2021 AAHA Working, Assistance, and Therapy Dog Guidelines

Cynthia M. Otto, DVM, PhD[†]; Julie A. Cohen, DVM; Tracy Darling, RVT, VTS (SAIM), CCRP; Lisa Murphy, VMD, DABT; Zenithson Ng, DVM, MS, DABVP[§]; Bess Pierce, MZS, DVM, DABVP, DACVIM, DACVSMR; Melissa Singletary, DVM, PhD, DACVPM; Debra Zoran, DVM, PhD, DACVIM-SAIM

ABSTRACT

The guidelines are the first comprehensive consensus report on veterinary healthcare recommendations for working, assistance, and therapy dogs. This category of canine patients includes a broad assortment of animals, some with well-defined functions and others that provide a more generalized support role. The guidelines discuss recommendations for dogs trained for protection, odor/scent detection, service functions for people with diagnosed disabilities or physical limitations, emotional support, and therapeutic intervention. Although the term is often used to describe dogs providing animal-assisted activities, true therapy dogs provide goal-directed therapy, often under the supervision of a healthcare professional such as an occupational therapist or psychologist. Many working dogs undergo extensive training and have rigorous physical demands placed upon them. These factors make working, assistance, and therapy dogs inherently valuable and impose a need for a high level of primary veterinary care as described in the guidelines. Because working dogs have a particularly close relationship with their handlers, a trust relationship between the practice team and the working-dog client is imperative.
(*J Am Anim Hosp Assoc* 2021; 57:253–277. DOI 10.5326/JAAHA-MS-7250)

Introduction

Working, assistance, and therapy dogs (collectively referred to as working dogs in these guidelines) have high intrinsic value because they perform various practical, utilitarian, or commercial functions. As such, these animals are generally expensive to purchase and train. In addition, the physical and behavioral demands placed on working dogs often require a particularly high standard of healthcare and close monitoring by the attending veterinarian. These guidelines are intended to

AFFILIATIONS

From The Penn Vet Working Dog Center, Department of Clinical Sciences and Advanced Medicine, University of Pennsylvania; The Seeing Eye, Inc.; National Disaster Search Dog Foundation; University of Pennsylvania School of Veterinary Medicine, Department of Pathobiology; University of Tennessee, Department of Small Animal Clinical Sciences; Lincoln Memorial University–College of Veterinary Medicine; Auburn University College of Veterinary Medicine, Canine Performance Sciences Program; Texas A&M Veterinary Emergency Team (VET), UC Davis, Health Sciences

CONTRIBUTING REVIEWERS

Kristin Jankowski, VMD, CCRP, UC Davis, Health Sciences Assistant Clinical Professor of Small Animal Community Medicine, Davis, California; Nicholas Cabano, DVM, MS, DACVS, DACVSMR, Tacoma, Washington

Correspondence: cmotto@vet.upenn.edu

[†]C.M. Otto is the chair of the AAHA Working Dog Guidelines Task Force.

[§]Z. Ng is the representative for the Primary Care Veterinary Educators.

Disclosure: These guidelines were prepared by a task force of experts convened by the American Animal Hospital Association (AAHA) and were subjected to a formal peer-review process. This document is intended as a guideline only, not an AAHA standard of care. These guidelines and recommendations should not be construed as dictating an exclusive protocol, course of treatment, or procedure. Variations in practice may be warranted based on the needs of the individual patient, resources, and limitations unique to each individual practice setting. Evidence-based support for specific recommendations has been cited whenever possible and appropriate. Other recommendations are based on practical clinical experience and a consensus of expert opinion. Fur-ther research is needed to document some of these recommendations. Because each case is different, veterinarians must base their decisions on the best available scientific evidence in conjunction with their own knowledge and experience.

*AAHA Foundation, Boehringer Ingelheim Animal Health USA Inc., CareCredit, Merck Animal Health, and Zoetis supported the development of the 2021 AAHA Working, Assistance, *and Therapy Dog Guidelines* and resources through an educational grant to AAHA.

© 2021 by American Animal Hospital Association

enable veterinary practitioners to anticipate the needs of these specialized patients and their handlers, to provide the care needed to maintain their health and serviceability, and to offer useful referral recommendations when appropriate. The terminology related to working dogs and how they are classified sometimes overlaps and can be confusing. The practice team needs to "speak the language" of the working dog community to better understand and relate to these specialized patients, their handlers, and sponsoring organizations. Thus, the guidelines begin with a section on acronyms and definitions related to working dogs and their societal roles. Although the advisory panel has attempted to clarify the definitions associated with working, assistance, and therapy dogs, some confusion and inconsistency is unavoidable owing to the lack of universally recognized nomenclature associated with this animal population.

The guidelines have four principal objectives as noted below, along with the rationale for each objective.

Improve the practice team's understanding of the special needs of working dogs. Although practitioners may intuitively realize that working dogs have special needs, they may lack full awareness of healthcare implications and challenges of caring for this type of patient. The need to handle high-value dogs, protection dogs trained for **on-command aggression**, or high-energy **service** dogs can be intimidating to some practice team members. Care must be taken to avoid treatment decisions that impair the functionality of the dog, such as its mobility, detection skills, or alertness. Working dogs always function along with a handler, partner, or service team. The practice team must care for the patient but always in concert with the individual responsible for the dog or with the sponsoring organization. The relationship between the working dog and its handler can be exceptionally strong, for instance, in military or law enforcement settings where human life is sometimes in the balance. In other cases, the working dog is literally priceless when the animal's performance is critical to human welfare, for example, in the case of guide dogs for visually impaired individuals. The working dog may not always be in the immediate or full-time care of the handler (e.g., customs dogs, TSA dogs, military working dogs). Some guide dog schools not only train the service dog but maintain ownership responsibility as well. Thus, treatment decisions and ownership responsibility for a working dog may fall to a sponsoring organization instead of an individual client as in the case of a conventional canine pet.

Develop an understanding of the dog's special needs from the perspective of its handler or trainer. The working dog's trainer or handler is an essential and committed partner in the animal's healthcare and has a role in executing the healthcare plan. It is essential that the practice team involve the human partner by understanding his or her role in the dog's performance and by obtaining that individual's observations and viewpoints on the dog's health status and needs. The working dog's human partner often has a different and more holistic role with a greater economic stake than a conventional pet owner might have. A working dog handler or trainer is attuned to their canine partner in a similar way as a zookeeper who is in continuous contact with and responsible for the care of a rare or exotic species, or a trainer working with an elite equine athlete. The working dog's human partner will often notice subtle changes in the dog's performance or disposition that can indicate early-onset disease, and in this respect can differ from conventional canine pet owners. The veterinarian should probe for these observations and give ample credibility to the dog handler's perspective. The information obtained from the handler should be recorded in a detailed patient history that can be correlated with performance. Because the handler is in contact with the dog in a highly observant role, the human partner can often identify changes indicative of the dog's physiologic status that would otherwise escape the veterinarian's detection.

Enhance the well-being and safety and decrease the stress imposed on the practice teams who care for working dogs. The practice team's confidence in skillfully and safely handling working dogs is in direct proportion to its understanding of the special needs of this type of patient. A principal reason why practitioners may not fully appreciate the special needs of working dogs is that veterinary schools generally do not provide curriculum offerings on specialized care required by these animals. These guidelines seek to fill this information gap by providing recommendations on how the practice team can effectively interact with high-value working dogs and their handlers. These include the essential role that low-stress handling plays in the effective interaction between the patient and the practice team. Recording a thorough patient history, including acquisition of related video or photo documentation, is an especially important component of working dog care and involves asking questions specific to the dog's societal or service role. Some working dog associations have veterinarians on staff that can serve as a valuable resource to the practice team, as described later in the guidelines.

Minimize the risk of infectious disease transmission and injury to working dogs by providing optimum preventive healthcare and nutrition. Working dogs often interact with human handlers or clients who are experiencing health problems that put them at risk of zoonotic diseases. These include very young or older individuals and those who are convalescing or affected by chronic conditions. Conversely, working dogs might be exposed to occupational risks associated with their environment or duties. The practice team should be aware of the circumstances of the dog's human partner and the setting in which the dog works. Video or photo documentation of work-related concerns or responsibilities (provided by the client) may also be facilitative for the care team's understanding of the patient's occupational hazards encountered. This may involve educating the human handler about first aid or husbandry specific to the dog's function, transmissible disease exposure risks (including zoonotic diseases), and other unique health risks to which the dog might be exposed.

Acronyms and Definitions

Veterinary practice teams should be familiar with the following acronyms and definitions related to working and service dogs. NOTE: All definitions and allowances are subject to change with updates to federal, state, and local regulations and policies. It is advisable to refer to the most current policy for guidance.

Acronyms and Abbreviations

AAA Animal-assisted activity
AAI Animal-assisted intervention
AAT Animal-assisted therapy
ADA Americans with Disabilities Act
CBRNE Chemical, biological, radiological, nuclear, and high-yield explosives
CBP Customs and Border Protection
DEA Drug Enforcement Administration
EMT Emergency medical technician
ESA Emotional support animal
FHA Fair Housing Act
HMO Health management organization
HUD U.S. Department of Housing and Urban Development
K9 Canine
MPC Multipurpose canine
MWD Military working dog
NRC National Research Council
PTSD Post-traumatic stress disorder
S&R Search and rescue
TSA Transportation Security Administration
USAR Urban search and rescue
USDA United States Department of Agriculture

Definitions

animal-assisted activities (AAA). The term for animal-assisted activities delivered in a variety of environments by specially trained professionals, paraprofessionals, or volunteers in association with animals that meet specific criteria and provide opportunities for motivation, education, or recreation to enhance quality of life. (A compilation of definitions of AVMA Animal-Assisted Interventions is available online.[1])

animal-assisted therapy (AAT). A goal-directed intervention in which an animal meeting specific criteria is an integral part of the treatment process delivered or directed by health or human service providers working within the scope of their profession. Animal-assisted therapy is provided in a variety of settings and may be group or individual in nature.[1]

assistance dog (assistance animal). Assistance animals do work, perform tasks, provide assistance, or provide psychological support for a person with a physical or mental impairment that substantially limits at least one major life activity or bodily function. An assistance animal is not a pet. (Eligibility requirements for an assistance animal are described in 24 C.F.R. §§ 5.303; 960.705; FHEO-2010-01, Assessing a Person's Request to Have an Animal as a Reasonable Accommodation Under the Fair Housing Act. Office of Fair Housing and Equal Opportunity, U.S. Department of Housing and Urban Development, January 28, 2020, pp 1–19).

canine handler (dog handler, K9 handler). A person who has successfully completed a recognized course of canine handling in a specific discipline and maintains those abilities through field applications, maintenance training, certification, recertification, and department-, agency-, or organization-required continuing canine education.[2]

detection dog (detection canine or K9). A dog trained to detect and alert to the presence of certain scents or odors for which it has been trained. May be referred to as a law enforcement or search and rescue service canine, which is not to be confused with dogs covered by the ADA (e.g., medical detection dog).[3]

dual-purpose canine (dual-purpose dog or K9). A canine trained in two disciplines (e.g., a narcotics detection dog also trained for apprehension).[3]

emotional support animal (ESA). An animal of any species that provides therapeutic emotional support for individuals with disabilities in which the use is supported by a qualified physician, psychiatrist, social worker, or other mental health professional based upon a disability-related need. ESAs do not qualify as service animals under the ADA or under a recent ruling by the U.S. Department of Transportation because they do not require training to perform a particular task. (Regulations involving ESAs are available at FHEO-2010-01, Assessing a Person's Request to Have an Animal as a Reasonable Accommodation Under the Fair Housing Act. Office of Fair Housing and Equal Opportunity, U.S. Department of Housing and Urban Development, January 28, 2020, p 1–19, and at 24 CFR Part 5, Pet Ownership for the Elderly and Persons With Disabilities; Final Rule. Department of Housing and Urban Development, Federal Register, Vol. 73, No. 208. October 27, 2008, pp 63834–63838 and Service Animal Final Rule, U.S. Department of Transportation.)

multipurpose canine (MPC). A military working dog employed by U.S. Special Forces.[3]

protection dog (protection canine or K9, operational canine or K9, security dog or K9). A broad term encompassing many individual types of dogs trained to alert to and deter human or animal threats. Protection refers to the behaviors associated with defense of self or other group members including humans when threatened or when a potential threat is perceived. Examples include police dog, law enforcement canine, private security dog, patrol dog, and livestock guard dog.[3]

sensory threshold (behavioral threshold). The amount of a stimulus that is necessary to produce a response from a dog.[3]

service dog. Any dog that is trained to do work or perform tasks for the benefit of an individual with a disability including a physical, sensory, psychiatric, intellectual, or other mental disability. Other species of animals, whether wild or domestic, or trained or untrained, are not considered service animals. (Service dog regulations are described in 28 C.F.R. §§ 35.104; 36.104, Americans with Disabilities Act Title III Regulations. Department of Justice, September 15, 2010, p 33).

single-purpose canine (sole-purpose canine, K9, dog). A dog trained in only one discipline, typically based on odor/scent detection (e.g., search and rescue dog, medical detection dog).[3]

therapy dog. An umbrella term for a dog that is used in animal-assisted activities or goal-directed interventions of animal-assisted therapy and is not recognized by the ADA as a service animal. (See 28 CFR 36, Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities. Department of Justice, Federal Register, Vol. 75, No. 178, September 15, 2010, pp 56268–56269; 73 FR 34508, 34553 (June 17, 2008); and AVMA Legal context for assistance animal use – definitions[4]).

