Systemic glucocorticoid usage in dogs under primary veterinary care in the UK: prevalence and risk factors

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Abstract

Glucocorticoids are widely used in primary-care veterinary practices. The study aimed to quantify the usage of systemic glucocorticoids (SGC) in dogs in UK using primary-care treatment records recorded during 2013 in the VetCompass™ Programme. From a study population of 455,557 dogs, 28,472 dogs (6.2%, 95%CI 6.2-6.3) received a total of 50,971 systemic glucocorticoid therapy events in 2013. Prednisolone represented the most frequently used oral preparation (27,362 events, 90.0% of oral events). Dexamethasone sodium phosphate was the most commonly used injectable agent (12,796 events, 62.7% of injectable events). The most common breed treated was Staffordshire Bull Terriers (2,236/28,472 dogs, 7.9%, 95% CI 7.5-8.2) and within-breed prevalence of SGC usage was 2,236/32,635, 6.9%, 95% CI 6.6-7.1. The most commonly treated age group was dogs older than 8 years (8931/102, 450,8.7%) and the most commonly treated bodyweight group was 10.01 to 20.0 kg (7,918/28,472, 27.8%).

Dexamethasone and prednisolone were the most commonly prescribed SGC. Short and intermediate-acting injectable SGC were more commonly used compared to long acting injectable SGC. Older and medium size dogs were most likely to receive SGC and certain breeds appeared predisposed. These data can provide a useful benchmark for glucocorticoid usage and highlight the benefits from "Big Data" analyses.

Introduction

Glucocorticoids are a potent class of corticosteroids that are widely used in veterinary clinical management as anti-inflammatory and immunosuppressive agents, which can also induce adverse effects (1). Additional uses include treatment for allergy/anaphylaxis, hypoadrenocorticism, neoplasia (lymphoma) and brain trauma (historically). The onset, duration and glucocorticoid potency (reflected in the dose) of effect depends on both the active

substance and the formulation. There are several injectable and oral preparations available in the UK, containing corticosteroids of intermediate duration of action, such as prednisolone and methylprednisolone and long duration of action, such as dexamethasone. The duration of action of these drugs may be prolonged by their formulation (especially if injected as poorly soluble esters).

Few studies have quantified and described the usage of glucocorticoids in dogs in the UK. A study of 3 primary-care practices in England estimated that systemic glucocorticoids (SGC) were prescribed for approximately 15% of all dogs that received at least one medication (2). Of these, 1,497 (50.8%) had oral therapy, 1,227 (42.1%) had parenteral therapy and 207 (7.1%) had both oral and parenteral treatment. However, this work did not evaluate the proportion of all dogs under veterinary care that received glucocorticoid therapy, studying only those that had received some form of medication, and was based on a small sample of practices. Other work reported systemic glucocorticoid usage specifically within primary-care treatment of skin disease and reported that 162 of 795 skin cases (20%) received glucocorticoids as part of their therapeutic management (3). These previous studies were based on a small sample size and may have introduced bias and limited the generalisability of results to the wider population.

Glucocorticoid administration has been associated with various adverse effects, including vomiting, diarrhoea, weight gain or loss, polyuria, polydipsia, delayed wound healing, immunosuppression and predisposition to infection, highlighting the value of reporting on current usage in veterinary clinical practice (4). Long-term glucocorticoid treatment has been associated with increased risk of urinary tract infection (UTI) (5, 6).

However, current evidence on usage levels that are generalizable to the overall caseloads seen in primary-care practice in the UK is currently unavailable. Routine data collection over time

across a large group of practices participating within the VetCompass™ Programme would facilitate evaluation of current usage levels. This study aimed to quantify and describe the usage of glucocorticoids across a large group of primary-care veterinary practices in the UK and provide benchmark results that can assist clinical audit in general practice. The current study did not aim to evaluate the underlying conditions for SGC treatment.

Materials and methods

The study population included all dogs under primary veterinary care during 2013 at exclusively primary-care small animal practices participating in the VetCompass™ Programme. The year 2013 was selected for study because it was the latest year with that a full available demographic dataset at the time when this study started. Dogs under veterinary care were defined as those with either i) at least one electronic patient record (EPR) episode of care (summary diagnosis term, free-text clinical note, treatment or bodyweight) recorded during 2013 or ii) at least one EPR recorded both before and after 2013. The VetCompass™ Programme collates anonymised EPR data from primary-care veterinary practices in the UK for epidemiological research (7). Dataset available for the study included species, breed, date of birth, sex, bodyweight, neuter status and treatments administered and dispensed with relevant dates.

