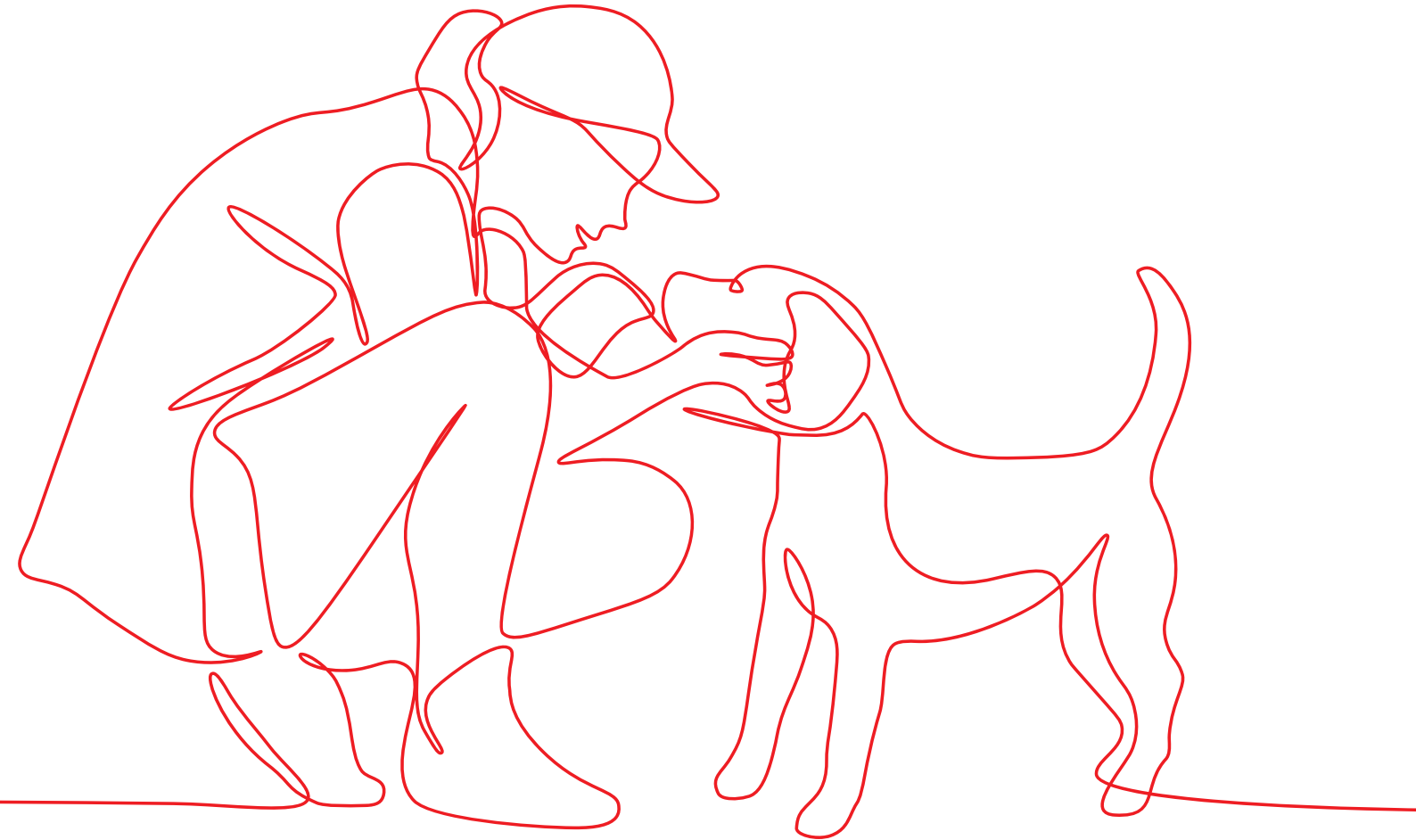


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CANINE FACT AND FICTION

“Dogs are not our whole life, but they make our lives whole” – Roger Caras

Given that humankind domesticated them at least 10,000 years ago, it is hardly surprising that dogs have become irretrievably interwoven with our history, our culture and our lives over the intervening centuries. Indeed, the saying “a dog is a man’s best friend” is well-recognized in many countries, and rightly so – we derive a huge amount of pleasure from keeping them as pets, and benefit enormously from their unique talents when it comes to security, rescue missions, assistance and so on. But there is a more supernatural side to the species. Take, for example, Cerberus, the mythical Greek animal often referred to as the Hound of Hades. A dog like no other, he had the task of guarding the gates of the Underworld to prevent the dead from leaving, and it would appear that he was blessed with certain features that made him ideal for the job – not only did he have three heads, he had a serpent for a tail, and snakes protruding from multiple parts of his body. Not, one can safely say, the average patient that we treat on a daily basis in our clinics. One can conjecture that Cerberus was the source for the various hellhounds that have become part of folklore, in that many mythologies around the world abound with tales of ominous paranormal dogs, many of which have characteristics that mark them out as formidable foes. Features often include glowing red eyes, incredible strength and speed, and other ghostly qualities which distinguish them as portents of evil or death. Modern literature, TV and cinema have also embraced the hellhound concept with enthusiasm, but fortunately, the reality is that dogs in our 21st century world are a blessing, not a curse. Today’s clinician does not have to wrestle with a three-headed phantom from the depths of hell, yet we are tasked with keeping our canine companions as healthy as possible, and to this end this issue of *Veterinary Focus* contains no disturbing myths or frightening tales, only hard facts and solid education.



Ewan McNeill
Editor-in-chief

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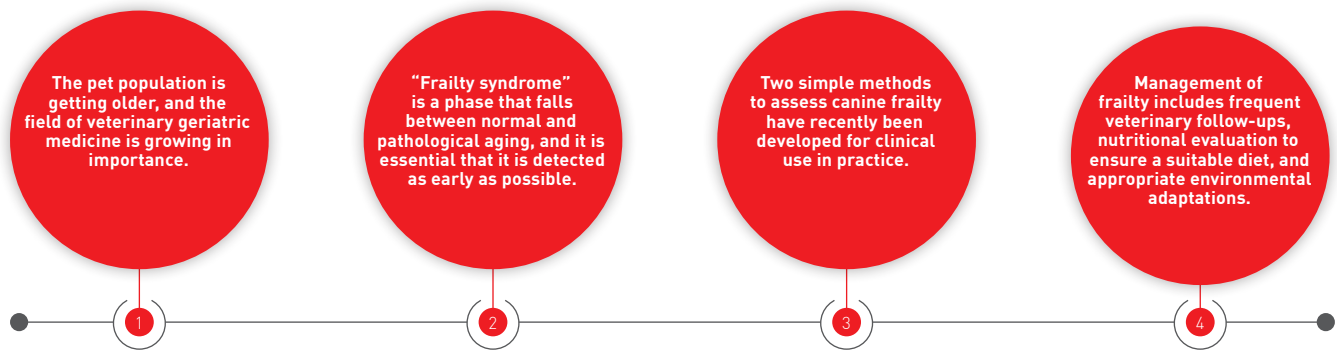
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CANINE AGING AND FRAILTY

Our understanding of aging in dogs is making great strides forward; in this paper the authors discuss how to assess if a dog comes into the “frail” category and what we as veterinarians can do to help in this situation.

KEY POINTS



Introduction

Aging is currently a popular subject – among scientists, in the media, and for both human and veterinary practitioners. The importance of companion animals in our society has led to an increased pet population, and consequently higher numbers of geriatric animals – for example, one survey showed that the percentage of the French canine population aged 12 or older had increased by more than 1 percentage point within a two-year period, from 14.5% in 2012 to 15.8% in 2014¹. There is an undoubted need for veterinary medicine to respond to this geriatric population of pets and for dedicated species-specific procedures to evaluate such patients. Fortunately, because dogs are increasingly used as a model for human aging, we now have methods which can be adapted for veterinary geriatric medicine.

What is “aging”?

Aging is a normal, multifactorial physiological process which has been defined as “a decline and deterioration of functional properties at the cellular, tissue and organ levels. This loss of functional properties yields a loss of homeostasis and a decreased adaptability to internal and external stresses yielding an increased vulnerability to diseases and mortality” [1].

However, there are differences between biological aging and chronological aging. The former – also called “*senescence*” – is a process that affects all individuals of a given species, but not at the same rate [2]. “Chronological aging” represents the passage of time [3], and is what we refer to when we talk about a “dog’s age”. This article will focus on canine aging in the biological sense.

What is an “old” dog?

As in human medicine, it can be difficult to get a consensus as to the definition of the geriatric stage in veterinary medicine. Different factors have a part to play (including breed, adult body size, etc.) but two stages can be identified: “pre-geriatric” and “geriatric” [or “senior” in the AAHA guidelines][4]. The pre-geriatric stage is less well-defined than the senior/geriatric stage, although it is essential to start prevention at the first stage. One review has defined the pre-geriatric stage by adult bodyweight: if the breed has an average adult bodyweight over 22.7 kg, a dog is pre-geriatric between 6 and 8 years of age, whereas for breeds with an adult body weight below this, this stage starts between 7 and 10 years old [5]. The geriatric/senior stage is defined as the last 25% of the predicted lifespan for a given breed [4], so using these designations a Labrador enters the geriatric stage at 9 years of age, but the pre-geriatric stage starts at 6 years old.

¹ <https://www.facco.fr>



Sara Hoummady,

DVM, MSc, PhD, Alfort School of Veterinary Medicine, Paris, France

Dr. Hoummady graduated from Alfort Veterinary School in the Paris region and went on to study canine ethology and behavior in working dogs. She then specialized in canine geriatrics, with a PhD carried out at CNRS (the French National Centre for Scientific Research) before training in veterinary nutrition within the petfood industry; she currently teaches animal nutrition at Alfort.



Franck Péron,

DVM, MSc, PhD, Dip. ECAWBM (AWSEL), Royal Canin, Aimargues, France

Dr. Péron graduated from Alfort Veterinary School and then studied animal cognition before specializing in neurosciences, gaining his PhD from Paris Ovest University. He achieved board-certification in Animal Welfare in 2016. After a short time in the pharmaceutical field he joined the petfood industry and is now part of the Scientific Support team at Royal Canin.

These definitions are entirely based on chronological aging, but dogs go through various changes which can affect their senescence, as older animals are at higher risk of chronic disease such as cardiac pathologies, kidney disease, hormone disorders and tumors (6). There are limited data about the mortality risk factors in pre-geriatric and geriatric dogs, but a retrospective study on service dogs in these categories gave some clues: breed, increased alanine aminotransferase levels (> 102 U/L) and presenting skin nodules were associated with remaining lifetime (7).

The field of geriatric veterinary medicine is still new, but some essential concepts, like the definition of healthy versus pathological aging, are emerging. Healthy aging in dogs has been defined as “the absence of clinically apparent diseases” and “age-related changes that don’t negatively affect quality of life” (4). Some changes associated with age may be considered to be “healthy”, including greying of the muzzle, mild thinning of the coat (**Figure 1**), moderate nuclear sclerosis, and even a slight reduction in activity levels (**Table 1**) (4,8).

A common sign of “unhealthy” aging is canine dementia, more properly known as canine cognitive dysfunction (CCD). This neurobehavioral syndrome is a clear example of changes that affect a dog’s quality of life, which can be summarized by the acronym **DISH** (**D**isorientation, **d**ysfunction in **I**nteractions, **S**leep, and **H**ousetraining). Affected animals may present with alterations in activity patterns, impaired learning, and changes in social interaction or sleeping patterns, as shown in **Table 2**. Despite recent research, this pathology is still underdiagnosed (4), but interest in pre-geriatric and geriatric animals has increased in recent decades, and new clinical evaluation tools, derived from human medicine, have been recently introduced and adapted for dogs, such as the notion of frailty.

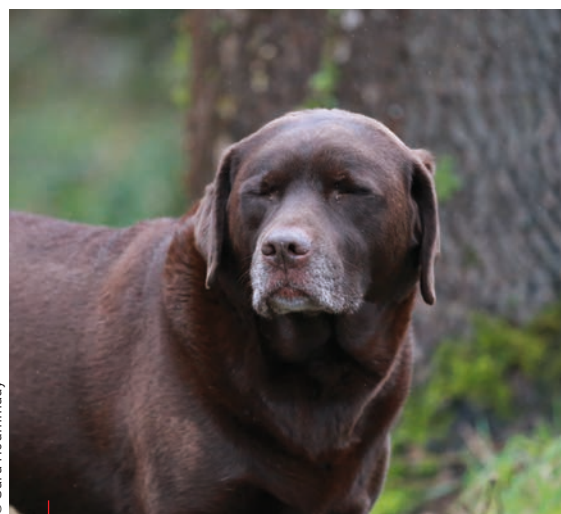


Figure 1. Some changes in a dog’s appearance that are associated with age may be considered to be “normal”, including greying of the muzzle.

Table 1. Some signs regarded as “healthy aging” in senior and geriatric dogs (adapted from [2]).

- Greying of coat color
- Presence of stable lipomas
- Slight thinning of coat and skin
- Dental tartar without periodontal disease
- Moderate hearing loss
- Nuclear sclerosis without decreased vision
- Moderate sensory changes without affecting quality of life
- Biochemical values within senior geriatric references limits
- Absent or moderate osteoarthritis

Table 2. Significant signs of canine cognitive dysfunction (Adapted from [25]).

- **Disorientation:** *e.g.*, gets stuck in front of a wall, has difficulty finding food, cannot find the way home on a routine walk
- **Alterations in interactions:** *e.g.*, avoids contact with owners, other pets and the environment, the greeting behavior is absent, changes in interaction with other people
- **Sleep-wake cycle disturbances;** *e.g.*, awake at night and sleeping during the day
- **House-soiling:** *e.g.*, indoor elimination in sleeping area, not asking to go out
- **Changes in activity:** *e.g.*, repetitive locomotor activity, loss of interest in treats or playing
- **Increased locomotor activity:** *e.g.*, aimless pacing at night
- **New fears (compared with 1 or 2 years before):** *e.g.*, phobia of normal locations within the house, fear of other dogs
- **Memory deficits:** *e.g.*, loss of memory, unable to perform a learned task, unable to learn a new task
- **Changes in personality:** *e.g.*, develops neuroses or aggressive signs

●●● The “frailty syndrome”

This concept has developed from the field of human geriatrics [9]. The definition of “frailty” has evolved in the last decade, and frailty is nowadays considered as a syndrome associated with an increased vulnerability when exposed to stressor events [10]. This clinical state is considered to be a consequence of a cumulative decline in various body systems and is associated with an accelerated and progressive decline in physiological reserves [11], which is quite different from normal aging. Frailty may therefore be defined [12] as:

- A limited capacity to maintain homeostasis
- A clinical state of age-related biological vulnerability to stressors
- Decreased skeletal muscle mass and quality
- Altered hormonal and inflammatory functions

From a practical point of view, frailty is associated with mortality or comorbidity (*i.e.*, the presence of two or more diseases) [13] which is independent from chronological aging [14] but also reversible, as it is a transitional state between normal aging and disabilities [10]. However, frailty can be a vicious circle, initiated by multiple factors such as low physical activity, nutritional imbalance, comorbidity, or environmental factors. From a clinical perspective, sarcopenia, weakness or exhaustion can be observed, leading to avoidance of physical activities, and the downward spiral may be initiated by other conditions such as chronic inflammation and hormonal dysfunction. The syndrome has been associated with metabolic abnormalities, increased inflammatory cytokines (*e.g.*, IL-6; CRP, TNF-Alpha) [14,15] or hormonal dysregulation (*e.g.*, Vitamin D, DHEA). There is still a lack of knowledge about the pathophysiological

pathway to frailty, but the term “frailty syndrome” is now widely used to indicate aged individuals that have an increased risk of an adverse outcome.

There are two approaches to evaluate frailty in human geriatrics, and both are suitable predictors of mortality in older patients [16]. The first is a phenotype model which was created for clinical use, and identifies five basic components [13];

- Poor grip strength
- Slow walking speed
- Low levels of physical activity
- Low energy or self-reported exhaustion
- Unintentional weight loss.

Using this method a patient can be classified as either Non-frail (where none of the components are abnormal), Pre-frail (1 or 2 components are abnormal), or Frail (where 3 or more components are abnormal). However the model does not consider factors such as cognition, mood or social frailty [17]. These are taken into account by a second common method, which considers frailty to be an accumulation of deficits including cognitive disorders, depressive syndrome, multiple diseases, and malnutrition. It employs a scoring system to produce a “Frailty index” which allows for a multidimensional vision of the individual frailty, although it makes no real distinction between frailty and comorbidity [18].

●●● Assessing unhealthy aging in dogs

Both methods have been recently transposed into canine medicine, and both identify frailty as a risk factor for death in aged dogs, independent of their chronological age.

Frailty phenotype

This has recently been evaluated with a study on service dogs (mostly Retrievers) using a simple geriatric scoresheet (Table 3) [19]. Any animal having two or more of the five components on



“Frailty is associated with mortality or comorbidity and is independent from chronological aging, but it is also reversible, as it is a transitional state between normal aging and disabilities.”

Sara Hoummady

Table 3. Geriatric scoresheet for assessment of frailty phenotype in dogs (19).

Category	Assessment
Weakness	Evaluation of muscular mass (normal or abnormal)
Exhaustion	Estimation of exercise (in)tolerance, which may appear as fatigue or marked breathlessness
Low physical activity	Evaluation of perceived activity level (as reported by the owner)
Chronic undernutrition	Appraisal via a combination of body condition, appetite, and coat quality; considered to be present if any one of these components is suboptimal
Poor mobility	Detection of abnormal gait evaluation and joint pain; considered to be present if either is noted

assessment was considered to be frail, and the study noted that affected dogs were more likely to die, even when age was taken into consideration. However, this method has only been studied in a single population subset so far, and (unlike the human frailty phenotype) it currently involves no real physical evaluation. A protocol of frailty phenotype assessment with physical evaluation is currently being tested at the French National Veterinary School of Maison-Alfort.

Frailty index

This method has recently been adapted for dogs and has been tested on a bigger group of individuals (age above 2 years, various breeds) (20). It assesses 33 potential health deficits, as shown in **Table 4**, with a score attributed to each factor; the overall total (with a range between 0 and 1) indicates a dog's status, where 0.25 is the entry point to the frailty state. The study concludes that dogs that score above this level should have more frequent follow-up visits to the veterinary clinic.

Such assessment tools are inexpensive and can facilitate a standardized follow-up of at-risk or frail patients. However, they do not really explore the cognitive aspects of aging, and if one of the two methods outlined above is used to evaluate a dog's frailty, an appraisal of its cognitive abilities should also be performed at each and every routine geriatric consultation.

Assessing cognitive dysfunction

A diagnosis of canine cognitive dysfunction (CCD) must be made only after exclusion of medical causes (e.g., epilepsy, hypothyroidism, joint pain), as such diseases may cause similar clinical signs. Various questionnaires can be used to assess for the condition in the clinic; one of the most common is the CCDR (Canine Cognitive Dysfunction Rating scale) as shown in **Table 5** (21). This tool assesses 13 factors related to

behavior impairment, with each factor scored depending on the frequency of each behavior. The maximum score is 80, but any dog that is assessed as over 50 is likely to have CCD.

Evaluation of pain linked to osteoarthritis is also recommended during these consultations, and this can be easily performed in a clinical context using a validated questionnaire, such as the Canine Brief Pain Inventory².