Categories of Working, Assistance, and Therapy Dogs

It is helpful for practitioners to define working and service dogs according to their specialized function or work environment, as follows:

- *Working dogs*, further categorized as detection or protection animals. As the name implies, working dogs are trained to accomplish specific, defined tasks.
- *Assistance dogs*, categorized as either service dogs or emotional support dogs. Assistance dogs help persons with a diagnosed psychological or physical limitation who benefit from interaction with the dog. Service dogs have a specific job to accomplish, whereas an emotional support dog does not have a specific job but provides support by their presence alone.
- *Therapy dogs* perform either animal-assisted activities (AAA) or animal-assisted therapy (AAT). AAA dogs have been described as "happiness delivery" animals, performing duties such as hospital visits and de-stressing interactions with people. AAT dogs provide goal-directed therapy, often directed by a healthcare professional such as an occupational therapist or psychologist.

Table 1 provides a summary of the attributes and attitudes that veterinary practices should have or develop in order to provide care to working, assistance, and therapy dogs.

Working Dogs: The Detection Dog

Definition

A detection dog (detector canine, detector dog) is defined as "a canine trained to detect and alert to the presence of certain scents or odors for which it has been trained."[5]

Examples

The discipline of detection dogs is expanding even as this report is developed, and therefore, providing an expansive list of all types of detection dogs would not be practical. Detection dogs are often categorized by the specific odor/scent or category of odors/scents for which they are trained to detect, for example, explosives, narcotics, live humans, human remains, invasive or endangered plants or animal species, contraband and weapons, ignitable liquids, medical conditions, and tracking (Table 2). They can also be classified by how they work (e.g., trailing, tracking, and air scenting). Finally, detection dogs can be categorized by the industry or sector for which they work (e.g., agriculture, conservation, and search and rescue).

Relevant Information for Practitioners

Dogs are reported to be capable of detecting odor at 1–2 parts per trillion, 10,000–100,000 times better than humans.[6] From a health and management perspective, it is important for the veterinary team to recognize that olfactory competence is of critical importance to a detection dog's success, and preservation of olfaction when possible is essential when making treatment decisions. Practitioners should understand that medical conditions and therapies may affect olfaction, and this potential should be discussed with the handler so decisions can be made to remove a dog from service if a decline in performance is expected. For example, oral administration of metronidazole may degrade a dog's ability to detect explosives.[7] Therefore, practitioners should consider limiting the use of metronidazole in detection dog patients to conditions that have no reasonable alternative. Systemic steroids may either enhance or inhibit olfaction. Use of a steroid for an underlying nasal inflammatory condition can be of assistance; however, high-dose, long-term, systemic steroids may have a negative impact on olfaction. Functional odor recognition reassessment and possible recertification should be advocated when placing the patient on an extended prescription of the aforementioned medications

Although there is growing scientific data on the olfactory effects of some pharmaceuticals and biologics, there is limited information on many commonly used therapies. It is the consensus of the advisory panel that any drug that may cause inflammation or dehydration or alter neurovascular function within the olfactory system could result in temporarily decreased olfactory performance. Detection dogs can be at risk of toxic exposure to opioids or other drugs and toxins. Practitioners must collect a comprehensive history to determine the likelihood of exposure and be aware of the presenting clinical signs. A dog exposed to opioids may be a fomite and carry those opioids on its fur/face, thus putting in-contact humans at risk.

Detection dogs come in many shapes and sizes, as well as temperaments. Although just about any dog can be trained to detect an odor, there are some specific characteristics that make some dogs

TABLE 1

Practice Team Attributes and Skill Sets for the Care of Working, Assistance, and Therapy Dogs

Knowledge Topics:	Veterinary Team Members Should:
Relationship with the handler	• Understand what the dog's "job" is, and how they interact with their handlers. • Have a willingness to partner with the handler
Handling: Locations	• Have a willingness to adapt waiting room policies to involve the handler/owner.
Handling: General	• Provide calm, low-stress handling.
Appointments	• Consider additional time for appointments (e.g., scheduled appointment at the end of the day). • Prioritize early intervention and accomodation for common disease processes (e.g., otitis, dermatitis)
Experience	• Have experience /work toward gaining experience—watch the dogs work. • Have a genuine interest in what these dogs do. • Develop/have an appropriate confidence in working with potentially reactive dogs.
Communication	• Use appropriate terminology for these dogs (canine vs. military working dog, etc.) • Recognize the importance of timely and thorough communication with the handler and/or the organization that owns the dog. • Discuss with the handler how they prefer to have initial and follow-up communications handled. • In many cases, provide written follow-up outlining the expected duration of recovery and return to work. • Understand when dealing with service/assistance dogs: Importance of communications tailored to disabled individuals (e.g., call-backs, e-mails).

successful in a detection career. These characteristics can also make some detection dogs challenging to work with as patients in a veterinary setting. It can be helpful to develop specific guidelines for your practice team for interacting with and caring for working canines with their handlers in your practice. Many of the breeds and breed mixes that are used in detection work have low thresholds for arousal and may become highly aroused quickly. This response characteristic can make handling a challenge and underscores the importance of recognizing threshold levels, low-stress handling, avoiding over-restraint, and focusing on safety and caution of the veterinary team. For example, to reduce arousal, bring the handler and their canine directly into a separate room or area of the hospital upon arrival (or leave them in their vehicle until you have an available exam room or greeting room space). Unless recommended by the handler, do not separate the handler from the dog unless absolutely necessary. If needed, administer sedative drugs before separating the two and ensure the handler is present during recovery. Make sure all team members recognize the difference in handling, approach, and care required by these specialized working dogs. The use of muzzles should be advocated when there is any question regarding the patient's disposition and temperament.

Working Dogs: The Protection Dog

Definition

A protection dog is trained to alert the handler to human or animal threats and to deter the threats. Law enforcement teams typically prefer the terminology "canine or K9 team" and "handler." "Military working dog (MWD)" is the standard terminology for dogs who work with the uniformed military services, whereas "multipurpose canines (MPC)" are dogs that work with the U.S. Special Operations Forces (SOF) component of the military.

Examples

Police dogs, patrol dogs, law enforcement dogs, military working dogs, private security dogs, and livestock guard dogs are examples of protection dogs.

Relevant Information for Practitioners

A protection dog that also performs a detection function (e.g., finding explosives or illicit drugs) is considered to be a dual-purpose dog. Protection dogs participate in criminal apprehension, which may involve

TABLE 2

Examples of Detection Dog Sensory Target Odors

Detection Category	Sensory Target Odor
Human remains	• Human blood • Human decomposition material (tissue, adipose, wet and dry bone, body fluids) • Burned human tissue
Narcotics	• Marijuana • Cocaine • Heroin • Methamphetamine
Commercial pest control	• Bed bug • Termite
Search and rescue	• Live human • Disaster setting, wilderness/wide area setting
Conservation	• Antipoaching (ivory, rhino horn, pangolin scales) • Invasive animal species (zebra and quagga mussels, emerald ash borer) • Invasive plant species (dyer's woad) • Endangered and elusive animal species scat (kit fox, black-footed ferret, orca)
Medical and research	• Human diseases: cancer (ovarian, prostate, thyroid cancers), infectious diseases (COVID-19, bacterial infections, tuberculosis, malaria) • Animal diseases: avian influenza, chronic wasting disease • Environmental/plant diseases: citrus canker, Huanglongbing (HLB)

tracking, evidence recovery, and bite work. These dogs are not "attack" dogs but are trained to bite and hold (and release) an individual as a method of restraint. Many law enforcement agencies never actually have to deploy a dog on a bite because the announcement from the officer that "they should surrender or else they will release their dog" is often successful in obtaining the surrender.

In order to perform the tasks required of a protection dog, appropriate physical structure, including dentition, orthopedic soundness, a body condition score of 4–5 out of 9, and physical conditioning are necessary.[8,9] Disruptions in normal anatomy or physiology that go unnoticed in a pet dog, such as dental disease or tooth fractures, being overweight, or lack of a fitness and conditioning, can lead to impairment of the protection dog's performance and put the handler's life at risk. Recognizing these deficiencies is the first step in a clinical assessment. Clinical acumen may benefit from direct observation of the patient's training. Alternatively, video or photo documentation of work-related compromise (provided by the client) may be facilitative for the practitioner's determination of the patient's medical diagnosis. Knowing when to refer the dog to a specialist familiar with problems and requirements of protection dogs (www.workingdogpractitioner.com) is critical and will be influenced by the ability to communicate the work, safety, and health implications to the handler or the sponsoring organization (e.g., police department). The practitioner should take an active role in injury prevention, for example, by educating the handler on the importance of the athletic requirements of the dog and the importance of allowing the animal to warm up prior to job performance.[10]

Behaviorally, protection dogs often exhibit increased arousal, reactivity, or potential aggression in response to treatments that may cause discomfort. To ensure a successful exam visit, practitioners should involve the handler as an active partner in low-stress handling techniques, for example, by keeping the dog muzzled, and consider preemptive sedative and analgesic drugs. Because overhandling protection dogs tends to make them more reactive and aggressive, the importance of low-stress handling cannot be overemphasized.[11–13] The handler should not be separated from the dog during evaluation or treatment unless absolutely necessary. It is important to consult with the handler before using treat or food techniques or sedatives, knowing that they could temporarily influence the dog's working performance or training. If it is necessary to separate the handler and the dog, sedative drugs should be considered before the separation. A smooth and

safe recovery will be facilitated with the handler present. Again, the use of muzzles should be advocated when there is any question regarding the patient's disposition and temperament.

Assistance Dogs: The Service Dog

Definition

A service dog is individually trained to do work or perform tasks for the benefit of an individual with a disability including a physical, sensory, psychiatric, intellectual, or other mental disability.[14] Other species of animals, whether wild or domestic, or trained or untrained, are not considered service animals. Although the terms *assistance dogs* and *service dogs* are often used interchangeably, assistance animal is considered the more encompassing terminology that includes service dogs and emotional support dogs.[15] An assistance dog is defined by the U.S. Department of Housing and Urban Development, and service dogs are defined by ADA regulations. Service dogs are not considered pets; they are trained to perform specific tasks related to their handler's disability.[15–17] Because of a lack of universal guidelines and enforcement, the current knowledge of the numbers and types of assistance dogs is evolving and only more recently becoming standardized.[18,19]

Examples

Examples of service dogs include guide dogs for the blind, hearing dogs, mobility assistance dogs, seizure alert or response dogs, psychiatric service dogs, diabetic alert dogs, autism support dogs, and allergy detection dogs.