A cohort study design was used to estimate the one-year period prevalence (2013) of systemic glucocorticoid (SGC) usage in dogs under veterinary care in the UK(8, 9). Assuming a UK dog population of 8 million dogs (10), sample size calculations estimated that a sample of approximately 180,000 dogs would be required to estimate an expected 5.0% level of usage of SGC with a precision of 0.1% at a 95% confidence level (11). Ethics approval was obtained from the RVC Ethics and Welfare Committee (URN 2015 1369).

A SGC was defined as any glucocorticoid preparation administered by injection, oral tablets or oral suspension. Inclusion criteria for SGC usage required that the systemic glucocorticoid was either administered or dispensed during 2013. A comprehensive list of active substance and brand names for systemic glucocorticoids relevant to the UK companion animal veterinary market was generated by searching the Veterinary Medicines Directorate (VMD), British Small Animal Veterinary Association (BSAVA) formulary (12) and National Office for Animal Health (NOAH) veterinary products databases (13). A list of search terms was derived from these chemical and brand names that reliably identified usage for all systemic glucocorticoids within the treatment field of the VetCompass™ database (Appendix 2). Glucocorticoid case finding involved initial screening of the treatment fields of all dogs within the study population for any treatment record that may have been a SGC using these search terms. A list of animal unique identification codes for these candidate cases for SGC usage was generated and treatment data (date, drug, volume/number of tablets, dosage instructions) on all treatments of any type during 2013 were extracted from the overall VetCompass™ database to an Excel format. Duplicates from the drug field were removed and all remaining dispensing terms used were manually coded as SGC (yes/no) to create a master list of SGC dispensing terms. All treatments from every candidate dog were then classified as either SGC or non-SGC using this master dispensing term list to identify all dogs from the overall study population with at least one SGC administered or dispensed during 2013.

A new systemic glucocorticoid episode was defined as usage of a systemic glucocorticoid that was not preceded by any recorded usage of a systemic glucocorticoid during the previous 31 days. Individual dogs could have had multiple episodes of systemic glucocorticoid usage during 2013. Individual episodes of systemic glucocorticoid usage could have included the usage of multiple systemic glucocorticoids. For every SGC administration or dispensing

episode (individual dogs could have had multiple events), additional information was extracted from the EPR on the animal unique identification code and the specific systemic glucocorticoid chemical used along with the date of administration, drug strength and dosage details. Usage was described overall and also by the number of dogs receiving the different types of SGC therapy, count of SGC events by dog and by quantities administered or dispensed.

A *purebred* variable categorised all dogs of recognisable breeds as 'purebred' and the remaining dogs as 'crossbred' (14). A *breed* variable included individual breeds with 300 or more dogs receiving at least one SGC, a grouped category of all remaining purebreds and a general grouping of crossbred dogs. This approach was taken to allow focus on commonly treated breeds and to quantify usage with reasonable levels of precision (15). *A neuter* variable described the status of the dog (neutered or entire) recorded at the final EPR. A *sex* variable categorized sex as male, female or unrecorded. Age (years) was calculated at December 31st, 2013 for all dogs. An *age* variable categorised age (years) into six groups (< 2, 2.0 to < 4.0, 4.0 to < 6.0, 6.0 to < 8.0, > 8.0 and unrecorded). Adult bodyweight described the maximum bodyweight recorded during the study period for dogs older than 18 months. An *adult bodyweight* variable categorised adult bodyweight into six groups < 10.0 kg, 10.0 to < 20.0 kg, 20.0 to < 30.0 kg, 30.0 to < 40.0 kg, ≥ 40.0 kg, unrecorded).