Practical geriatric support in the clinic

Frailty and CCD must be evaluated as soon as signs become evident to allow more precise observation of the patient and possible progression of the condition. It is therefore suggested that the veterinary clinic can institute several proactive steps to allow good clinical care of their older patients (**Table 6**).

² www.vet.upenn.edu/docs/default-source/VVIC/canine-bpi-user's-guide-2017-07

Table 4. Factors to assess for the canine Frailty Index (adapted from (19)).

1. Assistance when standing up
2. Decreased appetite
3. Assistance when eating
4. Incontinence
5. Assistance when climbing stairs
6. Decreased activity over the last year
7. Reduced cognitive ability
8. Reduced vitality over the last year
9. Weakness during exercise
10. Congenital defects
11. Weight loss (not due to diet or exercise)
12. Hair opacity
13. Chronic therapies
14. Epilepsy
15. Episodes of disorientation
16. Chronic infectious disease
17. Endocrine disease
18. Chronic inflammation
19. Acute vascular problems
20. Cancer
21. Diabetes
22. Osteoarthritis
23. Hearing impairment
24. Cardiomyopathy
25. Chronic respiratory disease
26. Hepatopathy
27. Neurological deficits
28. Disease of the oral cavity
29. Visual impairment
30. Chronic digestive disease
31. Disease of the hematopoietic system
32. Dermatological disease
33. Chronic kidney disease

Items 1-21 are scored as No (scoring 0) or Yes (scoring 1); items 22-33 are assessed as No (scoring 0), Mild (scoring 0.5) or Severe (scoring 1). The Frailty index corresponds to the sum of the score divided by 33. A score of 0.25 is the entry point to the frailty state.

Table 5. The canine cognitive dysfunction rating scale [20].

<ol style="list-style-type: none"> How often does your dog pace up and down, walk in circles and/or wander with no direction of purpose? How often does your dog stare blankly at the walls or floor? How often does your dog get stuck behind objects and is unable to get around? How often does your dog fail to recognize familiar people or pets? How often does your dog walk into walls or doors? How often does your dog walk away while, or avoid, being patted? How often does your dog have difficulty finding food dropped on the floor? Compared with 6 months ago, does your dog now pace up and down, walk in circles and/or wander with no direction or purpose? Compared with 6 months ago, does your dog now stare blankly at the walls or floor? Compared with 6 months ago, does your dog urinate or defecate in an area it has previously kept clean? (if your dog has never house-soiled, tick "the same") Compared with 6 months ago, does your dog have difficulty finding food dropped on the floor? Compare with 6 months ago, does your dog fail to recognize familiar people or pets? Compared with 6 months ago, how active is your dog? <p>For questions 1 to 6, the answers are "Never" (1 point), "Once a month" (2 points), "Once a week" (3 points), "Once a day" (4 points), "> Once a day" (5 points). For question 7, the answers are "Never" (1 point), "1-30% of time" (2 points), "31-60% of time" (3 points), "61-99% of time" (4 points), "Always" (5 points). For questions 8 to 12, the answers are "Much less" (1 point), "Slightly less" (2 points), "The same" (3 points), "Slightly more" (4 points), "Much more" (5 points). The score for question 11 must be multiply by 2 and the score for question 12 must be multiply by 3. For question 13, the answers are "Much more" (1 point), "Slightly more" (2 points), "The same" (3 points), "Slightly less" (4 points), "Much less" (5 points).</p> <p>The scores are totaled to give the dog's rating; the maximum possible score is 80, but any score above 50 is indicative of CCD.</p>

Frequent follow-up consults

A yearly routine geriatric examination is recommended for every dog in the pre-geriatric category [22], whilst animals in the geriatric stage should be assessed at least every 6 months, or every 3 months for frail dogs [4]. This involves performing a Frailty assessment, a Cognitive assessment (using the CCDR) and laboratory tests. A minimum blood panel (urea, creatinine, total calcium, total protein, albumin, cholesterol, bilirubin, serum alanine aminotransferase and alkaline phosphatase) should be done every 6 months for asymptomatic geriatric canine patients [4,22], or more frequently if necessary. Urinalysis, blood glucose levels and hematology should also be included if possible. A questionnaire about the dog's environment and habits (which can be completed by the owner in the waiting room) may also help the veterinarian to make recommendations.













Nutritional evaluation and recommendations

Nutritional assessment should be at the heart of all geriatric consults. Body weight, Muscle Condition Score (MCS) and Body Condition Score

(BCS) – both created by the WSAVA – should be evaluated from birth to construct a weight curve for each patient. The goal is to recognize the onset of sarcopenia, although this can sometimes prove to be difficult as it can be masked by an increased fat mass. Evaluation of MCS includes palpation of the lumbar vertebrae, the temporal bones, the scapulae and the pelvic bones [4]. Any obesity or weight loss should be noted.

An evaluation of the nutrient intake and energy provided by the daily ration is essential. Ideally the dog's nutritional history should be detailed and assessed with a feed ration calculator, although analysis using an appropriate software program allows for a more precise assessment of the food offered. Pre-geriatric and geriatric dogs have special needs and adequate nutrition is always to be recommended [23]: indeed,

Table 6. Evaluation criteria for senior and geriatric examinations and possible tools to aid assessment.

Criteria evaluation	Tools	People
Frailty	Frailty phenotype [19] 5 min	
	Frailty index [20]. 10 min	
Canine cognitive assessment	CCDR questionnaire 5 min (in the waiting room)	
Muscle condition score	WSAVA Muscle condition score 2 min	
Body score index	WSAVA score 2 min	
Assessing environment	10 min (in the waiting room)	
General clinical evaluation	10 min	
Nutritional assessment	Feed ration calculator 10 min	
Blood testing	In-house diagnostic equipment 30 min	
Urinalysis	In-house diagnostic equipment 15 min	
Assessing pain linked to osteoarthritis	Canine Brief Pain inventory, Helsinki chronic pain index 5 min (in the waiting room)	
Quality of life	HHHHMM scale/ Grey muzzle app 5 min (in the waiting room)	

¹ <https://vetsocialwork.utk.edu/wp-content/uploads/2016/03/Quality-of-Life.pdf>



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Figure 2. Exercise is beneficial for all dogs, including those that fall into the frail category, but the walks should be of short duration, at a gentle pace and on flat terrain.



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Figure 3. Older dogs may get beneficial cognitive stimulation by offering them a variety of toys and puzzle feeders.

sarcopenia and malnutrition are cornerstones of the frailty circle. With aging and increased protein turnover, unless chronic kidney disease (CKD) or other pathologies are present, a dog's protein requirement may increase. Protein quality should therefore be optimal (using a commercial petfood or home-prepared ration calculated by a nutritionist), and protein hydrolysates may be useful. One study has recommended 25% of the calorie intake for healthy senior dogs should come from good quality protein (24) and this quantity may be increased if sarcopenia is present and there are no contraindications (such as CKD). Note that BARF-type diets are not recommended for pre-geriatric and geriatric dogs.



“Sarcopenia and malnutrition are cornerstones of the frailty circle... senior and geriatric dogs have special needs, and adequate nutrition is therefore to be recommended for all animals in this category.”

Franck Péron

Dietary phosphorus levels should be reduced where necessary (aiming for 0.3-0.7% of DM diet) for senior dogs, and omega-3 products such as EPA (Eicosapentaenoic acid) and DHA (Docosahexaenoic acid) are recommended for joint pain. 2.5 g/1000 kcal of omega-3 from marine sources has been recommended for canine osteoarthritis (24) and in practice at least 2 g/1000 kcal of omega-3 from marine sources is necessary. These polyunsaturated fatty acids (PUFAs) have an anti-inflammatory action, which is important, as frailty is linked to inflammation. However, no study has been conducted on dogs combining nutrition and frailty, and most of the recommendations are extrapolated from human medicine (25). It is also important to ensure appropriate level of dietary vitamins and minerals, and a supplementary source should always be used if a home-prepared diet is fed.

As cognitive dysfunction is part of frailty, nutritional supplementation should also focus on this aspect; antioxidants are recommended for dogs with CCD (and the diet should therefore be supplemented as necessary), in combination with environmental enrichment (as discussed below) (23,26). Recently, medium-chain triglycerides have been shown as a good alternative energy source for the brain as a nutritional strategy for cognitive dysfunction (26). Some drugs may also be useful for dogs showing clinical signs of CCD; these include selegiline (0.5-1 mg/kg PO q24H in the morning) and propentofylline (2.5-5 mg/kg PO q12H) (26). Remember that the clinician should always consider potential risks, such as the presence of concomitant pathologies, before administering such drugs.

Environmental management and cognitive stimulation

The environment and quality of life offered by the owner are also important for frail dogs. Activity should be encouraged, and walks of variable duration (depending on the clinical status) are generally recommended (**Figure 2**). Exercise may be adapted as necessary (e.g., short, gentle walks or swimming) to help to maintain muscular mass.

Sensorial stimulation and cognitive motivation may be achieved by offering a variety of odor or tactile stimulations, food enhanced toys (e.g., puzzle feeders – **Figure 3**) and positive interactions (such as play sessions with the owner or social interaction with other dogs), combined with continuous learning, can be useful. Exploring new places to walk can also help. Offering multiple sleeping areas may be useful, although frequently moving the sleeping and feeding areas should be avoided. At the same time creating a predictable and safe environment is essential; this can be achieved by ensuring consistent feeding and walking times, and avoiding stressful noises [26]. The dog's quality of life must be discussed regularly with the owner, and tools like the HHHHMM scale (see **box on opposite page**) or IT

solutions (such as the VetMetrica questionnaire or "Grey Muzzle" app) can help assess how a dog is affected by his age and condition, and may also be useful for some end of life considerations.

The authors thank Dr. Delphine Moniot, Dr. Charlotte Devaux and Prof. Loïc Desquilbet for their valuable comments.



CONCLUSION

Interest in geriatric canine medicine is increasing, and in particular the frailty syndrome – and simple methods that can assess this problem – offers an opportunity for practitioners to approximate the biological aging of canine patients and to go beyond chronological aging. Being able to rapidly adjust the care and medication for old dogs with specific, dedicated consultations should promote owner adherence and help dogs to age healthily. There are still a lot of questions to be answered, such as the impact of the microbiome on canine frailty, but future long-term studies will provide new answers to the veterinary community and help our dogs to achieve healthier aging.



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THE HHHHHMM SCALE

Using a scale of 0 to 10 (0 = Unacceptable, 10 = Excellent), patients can be evaluated for their quality of life.

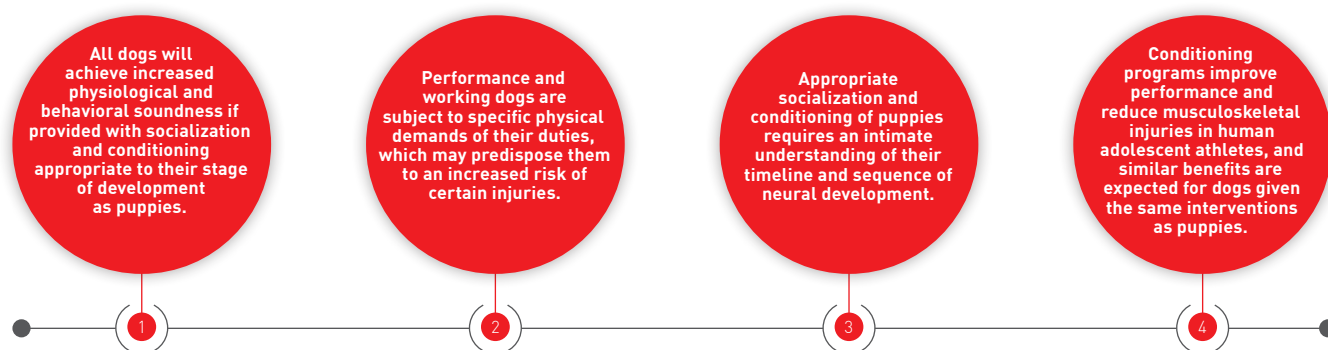
Score 0-10	Criterion
HURT	<ul style="list-style-type: none"> Is the patient in pain, including distress from difficulty in breathing? Can the pet's pain be successfully managed? Is oxygen necessary?
HUNGER	<ul style="list-style-type: none"> Is the pet eating enough? Does hand-feeding help? Does the pet require a feeding tube?
HYDRATION	<ul style="list-style-type: none"> Is the pet dehydrated? Are subcutaneous fluids once or twice daily enough to resolve the problem? Are they well tolerated?
HYGIENE	<ul style="list-style-type: none"> The pet should be kept brushed and clean, particularly after elimination. Does the pet have pressure sores?
HAPPINESS	<ul style="list-style-type: none"> Does the pet express joy and interest? Is he responsive to things around him (family, toys, etc.)? Is the pet depressed, lonely, anxious, bored, or afraid? Can the pet's bed be near the kitchen and moved near family activities to minimize isolation?
MOBILITY	<ul style="list-style-type: none"> Can the pet get up without assistance? Does the pet need human or mechanical help (e.g., a cart)? Does she feel like going for a walk? Is she having seizures or stumbling? <p>Note: Some caregivers feel euthanasia is preferable to amputation, yet an animal with limited mobility may still be alert and responsive, and can have a good quality of life as long as the family is committed to quality care.</p>
MORE GOOD DAYS THAN BAD	<ul style="list-style-type: none"> When bad days outnumber good days, the pet's suffering is appreciable and quality of life might be too compromised. When a healthy human-animal bond is no longer possible, the caregiver must be made aware that the end is near.
TOTAL	A total of > 35 points is acceptable quality of life for pets.

Original concept, Oncology Outlook, by Dr. Alice Villalobos, Quality of Life Scale Helps Make Final Call, VPN, 09/2004; Adapted from: *Canine and Feline Geriatric Oncology: Honoring the Human-Animal Bond*, Blackwell Publishing, 2007, with kind permission of Dr. Villalobos. Can be downloaded at <https://pawspice.com/quality-of-life-scale.html>

PUPPY NEURAL DEVELOPMENT AND CONDITIONING

Working dogs are subject to many demands in their line of duty; in this paper the authors explore how an appropriate start in puppyhood can set the stage for a lifetime of activity for this group of dogs.

KEY POINTS



Introduction

Working and performance dogs are career athletes that are subjected to a unique set of physical demands. Stakes are high for these dogs, as both their own safety and that of many people depend on their ability to carry out their duties with speed and agility. The dogs will often be called upon at a moment's notice to engage in pursuit at sprinting speeds or to navigate varied terrain in a search exercise. Furthermore, intensive resources are involved in the training of these specialized dogs, so there is much incentive to maximizing the time at which they are at peak performance. Ensuring these dogs are appropriately conditioned is a critical aspect of their care and of preparation for any event that may call upon their services. Conditioning and functional neuromuscular training should begin in puppies bred as working and sporting dogs; based on evidence from human sports, this early start is expected to optimize performance and reduce the risk of injury.

Of course, not all puppies are destined for working status, but the same principles of conditioning that are applied to the working dog can also be applied to the puppy intended for family life. Training a puppy in the fundamentals of exercise can have a

substantial pay-off when carried into adulthood. As with the benefits of exercise in humans, a foundation of conditioning helps maintain weight, contributes to a healthier metabolic profile, decreases the risk of injuries and certain chronic diseases, and facilitates pain-free movement throughout the dog's lifetime.

Physical demands on performance dogs

To develop conditioning programs for high-level working and sporting dogs requires a thorough understanding of the physiological and biomechanical demands placed on these animals during their regular activities. Dogs participate in a range of activities from recreational pursuits to high-end athletic competitions and working dog duties. The exercise involved can fall anywhere along the spectrum from low to high intensity – a dog may be a “weekend warrior” hiker or may be a high-end performer in competitive sports, search and rescue, sprinting or long-distance running. Most of these active dogs will be required to sprint, jump obstacles, turn sharply at top speed, scale walls and fences, move on unstable surfaces, and withstand potentially severe compressive and



Andrea L. Henderson,

DVM, MS, Dip. ACVSMR, Department of Defense Military Working Dog Veterinary Service, San Antonio, TX, USA

Dr. Henderson is a Major in the United States Army Veterinary Corps, serving as the Chief of Sports Medicine and Rehabilitation in San Antonio, Texas. She completed her sports medicine and rehabilitation residency and her Masters of Science (with a focus in kinesiology) at the University of Tennessee in Knoxville in 2014 and attained her Diplomate status in 2016. Dr. Henderson has a passion for working and service dogs and has been diligently developing preventive conditioning programs for this sector of the canine population.



Bess J. Pierce,

DVM, Dip. ABVP, Dip. ACVIM, Dip. ACVSMR, Lincoln Memorial University College of Veterinary Medicine, TN, USA

Dr. Pierce earned a BSc in biology from Tulane University, an MS in wildlife biology and a DVM from Auburn University and is currently an Associate Professor at Lincoln Memorial University, where she teaches small animal internal medicine and canine sports medicine. She is also an Adjunct Associate Professor in Canine Performance Sciences and Rehabilitation at the University of Pennsylvania's Penn Vet Working Dog Center and has served nearly 28 years in the US Army Veterinary Corps (where she currently holds the rank of colonel) where she focuses on military working dog health and fitness. Board-certified in canine and feline practice, small animal internal medicine and canine sports medicine, Dr. Pierce's primary interests are canine sports medicine and rehabilitation, conditioning and injury prevention, and veterinary education.

bending forces to the spinal column at some point in their activities. Scent detection requires searching of rooms, large tracts of land, vehicles and other areas, often in places that may require crawling or navigating unstable terrain without fatiguing (**Figure 1**). Therefore many physical attributes, such as strength, endurance, flexibility, proprioception and balance, are necessary for peak performance in active dogs. Several of these capabilities can be safely introduced in puppyhood, taking into account breed, age, diet, environment and other factors that influence puppy development.

non-combat injuries while deployed to Iraq showed that musculoskeletal injuries were the fourth most common reason for seeking veterinary care (3) and a report comparing emergency veterinary visits for police and pet German Shepherd Dogs noted that the police dogs were more likely to be seen for orthopedic injuries than the pet population (4). Significantly, handlers of police dogs in New Zealand reported normal function in only 29% of their dogs, and that functional assessment declined appreciably with age (5). Search-and-rescue dogs deployed in the aftermath of the September 11, 2001 terrorist attacks were found to have two orthopedic or spinal problem events per 1,000 dog search hours (6), whilst an electronic survey of agility dog handlers found that at least one injury was reported in 32% of training and competing dogs (7). A near-identical injury rate (33%) was reported in agility dogs with another survey of handlers (8), with 58% of those injuries occurring during competition. In summary, musculoskeletal injuries and diseases appear to play a key role in medical intervention and retirement from duty or competition in performance dogs, demonstrating a critical need for the development of prevention strategies.

