owner's postcode

› **clinical information**: clinical notes including presenting complaint and diagnosis, treatment, cost and deceased status with relevant dates

Species	Number of individual animals (2008-2017)
› Cats	→ 894,172
› Dogs	→ 2,180,527
› Horses	→ 131,682

The full story

Clinic consultation (notes entered as usual)

Automatic uploads of de-identified data

Data stored securely in centralised repository

University researchers analyse data

Results published and disseminated

More accurate and detailed information available for clinicians and student training

Benefits
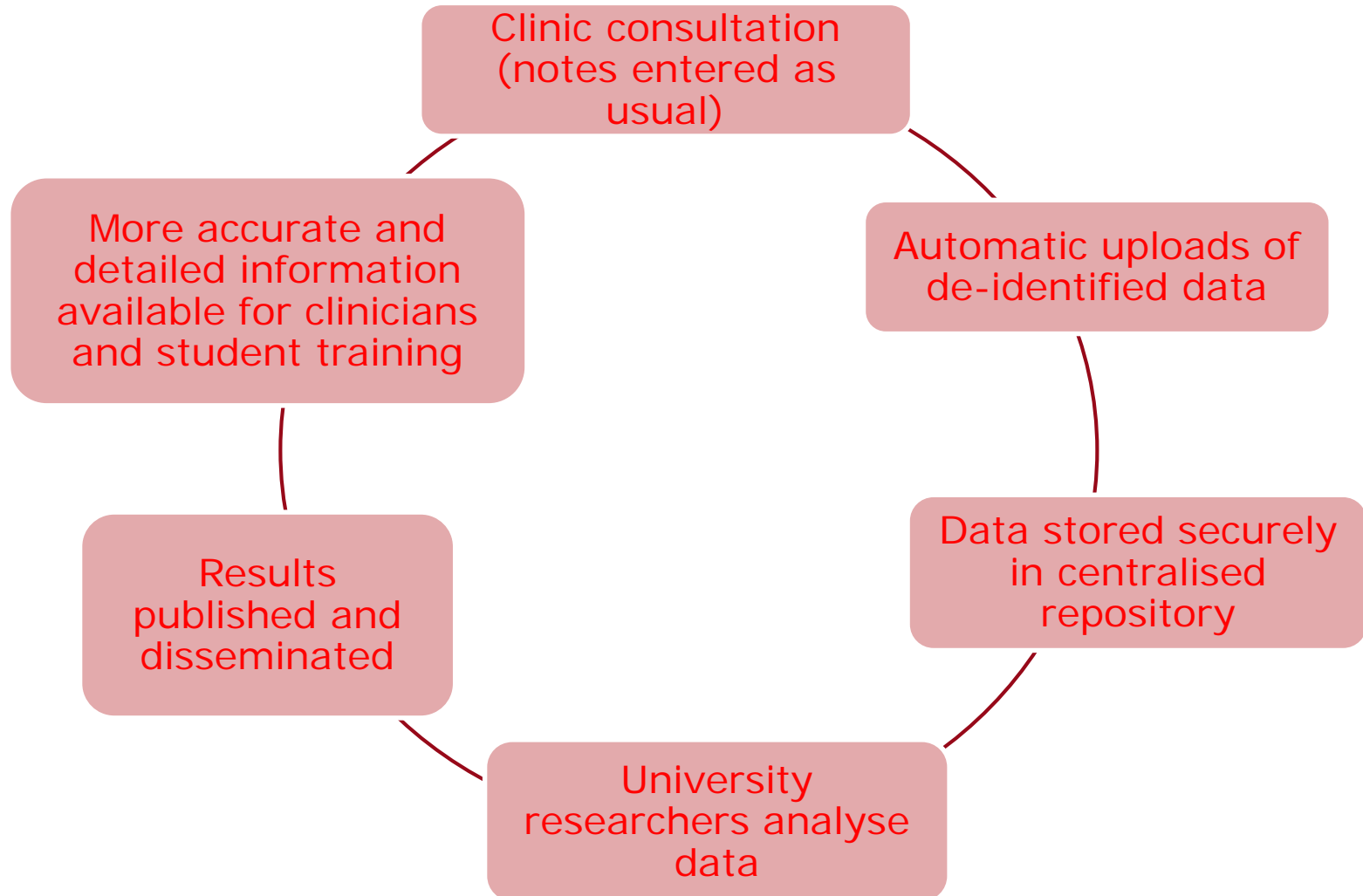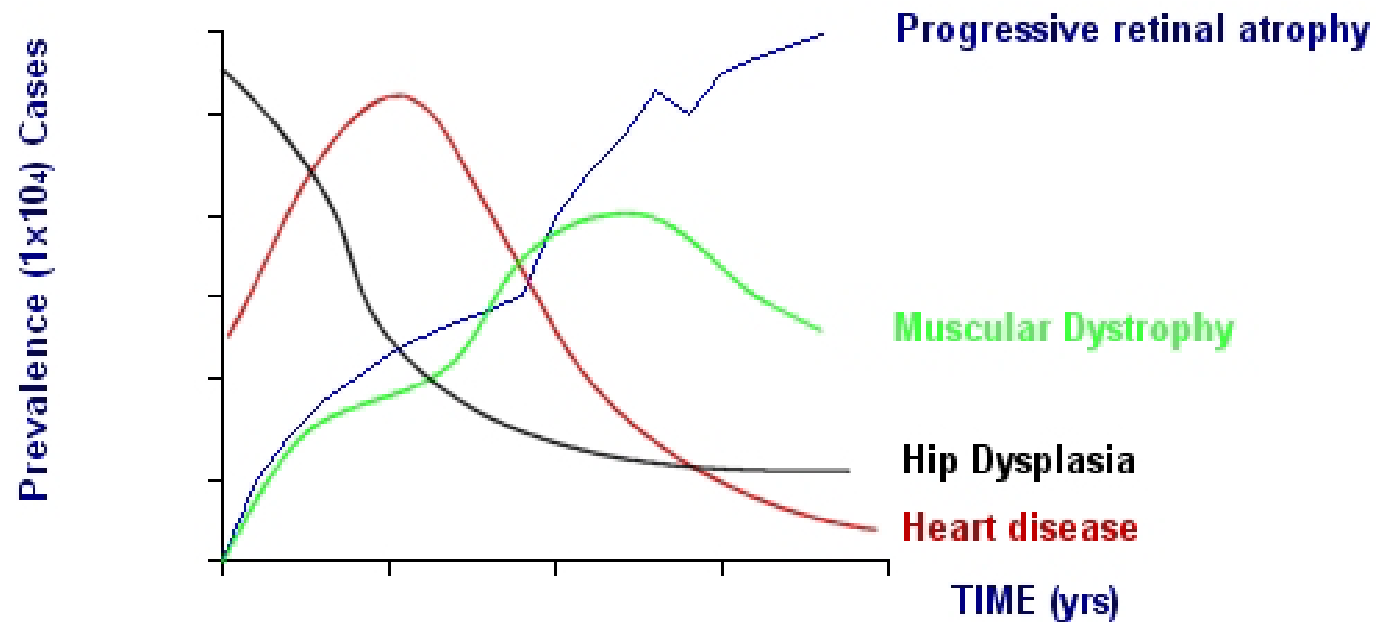
› veterinarians benefit by having access to local current data

› potential purchasers can make informed decisions when buying puppies and kittens.

› researchers obtain access to data with opportunities to conduct studies and publish results

› breeders can recognise which unwelcome traits are increasing and which are being successfully reduced.