Relevant Information for Practitioners

Service dogs are required to be trained. Many come from organizations registered through Assistance Dogs International (including Canine Companions for Independence, The Seeing Eye, Guide Dogs for the Blind, and Guiding Eyes for The Blind) or can be privately trained.[20,21] Medical considerations when working with assistance dogs include recognizing that pain and certain drugs and anesthetic procedures will temporarily impact cognitive ability to make decisions and therefore the ability to work, particularly in service dogs. Antihistamines, anxiolytics, epileptic medications, and analgesics or some pain medications may alter work performance. A service dog should refrain from work or be closely monitored when getting adjusted to these medications. Clients with assistance dogs should be given the opportunity to be present during medical exams and the communication with the handler needs to be adjusted to the handler's disability. Certain medical conditions can be incompatible with an assistance dog's job if a particular disease results in performance deficits.

Assistance Dogs: The Emotional Support Dog

Definition

Emotional support dogs are recognized by the ADA and defined by the Fair Housing Act as dogs providing therapeutic support to disabled individuals by providing companionship, relieving loneliness, and "sometimes help with depression, anxiety and certain phobias" but are not specially trained to perform specific tasks.[17,22] More specifically, an emotional support dog may help its owner to cope with conditions such as worry, mood swings, obsessive compulsive disorder, panic attacks, and irritability. An emotional support dog must be housebroken and obedient but requires no specialized training. Dogs used strictly for emotional support are not recognized as service animals, which are required to be trained.

Examples

Emotional support dogs have no restrictions on breed, size, or weight and can be any dog that alleviates symptoms of emotional or mental stress.

Relevant Information for Practitioners

Emotional support dogs should not exhibit disturbing behavior such as aggression or excessive barking. Generally, ESAs have the same public access restrictions as pets.[4,15,17,23] According to a recent Department of Transportation ruling,[24] ESAs are not considered service animals and airlines are not required to permit them to travel in the cabin. Although ESAs are recognized by the ADA, considerable controversy, confusion, and misinformation exist regarding these dogs because of the lack of a validated, universally recognized certification process. Additionally, an ESA requires a human health provider's prescription and there is currently substantial confusion within the human health community on indications for and the process of evaluating appropriate dogs. Finally, "counterfeit" certifications are easy to obtain by pet owners who want to bring their pet with them into situations typically reserved for service or assistance dogs, thereby "cheapening" the designation.[25]

Despite these ambiguities, the goal for the medical management of an emotional support dog is to focus on the canine standard of care, with an emphasis on preventive healthcare, prevention of infectious disease including zoonotic diseases, and ensuring the dog's general welfare.[26] Behavioral recommendations should focus on training consistent with the emotional support dog's role and ensuring that the dog has a stable temperament.

Therapy Dogs

Definition

A therapy dog promotes improvement in human physical, social, emotional, or cognitive function, and functions in either group or

individual settings. By providing comfort and affection, therapy dogs play a role in animal-assisted intervention (AAI) that helps people with or without diagnosed or physical conditions.[15] A therapy dog used in human AAI is not recognized by the ADA as a service animal. AAI is classified as either animal-assisted therapy (AAT) or animal-assisted activity (AAA). An AAT is either delivered or directed by health or human service providers working within the scope of their profession and is documented and evaluated, whereas an AAA is not.

Examples

A therapy dog used in an AAT is part of a goal-directed intervention in which the animal meets specific criteria that are integral parts of the treatment process. Examples of AAT include presence at sessions with a speech or occupational therapist or interaction with a licensed professional counselor. Examples of AAA, in which there is not a goal-directed intervention overseen by a professional, may include airport visits, de-stress events, and visiting hospital patients, caregivers, and residents of nursing homes.

Relevant Information for Practitioners

There are a number of medical considerations when working with therapy dogs. As in the case of service dogs, certain drugs (e.g., antihistamines, anxiolytics, epileptic medications, and analgesics or other pain medications) and anesthetic procedures may temporarily impact their cognitive ability to make decisions and to interact with people.

Practitioners should bear in mind the importance of disease transmission (particularly zoonotic disease) as therapy dogs are often visiting immunocompromised individuals. In agreement with AAHA recommendations, raw diets should be avoided because of the risk of contamination with pathogenic organisms.[27] Routine preventive healthcare and deworming for internal and external parasites is essential. Although someone other than the veterinarian is tasked with evaluation, therapy dogs must be behaviorally stable.[19]

How Working, Assistance, and Therapy Dogs "Earn a Living": Protection Dogs

Protection dogs by definition are trained to alert to and deter human or animal threats. The job of protection often demands that the dog works closely with its handler to assess a situation, react and move quickly, remain determined in the face of danger, and possess a balance of stamina, power, and agility. Protection dogs could be required at any point to sprint, jump over obstacles, turn sharply at top speed, scale walls and fences, move on unstable surfaces, and perform powerful bite and hold maneuvers, all of which can produce both significant mental stress and the physical stress of excessive biomechanical forces on the dog's mouth, joints, and spinal column. Breeds typically used for protection are highly intelligent, energetic, and reactive and have the body conformation to develop the fitness capacity necessary to meet the physical demands of the job.

A common scenario for a protection dog is for law enforcement backup and possible apprehension of a fleeing suspect. The handler typically loads the dog (if not already on patrol riding in the back of the police car) and heads to the scene. The dog may become increasingly excited for the anticipated work and the thrill of the chase, which could lead to stereotypic behaviors such as rapid circling in the travel kennel and excessive vocalizations. Once on the scene, the dog may need to approach the situation slowly and methodically with the handler or may be required to move explosively into action. The dog may have to sprint long distances and conclude with a physical encounter engaging the suspect, which may include bite apprehension. The hours of proper training and physical conditioning come into play at this time, and the goal of the team is to successfully meet the needs of the situation without injury to dog or handler. Once the situation is resolved, the team then must return to a calmer, cooled-down state and prepare for the next challenging situation.

The characteristics needed to build a successful protection dog can present a challenge for the veterinary personnel caring for the canine team. These dogs may have behaviors such as increased reactivity or potential aggression in response to treatments that may cause discomfort. Always incorporate the handler, use low-stress handling, and consider preemptive sedative and analgesic drugs as necessary, knowing that they could collectively temporarily influence the dog's working performance. For the safety of the veterinary team, muzzles should be used when working with protection dogs to help avoid bite injuries. Even a muzzled dog may strike with full head force (known as "muzzle-whipping"), which can lead to some painful concussive injuries to veterinary personnel. In light of these risks, the inclination is to often overhandle protection dogs, which makes them more reactive and aggressive. This is a common scenario that emphasizes the importance of low-stress handling techniques. Experienced veterinary personnel and dog handlers will develop a coordinated and calm flow of movements around the dog while performing the physical exam and various procedures and treatments. The handler should be consulted frequently in developing a hands-on plan for working with the canine partner. For example, it is particularly important to discuss rewards or any food or treat techniques to be used during the visit. Furthermore, it is critical not to separate the handler from the dog unless absolutely necessary. If so, the veterinary team should plan to administer sedative drugs before separating the two parties and to ensure the handler is present during recovery.

TABLE 3

Healthcare Recommendations for Protection, Detection, Assistance, and Therapy Dogs

Healthcare Category	Protection Dogs	Detection Dogs	Assistance/ Therapy Dogs
Preventive care	• Dental care • Core vaccines to include leptospirosis, Bordetella, CIV (in at-risk populations) • Annual heartworm testing; vector-borne disease in at-risk populations • Fitness and conditioning; adequate warm-up before work • Annual wellness screening tests (e.g., biochemistries, fecal analysis) • Flea and tick preventives • Prophylactic gastropexy • Leave functional dewclaws and tails intact • Awareness of susceptibility (exertional and nonexertional) to heat stroke	• Consideration that dogs may travel outside the area • Additional vaccines beyond core may include respiratory complex, leptospirosis, Lyme disease, etc. • Intranasal vaccines or medications may affect olfaction • May need frequently updated health certificates for travel • Health screenings may need to be expanded based upon unique risks (infectious disease or other exposures) • Annual wellness screening tests (e.g., biochemistries, fecal analysis)	• Standard canine preventive care based on lifestyle: vaccines, parasite (including HW), etc. • Annual wellness screening tests (e.g., biochemistries, fecal analysis) • May travel extensively with owner; therefore, preventive care may require a more global approach • May need frequently updated health certificates for travel

Behavior	• Be aware of and prepared to address
	  • Noise sensitivity
	  • Anxiety
	  • Environmental aversions
	  • Acclimation to husbandry practices and clinic/staff
	• Recognition and early treatment of post-traumatic stress
	• Implications of training methods on welfare
		• Be aware of and prepared to address
		  • High arousal
		  • Predisposition to compulsive behaviors
		  • Benefits of behavioral and environmental enrichment
			• Be aware of and prepared to address
			  • Highly trained
			  • When not in harness or vest, dog is not "working"

Nutrition	• Body Condition Scores (ideal is 3.5–4.5 out of 9) • Use of supplements as appropriate to the individual (joint, probiotics, skin) • Caloric requirements and dietary assessments • Need for special diets (prescription, performance)	• Dietary flexibility should be encouraged by regularly interchanging 2–3 complete and balanced diets to support lean body condition and GI microbial diversity • Use of supplements as appropriate to the individual (joint, probiotics, skin) • Encourage compliance with AAHA position on raw diets • Detection dogs may have different workloads that may require adjustment to protein and fat intake in order to maintain muscle condition and avoid weight gain	• Adjust based on activity level of their job/MER • Encourage compliance with AAHA position on raw diets owing to exposure of some of these dogs to immunocompromised patients

(*continued*)

TABLE 3 (Continued)

Healthcare Category	Protection Dogs	Detection Dogs	Assistance/ Therapy Dogs
Reproduction	• Delay desexing in both males and females until past closure of growth plates to decrease the risk of orthopedic issues later • Consider leaving males intact through working life • Neutering does not measurably change motivation to work • Consider minimally invasive ovariectomy or OHE and combining with gastropexy	• Delay desexing in both males and females until past closure of growth plates to decrease the risk of orthopedic issues later • Brucellosis if breeding • See heritable diseases	• Puppy stages (before being in service) • Discuss age of desexing based on orthopedic risks and breeding potential
Common injuries	• Feet, pads, nails • Musculoskeletal (muscle strains, DLSS , overuse/repetitive injuries) • Ballistic wounds (gunshot, handgun); penetrating injuries (knife, impalement); blunt trauma from falls • Dental trauma (fracture of teeth, particularly canines) • Tail tip trauma (“happy tail”) • Airway obstructions (e.g., inhaling ball) • Heat injury	• Heat-related • Bites/stings • Toxicities • Punctures/lacerations/trauma • Orthopedic and musculoskeletal injuries • Feet, pads, nails	• Blunt trauma: HBC, falls • Burns and cuts (advise booties in inclement weather) • Risks vary based on environment (hot, cold surfaces) • Local dermatitis such as harness rub • Bite wounds
Common diseases	• Infectious diseases (vector-borne, region-specific disease; leptospirosis) • Gastrointestinal: diarrhea, GDV • Ear/skin disease (atopy, environmental, food allergy) • Upper respiratory (in at-risk kenneled populations) • Urinary: UTIs; prostatitis • Ocular: corneal disease (pannus), foreign bodies	• Gastrointestinal: GDV/discuss prophylactic gastropexy • Environmental risk factors • Orthopedic: hip/elbow dysplasia, osteoarthritis, lumbosacral disease	• Based on age, breed, lifestyle • Early intervention and accommodation for all disease processes are encouraged • Osteoarthritis from increased load or strain (i.e., mobility/ balance)
Handling	• Low-stress techniques • Premedication as appropriate • Keep handlers with dogs • Have handler apply cage-style muzzles • Staying below threshold; avoid triggers • Practice calm behaviors from veterinary team and dog-handler team • Consider performing exams outside (do not trap dog in small area) • Understand and identify special commands	• Keep handler and canine together as a team • Avoid arousal • Do not over-restrain • Consider keeping them separate from other animals	• Should not be handled or examined while in harness or vest (working) • Understand/identify special commands • Presence of handler advised