Following data checking for internal validity and cleaning, descriptive analysis was undertaken in Excel (Microsoft Office Excel 2013, Microsoft Corp.) and Stata 14. The one-year (2013) period prevalence with 95% confidence intervals (CI) described the probability of SGC usage at least once during 2013 for all study dogs. The CI estimates were derived from standard errors based on approximation to the normal distribution for disorders with ten or more events (16). Demographic characteristics and prevalence of SGC usage in 2013 were reported by purebred

status, common breeds, sex, neuter, insurance, adult age and adult bodyweight with 95% CIs. Systemic glucocorticoid usage was classified by bodyweight and route of administration based on the dogs that received at least one treatment in 2013.

Results

The study population included 455,557 dogs under veterinary care during 2013 in the VetCompass™ database. Of these, 28,472 dogs received at least one SGC giving an overall one-year period prevalence of 6.2% (95% CI 6.2-6.3). The breeds with the highest one-year period prevalence of receiving at least one SGC were Staffordshire Bull Terriers (2,236/28,472 dogs, 7.9%, 95% CI 7.5-8.2), Labrador Retrievers (2,075/28,472, 7.3%, 95% CI 7.0-7.6), West Highland White Terriers (1,720/28,472 dogs, 6.0%, 95% CI 5.8-6.3), Jack Russell Terriers (1,705/28,472, 6.0%, 95% CI 5.7-6.3) and Cocker Spaniels (982/28,472, 3.4%, 95% CI 3.2-3.7) (Table 1). For these breeds, the prevalence of SGC usage within breed was Staffordshire Bull Terriers (2,236/32,635, 6.9%, 95% CI 6.5-7.1), Labrador Retrievers (2,075/33,321, 6.2%, 95% CI 6.0-6.5), West Highland White Terriers (1,720/12,017 dogs, 14.3%, 95% CI 13.7-14.9), Jack Russell Terriers (1,705/27,691, 6.2%, 95% CI 5.9-6.4) and Cocker Spaniels (982/15,827, 6.2%, 95% CI 5.8-6.6) (Table 2)

Of the SGC treated dogs with available data for the variable, 22,571/28,472 (79.3%, 95% CI 78.8-79.7) were purebred, 16,057/28,472 (56.4%, 95% CI 55.8-57.0) were male, 16,337/28,472 (57.4%, 95% CI 56.8-58.0) were neutered. (Table 1). From the overall population with available data, 22,571/340,767 (6.6%, 95% CI 6.5-6.7) were purebred; 16,057/234,211 (6.9%, 95% CI 6.7-7.0) were male, 16,337/205,019 (8%, 95% CI 7.8-8.1) were neutered (Table 2)

The most common age group that received SGC was more than 8 years [8,931/28,472 (31.4%, 95% CI 30.8-31.9)] and the most common weight group that received SGC was

10.01 to 20.0 kg [7,918/28,472, (27.8%, 95% CI 27.3-28.3) (Table 1). The prevalence of SGC usage within age group for more than 8 years category was [8,931/102,450, (8.7% 95% CI 8.5-8.9)] and the prevalence of SGC usage within weight group for 10.01 to 20.0 kg category was [7,918/91,594, (8.6%, 95% CI 8.5-8.8)] (Table 2).

The most common adult body weight group that received an injectable SGC was 10.1-20.0 kg (29.9%, 95% CI 29.0-30.8), followed by dogs that weighed 10.0 kg or less (29.7%, 95% CI 28.9-30.6). Similarly, dogs with 10.1-20.0 kg adult bodyweight were those that most commonly received oral SGC treatment and those that received the combination of both oral and injectable SGC (31.1%, 95%CI 30.2-32.0) and (31.4%, 95% CI 29.9-32.9) respectively. These were followed by dogs weighing 10.0 kg or less (24.2% oral, 95% CI 23.4-25.0) and (26.3% oral and injectable, 95% CI, 24.9-27.7) respectively (Table 3).

There were 50,971 unique SGC events identified during 2013 that comprised 30,570 oral and 20,401 injectable events. Of the oral usage events, prednisolone was the most frequently used agent (27,362 events, 90.0% of all oral events), followed by methylprednisolone (2,978 events, 9.7%) and prednisolone/cinchophen (205 events, 0.7%). Of the injectable events, dexamethasone sodium phosphate was the most commonly used injectable agent (12,796 events, 62.7% of injectable events), followed by dexamethasone phenylpropionate/dexamethasone sodium phosphate **(**6,243 events, 30.6%), methylprednisolone acetate (685 events, 3.4%) and dexamethasone isonicotinate (632 events, 3.1%) (Table 4).