●●● Musculoskeletal injuries in performance dogs

Knowledge of the types and frequencies of injuries sustained by performance dogs during activities allows incorporation of preventive strategies into a training program. There is information in the literature with regard to musculoskeletal injuries sustained by working and sporting dogs, although some of the evidence has relied on owner or handler recall rather than documented diagnosis by a veterinarian. One study that retrospectively evaluated 245 military working dog (MWD) records to determine reasons for discharge from service found that spinal cord disease and/or degenerative joint disease (DJD) were responsible for 56.3% of discharges in dogs five years of age or older (1). Similarly, an earlier retrospective study of records from 927 MWDs reported that appendicular DJD (19.2%) and spinal cord/cauda equina disease (15.6%) were two of the top three reasons for death or euthanasia (2). A study of MWDs treated for

●●● Programs for injury prevention and performance enhancement

Incorporation of neuromuscular training programs has been instrumental in reducing the risks of musculoskeletal injuries in youth and adolescent human athletes. Such programs varied among studies, but in general they incorporated the



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Figure 1. An urban search and rescue dog perches on rubble, representative of the unstable terrain these dogs must navigate.

use of exercises that focus on balance and proprioception, plyometrics and coordination. Programs implemented for six weeks or more into the training curriculum for various youth sports have demonstrated a reduced incidence of sports-related lower extremity injuries (9-11), specific injuries such as anterior cruciate ligament tears (12) and ankle sprains (13), as well as an increase in balance and body awareness (14) among young athletes. Most studies to date in the body of evidence have focused on middle school- and high school-aged children; injury prevention and performance improvement in younger children, and comparison of specific training programs, should be incorporated into future investigations.

Poor conditioning appears to be a major risk factor for sports-related injuries in young human athletes, and many working dogs are surprisingly inadequately conditioned despite the physical demands required by their duties. Some injuries sustained by human athletes have similar counterparts among working dogs, and analogous intervention strategies incorporated at the puppy stage are therefore likely to reduce injuries sustained during duty performance in these dogs. These programs, such as exposure to novel surfaces, obstacles and interaction with people, are expected to confer additional benefits to working

dog puppies including navigation ability, confidence, body awareness and proprioception. To the authors' knowledge there are no published evaluations or designs of programs that safely and effectively align with periods of puppy growth. Development of neuromuscular training programs at appropriate stages of growth requires an understanding of puppy neural development; this can be related to the stages of development in children.

●●●○ ●●○ ○ **Human neural development and impact on athletic performance**

Children appear to develop neuromotor skills in a cephalocaudal (head towards lower extremities) and proximodistal (trunk toward distal extremities) direction. They are in a reflexive movement phase for the first year of their lives, during which they learn more about their body and the world around it; this influences neural networking between the body and brain. Initially primitive reflexes, such as rooting and suckling, are present. Postural reflexes then begin to develop in preparation for voluntary movements that will be conducted later. These include the righting reflex, which assesses balance, the crawling reflex, which will give way to

voluntary locomotion, and the palmar grasp reflex. Throughout the first year of life the infant learns to gain control of the head and neck for stabilization and initiates unrefined voluntary movements. These movements begin to be controlled at around one year of age, which allow more directed movements of extremity segments and intentional manipulations of objects and the environment.

Within the “fundamental movement” phase, which occurs at 3 to 7 years of age, children explore bodily motion and the potential for movement in increasingly complex ways. Actions are initially uncoordinated and tend to be exaggerated, with gradual improvement in control and precision during the emerging stages at 3 to 5 years of age. This includes development of actions such as running and jumping, balancing on a beam or on one foot, and – by the latter stage of this phase – throwing and catching objects. This period of growth invites manipulation of a variety of fundamental skills required for athletic performance. This is critical, as environmental stimuli greatly influence the development of the fundamental movements during this timeframe. In fact, some adults may remain in these emerging stages for certain activities if they are not practiced and refined by external manipulation. At 7 years of age and beyond, children will improve simple skills for activities involved in daily living, but depending on environmental, cultural and inherent influences, they will also continue to develop increasingly complex and very precise movement sequences required for specific sports by age 13. At age 14 and beyond, the “lifelong learning” phase, children practice and utilize skills that will ultimately impact the distinction of elite athletes from other individuals, along with genetic variations. There is tremendous potential here for improvement of skill development, and most of the research in young



“The same principles of conditioning that are applied to the working dog can also be applied to a puppy intended for family life. Training the puppy in the fundamentals of exercise can have a substantial pay-off when carried into adulthood.”

Andrea L. Henderson



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Figure 2. A pair of 16-day-old littermates in the US Military Working Dog breeding program.



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Figure 3. A young puppy starting on its basic training; exposure to novel environments, people and objects is critical for puppies in their first 13 weeks of life.

athletes is targeted at this age group. Attempting to develop specialized skills at inappropriate stages of maturation appears to be of limited benefit (15).

●●●● Puppy neural development

As expected, a puppy’s central nervous system develops considerably more rapidly than those of humans. Puppies achieve spinal cord maturity at six weeks of age and have a mature brain with 96% adult-like brain function by four months of age (16). However, the direction and sequence of neuromotor development appears to progress similarly to that of humans. Puppies are born with intact vestibular function so that they can appropriately position to nurse. They are not born with muscle coordination or limb support, but will develop an upright posture at 10 to 14 days of age (Figure 2). Initial supported stepping with thoracic limbs is observed at 5-6 days after birth, followed by supported stepping with the pelvic limbs at 7-10 days. By two weeks of age, puppies are able to support weight on both



Figure 4. A five-week-old puppy learns to balance with her forelimbs elevated on soft, pliable materials.



Figure 5. A 14-week-old Labrador puppy learns to navigate Cavaletti rails.

thoracic and pelvic limbs and at 18-21 days they are able to ambulate with an uncoordinated gait. Spinal and myotatic reflexes can be initiated within a few days of life, but are weak and difficult to interpret until 3 weeks of age, when muscle tone is more developed. Tactile placing of limbs (thoracic first) becomes consistent at 5 weeks of age, while by around 6-8 weeks (although some breed variation exists) adult posture and balancing will be demonstrated, including postural reactions of the thoracic, followed by pelvic, limbs (17).

Behavioral development of puppies includes the sensitive period of socialization, which ends at 13 weeks of age. Manipulation of the environment

and exposure of working dog puppies to a variety of visual, auditory and tactile stimuli are critical during this timeframe. Appropriate exposure of puppies to kennels, home environments and people has been shown to result in a significant reduction in stress and altered behavioral outcomes (**Figure 3**), leading to improved performance in working dogs (18).

Genetic attributes such as body composition influence performance in non-human species as well, but these capabilities can be dramatically enhanced with appropriate environmental manipulations such as neuromuscular training. One study in horses (19) showed that only about 35% of speed performance could be explained by genetics, while the remaining 65% was due to environmental factors such as nutrition, training and management. Whilst little has been studied in this area in dogs, early conditioning may, to some degree, overcome suboptimal genetic attributes in the canine species. Exercising working dog puppies five days a week in a controlled environment has been shown to yield improved drive and confidence scores, as well as better performance on a number of tasks required for detection canines in the United States Transportation Security Administration (20). These puppies were compared to those that exercised formally for one hour per week, so it is unknown whether there is a critical minimum frequency that would deliver the desired performance results. Customs dogs in Australia demonstrated capabilities that predicted their performance as adults to some extent by three months of age (21), and positive reinforcement was correlated with increased success, suggesting that interventions that impact neural development may benefit puppies under 12 weeks of age.



“Many physical attributes, such as strength, endurance, flexibility, proprioception and balance, are necessary for peak performance in working and performance dogs, and several of these capabilities can be safely introduced in puppies.”

Bess J. Pierce

Puppy neuromuscular training

Early puppy socialization is critical for development of the human-animal bond, resilience and appropriate communication with people, whether as working and performance dogs or as companions. Socialization programs consist of exposing puppies to an extensive variety of novel stimuli, including humans, animals and different environments. The impact of such programs is even more significant for puppies raised in a professional breeding establishment or a working dog kennel. Puppies in their first weeks of immobility are sensitive to limited tactile, thermal and locomotor stimuli, so handling and other physical stimuli should therefore be integrated into the puppy's experience bank within the first three weeks of life (22). A program was assessed in a population of working dog puppies that involved application of stimuli between the third and sixteenth day after whelping. Manipulations were conducted once daily for 3-5 seconds at a time, and included changing of head and body position, application of interdigital tactile stimulation, and thermal stimulation (by setting the puppies momentarily on a refrigerated, damp towel). Puppies that received these interventions were found to be more exploratory and active, more assertive in competitive situations, and calmer with fewer distress signals and errors in a problem-solving scenario (23). Puppies can be introduced to more complex visual, auditory and tactile stimuli from three weeks of age up to 12-14 weeks, the remainder of the critical

socialization period. Exposure to novel surface textures, obstacles and other environmental stimuli can coincide with early development of neuromuscular conditioning (**Figure 4**).

Puppy conditioning programs should focus on balance and stability, basic functional fitness and – eventually – skills targeted to specific activities. As puppies enter their third week of life and begin uncoordinated movement, more specific interventions in motor learning can be implemented. Supported, static balance can be introduced by placing the puppy in a standing position on a slightly unstable surface such as a foam cushion. As the puppy begins walking and improving its coordination (from three to six weeks of age) balance activities can become more dynamic – for example, allowing the puppy to walk across an undulating surface such as foam pads or a mattress. After tactile placing emerges at five weeks of age, small obstacles and variations in terrain can be introduced for the puppy to navigate.

Proprioceptive training is critical, particularly for the pelvic limbs, as untrained dogs typically have insufficient body awareness in the hindlimbs for safe and coordinated obstacle navigation. At 12 to 16 weeks puppies can be asked to undertake more demanding tasks, such as stepping in and out of a box, walking across a moderately unstable surface such as balance discs or other inflatable equipment, and turning around as they ambulate, introducing abduction, adduction and

Figure 6. A US military working puppy takes a break during short bouts of swimming.



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Figure 7. A US military working dog puppy finds inflatable proprioceptive devices quite comfortable during an exercise break.



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rotational movements into the training (Figure 5). Low-impact cardiovascular training can be implemented; brief, 30-second bouts of swimming or wading in water to chase toys are particularly beneficial (Figure 6). From 4 to 6 months of age puppies can be introduced to more complex functional tasks, such as position transitions (stand-sit-stand, stand-down-stand) on unstable surfaces (Figure 7), and gaining recovery from extreme positions. Combination movements such as turning while stepping over obstacles, and turning while crawling, can also be implemented. Task-directed and problem-solving activities such as navigating obstacles for a reward should be included, and swimming sets can be lengthened in duration (to 1-2 minutes at a time). Puppies from 6 to 12 months of age can be introduced to more specific and fine movement skills – e.g., stepping on ladder rungs, searching on unstable surfaces, ascending and descending ramps, walking with forelimbs on a rolling chair. This stage should also include refinement of fine motor movements in previously introduced functional skills. At 12 months of age highly specific skills training can be refined and targeted to maximize performance for definitive duty or athletic requirements; this includes the gradual building of complex agility movements and fast-paced, high-impact or explosive propulsion-based activities [16].

Safe conditioning programs should be implemented in puppies that correspond with their level of neuromotor development and that minimize risk of injury to structures such as open physes, which are among the most easily damaged structures in skeletally immature adolescents [24]. In most large breeds the growth plates of extremities remain open until about 12 months of age, so whilst plyometric training is incorporated into many adolescent human sports programs, exercises that involve repetitive, high-impact forces (e.g., jumping down from a height, prolonged running) should be avoided in skeletally immature puppies.



CONCLUSION

The conditioning activities in this article are targeted to improving performance and reducing risk of injury in working dogs. However, these progressive manipulations of environmental stimuli are designed to benefit all puppies, from household pets to professional athletes. Dogs can be instilled with problem-solving capabilities, improved confidence and better performance during basic activities of daily living as well as complex functional tasks. Practitioners who understand the stages of canine neural development and motor learning, and utilize that knowledge to apply progressive functional training, can assist in developing puppies with stronger human-animal bonds, reduced risk of injury, and an overall higher quality of life in any capacity.



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INJURY PREVENTION IN SERVICE DOGS



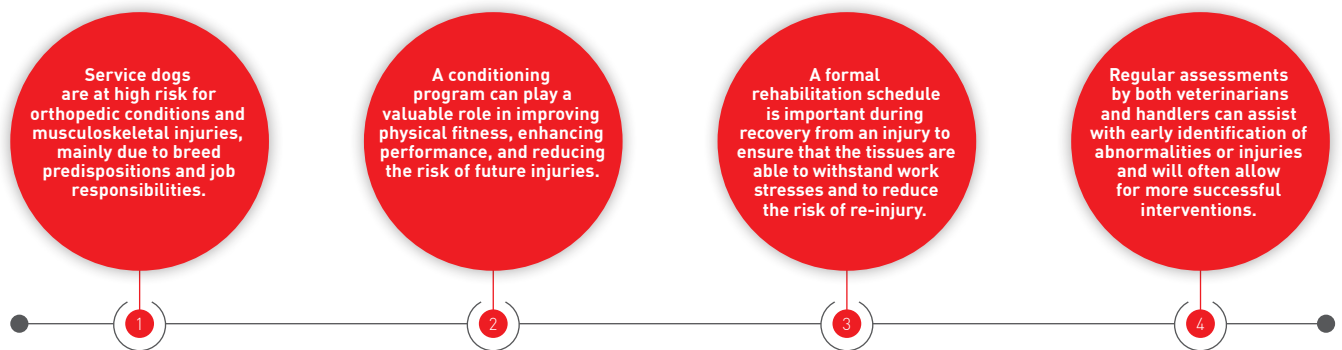
Tara R. Edwards,

DVM, Dip. ACVSMR, CCRT, CVPP, cVMA, VCA Tri Lake Animal Hospital and Referral Centre, Kelowna, BC, Canada

Dr. Edwards graduated from the Western College of Veterinary Medicine in 2002 and qualified as a Canine Rehabilitation Therapist (CCRT) in 2006. She currently works in private practice in charge of the rehabilitation and acupuncture service, and her areas of interest include improving the quality of care for geriatrics, raising the bar for pain management, and veterinary orthotics – she is certified as a Veterinary Pain Practitioner (CVPP) through the International Veterinary Academy of Pain Management. She is boarded with the American College of Veterinary Sports Medicine and Rehabilitation, and also holds the cVMA qualification in veterinary medical acupuncture.

Service dogs take on various unique roles in today's society, and the veterinarian plays a major part in ensuring that these dogs attain and maintain peak health, as Tara Edwards describes.

KEY POINTS



Introduction

In 2016, we said good-bye to the last service dog that assisted with the 9/11 Ground Zero rescue operations, and at times like these we are reminded how much we rely on these canine heroes who loyally serve and protect. Working service dogs (or K-9 units) are now commonly used in search and rescue, law enforcement, military operations and other aspects of security; in North America these include the Federal Bureau of Investigation, Customs and Border Protection, Transport Security Administration, Canadian Armed Forces, and Department of National Defense. The job description for these dogs varies immensely, and can include patrolling, tracking, detection (explosives, firearms, ammunition, narcotics, and cadavers), apprehension, as well as search and rescue for

missing individuals or during a mass casualty event (Figure 1). Service dogs are invaluable members of a larger team and play an incredibly important role in protecting and promoting human safety. Because of their daily duties and potential for working in high-risk scenarios, ensuring their safety, avoiding injury, and encouraging career longevity is a primary focus for preventative veterinary healthcare.

Underlying conditions & working hazards

Depending on their occupation, service dogs come in many shapes and sizes, with certain breeds (because of their conformation) being better suited to perform certain tasks. The most common service



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Figure 1. The job description for working dogs varies immensely, and can include detection of drugs and other banned substances at airports.



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Figure 2. Belgian Malinois dogs are often used because of their high “drive” and compact frames.

breeds include, but are not limited to, German Shepherds, Belgian Malinois (**Figure 2**), Labrador Retrievers, Rottweilers, and Beagles. Inherited orthopedic disease such as elbow dysplasia, hip dysplasia, intervertebral disc degeneration, patella luxation and cranial cruciate ligament disease can especially affect these breeds (1). One study looked at the prevalence of musculoskeletal conditions in service and working dogs and found that a staggering 41% of these individuals had a significant underlying orthopedic disease (2).

Other hazards are also encountered. Dogs deployed to disaster locations often succumb to illnesses such as dehydration and gastrointestinal disturbances, and search and rescue dogs often incur superficial injuries (e. g., wounds, abrasions, and paw, pad and nail injuries) due to environmental hazards (3,4) (**Figure 3**). Military and law enforcement dogs are prone to emotional distress and possible catastrophic trauma or weapon-related injuries due to their job requirements.

●●● Injuries

Individuals working with service dogs need to be proficient at providing not only emergency critical care but also dealing with many other problems. In addition to underlying orthopedic disease, the musculoskeletal system is involved in up to 14% of non-combat related injuries in service dogs (5) and these can further impact on a dog’s performance and career longevity. For example, retrospective surveys of agility handlers found that ~30% of competing dogs had suffered at least one sport-related injury (6,7), with the documented injuries being due to inappropriate contact with objects and uncontrolled movements such as turning, twisting, slips, and falls. Many of these were soft tissue problems, predominantly affecting the shoulder, back and neck, and it is

predicted that many of these injuries are likely the result of chronic and repetitive over-use. Service dogs are expected to work in unpredictable environments with inconsistent terrain and variable obstacles, and are likely to move at high speed, and it could be predicted that compared to agility dogs, service dogs could sustain similar injuries from chronic overuse. Certain common injuries and problems have been identified in service dogs.



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Figure 3. Healing paw and pad injuries in a service dog caused by thermal environmental conditions.

Carpal injuries

Due to the demands of jumping, the carpal and shoulder joints are prone to impact. Carpal hyperextension injuries are usually traumatic and result from jumping down from heights or working on uneven terrain. The carpus is a complex structure where stability is achieved by supporting ligaments, tendons, and palmar fibrocartilage, and repetitive jumping could perceivably increase the risk of degeneration of these supporting structures. It may therefore be well worthwhile introducing controlled exits when leaving service vehicles for these dogs.

Fibrotic myopathy

This is a unique soft tissue condition that causes a biomechanical lameness involving the pelvic limbs. Active working shepherd dogs appear to be the most susceptible to this disease, with reports that 90% of affected dogs are German or Belgian Shepherds, with approximately 40% actively involved in protection work (8). This disease involves normal muscle tissue being replaced by fibrous, non-elastic connective tissue and that predominantly affects the gracilis and semitendinosus muscles (**Box 1**). The result is a functional shortening of the affected muscles and a mechanical lameness from an inability to extend the stifle. Chronic, low-grade microtrauma of muscle fibers from excessive and explosive activity may be the initiating factor for this fibrotic process. The most effective treatment or intervention strategy is unknown at this time, but the possibility that this disorder is related to repeated muscle injury suggests that a targeted stretching program may be valuable in reducing the prevalence. Regular myofascial assessments may also encourage earlier detection and possibly more successful interventions in the future.

Lumbosacral disease

An increase in the prevalence of degenerative lumbosacral stenosis is a concerning trend in military working dogs, as it negatively impacts not only on career longevity but on quality of life and length of life. One study reviewed the medical records of 927 military working dogs and found that degenerative joint disease (19.2%) and spinal cord pain/cauda equina disease (15.6%) were common reasons for euthanasia (9), whilst another study

Box 1. The gracilis & semitendinosus muscles share similar anatomical features.