(*continued*)

TABLE 3 (Continued)

Healthcare Category	Protection Dogs	Detection Dogs	Assistance/ Therapy Dogs
Screening for heritable diseases	• Hip dysplasia • LS disease • Elbow dysplasia • Degenerative myelopathy • Progressive retinal atrophy (PRA)	• EIC • CNM • Elbow and hip dysplasia • Ophthalmic diseases: CERF exams (PRA, etc.)	• Note training facility may have already run these • Orthopedic, cardiac • Breed dependent: DM, PRA, MDR1, EIC
Mental/emotional considerations	• End-of-life or end-of-career decisions may be especially difficult and require additional considerations/ accommodations • Euthanasia: it will involve a network of support from teammates and honoring their process and culture • Traumatic events (apprehension, getting shot) create an incredibly strong bond with dog • Financial limitations and responsibilities • Dog may be a proxy for handler stress (emotions roll down the leash)	• End-of-life or end-of-career decisions may be especially difficult and require additional considerations/ accommodations • Financial limitations and responsibilities • Dog may be a proxy for handler stress (emotions roll down the leash)	• End-of-life or end-of-career decisions may be especially difficult and require additional considerations/ accommodations • Fatigue and burnout • Breaks appropriate for intensity of work? • High level of attachment to handler • Separation anxiety
First aid	• Trauma/hemorrhage • Airway obstruction • Toxicity, field decontamination (both oral and dermal decontamination) • Hydration • Heat injury • Transport • Triage GDV • Assessment of vital signs and knowledge of normal values	• Hemorrhage control • Airway obstruction • Toxicity, field decontamination (both oral and dermal decontamination) • Heat injury • Hydration • Opioid reversal • Allergic reactions	• Toxicity (e.g., human medications) • Minor wounds • Bite wounds
Triggers for retirement	• Loss of mobility, pain • Loss of interest in job • Terminal disease • Inability to certify/recertify • Contraindications for high-stress performance: Addison's disease, epilepsy, laryngeal paralysis, cardiac disease	• Agencies and organizations may have specific requirements and/or recommendations • Medical • Performance/behavioral	• Hearing or vision loss • Addison's disease (depending on service) • Any severe disease that impairs the dog's function • If handler cannot handle long-term treatment needed for dog • Loss of interest in job

(*continued*)

TABLE 3 (Continued)

Healthcare Category	Protection Dogs	Detection Dogs	Assistance/ Therapy Dogs
Needs of handlers	• Communication • Respect for bond • Access to medical education and medical information regarding their dog (resources 24/7)	• Include handlers in treatment decisions • Full treatment plans with detailed return to work strategies/requirements • Evaluate need for and implement return to work fitness program	• Disability may impair ability to treat dog (e.g., eye drops) • Accessibility of hospital • Discharge letters/ medications labeled such that client can get the information • Dog-proof the house to prevent FB
Needs of owners	• Financial planning • Communication; timely written reports • Utilizing "HMO" contract or insurance • Investment in dog, assurances; value of treatment	• Agencies or organizations may need to be involved in treatment decisions	• Usually as above (or as below) • Who is paying the bill? • Practitioners may consider offering discounts
Needs of organizations	• Education • Needs dogs that can provide the services expected of them • PR: media loves a good working dog story	• Agencies or organizations may need to be involved in treatment decisions	• Varies depending on organization • Some maintain ownership • Update to help in breeding for the future
Possible exposure risk	• Illicit drugs	• Illicit drugs	• Human pharmaceuticals

How Working and Service Dogs "Earn a Living": Detection Dogs

What They Do

A detection dog is a dog trained to detect and alert its handler to the presence of very specific scents or odors. Detection work dogs may be involved in many types of work. Some of the most commonly recognized detection canines include law enforcement, drug enforcement (DEA), transportation safety (TSA), border protection (CBP), and Search and Rescue (S&R). Other categories of detection dogs include those trained to alert to electronic storage devices, endangered and invasive plant and animal species (conservation detection), and most recently, medical detection. For a more detailed overview of different types of detection work, see Table 1.

How They Are Selected

Each type of detection dog has different physical, mental, or behavioral selection criteria for their job. For example, a dog working with the USDA in an airport to check baggage may be selected for being smaller in stature, friendly, and nonthreatening (e.g., a beagle), whereas the majority of S&R canines in the FEMA USAR system are either Labrador retrievers or Belgian Malinois. In the USAR environment, fearlessness, athleticism, toy drive, and a certain size are necessary to navigate the rubble of a disaster environment or search in highly unstable structures. Thus, the dog is matched to the job for which they are best suited, based on their physical stature and ability, personality (most single-purpose detection dogs work closely with people and therefore are selected for their lack of aggression to people or other animals), trainability, and ability to focus on the task relentlessly (drive for reward). Finally, ultimate selection for the work is not based on hereditary or physical characteristics or success in training as a young dog, but on the necessary mental or aptitude characteristics that will ultimately determine which job they are best suited for. For this reason, and because physical and behavioral maturity are important, working dogs often do not enter into the rigorous training required of their specialty until they are at least 1 year of age.

Training and Development

The training and development of a successful detection dog takes many hours, and this training continues throughout each dog's career. In very basic terms, the dogs are trained to seek out a specific odor and perform a final response to indicate the presence of the odor. Requirements vary greatly between disciplines, but once fully trained, most dog/handler teams are required to pass a certifying evaluation before becoming operational. This evaluation is repeated periodically throughout their career to ensure detection proficiency.

What Makes Detection Dogs Priceless to Handlers and Sponsoring Organizations

Every dog/handler team is engaged in many hours of training to achieve and maintain the level of expertise required in the field for which they were selected. In addition to the initial training, many detection dogs must achieve and maintain physical and behavioral fitness standards to meet the needs of the job. These requirements vary for the type of work performed, but each team spends innumerable hours—and typically, on a daily basis—engaged in exercise and training to maintain both fitness and performance, a process that builds a tight and lasting bond. In addition, this bond deepens through daily work, specialized deployments (e.g., disaster response), and shared work-life experiences. During deployments, handlers and their dogs spend long hours together away from home in often very harsh or minimalist conditions, circumstances that also strengthen the working partner relationship.

Work Environment

The working environment for detection dogs is as varied as their specific job focus, so the veterinarian should seek to understand the individual dog's risk, injury potential, and training requirements. For example, S&R and especially USAR canines are required to work in dangerous environments and therefore it is critical for the veterinary practice team to understand and recognize these risks (see Table 4 for details).[28–33] Furthermore, the veterinary team must be prepared to work closely with the handler and other members of the handler's team to address these sometimes emergent needs and be able to quickly react to get the team the most appropriate care for the dog.

How Working and Service Dogs "Earn a Living": Service, Assistance, and Therapy Dogs

Assistance dogs serve to assist their handlers, which can be further characterized by their specific roles such as guide dogs, hearing dogs, and mobility assistance dogs. Therapy animals serve to benefit humans other than their handlers in a variety of professional and nonprofessional settings.

The selection process for assistance dogs depends on their role and from where they originated (i.e., a not-for-profit organization versus independently trained). Many nonprofit organizations that train assistance dogs have their own breeding programs. These organizations select the best individuals for breeding based on health, temperament, and trainability. Orthopedic, ophthalmic, and cardiac screening tests are used in combination with breed-appropriate genetic tests to select breeding stock as well as working stock. Temperament evaluations are done at specified times to determine the dogs' suitability for the type of work they are being raised to perform. Dogs in breeding programs for assistance dog schools may reside at special breeding facilities or be housed with volunteer foster homes or caretakers.

In contrast, therapy dogs can be pet dogs whose owners have enlisted as volunteer therapy teams (AAA), usually under the supervision of a registering AAI organization, or belong to or work with health or human service providers working within the scope of their profession (AAT). These dogs are certified by the registering organization using a standardized behavior evaluation. They should be tested in the working environments in situations they may encounter and demonstrate minimal signs of behavioral stress.[34] Therapy dogs should demonstrate good-to-excellent social behavior without concern regarding their own safety or that of the patient and be reliable, predictable, and controllable.[35] In addition, they need to be certified as healthy and free of zoonotic diseases by a veterinarian.[36,37] Each AAI organization sets its own standards and requirements for therapy team registration, including handler education training and registration fees.

Assistance dogs formally trained through nonprofit organizations are typically raised by volunteers who expose the puppies to as many people, environments, and experiences as possible to help ensure calm, confident puppies.[38] The puppies should experience the challenges of everyday life such as crowds of people, playing children, other dogs, varieties of surface, elevators, and stairways. These puppies should learn how to ignore common distractions. Additionally, they should be comfortable traveling to different environments (from rural settings to busy city streets) and remain relaxed when receiving care and restraint (daily grooming and veterinary visits). Formal intensive and specific training begins when dogs return to the training facilities after puppy raising.

No specific training is mandated for pet dogs to become therapy dogs because a calm temperament and social personality are more critical aspects of therapy animal standards. However, therapy dogs often undergo basic obedience training, such as the American Kennel Club's Canine Good Citizen, to prepare for the specific behavior evaluation administered by the individual AAI organization.[39] In addition, many dogs will have advanced skills training for specific tailored tasks that meet identified goals in AAT. It is critical that the handler receive

TABLE 4

Common Health Risks to Detection Dogs Based on Working Category

Knowledge Topics	Higher-Risk Work Environment	Moderate- to Lower-Risk Work Environment
Urban search-and-rescue	• Respiratory, oral, ocular, or dermal exposure to toxic chemicals, waste, environmental (CBRNE) • Injury from falls (MS) or penetrating, skin, pad, or foot injury • Environmental (heat or cold) • GI distress/illness	• Illicit drug or toxin exposure • Direct exposure or hypersensitivity to plant toxins or animal venom (bees, snakes) • Infectious agents (regional)
Wilderness search-and-rescue	• Injury from falls (MS) or penetrating, skin, pad, or foot injury • Direct exposure or hypersensitivity to plant toxins or animal venom • Environmental (heat or cold)	• Illicit drug exposure • Infectious agents (regional) • Gunshot injury • GI distress/illness
Agriculture/pest	• Nothing out of ordinary for canine companions	
Police and law enforcement	• Orthopedic injuries • GI distress/illness • Gunshot or attack	• Toxin or illicit drug exposure • Blast or gunshot injury • Pad or foot injury
Medical	• Biohazard exposure	
Conservation	• Environmental injury or exposures	

basic education training in zoonotic disease management and monitoring the therapy dog for stress behaviors.[28,29]

Assistance dogs are invaluable because they enable individuals with disabilities to carry on with simple everyday tasks and address life-threatening medical situations. These dogs enable at-risk individuals to function effectively in order to lead happier, healthier, more productive lives and serve as their handlers' lifelines and connection to the public.

While therapy dogs are pet dogs that bring joy and benefits to those that they visit, the handler/owner also benefits greatly from the bond. The relationship between dog and handler is likely strengthened because of the additional time and energy the handler spends with the therapy dog during these activities. In addition, the handler and dog derive their identity by volunteering as a team, a partnership that brings about a sense of pride and joy by making a difference in the lives of others.

Assistance dogs work in a wide variety of environments because they are permitted in almost all public locations where handlers go, including public transportation. Therapy dogs also work in a wide variety of environments that have been preapproved by facilities and AAI organizations. In contrast to assistance dogs, therapy dogs do not have public access or transportation rights because they are considered to be "pet" animals.

