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U.S. ARMY VETERINARY SERVICES

**VETERINARY CARE AND MANAGEMENT
OF THE MILITARY WORKING DOG**

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DEPARTMENT OF THE ARMY
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**VETERINARY CARE AND MANAGEMENT
OF THE MILITARY WORKING DOG**

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CHAPTER 1

INTRODUCTION

1-1. Purpose and scope

a. The purpose of this document is to provide basic information pertinent to successfully managing the health and welfare of Department of Defense (DOD) Military Working Dogs (MWD). The material is directed toward Army Veterinary Corps veterinarians and animal care technicians, both military and civilian, that have primary responsibility for the care of these animals. However, it may be useful to others who work within the working dog community such as handlers, kennel masters (KM), dog-owning unit commanders, MWD program managers, and civilian veterinarians not employed by the Army providing care for MWDs and other federal working dogs.

b. This publication attempts to consolidate medical information, policies, procedures and regulatory directives specific to the medical management of MWDs into one document. This document is not, however, intended to be a veterinary medical text, therefore relevant applicable technical resources are essential. Army Veterinary Corps Officers have researched, extracted, and compiled the material from a variety of references from all services and standards of veterinary practice within the United States. In consonance with the Army Veterinary Medical Standardization Board (VMSB) process, information is evidence-based whenever possible.

1-2. References

See appendix A.

1-3. Abbreviations and terms

See the glossary.

1-4. Overview of the DOD MWD Program

a. Role of Services, Agencies and Organizations. The DOD MWD Program has the participation of all the branches of the Armed Forces. The United States Air Force (USAF) is the largest user of MWDs and has been designated as the DOD Executive Agent (EA) for the MWD program. The Army is the DOD Lead Agent for veterinary public and animal health services and as such, works closely with all services to support their respective programs. Specific roles of the various service elements include:

(1) Office of the Director, USAF Security Forces (USAF/A7S). USAF/A7S acts as the DOD Executive Agent for Military Working Dogs, represents MWD program interests at the Joint Service level, and designates the DOD MWD Program Manager (PM) as Chair of the Joint Services Military Working Dog Committee (JSMWDC). This office is also responsible for ensuring appropriate coordination between DOD and other federal agencies for utilization of canine resources to meet security and resource protection requirements.

(2) U.S. Army Veterinary Service (AVS). Provides veterinary support to all services and is responsible for ensuring MWDs receive full medical care irrespective of installation assigned or facility location. Veterinary Corps Officers (VCO) and Civilian Department of the Army General Service Veterinary Medical Officers (GS-VMO) perform requisite exams, treatments and surgery as necessary, specify diets to be fed, advise on operational use, and, in concert with the owning unit, are responsible for the health and welfare of MWDs at the unit level in accordance with (IAW) applicable service regulations. Civilian Non-Appropriated Fund Veterinary Medical Officers (NAF-VMOs) may provide care to MWDs when VCOs or VMOs are not available on a reimbursable basis. Within this guide, "VCO" means VCOs and GS-VMOs and "technician" means both military Animal Care Specialists (MOS 68T) and Civilian Department of the Army veterinary technicians.

(3) Joint Services MWD Committee (JSMWDC). This committee, chaired by the DOD MWD Program Manager, is comprised of MWD program representatives from each military service branch. It meets semiannually to discuss MWD policy and operational issues to include training requirements, inventory management, unfilled MWD requisitions, certification procedures, veterinary support, etc. The JSMWDC is the policy development arm of the overall MWD program. The Director, Department of Defense Military Working Dog Veterinary Service (DODMWDVS), serves on the committee as a voting member.

(4) Air Force Security Forces Center (AFSFC). Headquartered at JBSA-Lackland, TX, this office administers the DOD and USAF MWD Programs and coordinates activities with AF major commands (MAJCOMs) and the other services. DOD taskings to support other federal agencies in National Special Security Events and Presidential protection missions originate from U.S. Secret Service (USSS) through this office and are passed on to the services for execution. This office is also responsible for ensuring appropriate coordination between DOD and other federal agencies for utilization of canine resources to meet security and force protection requirements.