Discussion

This study represents the largest analysis to date of primary-care usage of SGCs in dogs in the UK. The results highlight relatively high levels of usage of both oral and injectable formulations. Heavier dogs, older dogs and certain breeds were more likely to receive

treatment. The most common oral treatments were prednisolone (90.0% of all oral SGC events) and methylprednisolone (9.7%). The most common injectable treatment was dexamethasone sodium phosphate (62.7%).

The current study reports that 6.2% of dogs under primary veterinary care in the UK received at least one SGC during 2013. A previous study in England reported a higher prevalence (14.6%) of SGC usage, but was based on usage by dogs over a 3 year period between 2007 and 2009 from 3 practices, and was also restricted to the subset of dogs that received at least one treatment of any type overall, and was therefore likely to over-represent usage levels across all practice-registered dogs (2). Interestingly, usage reported in the UK specific to skin conditions was reported to be much higher with approximately 20% of the skin cases in primary-care clinics receiving SGC (3). The current study analyzed all clinical records from 304 primary-care VetCompass™ practices for all dogs under veterinary care in 2013 and aimed to give a more generalisable interpretation of usage. From these results it is clear systemic glucocorticoids are commonly used classes of drugs in primary-care practice.

The Staffordshire Bull Terrier, Labrador Retriever and West Highland White Terrier had the highest usage within treated dogs and a considerably high prevalence of usage within breed category for the denominator population which suggests that the high prevalence of SGC usage in this breeds was not because of the more frequent admission of these breeds to VetCompass clinics. A previous study reported that the Labrador Retriever had a higher risk of osteoarthritis compared with cross breeds (17). Another study reported that Labrador Retriever dogs had the highest prevalence of pyoderma, followed by West Highland White Terrier dogs (18). Also, it was found that Bull Retriever dogs have an inherited high risk of acrodermatitis as a recessive trait, and a high risk of atopic dermatitis due to food adverse reaction (19). A study in Romania reported the highest risk of *Malassezia* dermatitis in West Highland White Terrier dogs (19). These conditions could potentially be treated with anti-inflammatories. Given that the most

common clinical application of SGCs are as anti-inflammatory and immunosuppressive agents (1, 20), breed-based results may be useful to identify breeds that are more likely to suffer inflammatory conditions and therefore also contribute to ongoing efforts to understand and prioritise breed health (21). The current study did not aim to evaluate the underlying conditions for SGC treatment; further work to evaluate these conditions as well as the outcomes from therapy could provide further perspectives on breed health and welfare.

Older dogs were more likely to receive systemic glucocorticoids with dogs 8 years and older having a prevalence of 8.7% within the age category of the whole population and 31.4 % of the treated dogs. This is consistent with a previous study in which dogs were found to receive systemic glucocorticoid therapy more than puppies and young adults (2). These results suggest that inflammatory conditions are more likely to develop with age and therefore older dogs are most likely to require systemic glucocorticoid therapy. A previous study of Swedish dogs reported that 10-year-old dogs had twice the odds of inflammatory conditions compared to 2-year-old dogs (22).

Prednisolone was the most frequently used oral systemic glucocorticoid (90.0% of all oral SGC events) followed by methylprednisolone (9.7%). Prednisolone is either prescribed at anti-inflammatory doses (0.5 to 1mg/kg/24h, tapered down to 0.25 to 0.5mg/kg/48h) or at immunosuppressive doses (1 to 2mg/kg/24, tapered down to 0.5mg/kg/48h or the lowest effective dose while assessing for clinical relapse) (12). In a previous study in a small animal hospital in UK, prednisolone was administered twice daily to assess the potential relapse in dogs with steroid responsive meningitis-arteritis (23). A previous smaller study of 3 practices in UK reported that, in dogs receiving oral SGCs, prednisolone (73.6%) and methylprednisolone (23.1%) were the most commonly used drugs (2). It is possible that prescribing habits are highly individual to veterinarians and to practices. This may explain the substantial differences between the older smaller study and the current study results, and

highlights the benefits from ‘Big Data’ analyses of merged datasets from multiple practices to be more representative of usage patterns across UK practice attending-dogs.