Table 3 provides a summary of basic healthcare recommendations for the various categories of working, assistance, and therapy dogs. Table 3 is a reference for the following sections on Medical and Care Considerations.

Medical Care Considerations: Protection Dogs

A trained, healthy working dog is an extremely valuable asset to an organization or individual and can save lives when appropriately deployed in a wide variety of situations. Keeping the canine team healthy and injury-free is paramount in maintaining the effectiveness and well-being of the dog, the handler, and those dependent upon the outcomes of the team's actions. Extensive resources are involved in training these specialized dogs, so there also is incentive to maximize

the time in which they are at peak performance. A comprehensive preventive medical care plan is the cornerstone of health for any working or service dog. Protection dogs are no exception.

Job requirements, environmental exposures, and travel requirements are important factors to consider when building an individualized care plan for a working dog. The 2017 AAHA Canine Vaccination Guidelines provide an excellent resource for information regarding vaccine recommendations that translate directly to optimal working dog care.[40] Veterinary teams that are involved with canine breeding and puppy raising programs that support the supply and demand for adult working dogs have special considerations for planning preventive care programs that may deviate from pet puppy programs. All working dogs should receive recommended core vaccinations, along with strong consideration for noncore vaccines based on risk factors and locale. Most working dogs are additionally vaccinated for infectious upper respiratory diseases and leptospirosis from the noncore group, and remaining noncore vaccine options should be evaluated on an individual basis.

The veterinary team can refer to the 2011 AAHA-AVMA Canine Preventive Care Guidelines as another valuable tool for planning preventive healthcare programs for working dogs.[41] In addition to vaccination, programs should include parasite prevention, dental evaluation and treatment, weight and diet evaluation, fitness evaluation, and behavioral and performance evaluation. Establishing routine health exams is important in early detection of issues that may affect sustained performance, and the AAHA-AVMA Canine Preventive Healthcare Guidelines recommend a minimum of once-yearly health exams. Although there is a paucity of data that defines an ideal interval for health exams in working dogs, it is the advisory panel's opinion that exams should be considered twice yearly for this population. As a component of these exams, it is important to obtain a thorough history about the dog's performance from the handler. Video or photo documentation of work-related concerns or responsibilities (provided by the client) may be facilitative for the care team's screening of the patient's needs. Although handlers may not have the knowledge to medically assess their canine partner, they are often so closely bonded with their dogs that they detect very subtle abnormalities in the dog's movements or behavior, well ahead of what the veterinary team can detect symptomatically.

As a component of preventive care, dental health is critical in sustaining the protection dog's ability to perform bite work duties. Because protection dogs routinely train by performing bite exercises on aids such as bite sleeves or suits (which often contain an inner core of metal mesh to protect the human decoy), coupled with the fact that they can create an extraordinary amount of occlusal force during maximal bite pressure, the potential for traumatic damage to the teeth is increased. A detailed review of the mechanics of the bite can be found in J. Bradshaw's article in the 2017 July/August issue of *Working Dog Magazine*.[42] The teeth that are most involved with creating functional grip and power in the bite, namely, the canine and carnassial teeth, should be preserved whenever possible following dental injury. The practitioner involved in working dog care should maintain a close working relationship with dental specialists who can provide advanced care such as root canal therapy when teeth are damaged.

FIGURE 1

Root canal therapy for a complicated crown fracture of a canine tooth in a working dog. Veterinarians should be prepared to recommend dental referral practices to organizations using protection dogs. Photo BJ Pierce.

It is important to discuss the policy of neutering with the working dog or breeding program manager, as many (particularly male) working dogs are left intact for an extended period of their working careers. There has been much debate about health outcomes of early neutering in dogs. Recent meta-analyses point to an increase in overall risk of hemangiosarcoma, lymphoma, mast cell tumors, and osteosarcoma in both sexes. This must be balanced with the known prevention of reproductive cancers such as mammary, uterine-ovarian, and testicular cancers when the dog is neutered. Additionally, gonadal hormones play an important role in normal musculoskeletal development, and removal of the hormone source during the developmental period is generally thought to worsen the risk of heritable orthopedic disease.[43]

Overall fitness is of critical importance in preparing the protection dog to perform efficiently and safely in the line of duty. Weight management is one of the first steps in promoting high functionality in working dogs. The veterinary team must develop a practiced eye for

evaluating lean yet well-muscled working body conditions. Caloric requirements should be specifically calculated for the working dog and adjusted as necessary to maintain a lean, ideal body condition, and often on a recurring basis. A useful formula to start the process is the National Research Council's (NRC) calculation for metabolic energy requirement for the active dog: 132 kcal/day × MBW, where MBW is the metabolic body weight calculated as ($kg^{0.75}$). Routine activities for the protection dog tend to be rigorous and involve running, jumping, abrupt direction changes, moving on unstable surfaces, and high impact. Given these requirements, an overweight protection dog may be at particular risk for impact-related injuries through both ballistic movement and high-velocity bite work, as excessive weight increases forces within the involved joints.

There are no studies in working dogs correlating fitness training to injury prevention. However, based on human studies, it is reasonable to expect that proper physical conditioning would serve a role in decreasing sports- or performance-related injuries.[44–49] Additionally, proper physical conditioning is important in the management of heat stress and may lessen the occurrence of work-related heat injuries. Working dogs are sometimes surprisingly ill-prepared for the physical demands of their jobs. In such cases, the veterinary team should have a detailed discussion of any fitness training that is conducted by the handler. Exercises for protection dogs should include a balance of sprint and moderate endurance training, strength exercises targeted at the core muscles of stability (primarily back, abdominal, and hip) and the cervical region (supporting safe and effective bite work), and functional neuromuscular exercises that promote balance and proprioception. Additionally, the importance of warming up before job performance and cooling down at the conclusion of duty needs to be communicated. Recent work by Farr et al. describes a fitness assessment and conditioning plan for working dogs that can aid the practitioner in developing a program of exercise for the canine team.[10] Specialists in canine sports medicine and rehabilitation can also serve as valuable consultants for creating programs to promote working dog fitness. The American College of Veterinary Sports Medicine and Rehabilitation (https://vsmr.org/) is a useful resource for veterinary care focusing on conditioning and rehabilitation.

Veterinary teams providing care to working dogs should be prepared to deliver urgent care for common injuries and toxicities. Although dermatologic disease, gastrointestinal disturbances, soft tissue and musculoskeletal injuries, and heat injuries are commonplace in the realm of working dog medicine, the protection dog is especially vulnerable to traumatic injuries such as gunshot wounds and penetrating injuries from knives. The veterinary team must be prepared to triage and stabilize such wounds if the dog is presented for emergency care. Swift and coordinated emergency care has saved the lives of

FIGURE 2

An athletic working dog performing bite work training. The photo illustrates the physical demands required of protection dogs. Photo BJ Pierce.

FIGURE 3

End of Watch – a funeral for police dog killed in the line of duty. Photo BJ Pierce.

many working dogs, so that the canine team can reunite as a functional unit. It is important to also address any behavioral issues that arise as a result of traumatic events. Dogs can develop their own form of post-traumatic stress that can endanger their careers if the condition goes untreated.[50] Traumatic injury can also result in the death of the working dog, an event that is particularly difficult for the handler and other team members. The veterinary team must be prepared to navigate the death of a working dog with an understanding and profound empathy for the rituals that are observed in honoring the loss of a four-footed partner.

Medical Care Considerations: Detection Dogs

Many detection dogs spend their careers in the local communities in which they serve. However, specialized detection tasks such as search and rescue (S&R) may result in the need for travel across the United States and internationally. Preventive medicine should include addressing likely risks associated with the deployment environment. Search dogs that work in wilderness areas or respond to natural disasters will require some noncore vaccines, including leptospirosis and potentially Lyme disease.[40,51] Some detection dogs are kenneled or gather in large groups for training and should be vaccinated for canine infectious respiratory disease syndrome. Regional endemic diseases (e.g., tickborne diseases, fungal disease, heartworm disease) in deployment areas should be anticipated, with preventives provided if available or postdeployment monitoring conducted. All detection dogs with the potential to travel should be on routine flea-and-tick preventives and heartworm prophylaxis. Routine (annual) health monitoring (e.g., chemistry profile, complete blood count, urinalysis, fecal parasite evaluation, heartworm and rickettsial disease screening) is recommended. Annual thoracic radiographs were of low yield in detecting occult disease in dogs responding to the 9/11 terrorist attacks and are of limited monitoring value.[52]

Detection dogs are some of the most highly trained yet uncooperative patients presented at veterinary practices. Many detection dogs are highly energetic and arousable, which is desirable for a fearless dog working in noisy environments with unstable surfaces or multiple distractions. These dogs are "spring-loaded" and when in "work-mode" are difficult to restrain or calm. They may be predisposed to compulsive behaviors.[49] Handling to prevent these dogs from exceeding a threshold of excitement can be challenging. Several techniques can facilitate a smooth evaluation.[11–13] The handler should be actively involved in the examination and procedures in which they can safely participate. The handler has a unique bond with the dog, and the dog may become anxious or exceed a behavioral threshold if the two are separated. Additionally, the handler may use trained commands that can facilitate an assessment.

Although examinations can be performed on the ground, some dogs are more cooperative on an elevated, nonslip surface (photo). (Tip: Have a yoga mat to cover the exam table.) Use of a high-pitched voice may inadvertently initiate a "work-mode" for the detection dog. Instead, use quiet voices and slow, calm movements, and if approved by the handler, use treats. (Tip: Frozen peanut butter on the inside of a coffee cup is a great way to occupy the dog during an examination; see photo.) Detection dogs that are kenneled, rather than living with the handler, may have special environmental enrichment needs to prevent unwanted behaviors.

Nutrition should focus on appropriate body condition (4–5 out of 9).[8,9] Because canine athletes are at risk for degenerative conditions like osteoarthritis,[53–56] lean body condition will contribute to longevity and slow the progression of arthritis. Dietary omega-3 fatty acids should be considered for the anti-inflammatory effects,[57] particularly for detection dogs with high-physical-impact jobs. Many detection dogs develop work- or stress-related diarrhea. Although a complete fecal evaluation (i.e., flotation and stained direct smear) for parasites (*Giardia*, *Clostridium*, and *Campylobacter*) is indicated, many dogs will respond favorably to the use of probiotics.[58] In anticipation of a stressful event (e.g., deployment to a natural disaster), prophylactic pro- and prebiotics may be beneficial. Unlike metronidazole, which has been reported to decrease olfactory sensitivity,[59] there is no known negative effect of probiotics on olfactory function. There is limited information on the direct impact of medications on canine olfactory function, and the translation of information available in human literature is unknown.[60–62] Although dietary changes have traditionally been discouraged, benefits of microbiome diversity suggest that dogs should rotate between 2–3 balanced diets, each with fat, protein, and carbohydrate content appropriate for the intensity of the work environment.[63]

FIGURE 4

Photo C. M. Otto.

Detection dogs traverse a variety of environments and surfaces. In buildings, on vehicles, or in disaster settings, the dogs are frequently required to stand on their hind limbs (see photos).