(5) Service/Command MWD Program Managers. These individuals are senior personnel with MWD program experience designated at the headquarters level of their respective services to oversee MWD activities. They coordinate and advise on distribution and disposition of MWDs within their respective service branch or major command. The Program Managers are extremely important in their role of coordinating taskings for their MWD teams.

(6) 341st Training Squadron (341 TRS). This is the unit designation for the DOD MWD Training Center (commonly referred to as “the Dog Center”) at JBSA-Lackland, TX. It is a subordinate unit of the 37th Training Group of the 37th Training Wing. Most DOD MWDs and handlers are trained through this unit. The 341 TRS procures, trains, distributes and manages disposition of dogs. The Operations Flight is composed of personnel from all services and is responsible for all dog and handler training. The Logistics Flight is charged with procuring dogs, conducting training evaluations on prospective dogs, shipping and receiving MWDs, and performing kennel care functions (feeding, grooming, cleaning, etc.) to support the dogs at JBSA-Lackland.

(7) Department of Defense Military Working Dog Veterinary Service (DODMWDVS). This Army unit is part of the Army Medical Command, but functions operationally as the 341 TRS Veterinary Service Flight (341 TRS/SGV). It has the mission of providing full veterinary support to the MWD Training Center and for comprehensive referral and consultation service to the MWD program worldwide. The Director, DODMWDVS advises the Defense Health Agency Veterinary Services (DHA VS) on veterinary aspects of MWD issues and drafts MWD policies for issue by DHA VS.

b. Interaction with other Federal Agencies. There is much interaction between the DOD MWD programs and other Federal Agencies, particularly with the Department of Homeland Security; specifically the Transportation Security Agency (TSA), Customs and Border Protection (CBP), and the United States Secret Service (USSS). These groups may work together with the military services operationally on joint missions, participate in procurement and/or training with the 341 TRS, and utilize Army Veterinary Services. Provision of veterinary medical care by VCOs is defined by Interagency Agreements (IAG), Memoranda of Understanding (MOU) or Agreement (MOA) between Army Medical Command (MEDCOM) and the specific federal agency. VCOs should be familiar with currently applicable care and reimbursement standards for federal non-DOD working dogs in their area. Every effort should be made by veterinary units to support these federal canine programs IAW published agreements in the interest of sharing government resources; however, this support should be appropriately prioritized with other military responsibilities. These dogs may be referred to the DODMWDVS for definitive care based on the IAG, but transportation is the responsibility of the respective agency. Generally, agreements will not be created locally by any veterinary organization. However, exceptions may apply so discuss potential new agreements with the chain of command prior to entering into any.

(1) Transportation Security Agency. TSA canines are evaluated, procured, medically processed and trained at the TSA Canine Training Center, JBSA-Lackland, TX. The TSA National Explosives Detection Canine Program trains and deploys both TSA-led and state and local law enforcement-led canine teams in support of day-to-day activities that protect the transportation system. TSA trains canine teams to operate in the aviation, multimodal, maritime, mass transit, and cargo environments. Considered the “center for excellence” for explosives detection canine training, the program is the largest explosives detection canine program in the Department of Homeland Security and the second largest in the federal government after the Department of Defense. The TSA has canine teams located at various major transportation facilities within and outside CONUS to assist in security and explosive detection.

(2) U.S. Secret Service. The USSS’s Canine Detection Training Program provides the highest level of explosive detection training and produces canine teams that are able to protect the President and our nation’s leaders, visiting heads of state and government, and National Special Security Events, in all environments and under all conditions. Many times, USSS works with DOD MWD teams to perform their mission.