Review

Getting priorities straight: Risk assessment and decision-making in the improvement of inherited disorders in pedigree dogs

Lisa M. Collins [a,*], Lucy Asher [b], Jennifer Summers [c], Paul McGreevy [d]

[a] School of Biological Sciences, Queen's University Belfast, Medical Biology Centre, 97 Lisburn Road, Belfast BT9 7AL, Northern Ireland, UK
[b] School of Veterinary Medicine and Science, University of Nottingham, Sutton Bonington Campus, Loughborough LE12 5RD, UK
[c] Royal Veterinary College, Hawkshead Campus, Hawkshead Lane, North Mymms, Hatfield AL9 7TA, UK
[d] Faculty of Veterinary Science, University of Sydney, Sydney, NSW 2006, Australia

ARTICLE INFO

ABSTRACT

The issue of inherited disorders in pedigree dogs is not a recent phenomenon and reports of suspected genetic defects associated with breeding practices date back to Charles Darwin's time. In recent years, much information on the array of inherited defects has been assimilated and the true extent of the problem has come to light. Historically, the direction of research funding in the field of canine genetic disease has been largely influenced by the potential transferability of findings to human medicine, economic benefit and importance of dogs for working purposes. More recently, the argument for a more canine welfare-orientated approach has been made, targeting research efforts at the alleviation of the most suffering in the greatest number of animals.

A method of welfare risk assessment was initially developed as a means of objectively comparing, and thus setting priorities for, different welfare problems. The method has been applied to inherited disorders in pedigree dogs to investigate which disorders have the greatest welfare impact and which breeds are most affected. Work in this field has identified 396 inherited disorders in the top 50 most popular breeds in the UK. This article discusses how the results of welfare risk assessment for inherited disorders can be used to develop strategies for improving the health and welfare of dogs in the long term. A new risk assessment criterion, the Breed-Disorder Welfare Impact Score (BDWIS), which takes into account the proportion of life affected by a disorder, is introduced. A set of health and welfare goals is proposed and strategies for achieving these goals are highlighted, along with potential rate-determining factors at each step.

Introduction

Selective breeding of dogs for human needs and aesthetics has a rich history that speaks of considerable commitment by breeders and has led to the domestic dog becoming the most morphologically diverse mammalian species (Boyko et al., 2010). The process of selective breeding was formalised with the founding of the UK Kennel Club (KC) in 1873, which introduced and has maintained written templates, the breed standards that define in detail the conformation, temperament, coloration and other traits that characterise a breed. Over 100 countries worldwide have since adopted the KC system for the registration of pedigree dogs. More than 200 breeds are now defined by a KC standard in the UK and 161 breeds are recogni-

any inherited disorders that arise. Nevertheless, breeding to conform to breed standards has been harmful for some breeds of dogs, with recent research showing that each of the top 50 breeds are predisposed to at least one disorder linked to their conformation (Asher et al., 2009). This may occur for two main reasons:

(1) Some individual breed standards stipulate morphological features which, when taken to extremes, are deleterious to health. These include brachycephaly or chondrodysplasia, which are a feature of more than a dozen breeds, including the Basset Hound, Dachshund, Corgi and Pekingese (Parker et al., 2009). Other standards specify very long ears, domed heads, long backs, screw tails, great or very small body size,

A possible next step could be the calculation of Breed-Disorder Welfare Impact Scores (BDWIS), to take into account the duration of the disorder as a proportion of the dog's life, which would be calculated as follows:

$$BDWIS = Prevalence \times Severity \times Proportion\ of\ life\ afflicted$$

Longevity and mortality of owned dogs in England

D.G. O'Neill [a,*], D.B. Church [b], P.D. McGreevy [c], P.C. Thomson [c], D.C. Brodbelt [a]

[a] Veterinary Epidemiology, Economics and Public Health, The Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Herts AL9 7TA, UK
[b] Small Animal Medicine and Surgery Group, The Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Herts AL9 7TA, UK
[c] R.M.C. Gunn Building (B19), Faculty of Veterinary Science, The University of Sydney, NSW 2006, UK

ARTICLE INFO

ABSTRACT

Improved understanding of longevity represents a significant welfare opportunity for the domestic dog, given its unparalleled morphological diversity. Epidemiological research using electronic patient records (EPRs) collected from primary veterinary practices overcomes many inherent limitations of referral clinic, owner questionnaire and pet insurance data. Clinical health data from 102,609 owned dogs attending first opinion veterinary practices ($n = 86$) in central and southeast England were analysed, focusing on 5095 confirmed deaths.