Most dogs lack the appropriate fitness and core strength to support their lumbar spines in this position.[10] Repetitive motion of the lumbosacral spine, inadequate stretching of the iliopsoas muscle, and coxofemoral laxity may result in back and hip pain that can be challenging to diagnose and treat. A fitness and conditioning program to enhance core strength and flexibility may help prevent injury and increase working lifespan.[10] Musculoskeletal injuries can occur from sudden movements, sprains, strains, and overuse. Although pet dogs typically recover from relatively minor injuries, detection dogs should be treated as performance athletes. After therapeutic pain control, detection dogs should follow a rehabilitation plan to prevent deconditioning from prolonged rest and to regain the strength and flexibility to safely return to work. Any intervention, treatment, or procedure should account for the potential impact on the dog's overall performance and anticipated return to work. Minor cuts and scrapes are among the most common injuries in detection dogs.[64–66] Some work environments preclude the use of foot protection, making foot injuries common and challenging. Nails, including dewclaws (important for traction and grip), should be kept trimmed to prevent injury. Detection dogs are at risk of heat injury. The working temperature of these dogs commonly exceeds 105°F,[67,68] temperatures that are tolerated, but the dogs work on the brink of heat exhaustion. Heat stroke was one of the most common preventable causes of early retirement in military working dogs.[69] Veterinarians should play a role in its prevention and be prepared for emergency treatment. Handlers should be educated on the physical signs of heat stress, including excessive panting, extended and flattened tongue, squinty eyes, laid back ears, retracted lip commissures exposing the molars,[67] and prolonged skin tent over the cranium,[70] so that they can end activity and initiate cooling. Common heat-induced behavioral changes include shade-seeking and failure to return directly to the handler after a retrieve. Weight control, physical fitness, hydration, and acclimatization are important contributors to heat tolerance.

Detection dogs are at risk for toxin exposure. Of particular concern for drug detection dogs are fentanyl and other synthetic opioids.

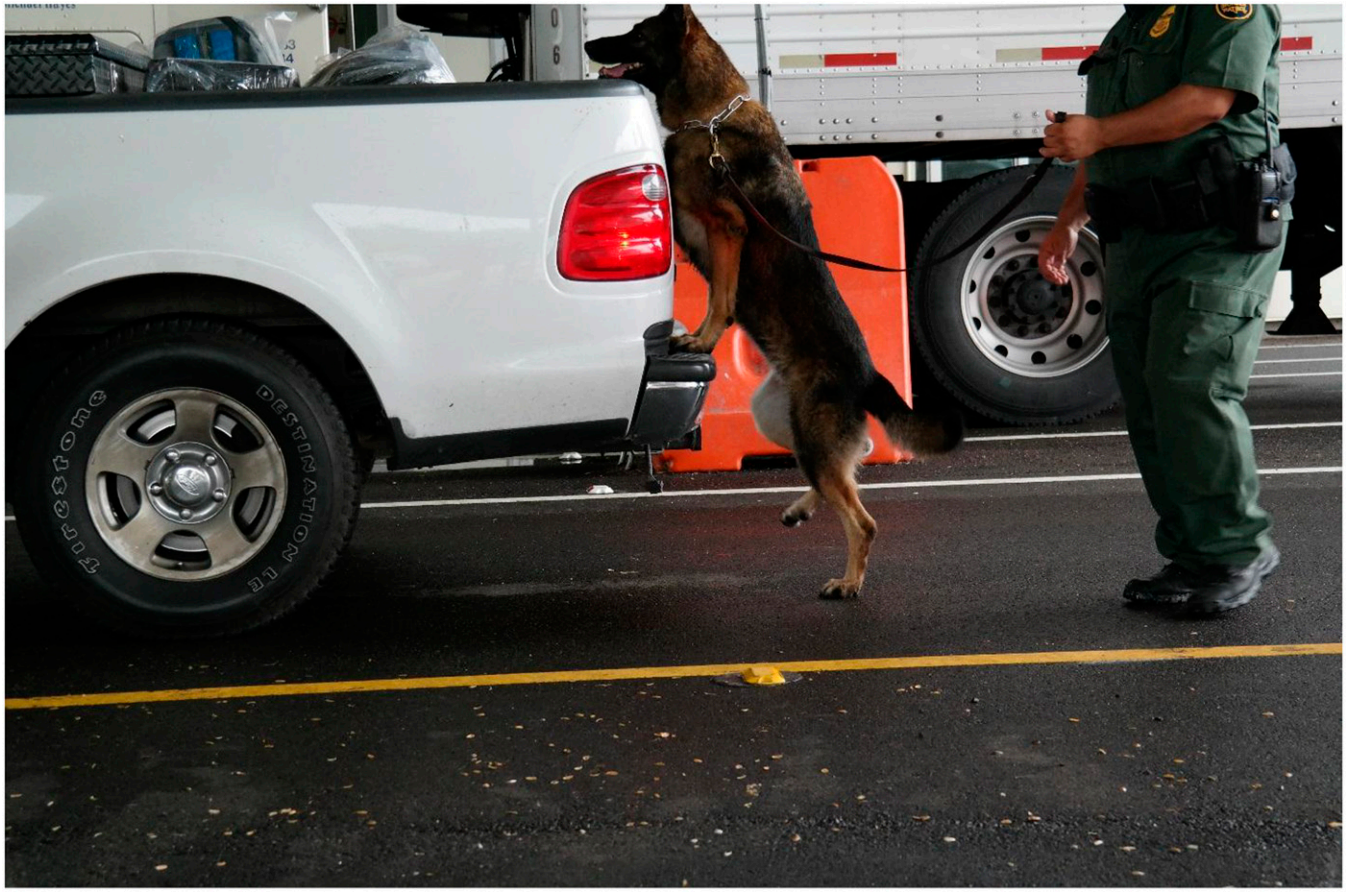

FIGURE 5

Photo T. Darling.

Although dogs are 10–20 times less sensitive to the effects of opioids than people, inhalation of fentanyl or the more potent synthetic opioid carfentanil can lead to toxicity.[71] Signs associated with exposure, ranging from panting, increased noise reactivity, salivation, and defecation to hypopnea, hypotension, collapse, and death, are dependent on the amount absorbed. With opioid toxicity, the dog can act as a fomite and potentially expose the handler, first responders, and veterinary personnel to hazardous levels of opioids.[72]

One of the most difficult tasks as a veterinarian is to deliver news of a terminal condition or a career-ending injury to a detection dog. A working dog and handler have a unique bond. The handler often spends more time with their canine partner than with any human. In addition, the dog may be responsible for saving someone else's life, including the handler's. The extensive amount of training further deepens the bond and communication between the handler and the dog. In the 9/11 response, first responders that deployed with a working dog had a lower incidence of post-traumatic stress disorder (PTSD) symptoms than noncanine first responders. However, if the dog died within 3 years of the 9/11 deployment, the handler's risk of PTSD increased.[73] It is important to appreciate this unique partnership between handler and dog as well as the necessity of the dog's purpose in its work.

Medical Care Considerations: Service, Assistance, and Therapy Dogs

Medical concerns and treatment goals should be adjusted accordingly for assistance dogs to attain the most rapid resolution and thus a rapid return to work. A mild problem or inconvenience such as soft stools for a pet may be a significant problem for an assistance dog because it can be very difficult to clean up afterward and the dog may even have accidents in areas in which pet dogs are not permitted, resulting in potential public relations nightmares and time off from work. An ear infection can pose a significant distraction to a service dog because of discomfort and constant itching and shaking of the head.

Side effects of medications can affect an assistance dog's work. For example, steroids can impact urination; increase drinking and hunger, leading to significant distraction; and cause accidents that result in the dog being pulled from work. Any medication that can cause sedation or

FIGURE 6

Photo courtesy of Taylor Goucher.

drowsiness can potentially affect a service dog's work. Whenever prescribing medications to an assistance dog, it is important to discuss the potential side effects with the client.

Although prognosis might be comparable for two different treatment options, quicker return to function will result in less time off work and should be the key factor in considering therapeutic options. For example, long-term prognosis might be comparable with conservative versus surgical management of cruciate disease but a significantly quicker return to function may be possible with a geometry-modifying procedure (such as TPLO or TTA).

Service dogs may be more prone to particular injuries based on the nature of their work. Damage to paw pads can occur from hot pavement or from salt residue on the sidewalks and streets, and paw pad lacerations can occur from broken glass present on the ground. The use of booties during work can prevent many of these injuries. Even the best guide dogs may sustain trauma from unpredictable vehicles or loose dogs.

Certain medical conditions may be incompatible with an assistance dog's job. Medical conditions that seem incompatible with service work may not preclude continued service once well managed. For example, epileptic dogs can often continue their roles as assistance dogs once they are acclimated to medications and when seizures are well controlled. It is important, however, to make sure clients are aware when starting these medications that the dog may experience drowsiness and decreased attention to detail initially, in which cases their work should be suspended or supervised until acclimated.

Although dogs are typically neutered before becoming service dogs, a practitioner may be called upon to care for foster breeders from a service dog organization. It is important to avoid any medications that could impact reproduction or have negative impacts on pregnancy, such as metronidazole, which has been shown to cause embryotoxicity or congenital malformations,[74] or steroids, which have been implicated in the cause of congenital malformations[75] and may induce premature labor.[76] It is also unclear how much systemic absorption there is of topical medications containing steroids (such as topical ear or ophthalmic medications). Thus, consideration of possible side effects must be made before prescribing these in pregnant bitches.

Vision and hearing are particularly important in service dogs and should be assessed at all routine veterinary appointments. The American College of Veterinary Ophthalmologists provides free ophthalmic exams to eligible service and working dogs administered by participating ophthalmologists through the National Service Animal Eye Exam Event, which typically takes place every May. Maintaining a healthy weight and body condition is important for all dogs but should be emphasized with service dogs because it is associated with improved health and longevity and can decrease the risk of degenerative joint disease,[77] a leading cause of retirement in working dogs.[78]

Although assistance and therapy dogs are generally calm, highly trained, and gentle, they can still be fearful in the veterinary setting. For this reason, gentle, low-stress handling should always be used. In addition, the veterinary team must request permission from the handler before interacting with and handling the dog. Service dogs wearing harnesses or vests are typically "on duty" and should not be handled until these have been removed.

Medications and discharge instructions need to be understandable and accessible based on the client's disability (e.g., use different-sized pill vials if more than one medication is dispensed for a dog with a blind handler). Administration of a liquid medication may be more difficult, so preloading single-use syringes or tablet/capsular medications may make administration easier and more reliable. Communications and the mode of communication need to be individualized based on the client's disability. There should be a discussion with the client about their preferred method of communication. Minimize background noise, face the client, and speak clearly to hearing-impaired handlers. Other clients may need to use pen and paper or a text app to communicate.

Consultation with veterinarians from the organizations that trained the assistance dog may be useful for several reasons. These include better understanding the prevalence of heritable disease, determining whether testing to obtain a better understanding of factors that influence a dog's working ability has already been performed, and gaining insight into financial options that may be available to the working team. Additionally, the organization that breeds and trains service dogs

may track medical conditions that occur in their dogs for purposes of future breeding selections and research to find disease-associated genetic markers.

Practitioners may want to consider offering discounts or waiving fees for assistance dogs. Most of the not-for-profit organizations training assistance dogs do not receive federal funding. Nonprofit discounting helps the client and furthers the organization's mission to assist people by decreasing its financial burden.

Because service dogs accompany their handlers everywhere, they typically travel much more than the average pet. USDA-accredited veterinarians treating service dogs may be called upon to assist in fulfilling requirements for international travel. These standards vary greatly from country to country and may include rigorous testing such as antibody titers, fecal floatation testing, vaccinations, examination and submission of permits and health certificates, and external and internal parasite treatments that are time dependent on travel dates.[79]

Depending on the organization, foster dogs (puppies or breeders) may go to local veterinarians for medical attention. Treatment decisions and veterinary bills are typically directed to the organization's staff veterinarians. Some schools ask foster caregivers to pay the veterinary bills up front and may be reimbursed later. In addition, some organizations maintain ownership of their dogs while they are actively working with the handler. It is important to discuss who is responsible for financial and treatment decisions when a service dog or service dog-in-training is brought to a veterinary office.