(3) United States Customs and Border Protection. The CBP is the unified border agency of the United States Department of Homeland Security (DHS). CBP Canine Program is headquartered in El Paso, Texas and oversees two training delivery sites in El Paso, Texas and Front Royal, Virginia. The primary goal of the CBP Canine Program is terrorist detection and apprehension. The working CBP canine team has become the best tool available to detect and apprehend persons attempting entry to organize, incite, and carry out acts of terrorism. Their secondary goal is detection and seizure of controlled substances and other contraband. The CBP agriculture detector dog teams are trained at the

USDA's National Detector Dog Training Center in Atlanta.

c. Functions of MWDs. Since the end of the Vietnam conflict, the operational use of MWDs within the DOD has essentially been vested in military police/security forces units. In this capacity, MWDs have performed primarily law enforcement and security functions. The concept of training MWDs for proficiency in two tasks was implemented in the mid-1970s and led to the development of the dual trained "patrol-detector dog." However, conflicts in Iraq and Afghanistan brought other types of dogs into the inventory to serve with non-law enforcement/security personnel and units. Further, some programs have considerable contractor involvement and are quite different in how they operate from the standard MWD which belongs to DOD law enforcement/security units. The following categories of MWDs have been trained and are in the DOD inventory:

(1) DOD-owned and DOD-operated program dogs (current programs).

(a) Patrol Dogs (PD). MWDs that are trained for the single purpose of performing security and law enforcement functions such as controlled aggression, scouting, resource protection, building searches, etc. These dogs are not trained or certified to detect drugs or explosives. They are utilized for foot patrol in high crime areas and perimeter patrol to augment security programs for resource and personnel protection. These dogs are handled on-leash except when released to interdict a suspect.

(b) Patrol/Drug Detector Dogs (PDDD). In addition to patrol capabilities, these dogs are trained to detect illegal drugs.

(c) Patrol/Explosive Detector Dogs (PEDD). In addition to patrol capabilities, these dogs are trained and certified to detect many different explosive substance odors. PEDDs are used to search and secure areas for explosive devices, particularly aircraft/terminals, VIP offices, vehicles, etc. They are frequently called on to assist the USSS in providing security and have been used extensively in other counter-terrorism missions.

(d) Patrol/Explosive Detector Dogs - Extended (PEDD-E). In addition to PEDD capability, these dogs have been trained to perform their detection function off leash at variable distance from the handler. This is an "add on" capability trained at the Advanced MWD Course. These dogs are trained through periodic use of the electronic collar. Within the Army, use of the electronic collar is restricted by ALARACT 070/2017 to use by/for dog teams specifically trained at the Advanced MWD Course. Note: VCOs should consider discussing host nation regulations addressing electronic collar use with KMs or MWD PMs. Technically, this is outside the responsibility of the VCO but is important for situational awareness.

(e) Explosive or Drug Detector Dogs (EDD or DDD). A small number of single-purpose detector dogs are trained each year. Sporting breeds and occasionally small terriers may be used for this category of MWD. The dogs are only trained for detection of either explosives or narcotics. These dogs are handled on-leash to search.

(f) Specialized Search Dogs (SSD). These dogs are trained to detect explosives and generally are handled off-leash to search. Currently they are found in the United States Marine Corps (USMC) only.

(g) Mine Detection Dogs (MDD). These dogs are trained to detect explosives (mines) in a minefield and are handled on-leash to search. The method employed for searching is generally in a straight line clearing a narrow path. Currently they are found in the Army only.

(h) Combat Tracker Dog (CTD). These dogs are trained to track human scent and are handled off-leash. Currently they are found in the USMC only.

(i) Multi-Purpose Canine (MPC). These dogs can perform patrol and detection duties and are utilized within Special Operations Forces. The MPCs procurement and disposition process is through the SOF and not through the 341 TRS. The SOF unit's VCO provides much of their medical care, but they can be seen at a VTF and are authorized care identical to traditional MWDs.

(2) DOD-owned, contractor-operated program dogs. (Note that these programs have been deactivated and no dogs currently exist in the inventory. These programs may be reactivated if needed in the future to meet surge requirements)

(a) Improvised Explosive Device Detector Dogs (IDD). This USMC program utilized Labrador Retrievers trained to detect explosives and generally handled off-leash to search. The difference from SSD is that the dogs are not handled by professional dog handlers, but rather infantrymen or engineers given training and temporarily assigned as handlers. These dogs were dispositioned from the inventory as they redeployed from the CENTCOM Theater and no replacements will be trained.