Pass over gastrocnemius
Insert on tibial surface & calcaneus
Contribute to common calcaneal tendon
Components of the Achilles tendon
Functionally assist with hip extension and stifle and tarsal flexion



© Dr. Tara Edwards

Figure 4. Radiographic evidence of changes in the lumbar and lumbosacral regions of a service dog.

reported that 30% of military working dogs suffered spinal cord disease and was a common cause for retirement (10). Physical activity-related strain and breed-associated structural uniqueness may encourage changes to the lumbosacral region and cause degenerative lumbosacral stenosis, which can contribute to altered biomechanics, nerve-related or neuropathic pain, and neurological dysfunction (11) (**Figure 4**).



Conditioning programs

An important focus in canine athletics and veterinary sports medicine has been the concept of injury prevention. Avoiding problems in service dogs is important, as injuries ultimately impact an individual's performance and dogs may be forced into early retirement due to injuries acquired. Many dogs have been selected because they have the desired conformation and behavioral characteristics to perform their jobs effectively and efficiently. Our role is to improve their ability to perform and work without injury by influencing their physical fitness.



“A conditioning program should be targeted towards the needs of each individual dog and their occupational role, as different tasks can lead to different physical demands and stresses on the body.”

Tara R. Edwards

Fitness on both ends of the leash is required for a team to function well, and there are many benefits to a conditioning program, including encouraging high performance, reducing risk of injury and improving recovery following an injury. This should be targeted towards the needs of each individual dog and their occupational role, as different tasks can lead to different physical demands and stresses on the body. Historically, proper conditioning of service dogs is often a challenge due to time management, but in order to achieve longevity and durability, the overall conditioning of a dog needs to exceed their drive. Ideally, conditioning should be considered an additional activity above and beyond regular skill training and work duties.

A conditioning program for individuals requiring enhanced endurance should focus on maximizing the utilization of oxygen, whilst a program for animals requiring strength should focus on increasing power and acceleration. A high level of endurance is important for service dogs involved in prolonged periods of activity (such as tracking) while strength is important for animals involved in short bursts of high intensity (12). Service dogs are unique athletes that require a combination of aerobic and anaerobic conditioning to advance their overall strength and endurance capacity. The prime objective of a conditioning program is to maximize a dog's physical fitness and improve both the cardiovascular and musculoskeletal systems. The program should allow for gradual increases in duration, frequency, and intensity of exercises to allow the cardiovascular and musculoskeletal systems to accommodate and adapt. An ideal condition program incorporates endurance, strength training, balance and core strength, proprioception, stretching, warm-ups and cool-downs.



"Encouraging ideal body condition in service dogs is paramount for both long-term joint health and overall performance; dogs that are in shape can perform job-related tasks better, whilst excess weight contributes to thermoregulation difficulties and impacts on scent detection."

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Figure 5. Obstacle course equipment can help develop limb and paraspinal musculature.

Endurance

Improving endurance in the service dog can have an impact on maximizing performance and minimizing fatigue. Exercises that lead to increased heart and respiratory rates will target endurance development, and examples of endurance activities include continuous swimming and jogging. The preferred gait when working on land for endurance training is the trot, a symmetrical 2-beat gait that exercises both sides of the body equally compared to a gallop or canter. Increasing the length or volume of training is not always the solution for making endurance gains; it has been found in highly trained human endurance athletes that performance improvement can only be achieved through high intensity interval training. In other words, a sprinting program in addition to endurance training is utilized for long distance runners (13).

A lack of conditioning can result in poor endurance, fatigue issues, and/or heat exhaustion. The prevention of overheating is a major concern for working dogs in a hot or humid environment, and endurance training encourages the body to respond with improved efficiency. Handlers cannot control environmental temperature, but the individual dog's physical fitness impacts their thermoregulation and internal body temperature. A lack of conditioning results in an increase in body temperature, excess panting, and mouth breathing, which ultimately influences olfaction and impacts scent detection abilities. Certain medications, such as metronidazole, can also impact olfactory senses and should be avoided or used with caution in service dogs involved in detection (14).

Strength

Strength training in humans often refers to resistance training with weights or power training, which involves a combination of strength and speed (*i.e.*, plyometrics). In canine athletes, strength training involves having the dogs move their own body weight over short distances. Agility equipment is excellent for strength training as it requires the dogs to move over, under, and through obstacles. Equipment items like tunnels force the dogs to move their bodies lower to the ground and will challenge the thoracic limb muscle groups of the shoulders, including biceps, triceps, and pectorals. Obstacle course equipment such as the catwalk, A-frame, steps, weaves, and jumps target the pelvic limbs and paraspinal musculature (**Figure 5**).

Balance and core strength

The core muscles in the dog include the abdominal and paraspinal muscles, which play an important role in stabilizing the body during movement. Improving strength in these powerhouse muscles enhances functionality and the ability to perform agile movements. There is a significant amount of stress placed on the back with the sort of movements performed by service dogs, and without core strength the back is not appropriately supported and can be injured with rotational torque and explosive types of activities (**Figure 6**). It has been found that dogs with degenerative lumbosacral stenosis have paraspinal muscle atrophy, which is also a common finding in humans with chronic lower back pain (15). Working on core strength is invaluable when dealing with breeds or conformations that are predisposed to spinal cord disease, and studies are currently under way to determine what role a conditioning program can have on increasing the mass of paraspinal muscles in dogs with mild or moderate lumbosacral pain. Many exercises performed on inflatable equipment focus on balance and will encourage the development of core strength (**Figure 7**).

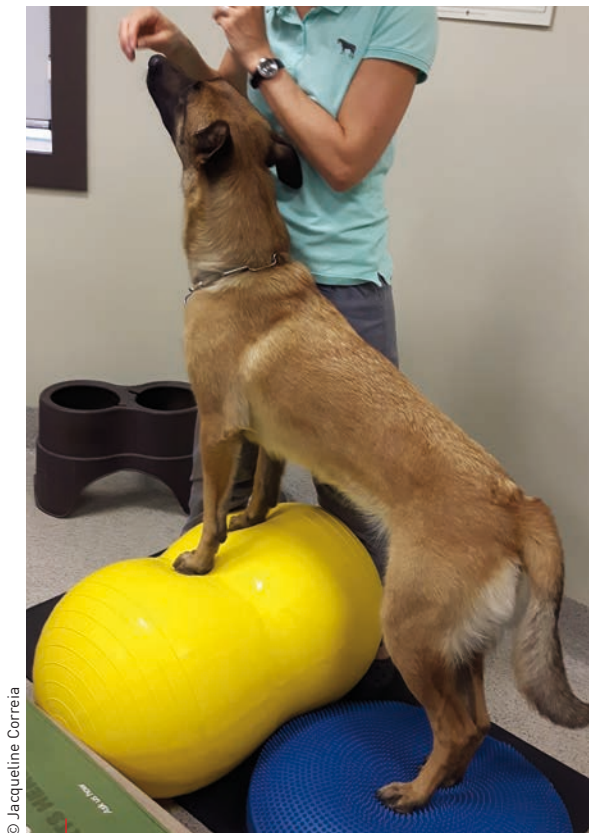
Proprioception

Proprioception refers to the concept of spatial awareness, *i.e.*, the body's ability to sense movement and acknowledge where the limbs and joints are in space. Proprioception is required for everyday functioning but is even more critical for the performance of coordinated and complicated sporting movements. The proprioceptive system is made up of special nerves that relay information, and this system can be challenged with training, which can have a positive impact on coordination, agility, stability and balance, as well as reducing the risk of injury. Enriching the training environment by working on a variety of terrains, inflatable equipment, cavalettis, and agility or obstacle course equipment are easy ways to challenge a dog's spatial awareness.



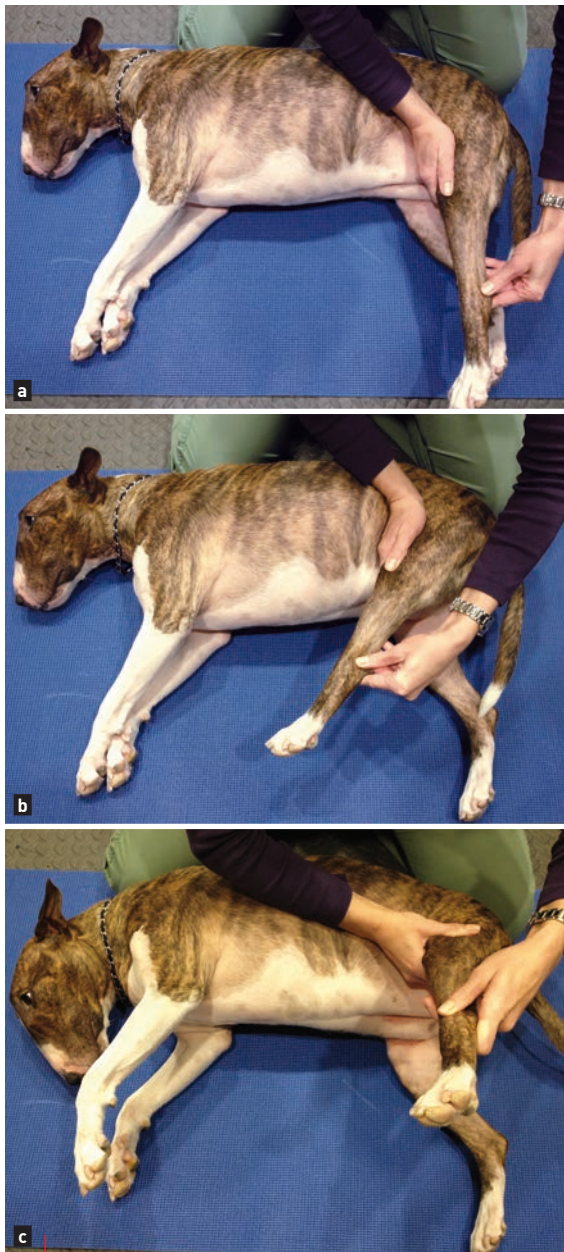
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Figure 6. Core strength is required to support the back during activities such as apprehension work.



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Figure 7. Working on inflatable equipment assists with the development of balance and core strength.



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Figure 8. (a) The hamstring stretch begins with the stifle in extension. (b) Slowly flex the hip joint while maintaining a straight stifle to target a semitendinosus stretch. (c) While flexing the hip and maintaining a straight stifle, slowly abduct the pelvic limb to target more of a gracilis stretch.

Stretching

Stretching involves placing a small amount of tension on a muscle and is effective at increasing not only muscle flexibility but also joint mobility. In addition to minimizing muscle injury, a regular stretching program in humans can increase the force and velocity of muscle contractions, resulting in more muscle power. There is a lack of consensus in human studies regarding the use of “pre-event” stretching to reduce the risk of injuries. It is thought that stretching immediately before an event may actually reduce muscle performance by decreasing the velocity and force

of muscle contractions [16]. The main benefit with improving muscle flexibility is to reduce the risk of micro-tear injuries. It may be beneficial to initiate a regular hamstring stretching program in breeds that are at high-risk for developing fibrotic myopathy (**Figures 8a,b,c**). The greatest gains in flexibility are achieved when stretching occurs on a regular basis over time. Ideally, a stretching routine should be performed on muscles that are warm, as there is an increase in extensibility and compliance of the tissue. A stretching program to the muscles that contribute to rapid bursts of power should be considered for canine athletes, performed on alternate days.

Warm-ups

An active warm-up session results in an increase in muscle temperature and ensures an adequate supply of oxygen to the muscles. This allows them to contract more powerfully and improves muscle extensibility, thereby reducing the risk of injury. Working muscles receive a greater portion of bloodflow which can assist in the removal of lactic acid, a common by-product of muscle contractions which may play a role in fatigue. A simple 5-10 minute warm-up, consisting of low impact activities such as walking and trotting, can help prepare the dog’s muscles for future training and work challenges. Ideally, warming-up prior to exercises, conditioning, or work-related activities when time permits will assist with improving performance and preventing injuries [17]. Consider adjusting the length of warm-up relative to the environment temperature (*i.e.*, longer warm-ups in cooler weather and shorter in hot/humid weather) [18].

Cool down

The cool-down period can be just as important as the initial exercise or activity. The main goal during this time is to bring the respiratory rate, heart rate, and body temperature slowly back to normal. As noted above, a common end-product of vigorous muscle contractions is lactic acid, which can cause a reduction in pH and may result in muscle fatigue and discomfort. Cooling down over a 5-10 minute period with light trotting followed by walking allows the blood supply to redistribute and can help remove excess metabolic by-products. This cool-down routine also provides “high-drive” service dogs an opportunity to unwind emotionally prior to being confined or returned to a vehicle.

Injury & rehabilitation

Injuries are bound to occur due to the nature of the work required by service dogs. Muscle injuries are extremely common in both human and canine athletes and can be acute or chronic in nature. They may be the result of poor flexibility, inadequate warm-up, fatigue, sudden forceful contractions, strength imbalances, and over-training. Acute muscle injuries are a consequence of muscle fibers tearing suddenly, while chronic injuries are



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Figure 9. A service dog with an Achilles tendon injury and secondary contracture of the superficial digital flexor tendons.

an accumulation of minor tears that have never healed appropriately due to constant overuse (**Figure 9**).

Rehabilitation is an appropriate standard of care when dealing with any underlying orthopedic disease or musculoskeletal injury to assist with recovery, minimize risk of re-injury, and encourage return to work in a service dog. Most tissues undergo similar stages of healing, *i.e.*, inflammation, repair, and maturation. It is during the repair phase that rehabilitation can ultimately guide healing to maximize tissue strength (**Figure 10**). Typical stages of rehabilitation include an acute phase, an intermediate phase, an advanced strengthening phase, and a return to sport or work-specific training. Proprioceptive abilities will often be deficient following an injury and can result in subtle changes to muscle control. Improving proprioception through specific exercises can help return to a competitive level.

During any prolonged medical illness or following abdominal surgery (*e.g.*, gastric dilatation/volvulus, foreign body removal, splenectomy), it is important to acknowledge that the body undergoes a state of deconditioning. There is loss of both cardiovascular fitness and musculoskeletal integrity when exercise restrictions are in place. A structured rehabilitation program focuses on the concept of gradual return to activity to ensure that the dog is physically ready, regardless of its mental determination to return to work.

●●● Early injury detection

Comprehensive screening to ensure a solid orthopedic foundation and regular musculoskeletal examinations or “sports assessments” for service dogs will encourage earlier identification of musculoskeletal issues (**Box 2**) (**Figure 11**). These musculoskeletal conditions can predispose this patient population



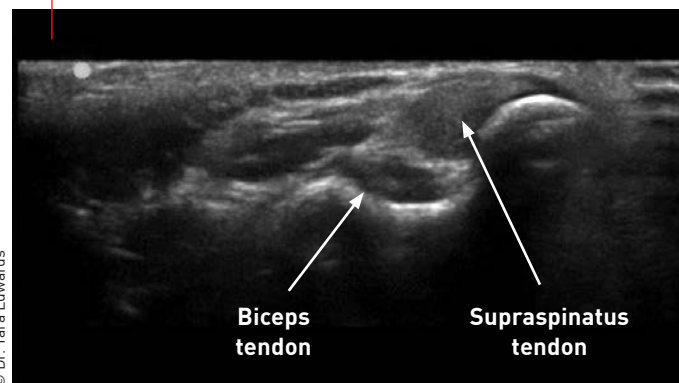
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Figure 10. A Belgian Malinois undergoing physical hydrotherapy rehabilitation for an acute stifle injury.

Box 2. A comprehensive “sports assessment” for service dogs will encourage earlier identification of musculoskeletal issues; this includes.

Gait analysis (with video capture)
Observation of static & dynamic postures
Body condition score
Muscle condition score
Muscle evaluation <ul style="list-style-type: none"> • Tone • Symmetry • Atrophy • Myalgia
Joint evaluation <ul style="list-style-type: none"> • Range of motion • Crepitus • Laxity • Pain
Neurological evaluation
Imaging (radiography and musculoskeletal ultrasound)

Figure 11. Comprehensive screening can aid early detection of injuries in working animals, such as this baseline musculoskeletal ultrasound assessment of a dog's forelimb, which demonstrates the normal appearance of the biceps and supraspinatus tendons.



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Box 3. A 5-minute evaluation checklist.

Observe movement (walking and standing)
Sitting
Standing palpation
Neck and back
Thoracic limbs
Pelvic limbs
Lateral evaluation
Muscle palpation
Joints – range of motion
Feet – digits, nails, pads and interdigital space

to performance issues due to underlying pain or earlier progression of a disease process from excessive wear and tear.

The combination of drive and adrenaline in service dogs often masks the early signs of an injury. Mild injuries can be a challenge to detect, as there are minimal tissue changes on physical examination. In humans with mild strains, the description of discomfort is often the key factor in diagnosis. It is important for handlers to routinely perform a quick “5-minute evaluation” of their dogs after strenuous work shifts (**Box 3**). With regular palpation, a better understanding of what is “normal” for a dog can be developed, and this increases the chances of detecting an initial minor change (**Figure 12**). The ability to identify an injury in its early stages is invaluable for both successful intervention and in preventing a minor injury from progressing or escalating to a more chronic performance-altering condition.

●●● Long-term joint health

Encouraging ideal body condition in service dogs is paramount for both long-term joint health and overall performance. Dogs that are in shape can perform job-related tasks better, whilst excess weight contributes to thermoregulation difficulties and impacts on scent detection. As the body condition score escalates, the shear force on the joints increases, as does the susceptibility to injury. Obesity increases not only the occurrence but also the severity of osteoarthritis. It is often quoted that 20% of adult dogs are impacted by osteoarthritis, but a recent study revealed a prevalence of 37% in dogs greater than one year of age (19). The number of overweight dogs is rapidly increasing and evidence suggests an association between lifespan and body condition



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Figure 12. Handlers should be routinely encouraged to perform a quick examination of their dog after a strenuous work shift; with regular palpation, a better understanding of what is “normal” will increase the chances of early detection of minor changes.

score (20); it has been shown that dogs fed a limited calorie diet developed osteoarthritis later in life and had a longer life expectancy in comparison to dogs on an *ad lib* diet (21-24).

Arthritis is the number one cause for pain in companion animals and the pain from arthritis can directly impede performance in canine athletes and service dogs. Due to their job demands, service dogs are at an increased risk for excessive wear and tear on their joints. Degenerative joint disease causes alterations in movements which results in overcompensation by other joints and muscles. These changes can cause muscle fatigue and increase the susceptibility to injury. Focusing on the prevention of arthritis, early arthritis identification, and the implementation of a multi-modal arthritis plan (**Box 4**) is paramount for extending the career life of service dogs.

Box 4. A multi-modal arthritis prevention and treatment plan.

Nutrition
Weight management
Disease modifying agents
Exercise & conditioning
Physical rehabilitation
Lifestyle modifications
Pharmaceuticals
Intra-articular therapy
Surgery



CONCLUSION

Preventative health care has come a long way with regards to physical examinations, dentistry, laboratory screening, nutrition, parasite control, and vaccinations for service dogs. The emerging field of sports medicine focuses on influencing the physical fitness of these animals and promoting career longevity, which ultimately fosters the bond between handlers and working dogs, and with a good knowledge base the veterinary healthcare team can play a vital role by implementing appropriate strategies to maximize injury prevention.

It must also be emphasized that nutrition plays a significant role in not only providing an appropriate fuel source but also by mitigating disease risk and progression. There are many different nutritional supplements and diets available with the primary goal of supporting long-term joint health. As part of a multi-modal arthritis plan, it is common to utilize chondroprotective agents to slow down the progression of osteoarthritis. Common products include, but are not limited to, omega-3 fatty acids from fish oils (EPA & DHA), avocado soybean unsaponifiables (ASU), curcumin, green tea extract, green-lipped mussels, glucosamine, and chondroitin sulfate.