Of deceased dogs with information available, 3961 (77.9%) were purebred, 2386 (47.0%) were female, 2528 (49.8%) were neutered and 1105 (21.7%) were insured. The overall median longevity was 12.0 years (IQR 8.9–14.2). The longest-lived breeds were the Miniature poodle, Bearded collie, Border collie and Miniature dachshund, while the shortest-lived were the Dogue de Bordeaux and Great Dane. The most frequently attributed causes of death were neoplastic, musculoskeletal and neurological disorders. The results of multivariable modelling indicated that longevity in crossbred dogs exceeded purebred dogs by 1.2 years (95% confidence interval 0.9–1.4; $P < 0.001$) and that increasing bodyweight was negatively correlated with longevity. The current findings highlight major breed differences for longevity and support the concept of hybrid vigour in dogs.

Table 3

Frequent attributed causes of death for dogs that attended primary veterinary practices in England and died at <3 years of age ($n = 489$) and at $\geqslant 3$ years ($n = 4606$), ranked by the number of attributed deaths.

Attributed cause of death	Age at death <3 years		Age at death $\geqslant 3$ years	
	Rank	No. deaths	Rank	No. deaths
Behavioural abnormality	1	72 (14.7%)	10	130 (2.8%)
Gastrointestinal (GIT)	2	71 (14.5%)	5	261 (5.7%)
No cause recorded	3	65 (13.3%)	2	596 (13.0%)
Road traffic accident (RTA)	4	62 (12.7%)		
Neurological	5	36 (7.4%)	4	533 (11.6%)
Trauma	6	32 (6.5%)		
Congenital defect	7	24 (4.9%)		
Respiratory	8	18 (3.7%)	7	179 (3.9%)
Cardiac	9	13 (2.7%)	6	252 (5.5%)
Dangerous Dogs Act 1991[a] decision	10	12 (2.5%)		
Collapse	11	10 (2.0%)	8	176 (3.8%)
Neoplastic	12	10 (2.0%)	1	831 (18.2%)
Anorexia/losing weight	13	9 (1.8%)	11	114 (2.5%)
Musculoskeletal	14	8 (1.6%)	3	567 (12.4%)
Renal/urinary	15	7 (1.4%)	9	171 (3.7%)
Incontinence			13	94 (2.1%)
Abdominal (non-GIT)			14	75 (1.6%)
Reproductive			15	54 (1.2%)
Diabetes mellitus			16	50 (1.1%)

[a] See: http://www.legislation.gov.uk/ukpga/1991/65/contents.

Undesirable behaviours in young dogs in England commonly result in mortality

› to determine the **proportional mortality** due to an unwelcome behaviour (UB)

› to identify **risk factors** for mortality due to UBs (including RTAs) in dogs aged under three years of age attending primary-care veterinary practices in England.

› to identify dog **breeds or type** (notably size) associated with increased mortality due to UBs,

› to characterise the UBs and describe their **clinical management**.

An **undesirable behaviour** was defined as any behavioural attribute that was recorded in the clinical notes and which the owner and/or other people deemed to be unwelcome.

RTA was included as a **UB**.

The **case definition for UB mortality** required that the stated

cause of death included either:

i)   a stated cause of death from a UB; or

ii)   death resulting from RTA.

- There are an estimated 5,000 clinics in the UK.

- Our overall sampling frame comprised 264,259 dogs attending 127 clinics.