(b) Tactical Explosive Detector Dogs (TEDD). This Army program utilized a variety of sporting and shepherd breeds. Similar to the IDD program, these dogs were trained to detect explosives and generally handled off-leash to search. These dogs were also handled by infantrymen given training and temporarily assigned as

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handlers. These dogs were dispositioned from the inventory as they redeployed from the CENTCOM Theater and no replacements will be trained.

d. Procurement, Training, and Inventory Management.

(1) Procurement. MWDs are obtained by the 341 TRS from vendors primarily in the United States and Europe. The majority of the dogs considered for purchase are Belgian Malinois and German Shepherd Dogs. A lesser number of Dutch/Belgian Shepherd dogs are presented for evaluation and a few sporting breeds and small breeds are purchased for use as single-purpose detectors. The procurement process is conducted by the Consignment Section of the 341 TRS Logistics Flight and the DODMWDVS. The Veterinary and Consignment sections perform the medical and temperament evaluations to ensure prospective MWDs meet specific criteria. Standard criteria has been developed from years of observations of performance and analysis of training data in order to meet the objective of maximizing the functional life span of MWDs. When dogs are purchased and trained for DOD, they are expected to work to approximately 10 years of age. It is very important financially and ethically to accept dogs into the DOD MWD program that can be easily trained and can remain serviceable for many years. However, the most important factor is that the dog can do the job required, so some dogs showing great aptitude that are imperfect physically (e.g. mild orthopedic dysplasia) may still be procured. Final determination of whether a dog is acquired rests with the Air Force and not DODMWDVS. Specifically, the procurement process involves:

(a) Medical Evaluation. This evaluation is oriented toward checking for conditions that may be debilitating or will likely compromise the functional life span of the potential MWD. Dogs with poor conformation, poor dental health, lameness, evident heart murmurs or indications of chronic dermatological, otic, ophthalmic, renal, or gastrointestinal disease are eliminated based on physical examination, hematology, serum biochemistry, urinalysis, heartworm testing and fecal exam. Other diagnostics (ECG, echocardiogram, special serum chemistry or immune testing, etc.) may be conducted in some cases as indicated.

(b) Radiographic Evaluation. Vendors are required to provide recent radiographs of dogs offered for procurement for veterinary assessment. If none are provided, local veterinarians or AVS personnel will perform required survey radiographs under sedation to include evaluation of pelvis, lumbosacral spine, and elbows. While sedated a complete oral exam and palpation for coxofemoral laxity is indicated. Prospective MWDs are recommended for rejection if there is evidence of hip or elbow dysplasia, transitional vertebrae, or past orthopedic or dental injury that may compromise future MWD service.

(c) Temperament Evaluation. Consignment section personnel from the 341 TRS conduct a temperament evaluation on dogs that are medically acceptable for MWD service.

(d) Consignment period. A timeframe for trainers to objectively evaluate search behavior, detector ability, aggressiveness, and potential trainability.

(e) Final Acceptance. Dogs meeting medical and training criteria are officially accepted, given a permanent tattoo number and assigned an ideal weight range. Intact females and cryptorchid males are neutered at this time, any necessary dental care is performed, and all dogs receive a prophylactic gastropexy. Dogs enter training following recovery.

(f) Training. New MWDs are entered into training as soon as possible. They are assigned to a training team and a specific trainer within the Operations Flight. Time in training is approximately 80-120 training days with dual trained dogs taking longer than single purpose dogs. MWDs are certified against established standards for the tasks trained.