Handlers and assistance dog clients typically have a high level of attachment to service dogs because they permit people to function in ways they would not otherwise be able to.[80–82] It can be difficult removing an assistance dog from its work because of this attachment and the client's reliance on the animal. Therefore, careful consideration must be given on how the person will function without relying on the animal when the dog is hospitalized, placed on medical leave, or suspended or retired from work. Because of the extremely strong animal-client bond and the client's reliance on the dog's work, client discussions about retirement of a service dog because of health concerns can be very difficult. Similarly, end-of-life decisions can be incredibly difficult and emotional.[83]

The age of retirement can vary based on criteria for retirement from their organization and the dog's occupation and breed. Many experts consider 9 years of age to be a traditional retirement age. The most important consideration at the end of a dog's service life is the determination of when the dog's limitations jeopardize the safety of the handler. In such cases, the dog should be retired.[83] The most common reasons for early retirement in guide dogs are musculoskeletal conditions followed by skin conditions and nervous sensory conditions.[79]

Because the organizations that qualify therapy dogs are nonprofit, annual registration fees usually cover the cost of operations and liability insurance for pet therapy teams. In addition, the sponsoring organizations are typically responsible for determining that therapy dogs are up to date on veterinary exams, core vaccinations, and prevention of zoonotic disease.[35]

Education and Training of the Practice Team

Low-Stress Handling

Many working dogs can be high-energy and reactive to strangers, application of restraint, and medical procedures. Therefore, low-stress handling strategies such as calm handling, positive reinforcement, taking breaks when needed, and appropriate use of anxiolytics should be practiced for effective control of service and assistance dogs. These techniques reduce fear and anxiety in the moment as well as for future visits. The net effect is to keep both the veterinary team and the dog safe. Veterinary practices can achieve formal certification through programs such as Fear Free and Low-Stress Handling.[12,84,85] Many certifying bodies provide continuing education and certification of low-stress handling specifically for individuals and veterinary teams.

Understanding the Working Dog Role

It is important for the veterinary team to have a basic understanding of the vast diversity in the specific tasks working dogs perform and the environments in which they work. The veterinary team should be familiar with state, federal, and local regulations regarding public access rights for assistance dogs and remain up to date with the fluid changes. This information influences the veterinarian's role in authorizing a dog's presence in flight and public housing.

Every working dog is an individual with a unique set of skills that should not be confused with other types of working dogs. The veterinary team should have a genuine interest in a specific dog's role and know the specific questions to ask of the handler to learn the role of that individual dog. This approach not only informs the veterinary team of the health risks the dog is predisposed to but also enhances the rapport they build with the handler. Continuing education in the way these dogs work can be achieved by developing ongoing relationships with local agencies, teams, and task forces that train and develop these dogs. These organizations are important resources for advice, experience, and healthcare recommendations and may be willing to provide continuing education to the practice team. Providing opportunities for members of the practice to observe training or participate in local certification events is an excellent strategy to introduce the veterinary team to the working lives of these dogs. It is also crucial to attend continuing education meetings and workshops provided by experts in working dogs or sports medicine. This requires each member of the practice team to have training and education outside of what is "standard" for pet dogs.

First Aid Training and Referrals

Working dogs require extensive training to achieve the skill necessary for their jobs. In a medical emergency, the expectation is that the veterinary practice can provide immediate, top-notch care. Hands-on experience in first aid and triage that is specific for working dogs is invaluable when a working dog presents to a veterinary practice. In addition, many S&R canines work in remote environments where veterinary care may be quite distant. As a result, S&R teams often use field care training and the assistance of EMT-paramedics to provide stabilization care for their dogs. Veterinarians should support this specialized training and actively engage and improve appropriate pre–hospital care activities for these working dogs.[86,87] Gunshot wounds in protection dogs, major injuries from falls or environmental exposures, surgical and critical care for GDV or urgent medical or surgical conditions, and respiratory emergencies are situations requiring immediate reaction and specialized medical capabilities for care.

A primary-care veterinary practice may not be equipped for providing 24-hour critical care support for a working dog in critical condition. However, it is important that all veterinary practices provide basic life support and stabilization followed by immediate transfer to a facility that can provide specialized care. Euthanasia in the field or in the veterinary setting should only be considered under the most dire humane and devastating injury circumstances, as this will impact the entire unit, not just the handler. Veterinary care providers must understand that their recommendations will impact the entire service team (police, S&R, working unit). To the extent that is reasonable and possible, the medical care rendered to the service/working dog merits the highest priority and highest capability available. In many organizations, working dogs are assigned rank immediately superior to the handler with whom they partner, serving to reinforce the highest levels of respect and recognition of their shared role and responsibilities. Similarly, end-of-life considerations may be impacted by organizational policy and requirements that include but are not limited to chain of command notification, funeral honors, mandatory necropsy and pathology sample submissions, and preferential remains handling and care.

Communications Training

Effective communication is the cornerstone for delivering quality veterinary care to working dogs. It is important to recognize that handlers have various degrees of education, training, and skills, so the veterinary team should tailor communications to that handler's particular level. This is critical when a handler or client has a disability that may be a barrier to understanding. Strategies such as respectfully asking the preferred mode of communication for an individual who is visually or hearing impaired may be the first step to enhancing the client experience and improving compliance. Opportunities for advanced training in veterinary communication skills as well as communications with individuals with disabilities should be sought to provide exceptional veterinary care to working dogs.[88,89]

Summary

The working dog is not the typical patient that companion animal veterinarians encounter in clinical practice. Working dogs have a utilitarian function that generally requires specialized temperament and training, involves intimate interaction with a handler or client, exposes them to exceptional physical and emotional demands, and sometime places them in high-risk environments. As a result, a practice team with working dog patients should have a training strategy that equips the staff with the knowledge and skills to effectively and compassionately examine and treat these important animals. Veterinarians are sometimes asked to certify the health status or behavioral suitability of working dogs, a demand that they should approach with caution. Any certification of the health status of a working dog should be based on a thorough exam and an evidence-based diagnosis. No sector of veterinary practice places a greater premium on effective communication with the presenting client than the care of working dogs. The working dog's handler has an intimate knowledge of the animal's physical status and functionality and is a principal source of information on the patient's history and presentation status. The practice team must establish credibility with the working-dog client and earn that individual's confidence and trust in order to maintain an effective and enduring veterinarian-client-patient relationship. When these skills and relationships are in place, the healthcare of working dogs represents one of the most rewarding and valuable services that a veterinary practice can render.

The authors gratefully acknowledge the contribution of Mark Dana of Kanara Consulting Group, LLC, in the preparation of the guidelines manuscript.

REFERENCES

1. American Veterinary Medical Association. Animal-Assisted Interventions: Definitions. Available at: https://www.avma.org/resources-tools/avma-policies/animal-assisted-interventions-definitions. Accessed July 11, 2020.
2. ANSI/ASB Standard 088, 1st ed. General Guidelines for Training, Certification, and Documentation of Canine Detection Disciplines. AAFS Standards Board, LLC. 2020. Available at: http://www.asbstandardsboard.org/wp-content/uploads/2020/02/088_Std_e1.pdf. Accessed July 11, 2020.
3. ASB Technical Report 025, First Edition. Crime Scene/Death Investigation – Dogs and Sensors Terms and Definitions. AAFS Standards Board, LLC. 2017. Available at: http://www.asbstandardsboard.org/wp-content/uploads/2019/05/025_TR_e1_2017.pdf. Accessed July 11, 2020.
4. American Veterinary Medical Association. Service, emotional support and therapy animals. Available at: https://www.avma.org/resources-tools/animal-health-welfare/service-emotional-support-and-therapy-animals. Accessed July 11, 2020.

5. ASB Technical Report 025, 1st ed. 2017; p 14. Available at: http://www.asbstandardsboard.org/published-documents/dogs-and-sensors-published-documents/. Accessed August 18, 2021.
6. Walker D, Walker J, Cavnar P, et al. Naturalistic quantification of canine olfactory sensitivity. *Appl Anim Behav Sci* 2006;97:241–54.
7. Jenkins EK, Lee-Fowler TM, Angle TC, et al. Effects of oral administration of metronidazole and doxycycline on olfactory capabilities of explosives detection dogs. *Am J Vet Res* 2016;77(8):906–12.
8. Baldwin K, Bartges J, Buffington T, et al. AAHA nutritional assessment guidelines for dogs and cats. *J Am Anim Hosp Assoc* 2010;46(4):285–96.
9. Santarossa A, Parr JM, Verbrugghe A. Assessment of canine and feline body composition by veterinary health care teams in Ontario, Canada. *Can Vet J* 2018;59(12):1280–6.
10. Farr BD, Ramos MT, Otto CM. The Penn Vet Working Dog Center Fit to Work Program: A formalized method for assessing and developing foundational canine physical fitness. *Front Vet Sci* 2020;7:470.
11. Yin S. *Low Stress Handling, Restraint and Behavior Modification of Dogs & Cats: Techniques for Developing Patients Who Love Their Visits*. Davis, CA: Cattledog Publishing; 2009.
12. Taking the "pet" out of "petrified." Available at: https://fearfreepets.com. Accessed October 13, 2020.
13. University of Pennsylvania. CALM Program: Companion Animal Low-Stress Management. Available at: https://www.vet.upenn.edu/veterinary-hospitals/ryan-veterinary-hospital/services/behaviormedicine/calm. Accessed October 13, 2020.
14. ADA Requirements Service Animals. ADA.gov. Available at: https://www.ada.gov/service_animals_2010.htm. Accessed August 12, 2020.
15. American Veterinary Medical Association. Service, emotional support and therapy animals. Available at: https://www.avma.org/resources-tools/animal-health-welfare/service-emotional-support-and-therapy-animals. Accessed August 12, 2020.
16. American Veterinary Medical Association. Service Animals. Available at: https://www.avma.org/resources-tools/avma-policies/service-animals. Accessed August 12, 2020.
17. ADA, Service animals and emotional support animals. Available at: https://adata.org/guide/service-animals-and-emotional-support-animals. Accessed August 12, 2020.
18. Walther S, Yamamoto M, Thigpen AP, et al. Assistance dogs: Historic patterns and roles of dogs placed by ADI or IGDF accredited facilities and by non-accredited U.S. facilities. *Front Vet Sci* 2017;4:1.
19. Walther S, Yamamoto M, Thigpen AP, et al. Geographic availability of assistance dogs: Dogs placed in 2013–2014 by ADI- or IGDF-Accredited or candidate facilities in the United States and Canada, and non-accredited U.S. facilities. *Front Vet Sci* 2019;6:349.
20. Assistance Dogs International. The global authority in assistance dogs industry. Available at: https://assistancedogsinternational.org/. Accessed August 12, 2020.
21. AVMA CE Webinar. Assistance Animals: Counsel clients, prevent fraud. Available at: https://axon.avma.org/local/catalog/view/product.php?productid=10. Accessed August 12, 2020.
22. Patterson-Kane E, Yamamoto M, Hart LA. Editorial: Assistance dogs for people with disabilities. *Front Vet Sci* 2020;7:87.
23. Traveling by air with service animals. *Fed Regist* 2020;85:79742–79776. 14 CFR Part 382.
24. U.S. Department of Transportation Announces Final Rule on Traveling by Air with Service Animals | US Department of Transportation. Available at: https://www.transportation.gov/briefing-room/us-department-transportation-announces-final-rule-traveling-air-service-animals. Accessed December 29, 2020.
25. American Veterinary Medical Association. Assistance animals: rights of access and the problem of fraud. Available at: https://www.avma.org/sites/default/files/resources/Assistance-Animals-Rights-Access-Fraud-AVMA.pdf. Accessed August 12, 2020.
26. Fine A, Knesl O, Hart B, et al. The role of veterinarians in assisting clients identify and care for emotional support animals. *J Am Vet Med Assoc* 2019;254:199–202.
27. American Animal Hospital Association. Position statements and endorsements, raw protein diet. Available at: https://www.aaha.org/about-aaha/aaha-position-statements/raw-protein-diet/. Accessed August 12, 2020.
28. Henneman KE, Zink C. Conditions and Rehabilitation of Working Dogs. In: *Canine Sports Medicine and Rehabilitation*. 2nd ed. Hoboken (NJ): John Wiley and Sons; 2018:520–44.
29. Gordon LE, Ho B. Injuries and illnesses among human remains detection-certified search-an-recovery dogs deployed to northern California in response to the Camp Fire wildfire of November 2018. *J Am Vet Med Assoc* 2020;256(3):322–32.
30. Parr JR, Otto CM. Emergency visits and occupational hazards in German Shepherd police dogs (2008-2010). *J Vet Emerg Crit Care (San Antonio)* 2013;23(6):591–7.
31. Gwaltney-Brant SM, Murphy LA, Wismer TA, et al. General toxicologic hazards and risks for search-and-rescue dogs responding to urban disasters. *J Am Vet Med Assoc* 2003;222(3):292–5.
32. Murphy LA, Gwaltney-Brant SM, Albretsen JC, et al. Toxicologic agents of concern for search-and-rescue dogs responding to urban disasters. *J Am Vet Med Assoc* 2003;222(3):296–304.
33. Wismer TA, Murphy LA, Gwaltney-Brant SM, et al. Management and prevention of toxicoses in search-and-rescue dogs responding to urban disasters. *J Am Vet Med Assoc* 2003;222(3):305–10.
34. Mongillo P, Pitteri E, Adamelli S, et al. Validation of a selection protocol of dogs involved in animal-assisted intervention. *J Vet Behav* 2015;10:103–10.
35. Pet Partners. Program Requirements. Available at: https://petpartners.org/volunteer/become-a-handler/program-requirements/#:~:text=The%20three%20terms%20Pet%20Partners,your%20animal%20in%20any%20situation. Accessed October 14, 2020.
36. Lefebvre SL, Golab GC, Christensen EL, et al. Guidelines for animal-assisted interventions in health care facilities. *Am J Infect Control* 2008;36:78–85.
37. Murthy R, Bearman G, Brown S, et al. Animals in healthcare facilities: recommendations to minimize potential risks. *Infect Control Hosp Epidemiol* 2015;36:495–516.
38. Yamamoto M, Hart LA. Professionally- and self-trained service dogs: Benefits and challenges for partners with disabilities. *Front Vet Sci* 2019;6:179.
39. American Kennel Club. Canine Good Citizen. Available at: https://www.akc.org/products-services/training-programs/canine-good-citizen/training-resources/. Accessed August 12, 2020.
40. Ford RB, Larson LJ, Schultz RD, et al. 2017 AAHA Canine Vaccination Guidelines. Available at: https://www.aaha.org/globalassets/02-guidelines/canine-vaccination/vaccination_recommendation_for_general_practice_table.pdf. Accessed October 15, 2020.
41. AAHA-AVMA Canine Preventive Healthcare Guidelines. Available at: https://www.aaha.org/globalassets/02-guidelines/preventive-healthcare/caninepreventiveguidelines_ppph.pdf. Accessed October 15, 2020.
42. Bradshaw J. Mechanics of the bite: sleeve progressions in police canine training. *Working Dog Magazine*. July–August 2017; 52–9.
43. Oberbauer AM, Belanger JM, Famula TR. A review of the impact of neuter status on expression of inherited conditions in dogs. *Front Vet Sci* 2019;6:397.
44. de la Motte SJ, Lisman P, Gribbin TC, et al. Systematic review of the association between physical fitness and musculoskeletal injury risk: part 3—