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PRACTICAL NUTRITION FOR WORKING DOGS



Veerle Vandendriessche,

DVM, Dip. ECVCN, Pavo Nutrition, Heijen, The Netherlands

A 2005 graduate of the Ghent University Faculty of Veterinary Medicine, Dr. Vandendriessche worked in private mixed practice for 8 years before completing a residency in companion animal and equine nutrition at Ghent University in 2016. She became a European board-certified nutritionist in 2019 and currently works as a nutritionist with a feed company.

KEY POINTS

1 The protein and energy requirements for working dogs can differ significantly from the needs of the average pet dog.

2 Diets must be tailored for individual working dogs, using a 9 point Body Condition Score as the primary benchmark when calculating the amount of food to be fed

What should an owner of working dogs feed their animals to ensure they stay in peak condition? Veerle Vandendriessche offers some hints and tips from her own viewpoint as a nutritional expert.



Introduction

Although the number of working dogs that will be presented to the average small animal practicing veterinarian may be low, it remains important to know how to advise their owners, as these dogs have very specific nutritional requirements. In order to give an overview of the different factors that should be taken into account when addressing this issue, this article will briefly discuss how muscle physiology functions during strenuous activity, and then present a summary of the requirements for the different types of working dog. It can be helpful to categorize these dogs as follows;

- Low-intensity, high-duration exercise (e.g., endurance dogs)
- Moderate-intensity, moderate to high-duration exercise (e.g., police dogs, hunting, search and rescue, service dogs)
- High-intensity, short-duration exercise (e.g., sprinting, agility and weight pulling)

It is essential to take into account not only the actual nutritional requirements for these animals, but also to consider other management factors that can be applied in order to help these canine athletes function to the best of their ability.



Energy sources during exercise

During exercise, muscles require ATP (adenosine triphosphate) as fuel. This can be obtained from different sources, and can be both from within the muscle (endogenous sources) and from other organs (exogenous sources). When oxygen is available, aerobic metabolism (oxidation of glycogen, fatty acids and amino acids) will occur in the cellular mitochondria, whereas in the absence of oxygen anaerobic metabolism will take place in the cytoplasm (**Figure 1**). Which fuel source will be used is determined by the type and the intensity of the work, and the conditioning and nutritional status of the working dog.

There are four important energy-generating pathways: creatine phosphate (Cr-P) and glycolysis, which occur in the absence of oxygen, and carbohydrate oxidation and fat oxidation, which can only take place when oxygen is available. The first two methods can generate ATP from endogenous storage in the muscle during the first seconds (Cr-P) or minutes (glycogen) of activity, and are thus very important for short, high-intensity exercise such as sprinting and weight pulling. Complete oxidation of carbohydrates and fatty acids will supply the muscles with energy over a prolonged period of time (hours) and

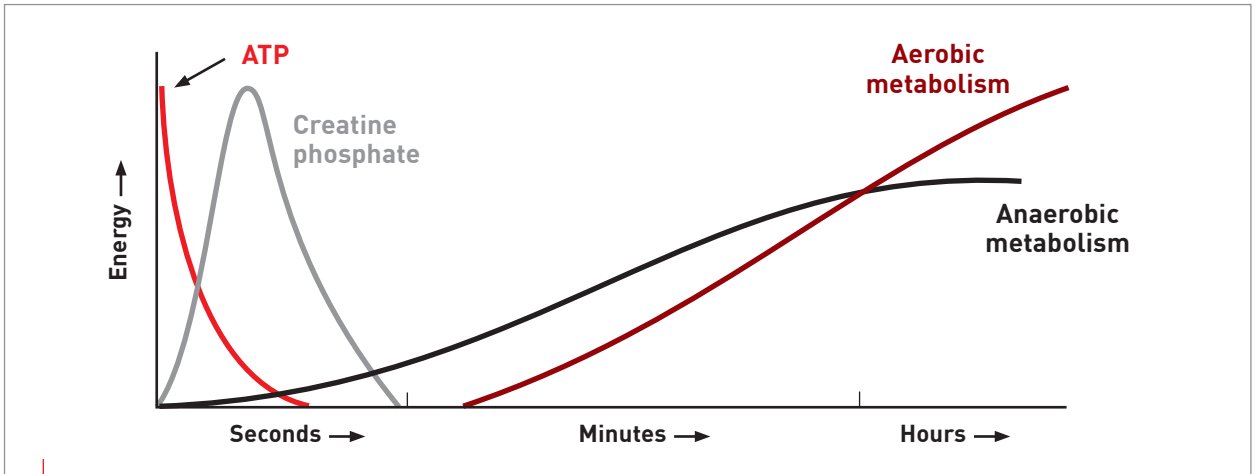


Figure 1. A graph showing the different energy sources that are used over time during exercise.

are thus the most important energy sources for low to moderate-intensity exercise such as hunting, agility, police work (Figure 2) and pulling sleds.

During exercise, negative byproducts are also produced, namely heat, acids (CO_2 and lactic acid) and free radicals. A dog will disperse the heat by panting, whilst the aerobically produced CO_2 is lost through the renal system or the respiratory tract. Anaerobic production of lactic acid will limit muscle functionality very quickly, because a suboptimal muscle pH will inhibit muscle enzymes. When a dog is no longer able to lose excess heat by panting, its body temperature will rise, and muscle functionality will decrease. Training will not only increase the endogenous storage capacity of the muscle, it will also enhance the number of mitochondria in muscle cells and the overall lung capacity, which in combination will increase the dog's capacity to perform exercise.

●●● How should a working dog be fed?

The amount and type of food a working dog should receive depends on various different elements. These include the work intensity and duration, but also environmental factors such as the ambient temperature (not only throughout the work period but also during rest/recovery), the terrain being worked, and the dog's temperament. Although consideration may be given to predicting caloric expenditure during training and exercise by assessing the speed and intensity of the work involved, it is important to also take into account the distance the dog will travel during an exercise period.

Whilst there are NRC (National Research Council) guidelines available that can be used as a starting point, each animal should be considered as an individual case. The 9 point Body Condition Score (BCS) is the main physical benchmark when calculating the amount of food to be fed. Dogs that perform low- or moderate-intensity exercise should be kept at a BCS of 4 or 5, whereas dogs performing high-intensity exercise are usually kept at a BCS 3 or 4. Dogs in the high- and moderate-intensity

classes usually do not require more than twice the recommended MER (Maintenance Energy Requirement) for pet dogs (1), whereas dogs in the low-intensity category may require up to 6 x MER, for example during a racing season. This variability in energy requirements also has an impact on the main energy sources that should be identified when advising a specific diet. Where dogs in the high and moderate class require energy both from digestible carbohydrates and fats, dogs that undertake low-intensity activities will require mainly fat as an energy source and negligible amounts of digestible carbohydrates (2). In contrast to other species of athletes (humans, horses), where the rapid reloading and replenishing of glycogen stores following a workout is proven, studies in dogs have resulted in conflicting results. However, from knowledge of

Figure 2. Police dogs are subject to low or moderate levels of exercise for a prolonged period of time, and should be fed a diet with both digestible carbohydrates and fat as the energy source.



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Figure 3. Sled dogs will race for many hours at a time and will have enormous energy requirements during this time.

muscle physiology it can be assumed that dogs in the high- and moderate-intensity categories will use some of their glycogen stores during exercise that (ideally) will be replenished as efficiently as possible. Therefore, it is advisable that these dogs have some of their energy requirement supplied as digestible carbohydrates. Dogs subject to high-intensity exercise should get 40% or more of their calories from the nitrogen free extract (NFE) section of their diet (*i.e.*, the fraction that contains the sugars and starches), whilst dogs in the moderate-intensity category should get 15-40% of calories from the NFE. Keep in mind that, in combination with the correct amount and type of training, these glycogen stores can be increased, thus improving performance by delaying the onset of acidosis.

Sled dogs are perhaps in a class of their own when it comes to nutrition (**Figure 3**). As can be imagined, the amount of food that can be physically consumed by a sled dog on a daily basis is a limiting factor, thus more than 60% of the energy for these animals should be supplied as fat, which has a high-energy density. Because of this, and also because of financial

restraints, some owners will prepare a home-produced diet for their sled dogs, which may include raw foodstuffs. The pro and cons of such diets have been extensively reviewed elsewhere in the literature and will not be discussed further here, although the risk of bacterial contamination (*e.g.*, *Salmonella*, *Campylobacter spp.*) should not be ignored. Emphasis should always be put on balancing these diets with appropriate addition of a vitamin/mineral/trace element premix in order to support performance.

Working dogs also have differing protein requirements. During training, and certainly during performance, protein turnover is increased, although to what extent is difficult to quantify. However, protein recommendations for the different intensity categories are not dissimilar: diets for dogs that do high-intensity and short-duration moderate-intensity work should contain between 24-28% protein (DM) from high-quality protein sources, whereas diets for animals subject to long-duration, moderate-intensity or low-intensity exercise should contain > 30% protein (DM) (3). As a general rule, the protein supplied should be sufficient to meet the dog's anabolic requirements with sufficient non-protein energy nutrients (fat and NFE) given to meet its energy requirements.



“The amount and type of food a working dog should receive depends on many different elements. These include the work intensity and duration, but also environmental factors such as the ambient temperature, the terrain being worked, and the dog’s temperament.”

Veerle Vandendriessche

●●● What about other factors?

Given the importance of the respiratory tract and the renal system to keep the body functioning optimally during and after exercise, the significance of water amount and supply cannot be overlooked. As a general rule fresh drinking water should be made available at all times whenever possible, so ideally before, during and after exercise. The one exception to this rule is with sprint dogs, where water is sometimes withheld before the race to decrease ballast.

Another important consideration is the digestibility of the food. The higher the digestibility, the less food is required to supply dogs with their energy requirements and the less fecal bulk is produced. A dry matter digestibility of >80% is therefore advisable. In addition, and as discussed earlier, with certain high- and moderate-intensity activities part

or even the entire glycogen storage may be depleted during exercise, so for dogs performing in multi-day events, a carbohydrate boost post-exercise could help replenish these stores more quickly.

As with every process in the body, free radicals are produced during exercise. Normally these are neutralized by the available antioxidants (e.g., vitamin E, vitamin C and selenium) but when free radical production is excessive, oxidative stress will result. In human athletes, this is known as chronic muscle disease or overtraining. When advising antioxidant supplementation, it is important to keep in mind that high doses of a single antioxidant may actually have a pro-oxidant effect and should therefore be avoided (4). Using a lower dose of a multi-nutrient antioxidant is always to be preferred, as vitamin E, Vitamin C and selenium work synergistically. **Table 1** offers recommended guidelines for the common antioxidants that can be added to the diets for working dogs, although as when considering addition of a multivitamin/mineral premix, a blanket recommendation to supplement without consideration of an animal's base diet is never a good idea.

Table 1. Recommended levels of antioxidants for working dogs.

- Vitamin E; > 500 IU/kg DM
- Vitamin C; 150-250 mg/kg DM
- Selenium; 0.5-1.3 mg/kg DM

Table 2. Summary of feeding advice for different categories of working dogs.

High-intensity, short-duration exercise
<ul style="list-style-type: none"> • Modest increase above MER (<25%) • Diet with digestible carbohydrates as main source of calories • Food and snacks should be fed > 4 h before exercise (to avoid a severe drop in blood glucose) • Allow free access to water, except immediately before performance • High-carbohydrate snacks within 30 minutes of performance to enhance glycogen repletion
Moderate-intensity, moderate to high-duration exercise
<ul style="list-style-type: none"> • Amount of food will be highly dependable on distance covered during exercise, therefore assess BCS frequently • Diet with both digestible carbohydrates and fat as energy source; the longer the exercise duration, the greater the contribution from fats should be • Although rarely required, vegetable oils can be added to commercial diets to increase fat content if necessary; one tablespoon of oil per pound (15 mL per 450 g) of food increases the fat content by 3%. • Allow free access to water at all times • Snacks can be given at exercise or during breaks < 15 minutes before resuming exercise • If diet is changed during off season, adjust back at least 6 weeks before start of new season
Low-intensity, high-duration exercise
<ul style="list-style-type: none"> • Amount of food required will be very dependent on distance covered during exercise, therefore assess BCS frequently • Diet with fat as main source of energy (> 60% of calories) • Consider adding a multivitamin/mineral premix to home-prepared diets • Allow free access to water at all times • Feed after exercise, snack during or after exercise • Steatorrhea and decreased food palatability are indicators that fat tolerance has been exceeded.

Table 2 offers a brief summary of the various factors that should be considered when advising the owner of a working dog as to their nutritional requirements.

How about a puppy with working dog ambitions?

A brief mention of puppies that are scheduled to be working dogs is appropriate, as environmental and nutritional factors will greatly influence the future athletic performance of a growing dog. Above all, these animals should be fed a puppy diet designed specifically for their expected adult weight; so for example large breed puppies require a diet with less calories and calcium that allows them to maintain a lean body weight at all times, in order to avoid them gaining excess weight or growing too fast. Failure to do so may result in osteochondrosis lesions, skeletal abnormalities and hip dysplasia. High-intensity training for puppies should be avoided until skeletal growth is complete, but low-intensity/impact training can be undertaken during dynamic growth.

In addition, at least one study has shown that beneficial effects on early performance and behavior training can be achieved by modulating the uptake of the omega-3 fatty acid DHA (docosahexaenoic acid) in puppies up to 1 year of age. However, more work needs to be done in this area, as the diet used in this study contained other additional nutrients that could positively affect learning and memory (e.g., vitamin E, taurine, choline and L-carnitine) (5).

CONCLUSION

It is important to appreciate that working dogs will not only vary in their dietary requirements depending on the type of work that they do, but that many extrinsic factors also come into play. The veterinarian should take an individual approach to each dog and make recommendations after a thorough assessment of the work undertaken, as well as considering the physical and emotional aspects of the animal.

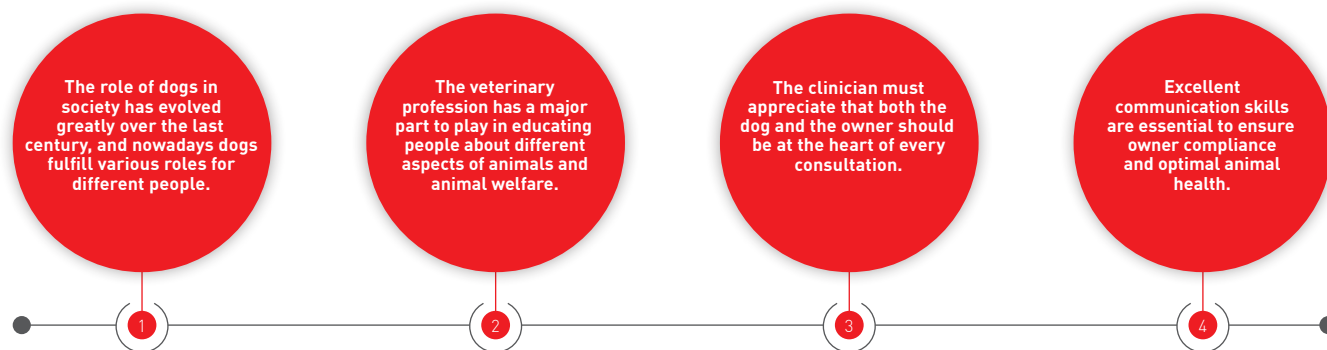
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DOGS AND VETERINARIANS IN TODAY'S SOCIETY

Dogs hold a special place in today's society, and understanding how different people regard their dogs has a major impact on how veterinarians function on a daily basis.

KEY POINTS



Introduction

Humans and animals have interacted in different ways for many thousands of years, depending on how society has assigned certain roles to different species of animal. For example, some animals are regarded as true commodities, being used for food and their fur or leather employed for clothing. On the other hand, humans also have an emotional bond with animals, which means that we allow certain species to co-habit with us as partners or family members (Figure 1). The ways in which we interact with them have also altered over the centuries, and in particular the anthropomorphization of animals (*i.e.*, the tendency to ascribe human attributes to them), has had a lasting influence in how we now keep, feed and treat them (1). It is essential that veterinarians understand how owners relate to their pets, as it influences both our professional behavior and how we can achieve optimal animal welfare. This article seeks to outline the social importance currently attributed to animals in general and dogs in particular, and will explore the roles society attributes to them.

Animals and science

For a long time fields such as ethology, physiology and evolutionary biology were the drivers for scientific research involving animals, but the humanities and social science disciplines almost



Figure 1. Humans have an innate emotional bond with animals, which means that we will often regard our pet dog as a true member of the family.

completely ignored animals until towards the end of the 20th century. This gradually altered, mainly due to the rise of the animal protection and animal rights movements, and transformed the way in which we perceive animals, so that rather than taking an anthropocentric view (which regards humankind as the most important element of existence, as opposed to God or animals) we now



Katharina Ameli,

BSc, MSc, International Center for 3Rs in Animal Research,
Justus-Liebig University, Giessen, Germany

Dr. Ameli holds a PhD in sociology with a research focus on human-animal studies and professionalization for animal-assisted interventions. She has worked as a coordinator at the International Center for 3Rs (Replacement, Reduction and Refinement) in Animal Research since 2018 and is currently studying the methodological design of interdisciplinary collaboration in multi-species research.

have a more zoocentric focus, whereby animals are often given preference above other considerations (2). Recent research has focused on the importance of analyzing social human-animal relations, with special reference to cats and dogs (3), and interest in evaluating how we relate to animals has increased, leading to the development of Human-Animal Studies, sometimes known as anthrozoology. This is an interdisciplinary field that explores the areas animals occupy within human society and culture, and how we interact with them (4).

●●● The veterinary profession

While animals have only recently been given greater consideration in the humanities and social sciences, the veterinary profession has always been centered on animals and their wellbeing. At the beginning of the 18th century, veterinary medicine was focused on the treatment and prevention of animal diseases, along with an expert assessment of meat quality, but these fields gradually developed and diversified to include other areas, such as veterinary drug research (5) and laboratory animal science (6). Professional uniformity was achieved as countries introduced systems which licensed individuals to practice veterinary medicine, and this was followed by the formation of various veterinary associations.

Nowadays veterinary involvement in various aspects of modern society is notable. For example, there has been significant veterinary input and influence on the overproduction of domestic animals, the selective breeding for certain features that are deleterious to an animal's overall health, and the contentious topics of ear cropping and tail docking and their damaging effects on animals. Veterinarians have also taken the lead in other areas such as pet nutrition and dog training and behavior, a reminder that the profession is undergoing constant change (7). We must be willing to play a central role if future research into the relationships between humans and animals is to be holistic, and our specialized veterinary knowledge should be recognized and acknowledged whenever there are cultural and social debates on issues involving animals.

Veterinarians are also often confronted with a multitude of real social problems which may require us to overcome our professional boundaries and consider how we should respond in certain situations. This includes taking into account the particular needs and wishes of pet owners (8), recognizing relevant social problems – such as the connection between animal abuse and domestic violence – and acting accordingly (9), as well as skillfully using our communication abilities in

clinical practice (10). The increase and diversity of relevant skills and competences required for a veterinarian to interact in today's broad society impacts greatly on both undergraduate training and the daily routine of veterinary practice.