(2) Distribution and Inventory Management. All distribution and inventory management of MWDs is the responsibility of the Logistics Flight Inventory Manager. Upon certification, MWDs are designated available for shipment to fill official requisitions from DOD customers. Each branch of service requests MWDs based on need and their requisitions are maintained by the Logistics Flight Inventory Manager. MWDs are distributed to the units at the direction of each service/branch MWD coordinator. Dogs may be moved from one installation to another by the respective service program managers as missions dictate; excess dogs may also occasionally be returned to JBSA-Lackland for redistribution. All movements are coordinated with the 341 TRS MWD Inventory Manager who maintains a listing of all MWDs and their locations.

1-5. Other Working Dogs.

a. Interaction with other Nations. MWDs belonging to allied nations (NATO, etc.) are key assets in deployed environments and are often supported by US AVS personnel, and current strategic policy makes these interactions increasingly likely. The issues these allied MWDs face are similar to MWDs so this document can assist supporting

them as authorized as well as provide proficiency-building opportunities for AVS personnel. VCOs must coordinate with their command to ensure protocols are followed to ensure US government reimbursement, and future AVS resourcing as necessary.

b. Contract Working Dogs (CWDs) are not specifically addressed in this MWD Handbook, but must be mentioned as they are common assets in deployed environments. The issues these CWDs face are similar to MWDs so this document can assist supporting them as authorized as well as provide proficiency-building opportunities for AVS personnel. VCOs must coordinate with their command to be aware of which dogs they are authorized to treat on a routine/preventive and/or emergency basis due to contract agreements, and ensure protocols are followed to ensure government reimbursement and future AVS resourcing as necessary. CWDs will be seen as a lower priority than MWDs, though authorized emergency cases may be triaged as a higher priority subject to contract agreements. If any ambiguity exists as to the appropriateness of treating a CWD that is presented to a veterinary care team, treat the dog while ascertaining the status of contract agreements.

CHAPTER 2

EQUIPMENT AND FACILITIES

2-1. Purpose. The purpose of this chapter is to clarify capabilities among the various DOD veterinary facilities around the world that provide veterinary care to MWDs at the installation level. Additionally, this chapter will convey information regarding obtaining medical equipment for MWD care. The Director of DODMWDVS establishes the following minimum standards for MWD care. Veterinary care of MWDs requires that VCOs are able to:

- a. Conduct physical examinations
- b. Obtain and interpret the results of routine clinical pathological tests
- c. Prescribe, administer and dispense medications
- d. Safely perform anesthesia and surgery
- e. Perform Comprehensive Oral Health Assessment and Treatment (COHAT)
- f. Expose, process, and interpret radiographs (including dental radiographs)
- g. Confine MWDs for short-term hospitalization
- h. Provide emergency care
- i. Conduct necropsy examinations
- j. Maintain Veterinary Health Records (VHR) in an electronic medical record or deployment hard-copy VHR (see Chapter 3, section 3-2)

2-2. Tiering Standards. All veterinary facilities across the DOD do not possess the same capabilities, staffing, and equipment. Installation mission requirements, number of MWDs supported, and various other factors play into how a facility is equipped and/or staffed. The following tiers (in order of increasing capability) have been established by the VMSB:

a. Veterinary Clinic (VC). No permanent active duty military assigned at these facilities with an emphasis on providing wellness/preventive medicine services. Surgical/dentistry services will not be readily available at these facilities. An equivalent to this type of facility in civilian veterinary practice would be what is generally considered to be a satellite clinic.

b. Veterinary Treatment Facility (VTF). Most veterinary facilities are tiered as a VTF with at least one permanently assigned VCO, and at least a 2:1 technician to doctor ratio, with in-house surgical/dentistry capabilities as well as laboratory analysis and radiology capabilities.

c. Veterinary Activity (VETAC). Same as VTF capabilities with the additional staffing of a Veterinary Clinical Specialist (64F). Have an increased surgical capability and hospitalization capability.

d. Veterinary Center (VETCEN). Same as VETAC with the additional staffing of a Veterinary Preventive Medicine Specialist (64B) and may have a First Year Graduate Veterinary Education (FYGVE) training program. They have the ability to perform advanced surgical/medical procedures, referrals, and consultations.