flexibility, power, speed, balance, and agility. *J Strength Cond Res* 2019;33:1723–35.
45. Foss KDB, Thomas S, Khoury JC, et al. A school-based neuromuscular training program and sport-related injury incidence: a prospective randomized controlled clinical trial. *J Athl Train* 2018;53(1):20–8.
46. Soomro N, Sanders R, Hackett D, et al. The efficacy of injury prevention programs in adolescent team sports: a meta-analysis. *Am J Sports Med* 2016;44(9):2415–24.
47. Rössler R, Donath L, Verhagen E, et al. Exercise-based injury prevention in child and adolescent sport: a systematic review and meta-analysis. *Sports Med* 2014;44(12):1733–48.
48. McLeod TC, Armstrong T, Miller M, et al. Balance improvements in female high school basketball players after a 6-week neuromuscular-training program. *J Sport Rehabil* 2009;18(4):465–81.
49. Verhagen E, van der Beek A, Twisk J, et al. The effect of a proprioceptive balance board training program for the prevention of ankle sprains: a prospective controlled trial. *Am J Sports Med* 2004;32(6):1385–93.
50. Burghardt WF. Behavioral considerations in the management of working dogs. *Vet Clin North Am Small Anim Pract* 2003;33(2):417–46.
51. Jones KE, Dashfield K, Downend AB, et al. Search-and-rescue dogs: an overview for veterinarians. *J Am Vet Med Assoc* 2004;225(6):854–60.
52. Otto CM, Downend AB, Moore GE, et al. Medical surveillance of search dogs deployed to the World Trade Center and Pentagon: 2001-2006. *J Environ Health* 2010;73(2):12–21.
53. Otto CM, Hare E, Buchweitz JP, et al. Fifteen-year surveillance of search-and-rescue dogs deployed to the September 11, 2001, terrorist attack sites: pathology associated with death or humane euthanasia. *J Am Vet Med Assoc* 2020;257:734–43.
54. Moore GE, Burkman KD, Carter MN, et al. Causes of death or reasons for euthanasia in military working dogs: 927 cases (1993-1996). *J Am Vet Med Assoc* 2001;219(2):209–14.
55. Lawler DF, Larson BT, Ballam JM, et al. Diet restriction and ageing in the dog: Major observations over two decades. *Br J Nutr* 2008;99(4):793–805.
56. Strasser B, Volaklis K, Fuchs D, et al. Role of dietary protein and muscular fitness on longevity and aging. *Aging Dis* 2018;9(1):119–32.
57. Vandeweerd J-M, Coisnon C, Clegg P, et al. Systematic review of efficacy of nutraceuticals to alleviate clinical signs of osteoarthritis. *J Vet Intern Med* 2012;26:448–56.
58. Herstad HK, Nesheim BB, L'abée-Lund T, et al. Effects of a probiotic intervention in acute canine gastroenteritis – a controlled clinical trial. *J Small Anim Pract* 2010;51:34–8.
59. Jenkins EK, Lee-Fowler TM, Angle TC, et al. Effects of oral administration of metronidazole and doxycycline on olfactory capabilities of explosives detection dogs. *Am J Vet Res* 2016;77:906–12.
60. Lötsch J, Knothe C, Lippmann C, et al. Olfactory drug effects approached from human-derived data. *Drug Discov Today* 2015;20(11):1398–1406.
61. Otto CM. Effects of Disease on Canine Olfaction. In: Jezierski T, Ensminger J, eds. *Canine Olfaction Science and Law*. Boca Raton (FL): Taylor & Francis/CRC Press; 2016:49–56.
62. Jenkins EK, DeChant MT, Perry EB. When the nose doesn't know: Canine olfactory function associated with health, management, and potential links to microbiota. *Front Vet Sci* 2018;5:56.
63. Pilla R, Suchodolski JS. The role of the canine gut microbiome and metabolome in health and gastrointestinal disease. *Front Vet Sci* 2020;6:498.
64. Slensky K, Drobatz KJ, Downend AB, et al. Deployment morbidity among search and rescue dogs. *J Am Vet Med Assoc* 2004;225(6):868–73.
65. Gordon LE. Injuries and illnesses among urban search-and-rescue dogs deployed to Haiti following the January 12, 2010, earthquake. *J Am Vet Med Assoc* 2012;240(4):396–403.
66. Gordon LE. Injuries and illnesses among Federal Emergency Management Agency-certified search-and recovery and search-and-rescue dogs deployed to Oso, Washington, following the March 22, 2014, State Route 530 landslide. *J Am Vet Med Assoc* 2015;247(8):901–8.
67. Robbins PJ, Ramos MT, Zanghi BM, et al. Environmental and physiological factors associated with stamina in dogs exercising in high ambient temperatures. *Front Vet Sci* 2017;4:144.
68. Niedermeyer GM, Hare E, Brunker L, et al. A randomized cross-over field study of pre-hydration strategies in dogs tracking in hot environments. *Front Vet Sci* 2020;7:292.
69. Evans RI, Herbold JR, Bradshaw BS, et al. Causes for discharge of military working dogs from service: 268 cases (2000-2004). *J Am Vet Med Assoc* 2007;231(8):1215–20.
70. Goucher TK, Hartzell AM, Seales TS, et al. Evaluation of skin turgor and capillary refill time as predictors of dehydration in exercising dogs. *Am J Vet Res* 2019;80:123–8.
71. Epstein ME. Opioids. In: Gaynor JS, Muir III WW, eds. *Handbook of Veterinary Pain Management*. 3rd ed. St. Louis: Elsevier; 2009:163–82.
72. Essler JL, Smith PG, Ruge CE, et al. The first responder exposure to contaminating powder on dog fur during intranasal and intramuscular naloxone administration. *J Vet Emerg Crit Care*. In press.
73. Hunt M, Otto CM, Serpell J, et al. Interactions between handler well-being and canine health and behavior in search and rescue teams. *Anthrozoos* 2012;25(3):323–35.
74. Rubeulto M, Loza ME. Antibiotic treatment of dogs and cats during pregnancy. *Vet Med Int* 2010;2010:385640.
75. Kaplan JL, Gunther-Harrington CT, Sutton J, et al. Multiple midline defects identified in a litter of golden retrievers following gestational administration of prednisone and doxycycline: a case series. *BMC Vet Res* 2018;14:86.
76. Papich M. Effects of drugs on pregnancy. In: Kirk R, ed. *Current Veterinary Therapy X: Small Animal Practice*. Philadelphia: Saunders; 1989:1291–9.
77. Smith GK, Mayhew PD, Kapatkin AS, et al. Evaluation of risk factors for degenerative joint disease associated with hip dysplasia in German Shepherd dogs, golden retrievers, Labrador retrievers and rottweilers. *J Am Vet Med Assoc* 2001;219(2):1719–24.
78. Caron-Lormier G, England GC, Green MJ, et al. Using the incidence and impact of health conditions in guide dogs to investigate healthy ageing in working dogs. *Vet J* 2016;207:124–30.
79. APHIS Pet Travel. Available at: https://www.aphis.usda.gov/aphis/pet-travel. Accessed August 12, 2020.
80. Yamamoto M, Hart LA. Separation from assistance dogs. In: Kogan L, Erdman P, eds. *Pet Loss, Grief, and Therapeutic Interventions: Practitioners Navigating the Human-Animal Bond*. Abingdon (UK): Routledge; 2019:194–197.
81. Audrestch HM, Whelan CT, Grice D, et al. Recognizing the value of assistance dogs in society. *Disability Health J* 2015;8:469–74.
82. Rintala DH, Matamoros R, Seitz LL. Effects of assistance dogs on persons with mobility or hearing impairments: a pilot study. *J Rehabil Res Dev* 2008;45(4):489–503.
83. Ng Z, Fine A. Paving the path toward retirement for assistance animals: Transitioning lives. *Front Vet Sci* 2019;6:39.
84. Low Stress Handling University. Available at: https://lowstresshandling.com/low-stress-handling/. Accessed October 15, 2020.
85. CALM program: Companion Animal Low Stress Management. Available at: https://www.vet.upenn.edu/veterinary-hospitals/ryan-

veterinary-hospital/ services/behaviormedicine/calm. Accessed December 1, 2020.
86. Palmer LE, Maricle R, Brenner JA. The operational canine and K9 tactical emergency casualty care initiative. *J Spec Ops Med* 2015;15(3): 32–8.
87. K9 Tactical Emergency Casualty Care. Available at: http://www.k9tecc.org/resources.html. Accessed October 15, 2020.
88. Communicating with people who have hearing, vision, and speech disabilities : ADA requirements for facilities, vehicles, and services. Available at: https://www.adainfo.org/training/communication-vision-hearing-speech. Accessed October 15, 2020.
89. Frank Workshop Series. Available at: http://csu-cvmbs.colostate.edu/academics/clinsci/veterinary-communication/Pages/frank-workshops.aspx. Accessed October 15, 2020.