- Of these, 41,280 were recorded as "deactivated" overall with 7,882 of these recorded as deactivated prior to three years of age.

Reasons for deactivation of the dogs that were <u>not confirmed deaths</u> included dogs that were :

- re-homed, or

- belonging to owners who moved away,

- switched practices or were

- bad debtors.

- Manual EPR evaluation of all of these **7,882** records confirmed that **1,574** were records for single dogs that had died aged under three years of age.

› Of the 1,574 deaths, the mechanism of death was not recorded for 109 (6.9%) of deaths.

› Of the remaining deaths, **984** (76.2%) were by euthanasia and **481** (32.8%) were unassisted.

'Bodyweight' described the maximum bodyweight recorded during the study period and was categorized into six groups:

- 0.0–9.9 kg,

- 10.0–19.9 kg,

- 20.0–29.9 kg,

- 30.0–39.9 kg,

- ≥ 40.0 kg,

- not recorded

- Aggressive
- Anxious/Nervous
- Destructive
- Dog Attack
- Excessive vocalisation
- Hyper-excitability
- Hyper-sexuality
- Inappropriate elimination
- Inter-family conflict
- Inter-pet conflict
- Limited training

- Owner can't cope
- RTA
- Unidentified Behaviour
- Limited examination

- Was pharmacological therapy tried?

- Was neutering due to behaviour?

- Did the owner seek referred solution?

- Did the vet advise referral?

- Did the owner attempt to rehome the dog before death?

Table 1 Descriptive and univariable logistic regression results for risk factor (bodyweight, age at death, sex, neuter status and insurance status) associations with deaths that were or were not ascribed to undesirable behaviour (UB) among dogs attending primary-care veterinary practices in England that died before three years of age (n = 1,574).

Variable	Category	UB number (%)	Non-UB number (%)	Odds ratio	95% CI	P-value
Bodyweight (kg)	< 10.0	107 (22.6)	307 (32.9)	Base		
	10.0–19.9	60 (12.7)	115 (12.3)	1.50	1.02–2.19	0.038
	20.0–29.9	55 (11.6)	84 (9.0)	1.88	1.25–2.82	0.002
	30.0–39.9	34 (7.2)	49 (5.3)	1.99	1.22–3.25	0.006
	≥ 40.0	10 (2.1)	29 (3.1)	0.99	0.47–2.10	0.978
	Not recorded	208 (43.9)	349 (37.4)	1.71	1.29–2.26	< 0.001

Table 1 Descriptive and univariable logistic regression results for risk factor (bodyweight, age at death, sex, neuter status and insurance status) associations with deaths that were or were not ascribed to undesirable behaviour (UB) among dogs attending primary-care veterinary practices in England that died before three years of age (n = 1,574).

Variable	Category	UB number (%)	Non-UB number (%)	Odds ratio	95% CI	P-value
Bodyweight (kg)	< 10.0	107 (22.6)	307 (32.9)	Base		
	10.0–19.9	60 (12.7)	115 (12.3)	1.50	1.02–2.19	0.038
	20.0–29.9	55 (11.6)	84 (9.0)	1.88	1.25–2.82	0.002
	30.0–39.9	34 (7.2)	49 (5.3)	1.99	1.22–3.25	0.006
	≥ 40.0	10 (2.1)	29 (3.1)	0.99	0.47–2.10	0.978
	Not recorded	208 (43.9)	349 (37.4)	1.71	1.29–2.26	< 0.001
Age at death (years)	< 1.0	112 (23.9)	559 (60.4)	Base		
	1.0– < 2.0	190 (40.6)	189 (20.4)	5.02	3.77–6.68	< 0.001
	2.0– < 3.0	166 (35.5)	178 (19.2)	4.65	3.47–6.24	< 0.001
Sex	Female	171 (36.2)	422 (46.2)	Base		
	Male	302 (63.9)	491 (53.8)	1.52	1.21–1.91	< 0.001

Table I   Descriptive and univariable logistic regression results for risk factor (bodyweight, age at death, sex, neuter status and insurance status) associations with deaths that were or were not ascribed to undesirable behaviour (UB) among dogs attending primary-care veterinary practices in England that died before three years of age (n = 1,574).