●●● Dogs and society

As noted above, the role of animals within society has changed greatly over the last few decades, influenced by cultural and social developments. Scientific debate continues to focus on the human-animal relationships, but from varying viewpoints. For example, research in German-speaking countries relates primarily to the historical changes in how humans and animals interact and how we choose to selectively breed animals for certain features. In English-speaking countries many studies will focus on animal welfare and the use of animals in scientific research (2). This dichotomy can be attributed on the one hand to the increased number of animals kept as pets, and on the other to a shift in how animals are used to benefit humankind and our attitudes towards them (11,12).

The number of dogs in private households has been gradually rising in recent years. For example, Germany recorded approximately 9.4 million dogs in 2018, and any observer in a residential area, park or shopping center will testify to the popularity and numbers of dogs kept as pets (**Figure 2**). Dog ownership is seen across all strata of society, although below-average levels

Figure 2. Dogs are an integral part in the lives of many people today.



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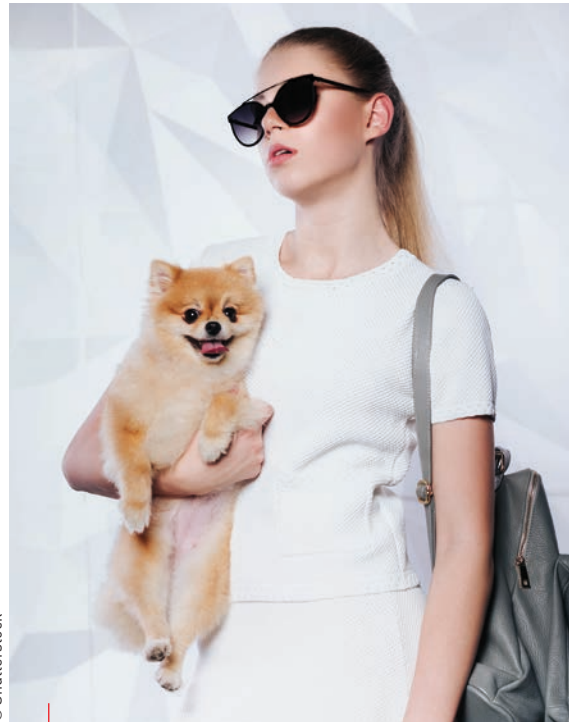
are reported in lower social classes, and it is recognized that certain breeds are often linked to certain levels within society (13). This offers an insight into how society regards dogs; they are often regarded as an expression of lifestyle and will frequently function as a status symbol (Figure 3) (14). However, dogs also serve to stimulate interaction and communication, and perhaps because individuals within a family can have flawed relationships with one another (13), the rapport between owner and dog fulfills and satisfies our human need for company, friendship and affection (8).

It is well recognized that pet-owning in general – and dogs in particular – has many physiological and psychological benefits. Many qualitative studies have already pointed out that dogs can contribute to stress reduction and better physical health, mainly because dog owners are more physically active (15). One particular study that investigated how older people interacted with their pets emphasizes the many different ways dogs can impact our lives (16). The respondents noted that their animals offered them love, affection and happiness, as well as appreciation and loyalty, thereby enriching everyday life. The animals provided older people with a valuable daily purpose, strengthening social contacts and stimulating a wide range of activities, and helped abolish loneliness, resulting in an overall feeling of well-being. Some participants who had owned pets since childhood also stated that animals helped establish a link to their past. Negative aspects were also cited, including the financial costs and the physical exertion involved when caring for an animal, yet all the respondents wanted to live with animals long term (17). These findings underline the fact that the majority of people who live or work with dogs



“We must be willing to play a central role if future research into the relationships between humans and animals is to be holistic, and our specialized veterinary knowledge should be recognized and acknowledged whenever there are cultural and social debates on issues involving animals.”

Katharina Ameli



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Figure 3. Dogs are often regarded as an expression of lifestyle, and some owners will choose a certain breed as a status symbol.

regard them as almost human in many ways – intelligent, unique, individual beings who receive and return affection (18).



Canine roles

We can therefore use the dog to illustrate the main “functions” of animals with respect to humans.

- The “sociability function” – how dogs participate in society and how they can act as partners in everyday life.
- The “surrogate function” – how a dog can essentially be a substitute for a human relationship by serving as an alternative for a partner or even a child, satisfying our highly emotional need for intimacy.
- The “projective function” – how a dog reflects an owner’s personality, thus strengthening and acknowledging an individual’s own character (Figure 4) (19).

These diverse roles both illustrate the close connection between dogs and their owner’s lifestyle, and demonstrate the fact that a dog can be perceived differently by different people. How people perceive and interact with dogs will always be shaped by cultural factors (20), and such influences and perspectives are subject to constant change. This in turn significantly impacts on us as veterinarians in everyday life, especially when it comes to communication with owners.

●●● The role of the veterinarian in human-animal relationships

The recent rise in pet numbers and the cultural perception of animals greatly influence the skills required to be an effective veterinarian in today's society. Importantly, because a dog is now often regarded as a family member, many owners will see their pets as active participants in the consulting room, and the owner will often grant them self-determination and participation in the veterinary treatment. This may not be in line with our professional values, as we strive to make decisions in an animal's best interests, and can significantly impact on our working lives.

It has been suggested that veterinarians fall into one of two categories. The first group is primarily concerned with promoting animal welfare, and will assume that this is also the client's main concern. In the second group are veterinarians who see themselves as service providers and who, when confronted by a client who has a potentially unsuitable stance on a particular matter, will modify their attitude accordingly – but will still keep animal welfare at the heart of their approach [23]. Both categories must be able to communicate in a way that balances animal welfare and the needs and concerns of the owner. For instance, veterinarians are often the chosen source when a client wants to ask about a pet's nutritional needs or behavioral problems. How should we respond when an owner who follows a vegan lifestyle asks if they can offer the same diet to their dog? The various possible pros and cons of a canine vegan diet should be presented by the veterinarian with the dog's best interests at heart, but consideration must also be given to the needs and beliefs of the owner. This illustrates

Figure 4. A dog will often be used to reflect an owner's personality, thus strengthening and acknowledging an individual's own character.



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Figure 5. In the consultation room the veterinarian must work within a "triad" in which an animal can sometimes be given more weight than the pet owner.



"It is essential that veterinarians understand how owners relate to their pets, as it influences both our professional behavior and how we can achieve optimal animal welfare."

Katharina Ameli

the challenge often faced in the consulting room; whilst an animal's needs should be taken into account, should human concerns and values ultimately take priority when it comes to veterinary treatment (12)?

This means that there is a triad in every consultation – the clinician, the owner and the pet – and the characters involved will interact and modify each other's response and the eventual outcome of the consult (1). Sometimes the animal can be given more emphasis than the owner, although the latter obviously has a significant part to play in ensuring that treatment is successful (Figure 5). Active engagement with the pet owner is therefore essential, and this requires excellent open and careful communication; it is essential to work out how to reach the owner without being over-judgmental or critical (21), and we should be aware of their emotions, concerns and fears. We must be able to interact with an owner on a level which allows them to appreciate how he or she behaves

towards their pet, and this will significantly contribute to the success of the recommended veterinary treatment [22,23]. A positive outcome is largely due to good communication skills of the clinician and not simply to professional expertise [21] – and conversely, a lack of trust and poor communication will often be major factors when an owner adversely evaluates a veterinarian's performance and professionalism. A good communicator enables an empathetic and sympathetic engagement with the concerns and needs of owners through active listening, and can deliver professional information in a way that lay persons can understand and use to make informed choices about treatment [21,25]. Even details such as body language will play a significant role; it has been shown that the facial expressions of human health workers have a major impact on a patient's faith in their prescribed treatment [24]. Possibly linked to this, telephone advice is particularly open to misinterpretation, as clients do not always understand information provided in this way. This can lead to pet owners misunderstanding what they have been told, or that vital details are missed during the call, for example because an owner is worried about his pet and is not concentrating on the conversation. That said, the advent of telemedicine may in some cases be beneficial for animal welfare – for example, if there are major obstacles that prevent an owner attending the clinic in person. It would therefore seem relevant that today's veterinarians are also enabled to conduct "distant" consultations in a manner that allows them to elicit the correct information from a pet owner and advise accordingly.

In short, if we can communicate well, this will build a basis of trust; pet owners will then rely on us, and this in turn creates a foundation for delivering excellent healthcare, animal well-being, and satisfaction for both clients and ourselves.



CONCLUSION

So what of veterinary practice in the future? The altered relationship between humans and animals in general, and dogs in particular, has meant that many pets are now family members, and we must recognize this. At the same time, the perception of veterinarians as social service providers has become more widespread, and our communication skills and abilities are decisive factors in achieving professional success. Practical communication skills must not only be taught to students (which requires making time in an already-intense undergraduate syllabus) but also provided as post-graduate training, with in-depth supervision and coaching. Finally, veterinarians can further develop certain communication channels such as social media to better disseminate information on relevant animal-related issues, thereby contributing to a distinctive – and better – perception of animals.



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HOW TO BEAT "DR. GOOGLE" IN NUTRITION

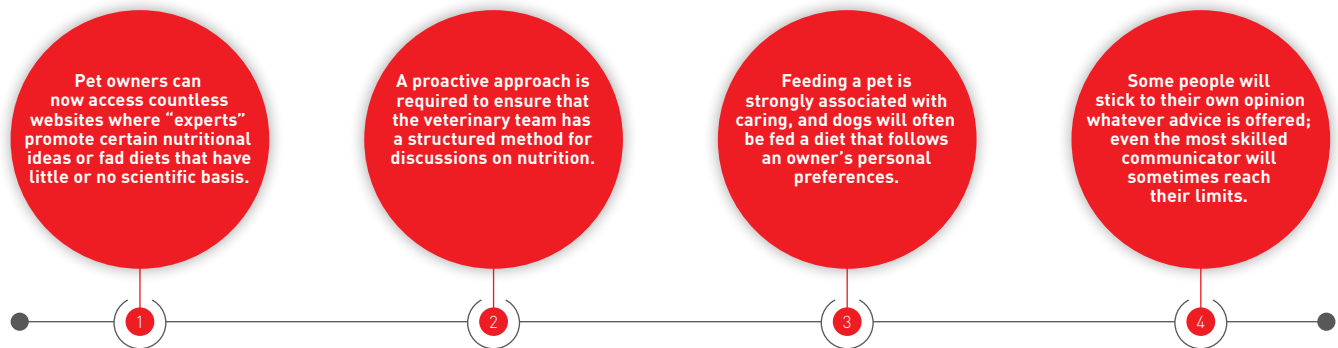


Antje Blättner,
DVM, *Vetkom*, Neustadt, Germany

Dr. Blättner studied in Berlin and Munich and after graduating in 1988 she set up and ran her own small animal practice. She then completed a post-graduate course on training and coaching at the University of Linz, Austria before founding *Vetkom*, an international company dedicated to educating veterinarians and veterinary technicians on practice management, client communication, marketing and other related topics through lectures, seminars and in-house training. As well as editing two veterinary journals she works alongside Royal Canin training veterinarians in more than 20 different countries.

When it comes to nutritional advice veterinarians are better than "Dr. Google" – but can a practice effectively communicate this to pet owners? Antje Blättner explains how to successfully integrate the topic into a consultation.

KEY POINTS



Introduction

In the daily practice routine, are you often frustrated when a client wants to discuss a particular subject, but you struggle to address it properly? Or are there topics that you want to address during a consultation – such as vaccination and nutrition – but which can lead to long and often tedious debate, so that you tend to avoid them? Certainly with the former topic, given that current recommendations are changing dramatically, with a move towards less vaccination overall, individual protection schedules and longer vaccination intervals, client education is essential. With the latter, the constant exposure to new feeding recommendations and dietary products from an infinite number of "experts" can lead to owners becoming confused. Both topics have one thing in common: "Dr. Google" has become an

integral part of pet care, and owners now have access to countless websites and apps vying for their attention which often employ content which, at first sight, appears to be interesting and convincing. What can the veterinarian do in these situations?



An ad hoc approach to communication?

We can only offer a premium service if, in addition to purely technical expertise, we also have a communication model for specific topics which can be used to reach out to clients. What is your position? Do you have a method for providing nutritional advice, or does it simply happen "on the go"? In other words, does your approach vary

depending on the day, client, and your own motivation? If you are one of the few veterinarians who plan and conduct their consultations in a precise and structured manner, then you can read this article, feel vindicated in your approach and maybe get one or two (new) tips. However, the *ad hoc* approach adopted by most veterinarians is not the best method for providing successful advice – regardless of the topic in hand – and inevitably gives rise to conflict between clinician and owner. This may be swept under the rug (*i.e.*, avoidance behavior) or dealt with in a manner that takes time and effort; this is especially the case if a client has a focus on a particular topic, such as the pros and cons of commercial petfood and home-prepared diets.

TAKE HOME MESSAGE

You have to actively decide whether and how you incorporate the topic of nutrition into your daily practice routine and then implement it – this is the only approach that will be successful.

Your decision

To implement a strong and convincing communication method for animal nutrition, it is essential to first acknowledge the importance of this topic within the practice. Without an active commitment, discussion with your clients will either not work or will simply be ineffective and time wasted. If you decide not to provide dietary advice, the pet owner will simply look elsewhere for answers to their nutritional questions, so the choice is yours as to whether to relinquish this service to the search engines or not. In fact, offering sound, effective advice on animal nutrition is not particularly difficult and can even be enjoyable.

The client perspective

No matter what type of diet an owner chooses for their pet, it is almost always an emotional issue, because love goes via the stomach. Apart from a few individuals who have a restrained “working” relationship with their animal, most owners have a strong emotional attachment to their pet. Because feeding is strongly associated with caring, it is a major factor in the human-animal bond, and most people believe that a balanced healthy diet is very important for their pet. It is not surprising that there are currently distinct trends towards home-prepared “fresh” foods for pets, and these will often mirror the dietary preferences of the owner: vegetarian, vegan and so on. Therefore many people will research recipes and prepare food as an act of love for their pet, and especially those owners in the “millennial” and “older single” categories. Essentially this means that the topic is emotional and cannot be dealt with by simply giving the client a scientific lecture on the subject.

The foundation

Although a technical lecture on animal nutrition in itself will probably not inspire a client, solid knowledge of the subject, as well as excellent communication skills, are essential prerequisites for a successful conversation. An owner will expect the veterinary team to know about the latest trends in this field and to make individual recommendations for their pet (**Figure 1**). The key word here is “individual” because this is exactly what search engines cannot do, at least not yet. Whilst there are numerous recommendations, recipes and instructions on the internet, it is doubtful that such sources genuinely offer tailor-made solutions for a specific animal – although a client may believe that this is the case when, for example, they fill out an on-line “questionnaire” to identify the “best” diet. It is obvious that it is the veterinary team who really knows a pet and the owner, but to maintain this relationship all practice members who provide advice to clients must have excellent nutritional knowledge.

However, this is a major sticking point; a recent study of opinion-leading veterinary practices in Austria and Germany (1) that asked “Is there someone in your practice with special training in the field of animal nutrition and dietetics?” reported that most respondents replied “no” – even though over 90% of those questioned offered pet food for sale in the practice. Remember that we have unique training in other matters such as vaccination, yet we would not recommend vaccines if we didn’t know all the facts; detailed knowledge of animal nutrition is therefore a core aspect of veterinary work.

TAKE HOME MESSAGE

Clients are generally interested in optimal nutrition for their pets. With expert knowledge, good communication and careful use of emotion you can win them over!

Creating communication

Even if a client persistently pursues a strongly held opinion on certain aspects of nutrition, it can at least be argued that they are interested! It is much easier to talk about a topic that captivates and engages someone than something unexciting, such as discussing routine parasite control. Full use must be made of this advantage, and to ensure the client’s interest is channeled in the right direction when discussing animal nutrition, a communication protocol should be designed. Three key questions can guide this process:

- Who is the main point of contact for the topic in the practice – *i.e.*, who takes care of current information and updates, orders pet food and maintains the product range on offer?



Figure 1. A pet owner expects their veterinary clinic to make individual recommendations for their pet's diet – so the whole team must know how to approach this topic.

- How is new information transmitted to the entire team?
- Who broaches the subject with the client and how is the topic specifically addressed – *i.e.*, how is communication integrated into the daily practice routine?

Although practice members will frequently know which topics to raise with clients, they may lack the knowledge to respond properly – and may also be afraid of potential conflicts, controversial topics and questions they cannot answer. Unfortunately only a minority of practices regularly provide nutritional advice to their clients (**Figure 2**), but because animal nutrition is so important, a proactive approach is essential. The essential factors required for a good communication procedure are shown in **Figure 3**, and the team should develop a technique for this together. Initially design an approach for the “standard” client, and then move on to construct dialogs for “difficult” clients. Role-playing can be invaluable to develop the technique, and can be enjoyable, even if it feels strange, as it offers a protected space where everyone is allowed to make mistakes. Consultation scenarios can be repeated as necessary, and conversations can be worked on until everything is in place. Playing a difficult owner who asks problematic questions can help prepare the team properly, so that ultimately everyone can confidently discuss nutritional basics with clients.

●●●● What does the client need?

○ ○ ○ As veterinarians we will often give clients information on a topic that is important from our expert point of view. Although this is basically a sound professional approach, it does not usually correspond with what owners need, and what interests them; they live in their own world and will often have a completely different perspective from us. Inspiring clients and meeting them where they stand is the fine art of an exciting and mutually successful dialog. The easiest way to do this is to ask the client what they need and want, so when discussing nutrition use a specific, open-ended



“We can only offer our clients a premium service if, in addition to purely technical expertise, we also have a model for communication on specific topics which we can use to reach out to clients.”

Antje Blättner

Do you have discussions with owners on how they feed their dogs? [169 replies]

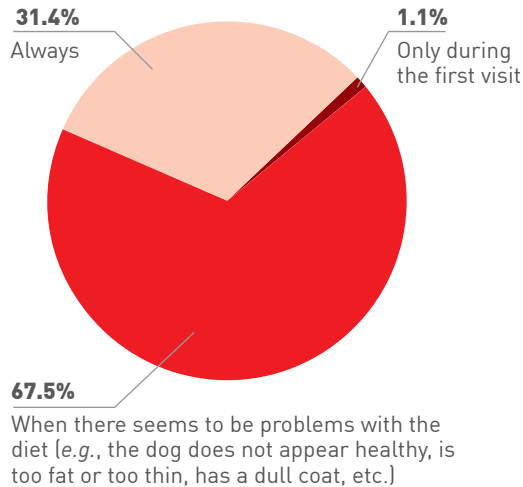


Figure 2. In 67.5% of practices surveyed the veterinary surgeon only talks to pet owners about nutrition when problems arise, e.g., if the animal is too thin, or too fat, or looks ill (1).

question to start the conversation and to emphasize your focus. For example;

- "What do you feed Rex?"
- "What can I do for you?"
- "What interests you about feeding fresh food?"
- "Why do you find BARF so interesting?"
- "What information can I give you on grain-free dog food?"

So if the client replies: "I wanted to talk about fresh food" there are basically two options: either begin by discussing the pros and cons of fresh food, giving all the information you think is accurate and important, or start with a counter-question to find out what the client's reasons and motivations are. This allows you to offer a better and more specific response, and will signal interest and build trust. So a possible conversation could develop as follows;

Client: "I wanted to talk to you about fresh food."