The current study reported that dexamethasone sodium phosphate was the most commonly used injectable therapeutic (62.7%). This ranking is in agreement with the earlier primary-care study that also reported dexamethasone sodium phosphate as the most common injectable therapeutic used in dogs (2). Dexamethasone sodium phosphate is used widely in veterinary practices because it has good efficacy and a medium duration of action (48 hours). Blood cortisol levels have been shown to be suppressed with dexamethasone at 24 hours following injection (24). Intermediate-duration injectable formulations of dexamethasone (ester of isonicotinate and or phenylpropionate combined with sodium phosphate) were only used in one third of the injections. The use of the long acting methylprednisolone acetate ester was rare, and the fast acting methylprednisolone sodium succinate salt was practically never used.

The study had some limitations. As previously described, these data were not recorded primarily for research purposes and thus were limited by some missing data as well as reliance on accurate and thorough record-keeping of the clinicians (25). The study did not include the indication and underlying conditions for treated dogs, which could have offered a more complete picture to explain the patterns of usage in UK dogs. Knowledge of the prescribed daily doses (mg/kg) could help to define the intended therapeutic effect (high “shock” dose, immunosuppression, anti-inflammatory daily or alternate days) but the variable recording formats of dispensing events across the thousands of animals in the study (for example, start 1 tablet twice a day reduce to 1 daily then to 1 every other day) constrained the extraction of these data.

Conclusion

In conclusion, systemic glucocorticoids constitute a commonly used element of the therapeutic armamentarium of primary-care practitioners, with just over 6% of dogs under veterinary care receiving at least one systemic glucocorticoid annually. Certain breeds such as Staffordshire Bull Terriers (7.9%, 95% CI 7.5-8.2), Labrador Retrievers (7.3%, 95% CI 7.0-7.6), and West Highland White Terriers (6.0%, 95% CI 5.8-6.3) have an especially high prevalence of systemic glucocorticoid usage. Older dogs and dogs with higher adult bodyweight were more likely to be treated with systemic glucocorticoids. Prednisolone was the most frequent oral and dexamethasone sodium phosphate was the most common injectable systemic glucocorticoid.

Tables

Table 1: Demographic characteristics and prevalence of usage in 28,472 VetCompass™ dogs that had at least one systemic glucocorticoid (SGC) under primary veterinary care in the UK during 2013

Variable	Category	Frequency of treated dogs	Prevalence (%) of at least one SCG usage (95% CI)
Purebred status[1]	Crossbred	6,530	22.9 (22.4-23.4)
	Purebred	22,571	79.3 (78.8-79.7)
Common breeds[2]	Crossbred	6,530	22.9 (22.4-23.4)
	Other purebred	5,751	20.2 (19.7-20.7)
	Staffordshire Bull Terrier	2,236	7.9 (7.5-8.2)
	Labrador Retriever	2,075	7.3 (7.0-7.6)
	West Highland White Terrier	1,720	6.0 (5.8-6.3)
	Jack Russell Terrier	1,705	6.0 (5.7-6.3)
	Cocker Spaniel	982	3.4 (3.2-3.7)
	Shih Tzu	967	3.4 (3.2-3.6)
	German Shepherd Dog	927	3.3 (3-3.5)
	Yorkshire Terrier	924	3.2 (3-3.5)
	Cavalier King Charles Spaniel	646	2.3 (2.1-2.4)
	Border Collie	576	2 (1.9-2.2)
	Bichon Frise	571	2 (1.8-2.2)
	Boxer	569	2 (1.8-2.2)