Variable	Category	UB number (%)	Non-UB number (%)	Odds ratio	95% CI	P-value
Bodyweight (kg)	< 10.0	107 (22.6)	307 (32.9)	Base		
	10.0–19.9	60 (12.7)	115 (12.3)	1.50	1.02–2.19	0.038
	20.0–29.9	55 (11.6)	84 (9.0)	1.88	1.25–2.82	0.002
	30.0–39.9	34 (7.2)	49 (5.3)	1.99	1.22–3.25	0.006
	≥ 40.0	10 (2.1)	29 (3.1)	0.99	0.47–2.10	0.978
	Not recorded	208 (43.9)	349 (37.4)	1.71	1.29–2.26	< 0.001
Age at death (years)	< 1.0	112 (23.9)	559 (60.4)	Base		
	1.0– < 2.0	190 (40.6)	189 (20.4)	5.02	3.77–6.68	< 0.001
	2.0– < 3.0	166 (35.5)	178 (19.2)	4.65	3.47–6.24	< 0.001
Sex	Female	171 (36.2)	422 (46.2)	Base		
	Male	302 (63.9)	491 (53.8)	1.52	1.21–1.91	< 0.001
Neuter	Entire	36 (7.6)	118 (12.7)	Base		
	Neutered	117 (24.7)	111 (11.9)	3.45	2.19–5.44	< 0.001
	Not recorded	321 (67.7)	704 (75.5)	1.49	1.01–2.22	0.047

Table 2 Descriptive and univariable logistic regression results for risk factor (purebred status, breed and Kennel Club [KC] Breed Group) associations with deaths that were or were not ascribed to undesirable behaviour (UB) among dogs attending primary-care veterinary practices in England that died before three years of age (n = 1,574).

Variable	Category	UB number (%)	Non-UB number (%)	Odds ratio	95% CI	P-value
Purebred status	Purebred	347 (73.4)	734 (78.8)	Base		
	Crossbred	126 (26.6)	198 (21.2)	1.35	1.04–1.74	0.024
Breed	Labrador Retriever	12 (2.5)	39 (4.2)	Base		
	Boxer	0 (0.0)	20 (2.2)	~	~	~
	Staffordshire Bull Terrier	92 (19.5)	75 (8.1)	3.99	1.95–8.15	< 0.001
	Cocker Spaniel	20 (4.2)	19 (2.0)	3.42	1.39–8.43	0.008
	West Highland White Terrier	6 (1.3)	7 (0.8)	2.79	0.78–9.90	0.113
	Jack Russell Terrier	34 (7.2)	49 (5.3)	2.26	1.03–4.92	0.041
	Crossbred	126 (26.6)	198 (21.2)	2.07	1.04–4.10	0.037
	Husky	6 (1.3)	11 (1.2)	1.77	0.54–5.81	0.344
	Rottweiler	11 (2.3)	21 (2.3)	1.70	0.64–4.51	0.285
	Cavalier King Charles Spaniel	8 (1.7)	17 (1.8)	1.53	0.53–4.42	0.432
	English Springer Spaniel	5 (1.1)	11 (1.2)	1.48	0.43–5.10	0.537
	American Pit Bull Terrier	8 (1.7)	19 (2.0)	1.37	0.48–3.91	0.558
	Border Collie	9 (1.9)	22 (2.4)	1.33	0.48–3.65	0.580
	Other purebreds	78 (16.5)	201 (21.6)	1.26	0.63–2.53	0.515
	German Shepherd Dog	14 (3.0)	36 (3.9)	1.26	0.52–3.09	0.608
	Shih-Tzu	10 (2.1)	27 (2.9)	1.20	0.46–3.18	0.709
	Yorkshire Terrier	13 (2.8)	39 (4.2)	1.08	0.44–2.67	0.862
	Chihuahua	11 (2.3)	44 (4.7)	0.81	0.32–2.05	0.660
	Bulldog	4 (0.9)	22 (2.4)	0.59	0.17–2.06	0.408
	Dogue de Bordeaux	3 (0.6)	17 (1.8)	0.57	0.14–2.30	0.432
	French Bulldog	2 (0.4)	19 (2.0)	0.34	0.07–1.68	0.187
	Pug	1 (0.2)	19 (2.0)	0.17	0.02–1.41	0.101