Veterinarian: "What particularly interests you on the subject of fresh food?"

Client: "I read in a dog newspaper that it's better, because all the ingredients are natural and healthier."

Veterinarian: "I understand that a healthy diet for your dog is very important to you. What fresh ingredients do you use?"

Client: "Well, basically what I eat too; mainly vegetarian, for example, zucchini, pasta, tomatoes and herbs, although of course for my dog I leave out the spices, which are supposed to be less healthy."

Veterinarian: "That sounds tasty! But I'm concerned that this type of diet does not contain enough nutrients for Rex. Have you had the mixture analyzed to see whether it contains everything a young dog needs? This is very important, especially in the growth phase"

Client: "No, do I have to?"

Veterinarian: "It would be a good idea if you want to be on the safe side. And, as I understood you, health is very important to you?"

Client: "That's true. What do we do now?"

Veterinarian: "I suggest that for now I give you a small bag of our food designed for young dogs and that you bring me your recipes, which my assistant will review with our computer program; we can then discuss the results and find the best solution."

Client: "But it must contain some fresh ingredients!"

Veterinarian: "I understand that, and I'm sure we'll find an optimal way to incorporate them."

Keep asking questions

The best way to develop the conversation is to keep asking questions. This will ensure that the dialog with the owner is meaningful and remains focused on the dog's nutritional requirements. This means that follow-up questions should be a little more direct in order to share the client's point of view and understand their existing knowledge and assumptions. This is especially important to break down any barriers that may exist, because arguing does not help to comprehend the reasoning behind what a client says and means, and understanding this is essential. Follow-up questions could therefore be as follows:

- "Where did you read or hear that BARF is the best nutrition for all dogs?"
- "What do you think is the benefit of preparing the food yourself?"
- "What are your concerns regarding dry food?"

TAKE HOME MESSAGE

Questions are the best way to start a dialog, learn about a client's needs, and get information about their opinion and concerns – all important ingredients to get your point of view across.

Use the statements

Whoever asks questions gets answers; whoever asks good questions gets good answers. So it is crucial to know exactly what you want to find out before starting a conversation. Only then can you identify the right questions and obtain answers that can be used properly. The next step is to evaluate the client's answers, because they have then revealed their opinion, knowledge and point of view. The aim is to keep in touch with the client, to promote real exchange and to work out starting points for your advice. Remember that someone's beliefs are generally their own "dominion", so tread carefully when a client has a strong point of view. Your technical expertise is certainly superior, but your veterinary degree will count for little; for a client to believe in you he must trust you – and this has to be earned and nurtured over time. **Boxes 1-3** show examples of questions and answers, what information the answers provide and what they mean, and how you can respond to them (**Figure 4**).



Client categories

The awkward client

With certain individuals we may find that the interaction is just not right. At the very start of a consultation, before anything has been said, there may already be a perceived tension and a slight uneasiness. This is important to recognize, because for some reason this client has activated one (or more) triggers within ourselves. This is usually linked to the body language perceived within the first few seconds of meeting, and is based on the

brain's primeval ability for making quick decisions, such as: "Who is in front of me – friend or foe? Do I have to flee, fight or is everything okay?" So if our brain classifies a situation as a "threat" we feel uncomfortable and will be prejudiced toward the other person, and the subsequent conversation will be suboptimal, as we concentrate on the perceived threat and not on the person (and the pet) in front of us. However, recognition of this mechanism allows application of active countermeasures, so if we feel uncomfortable with a client, pause briefly and analyze the situation:

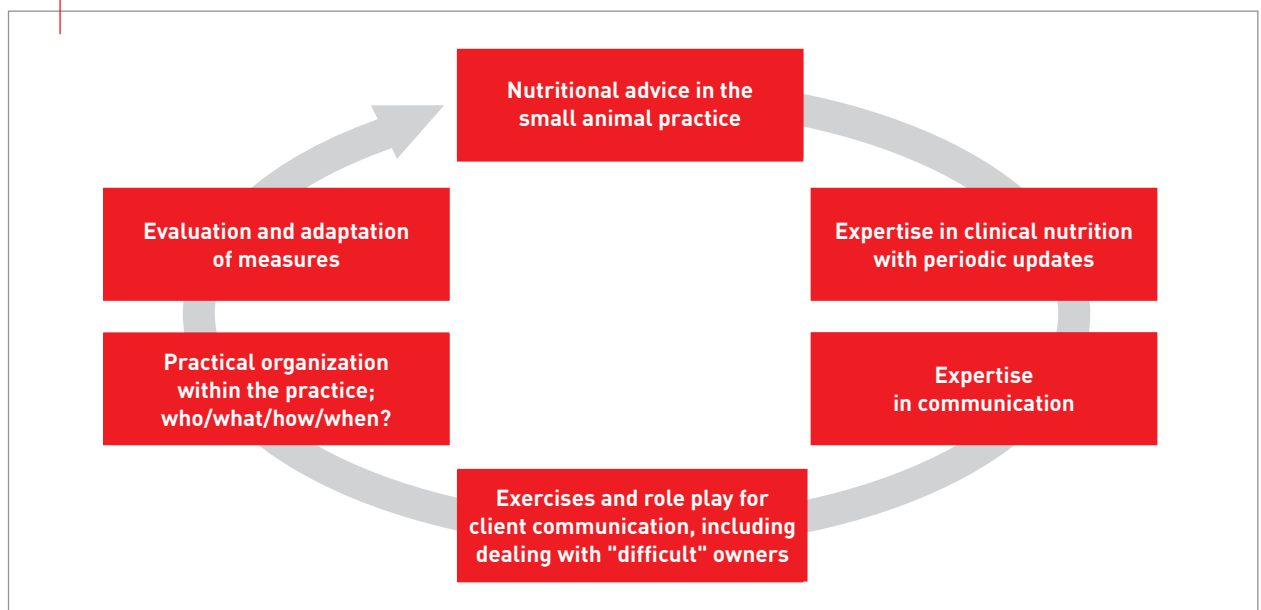
- What is my own state of mind? Am I relaxed and in a good mood? Or was I annoyed by the last client? Our state of mind and mood at the beginning of an encounter largely determine the outcome.
- What did the client say or do that activated a trigger? This can be something very simple; perhaps they brought to mind a relative or friend who uses every get-together to offer an unwanted opinion to everyone present and who blocks real conversation.

This quick check usually allows you to know exactly what is going on. You can free yourself from it and then approach the client with an open mind.

TAKE HOME MESSAGE

Difficult clients can be approached with an open mind, specific questions and a dash of composure. Deal with it competently, and you often get a second chance!

Figure 3. Ingredients for success to implement professional nutritional advice within the practice.



Box 1.

Question	"Why do you find BARF so interesting?"
Answer	"Well, because the breeder recommended it. And he knows his stuff!"
Information and importance	The breeder recommended BARF – in the eyes of the client, the breeder is a dog nutrition expert. The breeder is already recognized as a specialist, but the veterinarian is not (yet). Be careful; questioning the breeder or putting too much emphasis on one's own expertise could backfire.
Possible response	Surprise: "Oh, that's interesting! Did the breeder also give you recipes for the different life stages? Can I go through them with you?"

Box 2.

Question	"What is the benefit of preparing the food yourself?"
Answer	"I heard at the dog club that I can take care of Lucky's health much better this way. Because it's all fresh then!"
Information and importance	The dog club says that fresh ingredients are good for Lucky's health. Caution is advised; you do not know how important the dog club is to the owner.
Possible response	Reinforcement and invitation: "That sounds exciting. Do you have anything in writing about this or a website that we can discuss together?"

Box 3.

Question	"Why is a grain-free diet interesting for you?"
Answer	"I can't tolerate wheat myself and I read on the internet that it can also be rather difficult for animals to digest."
Information and importance	Internet information, which can be doubtful... Be careful; the owner is "pre-informed" and possibly proud of his research.
Possible response	Invitation: "We have to talk about that. Not all facts on the internet are correct and not everything from human nutrition can be transferred to the animal. Why don't you bring me a printout of your findings to the next appointment? Then we can discuss it."

The client who says "no"

Pet owners who say "no" to everything you suggest or who simply know better can be exhausting, and a solution may not be found in all cases. Such clients usually have another person or thing that they use as a reference, perhaps someone who either has more influence on them or whom they simply consulted before you, or an internet source. It can be worth trying the "what if" method to find out if the client has valid arguments (from their point of view) or simply wants to be contrary, as follows.

Client: "Your food is far too expensive; the food in the pet shop is just as good and cheaper!"

Veterinarian: "I understand that the price of Lucky's food is important to you. What if I price match, would you buy it from me then?"

There are two basic responses here; either the client can say "yes, then we could talk about it" or "no, the other food is still better in my opinion." With the first response you now know that the price is what is important, and you can consider how far you want to go with this, along with offering additional services (weight checks, calculation of rations, discounts when purchasing certain quantities). With the second response you know that the client has more trust in the other food and is less concerned about the price. This allows the opportunity to speak specifically about your food and its quality, and whilst you may not convince the client, it does open the door to a constructive dialog.

Client: "No, the other food is still better in my opinion."

Veterinarian: "I understand that you are concerned about the quality of the food. What do you think makes our food inferior?"

Client: "There is no rice in my food, and rice is bad for Lucky!"

Veterinarian: "I appreciate that you are concerned about rice. What have you read or heard about it?"

Client: "It causes allergies and it is only a filler!"

Veterinarian: "Who says so?"

Client: "The breeder. He recommended feeding lots of meat and minimal carbohydrate."

Veterinarian: "Okay, so suppose we make an appointment for you to bring in your bag of food so we can analyze the nutritional content, compare the two foods using a computer program, and then decide what is best for Lucky?"

Basically, the client can either say "great idea!" or "no, I believe the breeder. He knows what he says and does!" With the second response it is fruitless to invest any more time and energy in this client at this stage. He has his own opinion and wants to stick to it – although this can change when his dog



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Figure 4. The clinician's response to a client's questions can make all the difference as to whether or not the owner accepts the advice that is given.

enters the next lifestage, if it falls ill, or does not tolerate the breeder's food in the long run. And if you continue to provide nutritional advice at every opportunity, then you may get another chance later on!

The "uncooperative" client

Perhaps the most difficult thing is dealing with a client who seemingly cannot be reached with any argument and who doggedly sticks to their opinion, no matter what strategy is used. Reassuringly, even the most skilled communicator will reach their limits from time to time, because there is no such thing as 100% success in life. So if you occasionally hit a "brick wall", the rule is – analyze what you could possibly have done better, check it off, and face the next client without prejudice.

Action points

In order to deliver good nutritional advice, three points need to be actioned:

- Ensure solid, up-to-date knowledge on animal nutrition, e.g., from online seminars or congresses
- Know how to communicate (see above)
- Ensure there are protocols in place to deliver nutritional advice within the practice: who speaks to the client, where, when and how?

Experience shows that the last point is the greatest hurdle in a daily routine, as few practices have set procedures for this. This means that no one in the team knows exactly how to deal with the topic and only reacts to client questions, instead of approaching the owner proactively. But only a positive approach can be successful, and using a defined protocol, as set out below, can be rewarding.

- Each animal is weighed when brought into the practice (even if the owner is not attending for a consultation) and the weight documented. This is not only a practical step to ensure correct dosage of all medications, but also invaluable for nutritional advice.
- Every patient receives a nutritional assessment. This can be done when an owner registers as a client; ask what they feed their pet daily, including snacks, and record the data in the patient's file. A questionnaire that the client can complete whilst waiting for a consultation, and which is then inserted into the animal's file, is also suitable for this purpose.
- A responsible member of staff analyzes the existing diet, discusses it and, if necessary, adapts it to the current needs and lifestage of the animal. A follow-up consultation should be scheduled on a yearly basis, or if the animal has to be switched to a different diet for health reasons.



CONCLUSION

A structured approach will ensure that the practice staff always have up-to-date data on the dietary needs of their patients; this will allow them to prioritize the topic, creating an awareness with clients and ensuring that the practice is the "go-to" place for complete and trustworthy nutritional advice. On this basis owners will gradually accept and appreciate that the practice team is the preferred expert to be consulted when it comes to a healthy diet for their pets – but the bottom line is that nothing good happens unless you do it! A proactive approach to pet nutrition will strengthen client loyalty, improve your practice image and increase profits.



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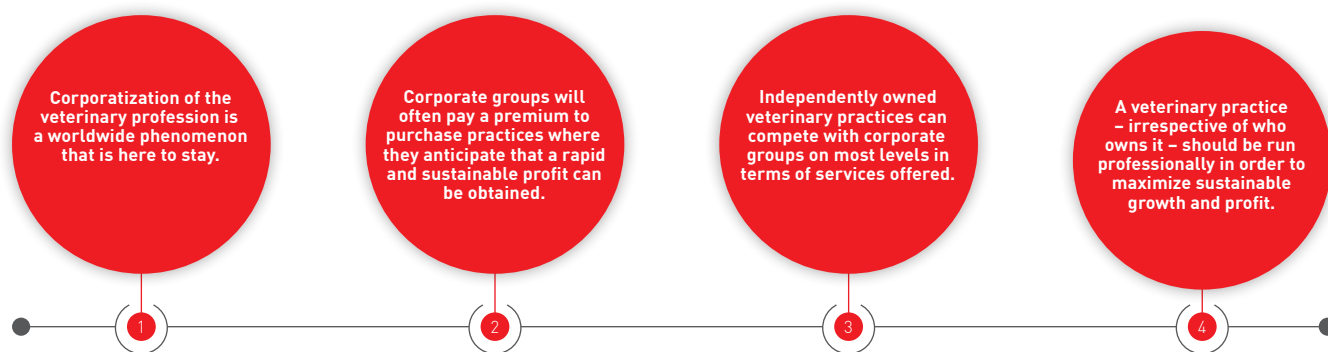
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CONSOLIDATION IN THE VETERINARY PROFESSION

The explosion in corporate ownership of veterinary practices has been nothing short of phenomenal over the last two decades or so; this paper offers an oversight of the current situation and gives some pointers for independent clinic owners.

KEY POINTS



Introduction

In many parts of the world, the current phenomenon of consolidation within the veterinary profession is a major trend, and one which may change the rules of the game for independent veterinarians (i.e., veterinary surgeons who own and run their own practice). This article reviews the development of corporate groups over the last few years and also considers the place of independent veterinarians in the current marketplace.

25 years of change

Veterinary corporatization began in the mid-1990s in the United States, specifically in 1994 when Mars Petcare acquired a stake in Banfield Pet Hospitals. On the other side of the Atlantic, the CVS group began consolidation of UK veterinary clinics at the end of the 1990s, but it was not until 2010 that corporate groups started to develop in other parts of the world. Interestingly, the two groups that now have a global influence – Mars Petcare and National Veterinary Associates (NVA) – both started in the USA, and today, 25 years after consolidation began, approximately 35% of US small animal veterinarians work for companies that employ more than 500 clinicians. By 2020 Mars Petcare had 6 divisions that between them owned more than 2,300 clinics and veterinary hospitals across 17 countries, employing more than 14,000 veterinarians (Figure 1). NVA also has an



Figure 1. Mars Petcare currently has more than 2,300 clinics that trade under various names including Banfield in the USA (a) and Anicura in several European countries (b).



Philippe Baralon,

DVM, MBA, Phylum, France

Dr. Baralon graduated in 1984 from the École Nationale Vétérinaire of Toulouse, France and founded Phylum, a consulting group for veterinary practices, in 1990. He currently acts as a management expert in more than 20 countries, with his main areas of specialization being strategy, marketing and finance. He delivers training for veterinarians and support staff on practice management topics and is also involved in benchmarking the economics of veterinary medicine in different parts of the world. A prolific author, he has authored more than 50 articles on veterinary practice.



Lucile Frayssinet,

DVM, Phylum, France

Dr. Frayssinet is a French veterinarian who graduated from the École Nationale Vétérinaire of Toulouse in 2019 and now works as a consultant in veterinary practice management at Phylum, with an international focus on strategic and marketing issues. The trend of corporatization in the veterinary world, both in Europe and elsewhere, is a particular interest, and she was recently involved with an in-depth survey on the evolution of French and European veterinary demographics.

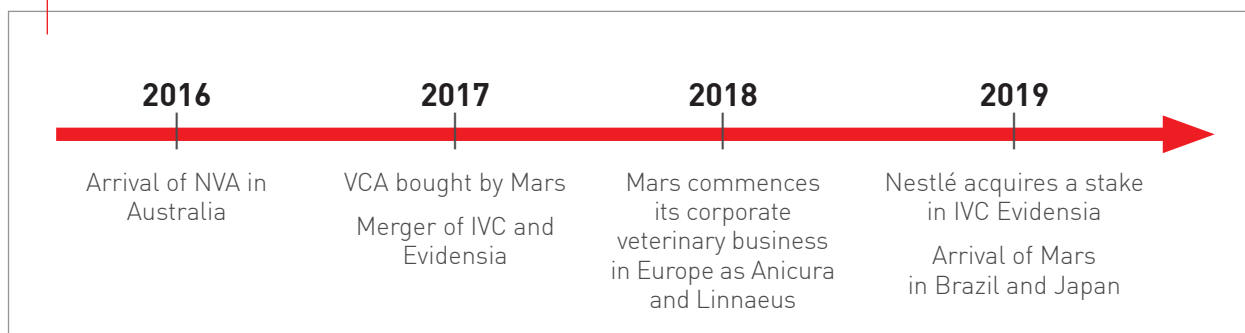
international presence, with a total of 950 veterinary care establishments in North America, Australia, New Zealand and Singapore. The Australian and New Zealand market is not only home to NVA (which has some 250 clinics), but also to two national players, both listed on the stock exchange: Greencross (with 200 clinics) and Apiam Animal Health, which has around 50 clinics and also has a stake in some farm animal practices.

In Europe the current situation is rather different. On the one hand Sweden, the UK, Finland, Norway, Denmark and the Netherlands are all at an advanced stage of the consolidation process: in these countries between one quarter and more than half of small animal veterinarians work in groups. On the other hand Spain, France, Germany, Austria, Ireland, Switzerland, Belgium and Portugal are still just beginning the process, with groups employing less than 10% of small animal veterinarians. In Asia the Chinese market became strongly consolidated within a few years; there are now two main companies in the country, one of which owns more than 1,000 clinics and has plans for a public listing shortly.

Overall, consolidation of the veterinary market has generally been very rapid. For example, between 2017 and 2019, IVC-Evidensia (the European leader in terms of clinics owned and veterinarians employed) went from 500 to more than 1,200 practices and from 2,000 to more than 4,000 veterinarians. **Figure 2** shows the major events that have taken place between 2016 and 2020 in the veterinary world.

As in most consolidation situations, rapid growth is the rule and not the exception. This may pose the question; is there still room in the market for the independent veterinarian? Veterinary consolidation is an irreversible trend: the clinics that are owned by groups today will not return to being independent again. On the contrary, the trend for consolidation is set to spread to most of the world's markets and will intensify where it is already present. However, this does not mean that there will no longer be a future for independent veterinary clinics; in fact, quite the opposite is true.

Figure 2. Some of the major events in veterinary corporatization within the last four years.





“When prices are currently not in line with the local marketplace and the positioning of the business, it's possible to increase revenue by raising prices, but the first priority is to implement a thorough invoicing of all services and products provided.”