[1] 2009(0.44 %) missing values
[2] 2009(0.44 %) missing values

	Lhasa Apso	459	1.6 (1.5-1.8)
	Golden Retriever	424	1.5 (1.3-1.6)
	Border Terrier	419	1.5 (1.3-1.6)
	Springer Spaniel	378	1.3 (1.2-1.5)
	Pug	320	1.1 (1.0-1.2)
	Chihuahua	313	1.1 (1.0-1.2)
	Rottweiler	311	1.1 (1.0-1.2)
Sex	Female	13,043	45.8 (45.2-46.4)
	Male	16,057	56.4 (55.8-57)
	Unrecorded	57	0.2 (0.1-0.3)
Neuter status	Entire	9,905	34.8 (34.2-35.3)
	Neutered	16,337	57.4 (56.8-58)
	Unrecorded	2,915	10.2 (9.9-10.6)
Age (years)[3]	< 2.0	5,170	18.2 (17.7-18.6)
	2.0 to < 4.0	5,838	20.5 (20-21)
	4.0 to < 6.0	4,851	17.0 (16.6-17.5)
	6.0 to < 8.0	4,187	14.7 (14.3-15.1)
	> 8.0	8,931	31.4 (30.8-31.9)
	Unrecorded	180	0.6 (0.5-0.7)
Adult bodyweight (kg)[4]	<10.00	6,936	24.4 (23.9-24.9)
	10.01 to 20.00	7,918	27.8 (27.3-28.3)
	20.01 to 30.00	5,009	17.6 (17.2-18)
	30.01 to 40.00	3,723	13.1 (12.7-13.5)
	> 40.00	2,249	7.9 (7.6-8.2)
	Unrecorded	3322	11.7 (11.3-12)

[3] 6,175 (1.36 %)missing values
[4] 123,808 (27.18 %)missing values

Table (2): Demographic characteristics and prevalence of usage of systemic glucocorticoid in 455,557 dogs from the VetCompass Programme under primary veterinary care during 2013

Variable	Category	Frequency of treated dogs	Total within category	Prevalence within category (95% CI)
Purebred status[5]	Crossbred	6530	112,777	0.1 (5.6-5.9)
	Purebred	22,571	340,767	6.6 (6.5-6.7)
Common breeds[6]	West Highland White Terrier	1,720	12,017	14.3 (13.7-14.9)
	Boxer	569	6,288	9 (8.3-9.8)
	Bichon	571	6,607	8.6 (8.0-9.3)
	Border Terrier	419	5,449	7.7 (7.0-8.4)
	Golden Retriever	424	5,670	7.5 (6.8-8.2)
	German Shepherd Dog	927	12,520	7.4 (6.9-7.9)
	Staffordshire Bull Terrier	2,236	32,635	6.9 (6.6-7.1)
	Lhasa Apso	459	6,840	6.7 (6.1-7.3)
	Springer Spaniel	378	5,800	6.5 (5.9-7.1)
	Tzu Shih	967	15,038	6.4 (6.0-6.8)
	Cavalier King Charles Spaniel	646	10,143	6.4 (5.9-6.8)
	Labrador Retriever	2,075	33,321	6.2 (6.0-6.5)
	Jack Russell Terrier	1,705	27,691	6.2 (5.9-6.4)

[5] 2009(0.44 %) missing values
[6] 2009(0.44 %) missing values

	Cocker Spaniel	982	15,827	6.2 (5.8-6.6)
	Yorkshire Terrier	924	15,426	6 (5.6-6.4)
	Pug	320	5,376	6 (5.3-6.6)
	Rottweiler	311	5,321	5.8 (5.2-6.5)
	Springer English Spaniel	298	5,384	5.5 (4.9-6.1)
	Border Collie	576	12,268	4.7 (4.3-5.1)
	Chihuahua	313	11,782	2.7 (2.4-2.9)
	Other purebred	5,751	89,364	6.4 (6.3-6.6)
	Crossbred	6530	112777	0.1 (5.6-5.9)
Sex	Female	13,043	219,032	6 (5.9-6.0)
	Male	16,057	234,211	6.9 (6.7-7.0)
	Unrecorded	57	2,310	2.5 (1.8-3.1)
Neuter status	Entire	9,905	178,216	5.6 (5.4-5.7)
	Neutered	16,337	205,019	8 (7.8-8.1)
	Unrecorded	2,915	72,318	4 (3.9-4.2)
Age (years)[7]	< 2.0	5,170	128,818	4 (3.9-4.1)
	2.0 to < 4.0	5,838	93,411	6.2 (6.1-6.4)
	4.0 to < 6.0	4,851	70,784	6.9 (6.7-7.0)

[7] 6,175 (1.36 %)missing values

	6.0 to < 8.0	4,187	53,915	7.8 (7.5-8.0)
	➢ 8.0	8,931	102,450	8.7 (8.5-8.9)
Adult weight (kg)[8]	<1 0.00	6,936	101,703	6.8 (6.7-7.0)
	10.01 to 20.00	7,918	91,594	8.6 (8.5-8.8)
	20.01 to 30.00	5,009	68,626	7.3 (7.1-7.5)
	30.01 to 40.00	3,723	45,749	8.1 (7.9-8.4)
	> 40.00	2,249	24,073	9.3 (9.0-9.7)