Table 3 Prevalence of the most common groups of undesirable behaviours (UBs) recorded as contributing to deaths from a UB among dogs attending primary-care veterinary practices in England that died before three years of age with an ascribed cause (n = 474).

Undesirable behaviour	N (%)	95% CI
Aggression	256 (54.0)	49.4–58.6
Road Traffic Accident (RTA)	185 (39.0)	34.6–43.6
Inter-pet conflict	31 (6.5)	4.5–9.2
Dog attack	28 (5.9)	4.0–8.4
Anxious/nervous	25 (5.3)	3.4–7.7
Restraint required for vet examination	24 (5.1)	3.3–7.4
Hyper-excitability	9 (1.9)	0.9–3.6
Limited training	9 (1.9)	0.8–3.4
Destructive	7 (1.5)	0.6–3.0
Excessive vocalisation	5 (1.1)	0.3–2.4
Hypersexuality	4 (0.8)	0.2–2.1
Inappropriate elimination	4 (0.8)	0.2–2.0
Owner unable to cope	1 (0.2)	0.0–1.2
Other or undiagnosed behaviours	20 (4.2)	2.6–6.4

Note that some deaths had multiple contributory UBs ascribed.

› Aggression is the most prevalent UB group and of the dogs that died due to a UB:

› 100% of Rottweilers,

› 100% of Bulldogs,

› 88.9% of Border Collies,

› 71.4% of German Shepherd Dogs,

› 73.9% of Staffordshire Bull Terriers and

› 53.2% of crossbreds in the study died due to aggression.

Mortality resulting from undesirable behaviours in dogs aged under three years attending primary-care veterinary practices in England

C Boyd*†, S Jarvis†‡, PD McGreevy§, S Heath#, DB Church¶, DC Brodbelt¥ and DG O'Neill¥

† Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush EH25 9RG, UK
‡ SRUC, West Mains Road, Edinburgh EH9 3JG, UK
§ Sydney School of Veterinary Science, The University of Sydney, NSW 2006, Australia
# Behavioural Referrals Veterinary Practice, 10 Rushton Drive, Upton, Chester CH2 1RE, UK
¶ Clinical Sciences and Services, The Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Herts AL9 7TA, UK
¥ Production and Population Health, The Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Herts AL9 7TA, UK
* Contact for correspondence and requests for reprints: caitlinboyd25@gmail.com

Abstract

Undesirable behaviours (UBs) are common in dogs and can jeopardise animal and human health, leading to dog abandonment and euthanasia. Dogs exhibiting UBs may have compromised welfare from underlying emotional motivations for the behaviour (eg anxiety) or from the methods used by owners to resolve the problem (eg aversive techniques). The objective of this study was to estimate proportional mortality due to UBs and risk factors for death due to UBs, including death from road traffic accidents, in dogs under three years of age attending primary-care veterinary practices in England from 2009–2014. Cases were identified by searching de-identified electronic patient records from primary-care veterinary practices participating in the VetCompass Programme. The findings highlight that dogs under three years of age are at a proportionately high risk of death due to UBs (33.7%) compared with other specific causes of death (eg gastrointestinal issues:14.5%). Male dogs had 1.40× the odds of death from UB compared with females. The proportional mortality from UB for male dogs where information on the cause of death was available was 0.41. Neutered dogs had 1.94× the odds of death due to a UB compared with entire dogs. Aggression was the most prevalent UB overall. Veterinarians had recommended referral in 10.3% of cases where dogs died due to exhibiting a UB and had dispensed nutraceutical, pheromone or pharmacological treatment to 3.0% of the UB cases that died. This study shows that undesirable behaviours require better preventive measures and treatment, through further research and education of veterinarians, other professionals within the dog industry and owners.