Philippe Baraton



Group ownership of veterinary practices

How are corporate groups funded?

Depending on their stage of development, corporate groups will differ in their financial structure. Traditionally, a veterinary practice will be owned by one or more veterinarians. However, when a corporate group is formed it is initially financed by bank borrowing. If and as soon as it begins to grow quickly, it becomes necessary to finance the group with equity, usually by bringing in a private equity fund to provide capital. The aim at this stage is for quick external growth (*i.e.*, by increasing the number of clinics owned by the group) in order to increase the value of the company over a short period of time, generally between 3 and 7 years. It is commonplace for a private equity fund to take profits after a few years and for another fund to take its place. After several investment cycles, the corporate group may become part of a multinational group (as when Nestle took a stake in IVC-Evidensia) or be listed on the stock markets. From this point, rapid external growth is no longer the sole priority; acquisition of new sites is still important, but internal growth by increasing revenue and profit from each of the group's clinics becomes a major objective.

This funding variation explains the difference between a group like IVC-Evidensia, which has shown spectacular external growth, and a group like VCA (a subsidiary of Mars Petcare) which continues to develop rapidly but where a large part of the growth is achieved at a consistent rate by developing existing sites.

Can a single brand for several hundred clinics recruit more clients?

Not all groups will adopt the same brand strategy. For example, in Europe Anicura, a subsidiary of Mars Petcare, puts its name on the facades of all its clinics, while the CVS group (which is listed on the London Stock Exchange) retains the historical identity of each clinic and does not have a national – let alone European – brand known outside the financial markets. Whilst certain groups have a clear strategy, others – for example, BluePearl in the USA – have a variable approach, and will adapt the branding for each clinic on a case by case basis according to what is best for a particular site. From the consumer's point of view, a pet owner will usually attend only one first-opinion practice. It is therefore important to have a strong, well-known and unambiguous brand at a local level, but (at first glance at least) it would seem that having a national or even an international brand image brings very little competitive advantage to the market providing each practice or pool of practices have strong local brands.

What about recruitment?

There does seem to be a genuine shortage of veterinary manpower in many countries at the present time, and this is an area where companies may have a distinct advantage over independent practices. All the major veterinary companies have developed recruitment, integration and training programs – involving substantial input and resources – and these can be shared by a large number of their clinics at a country-wide, or even an international level. Independent owners can rarely afford the time or the money required to develop such schemes.

Why do groups value veterinary businesses more than independent veterinarians?

In order to grow quickly, groups will purchase veterinary establishments, generally paying a premium (sometimes two or three times more) than a traditional professional (*i.e.*, a veterinary surgeon) purchaser would offer. The value of a practice is usually determined by applying a multiplier to the net profit, which is based on EBITDA (Earnings Before Interest, Tax, Depreciation and Amortization). This multiple will be based on the anticipated future growth in EBITDA; the greater the opportunity to achieve rapid growth, the better the price offered.

Valuation of a veterinary practice

When valuing a traditional practice, the total cost of all purchases for the clinic (usually comprising medicines, laboratory supplies and clinical waste – often referred to as “cost of sales”) are subtracted from the annual revenue to derive the gross margin (or gross profit) (**Figure 3**). The gross margin in a business must cover all operating

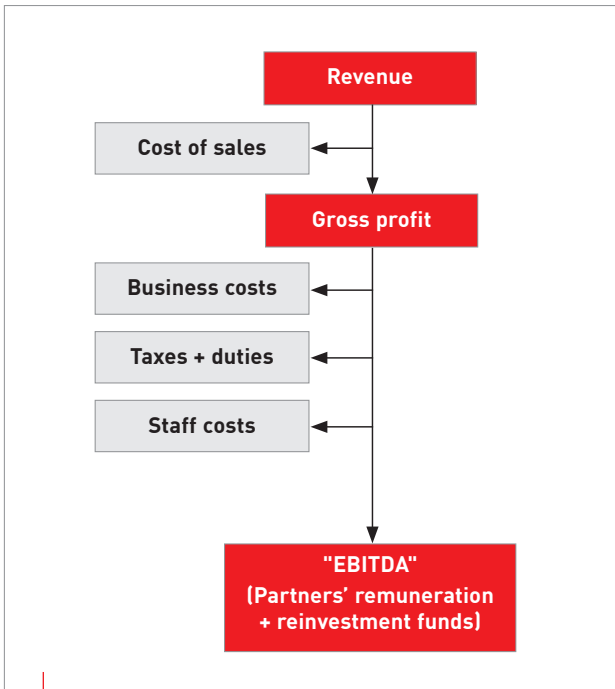


Figure 3. The traditional financial valuation of a veterinary practice.

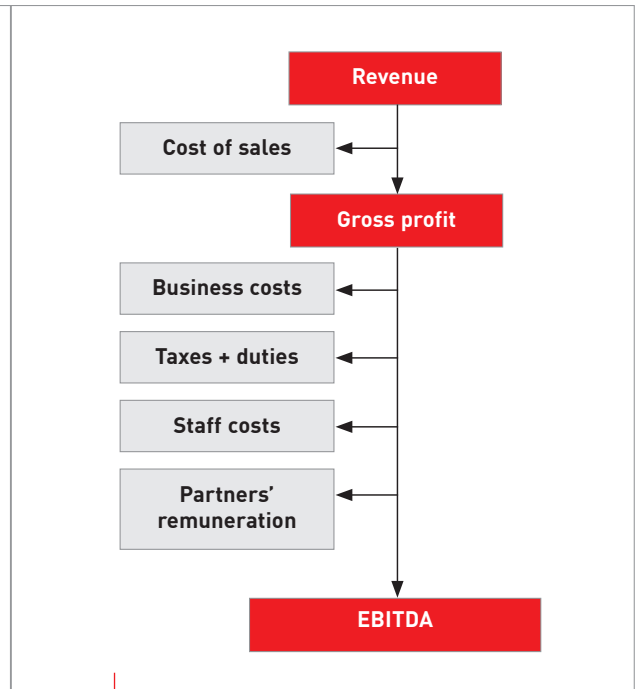


Figure 4. The corporate financial valuation of a veterinary company.

costs (including wages, other purchases and external charges), taxes and duties, as well as delivering a profit (EBITDA) for the owners. Note that the wage costs do not include the cost of the partners' clinical work, and the calculated EBITDA basically enables remuneration of the partners and reinvestment in the practice. The implicit management objective of a privately owned practice is to ensure a good financial return for the owners or partners, taking into account their working time, their aspirations, etc. Any increase in profitability improves the partners' reward, but once a comfortable level of remuneration is reached the incentive to marginally increase profit is less, mainly because of the extra government taxes that are incurred (and which are often progressive in nature – *i.e.*, the higher the profit, the higher the tax imposed). This is often referred to as “the law of diminishing returns” – *i.e.*, the increased profit may seem too small to justify the effort required to obtain it. When valuing a veterinary business for a professional (*i.e.*, veterinary) purchaser the method is typically based on applying a small multiplier (1 to 2 in most cases) to the EBITDA.

However, a corporate group will value a veterinary business by using a financial analysis model that includes remuneration of the partner's work within the fixed charges (Figure 4). The resulting EBITDA is then a good approximation of the profit available to the shareholders, and therefore of the company's overall value. If this profit increases, even marginally, it is good news for shareholders — despite the imposition of corporation tax, which is proportional and not progressive. It is still in their interest to continue to improve the profitability of the company.

With this analysis, a company's EBITDA represents a narrower base than with the traditional model. However, if a buyer believes that profits can be increased quickly, they will be prepared to apply a higher multiple (usually 5 to 12, sometimes more) to determine the price they are prepared to pay. Corporate groups therefore pay more than traditional purchasers because they are reasonably confident in their ability to quickly increase the EBITDA, and thus the value of the business, whereas independent clinics primarily aim to deliver a good return for the partners, with the value of the business based on this remuneration.

●●● Strategies for independent veterinarians

In the face of competition from corporate groups, how should an independent veterinarian plan their development strategy? Undertaking a financial review of the business and budgeting for the future is not in itself sufficient, but it is nevertheless essential. This review should also consider if the current veterinarian or partners are the best owners of their company. Since the value of a veterinary clinic is based on the practice's recurring profit, the best owner – or the best buyer – is therefore the one who can maximize and sustain this performance. The succession plans of the owner or partners must also be considered. Anticipating significant changes, such as an owner wanting to retire or sell his share of the business, is a major factor for planning ahead and when looking to maximize the value of a practice.

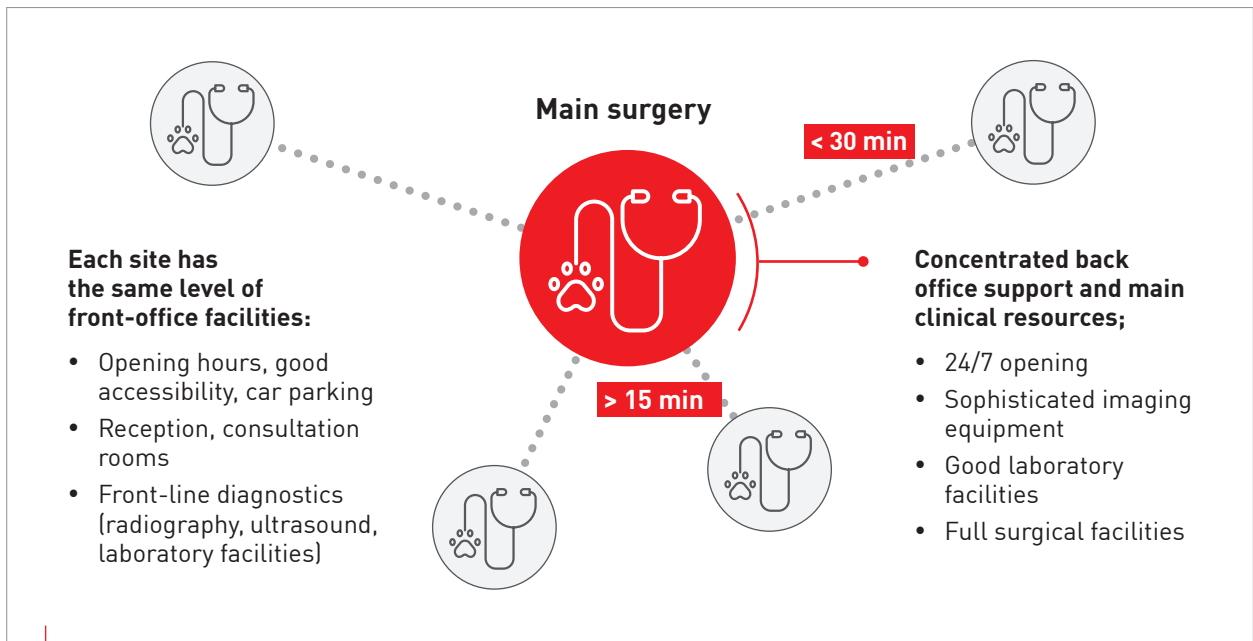


Figure 5. The “hub-and-spoke” multi-site model, with a cluster of clinics around a central hospital.

Can a one-site model work?

A veterinary clinic established on a single site, assuming it is in an optimal location and within a sufficient population pool, is an interesting and common business model. The main advantage is that it is relatively simple to manage, and with all activity taking place in the same location an owner or manager can monitor the progress of the company using simple management tools. However, as it develops, there is a risk that business expansion will be restricted by the clinic’s geographical proximity to the population base, limiting the acquisition of new clients. Development is therefore based mainly on increasing sales per client; this can allow sustained and steady progression over many years, although there may be major variations in the degree of growth depending on various factors, including the location of the practice.

What about multi-site models?

In order to overcome the geographical limitations of a single-site development, a business may choose to operate several clinics, often on a “hub-and-spoke” model, with each site typically more than 15 minutes (but less than 30 minutes) drive from a primary central base (Figure 5), where all the concentrated “back office” functions such as payroll and other management tasks are performed. The peripheral clinics should not be regarded as “secondary” sites, because all front-line services and aspects – including opening hours, reception area, consultation rooms, practice staff, first-level diagnostic resources – can be provided on the same level as the main site. Identifying synergies between the sites is at the heart of this model: for example, all surgical procedures – including the simplest of surgeries – can be undertaken at the main site. This model therefore allows management

resources to be shared but also permits the underlying core services and the major items of equipment at the main site to be utilized better without the potential problems associated with the geographical locations of the peripheral sites. The company’s development is therefore achieved both by increasing the revenue per client ratio, and by the acquisition of more patients, particularly when new peripheral sites are opened. Managing this model is more complex than a single site, because it requires a competent manager to be installed at each premises, and it is essential that factors such as working methods and marketing positioning are standardized across all sites. Nevertheless, this is possible because all the clinics are relatively close to one another.



“Managing a multi-site model is more complex than managing a single site, because it requires a high-performance manager to be installed at each premises, and it is essential that factors such as working methods and marketing positioning are standardized across all sites.”

Lucile Frayssinet

Can multiple independent clinics be structured as a group?

This requires a different type of growth; essentially the hub-and-spoke system described above is duplicated in a location at some distance from the original territory, resulting in the establishment of a regional (or even, depending on the distances involved, a national) group. Such a model is usually created progressively, and here there will be relatively few – or indeed no – synergies between each multi-site business. However, there is a major difficulty with this model: remote multi-site organization requires a professional approach to management, and therefore the establishment of a central team. To ensure the costs of this team can be recouped within a reasonable period of time, rapid growth to achieve a significant number of sites (several dozen or even several hundred) is necessary. However, this is an unusual model for the veterinary market and is rarely seen, because the complexities of effectively managing multiple geographically distant sites are numerous.

What about selling to a corporate owner?

The final stage of independent development is often (although not always) transferring (*i.e.*, selling) the company to a group. Although not all practices will be suitable or attractive to a corporate buyer, the development of corporate groups now offers more strategic possibilities for many independent veterinarians who are looking at exit options: the latter can sell if and when they decide to. This stage can therefore appear at different times in the life of a veterinary business; it could be once a single-site clinic has developed and matured, after a pool of clinics has been established, or after the formation of a regional or national group.

The most important thing for the owner is to sell the business at the right time and at a good price. It is important to emphasize that selling one's business is not a failure; rather, it can be seen as an acknowledgement of the business's success. On the other hand, it is essential not to regard selling to a group as the default, for example because it is the only option when succession planning has been poor or absent.

Whether or not the owner(s) of a veterinary practice wish to sell to a group, it is vital to ensure that long-term management of the business is done in a way that optimizes its value. As this is always linked to future profitability, it is essential to generate a recurring profit which is comparable to that which a corporate group could obtain. Whatever the development strategy of an independent veterinary company, the most important thing to remember is to manage the clinic as if it was to be sold tomorrow – even if it will never be sold.

●●●○ Maximizing profitability

How can profitability be increased?

In order to rapidly increase a company's EBITDA, three main tools can be exploited.

- The first is to increase revenue. It is possible to do this simply by raising prices, but in fact the first priority is to implement thorough invoicing for all work done. Correct invoicing is essential in any case, but even more so if a fee increase is planned, because if the team does not already invoice everything that is done, it will be even more difficult to do so with higher prices. When the fees charged by the practice are not in line with the local marketplace and the positioning of the business, then raising prices to increase revenue is appropriate. However, the essential factor for increasing revenue ultimately lies in developing what the clinic offers its clients, primarily in terms of services but also in terms of products. Keep in mind that it is important to start by analyzing market penetration; before creating new services, make sure that clients are already using the existing services.
- The second is to optimize purchases; this means ensuring that the business is getting the best discounts from its suppliers in order to reduce the cost of purchases, thus increasing the gross margin. In some countries this approach is already widely used by veterinarians, but in others there is still the opportunity to negotiate better margins for purchases.
- Thirdly, it is fundamental to control establishment costs and, most importantly, wages. This may necessitate adjusting the team structure to optimize the ratio between the number of veterinarians and the number of support staff. This is based on productivity, with the clinicians concentrating on all the value-added duties that require their technical skills, whilst using support staff for all tasks that do not require direct veterinary input.

Figure 6. Teleconsultations are one way to improve the service offered to clients.



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This will also help if there is a shortage of veterinary manpower, which is the current situation in some countries.

●●● How can the service offered be strengthened?

Developing areas such as preventive medicine (e.g., with wellness plans), the monitoring of chronic diseases (such as osteoarthritis), and the introduction of telemedicine services are priority areas for first-opinion practice, and can all help increase revenue considerably. For example, telemedicine can be an effective method for monitoring a chronic patient (Figure 6); the initial consultation at the clinic should be done by the veterinarian, but the service can be enhanced by offering telemedicine follow-ups at appropriate timepoints, and this may be delegated to a member of the support staff team, allowing development of a long-term interaction while being easily monetizable. Telemedicine can therefore increase a practice's ability to interact with its clients over time.

In addition to telemedicine, new technologies offer other possibilities for the veterinary market. In many countries the development of E-commerce has been – at least partly – detrimental to veterinary practices, so when available, it is important to use suitable tools to remain competitive in the face of challenges like the online pharmacies available in countries such as the UK and USA, or the Click-and-Collect services currently offered in France. The ongoing digital revolution provides veterinarians with new tools, not only with things such as telemedicine or E-commerce, but also – and above all – in terms of communication. The ability to create a “community” of owners around the clinic through social media platforms can strengthen and extend the relationship between the veterinary practice and both current and potential clients. In addition, other options, such as offering online appointment systems or sharing medical records, can also benefit the business. It is safe to say that the full potential of new technologies has yet to be fully exploited and will continue to develop and offer opportunities in the years ahead.



“It would seem that having a national – or even an international – brand image brings very little competitive advantage to the market providing each practice or pool of practices have strong local brands.”

Philippe Baralon



CONCLUSION

Corporatization of the veterinary marketplace is here to stay, and the groups now offer independent veterinary surgeons a useful exit strategy, often paying considerably above traditional levels to purchase profitable practices. Although independent practices may currently struggle to recruit veterinarians in a market where there is a shortage of young graduates, it can still be argued that independent veterinarians can generally contend with groups, in that they still have the economic, financial and organizational abilities to remain competitive, provided they have the desire, skills and time required to enable good business management.



FURTHER READING

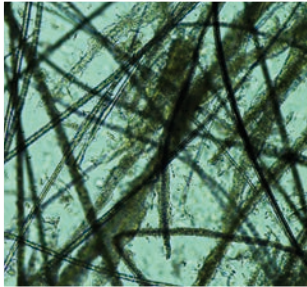
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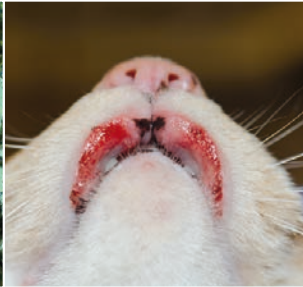
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COMING UP...

In our next issue, we will look at various aspects of feline dermatology.

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Deputy publisher:

Buena Media Plus
Chairman: Julien Kouchner;
CEO: Bernardo Gallitelli
11-15, quai De Dion-Bouton
92800 Puteaux, France
Phone: +33 (0) 1 76 21 91 78
Editor-in-chief: Ewan McNeill, BVMS, Cert VR, MRCVS
Editorial secretary
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(laurent.cathalan@1health.fr)

Artwork

• Pierre Ménard
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