[8] 123,808 (27.18 %)missing values

Table 3. Systemic glucocorticoid usage for adult dogs (more than 18 months of age) from the VetCompass™ Programme that received at least one systemic glucocorticoid therapy in 2013. Results are shown overall and by bodyweight[9] and route of administration (N = 25,835) [1]

Adult body weight (kg)[10]	Route of administration									
	Injectable only			Oral only			Both injectable and oral			Total (%)
	Frequency	Prevalence (%) within injectable (CI)	Prevalence (%) within weight group (CI)	Frequency	Prevalence within oral (CI)	Prevalence within weight group (CI)	Frequency	Prevalence within both injectable and oral (CI)	Prevalence within weight group (95% CI)	
1.22-10.00kg	3,226	29.7 (28.89-30.61)	46.5 (45.34-47.68)	2,678	24.2 (23.4-25)	38.6 (37.46-39.76)	1,032	26.3 (24.92-27.67)	14.9 (14.04-15.72)	6,936 (26.8)
10.01-20.00kg	3,242	29.9 (29.03-30.76)	40.9 (5.7-6.76)	3,442	31.1 (30.24-31.97)	43.5 (5.7-6.76)	1,234	31.4 (29.99-32.89)	15.6 (5.7-6.76)	7,918 (30.6)
20.01-30.00kg	2,035	18.8 (18.03-19.5)	40.6 (6.15-7.55)	2,221	20.1 (19.33-20.82)	44.3 (6.15-7.55)	753	19.2 (17.95-20.42)	15.0 (6.15-7.55)	5,009 (19.4)
30.01-40.00kg	1,476	13.6 (12.96-14.26)	39.6 (5.39-6.93)	1,687	15.2 (14.58-15.92)	45.3 (5.39-6.93)	560	14.3 (13.17-15.36)	15.0 (5.39-6.93)	3,723 (14.4)
>40.01 kg	866	8.0 (7.48-8.5)	38.5 (5.21-7.2)	1,037	9.4 (8.83-9.91)	46.1 (5.21-7.2)	346	8.8 (7.93-9.7)	15.4 (5.21-7.2)	2,249 (8.7)
Total (%)	**10,845 (42.0)**			**11,065 (42.8)**			**3,925 (15.2)**			**25,835**

[9] Bodyweight data was missing for 3322 (11%) dogs
[10] Maximum bodyweight recorded for dogs aged over 18 months

Table 4: Frequency of treatment events for systemic glucocorticoid active substances and strengths. Results are shown by method of administration (percentage for each column shown in brackets) based on 50,971 glucocorticoid usage events recorded during 2013.

Active substance		**Route of administration**			
		Injectable		**Oral**	
	Duration injectable	Number of Events (%)	Total mgs prescribed (%)	Number of Events (%)	Total mgs prescribed (%)
Budesonide				11 (0.04)	18 (0.003)
Dexamethasone Isonicotinate	Intermediate	632 (3.10)	945 (1.55)		
Dexamethasone Phenylpropionate and Dexamethasone Sodium Phosphate	Short to Intermediate	6,243 (30.60)	8,278 (13.61)		
Dexamethasone Sodium Phosphate	Short	12,796 (62.72)	31,773.9 (52.24)		
Dexamethasone (other)				14 (0.05)	664 (0.01)
Methylprednisolone				2,978 (9.74)	586 (8.86)
Methylprednisolone sodium succinate	Very short	45 (0.22)	2,876 (4.73)		
Methylprednisolone Acetate	Long	685 (3.36)	16,953 (27.87)		
Prednisolone				27,362 (89.51)	6,014,955 (90.92)
1 mg tablets				1443	52,539
5 mg tablets				23,116	4,896,285
25 mg tablets				2803	1,066,131
Prednisolone/cinchophen				205 (0.67)	13,617 (0.21)
Total		**20,401**	**60,826**	**30,570**	**6,602,037**

Abbreviations

CI Confidence intervals

SGC Systemic glucocorticoids

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