Keywords: animal welfare, behaviour, canine, epidemiology, euthanasia, VetCompass

Introduction

Dogs are the most common mammalian companion animal in the UK, with an estimated 24% of households owning a

and the human's expectations of how a dog should behave (Jagoe & Serpell 1996). This underlines the importance of veterinary and behaviourist input for dogs suspected of

1,574 dogs that died under 3 years of age

Mortality resulting from undesirable behaviours in dogs aged under three years attending primary-care veterinary practices in England

C Boyd*†, S Jarvis†‡, PD McGreevy§, S Heath#, DB Church¶, DC Brodbelt¥ and DG O'Neill¥

† Royal (Dick) School of Veterinary Studies, University of Edinburgh, Easter Bush EH25 9RG, UK
‡ SRUC, West Mains Road, Edinburgh EH9 3JG, UK
§ Sydney School of Veterinary Science, The University of Sydney, NSW 2006, Australia
# Behavioural Referrals Veterinary Practice, 10 Rushton Drive, Upton, Chester CH2 1RE, UK
¶ Clinical Sciences and Services, The Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Herts AL9 7TA, UK
¥ Production and Population Health, The Royal Veterinary College, Hawkshead Lane, North Mymms, Hatfield, Herts AL9 7TA, UK
* Contact for correspondence and requests for reprints: caitlinboyd25@gmail.com

Abstract

Undesirable behaviours (UBs) are common in dogs and can jeopardise animal and human health, leading to dog abandonment and euthanasia. Dogs exhibiting UBs may have compromised welfare from underlying emotional motivations for the behaviour (eg anxiety) or from the methods used by owners to resolve the problem (eg aversive techniques). The objective of this study was to estimate proportional mortality due to UBs and risk factors for death due to UBs, including death from road traffic accidents, in dogs under three years of age attending primary-care veterinary practices in England from 2009–2014. Cases were identified by searching de-identified electronic patient records from primary-care veterinary practices participating in the VetCompass Programme. The findings highlight that dogs under three years of age are at a proportionately high risk of death due to UBs (33.7%) compared with other specific causes of death (eg gastrointestinal issues:14.5%). Male dogs had 1.40× the odds of death from UB compared with females. The proportional mortality from UB for male dogs where information on the cause of death was available was 0.41. Neutered dogs had 1.94× the odds of death due to a UB compared with entire dogs. Aggression was the most prevalent UB overall. Veterinarians had recommended referral in 10.3% of cases where dogs died due to exhibiting a UB and had dispensed nutraceutical, pheromone or pharmacological treatment to 3.0% of the UB cases that died. This study shows that undesirable behaviours require better preventive measures and treatment, through further research and education of veterinarians, other professionals within the dog industry and owners.

Keywords: animal welfare, behaviour, canine, epidemiology, euthanasia, VetCompass

Introduction

Dogs are the most common mammalian companion animal in the UK, with an estimated 24% of households owning a

and the human's expectations of how a dog should behave (Jagoe & Serpell 1996). This underlines the importance of veterinary and behaviourist input for dogs suspected of

› Would targeted education of veterinarians increase their effectiveness in the management of UBs and in recognising the triggers for referral of these dogs so that they can receive appropriate help?

› Overview of interactions within and between species

› Vets and dog behaviour

› Attachment

› Arousal and affective state

› Training behaviour

› Human personality

vetcompass.com.au