2-3. Equipment Requirements. Equipment standards for each tier are also published by the VMSB and can be accessed via the Army Veterinary Services' milSuite site at:

<https://www.milsuite.mil/book/community/spaces/armyveterinaryservices>, under VMSB. These standards provide guidance on what equipment is required, recommended model, and sourcing information for each veterinary facility based on tier. When submitting purchase requests for facilities, one should ensure that equipment purchases are commensurate with the tiering of that particular facility. All commanders are responsible for allocating resources and aligning personnel and equipment to provide full care to MWDs. For example, within MEDCOM, Public Health Command (PHC) Regional Commanders allocate resources for MWD care. Each Public Health Activity Commander (PHA) has responsibility for aligning their resources (equipment, facilities, and personnel) to insure that consistently high quality veterinary care is available for all MWD's within their area of responsibility. Below are the minimum equipment requirements that meet the standard of care:

a. Conduct physical examination. Exam table, stethoscope, thermometer, exam light (fixed or portable), scale, otoscope and ophthalmoscope.

b. Obtain the results of routine clinical pathological tests. Microscope, refractometer, microhematocrit centrifuge, stain kit for cytology, reagent dipsticks for screening blood/urine tests, CBC, and basic clinical chemistry. The capability to obtain more sophisticated diagnostic testing (endocrinology, serology, immunology, detailed urinalysis, and clinical microbiology) may be met by submitting samples to an outside laboratory. Some laboratory support can be obtained from a local Military Medical Treatment Facility (MTF) laboratory but many of the tests conducted on MWDs are not valid when completed in a lab equipped and calibrated for examination of human samples; therefore, the use of a commercial veterinary reference laboratory is necessary and use of human laboratories should be avoided (See Chapter 3, Section 3-5 for more information).

c. Prescribe, administer and dispense medications. Properly stored controlled drugs (GSA approved safe) should be available for anesthetic induction, analgesia and euthanasia. The VMSB formulary dictates the current inventory of products available for procurement and use in its most currently published document which can be found on the Army Veterinary Services' milSuite site. MWDs are considered Service members for the purpose of receiving prescription medications from MTF pharmacies. This option should be used when appropriate for generic or non-veterinary labeled medications are indicated in a therapeutic regimen for an MWD. When veterinary label medications are available, use of human (near) equivalents from the MTF may not be in compliance with current veterinary standards of practice and FDA extra label drug use directives. It is recommended that a joint SOP for MTF prescriptions be completed by the responsible VCO and MTF Pharmacist so that prescriptions can be filled in a timely manner. Most commonly, a requirement exists for the VCO to register with the MTF pharmacy as a provider and for the MWD to be entered into the medical system database. To input an MWD into the database, access the non-human registration (NHR) field. Last Name should be "MWDOG", First Name should be the actual name of the MWD (i.e. "Rex"), followed by a space and the tattoo number. Enter sex and date of birth. Under SSN, enter the final 9 digits of the microchip number. Patient Category should be listed as K99 (patient not elsewhere classified). This non-human patient can now be "arrived" and procedures selected as with a normal patient. For veterinary specific medications not available through the MTF, or if the need for medications through a compounding pharmacy arises, consult with the supporting 64F for guidance.

d. Safely perform anesthesia and surgery. Pre-anesthetic medications, properly-sized endotracheal tubes/anesthetic mask, laryngoscope, bag valve mask (BVM), gas anesthetic machine with oxygen source and isoflurane vaporizer, waste anesthetic gas scavenging capability, anesthetic monitor (at a minimum the vital signs monitor should have continuous ECG trace, pulse oximetry, capnography, non-invasive blood pressure measurement, and core temperature sensor), surgery lights (fixed or portable), scrub sink, surgery preparation area, surgery table capable of "V" positioning, general elective surgery packs, autoclave, patient warming system (i.e., forced air heating blanket or conductive fabric blanket), suction apparatus with sterile tips/tubing, and electrosurgical system.

e. Perform comprehensive oral health assessment and treatment. Clean teeth, perform extractions and evaluate dental health. Chapter 8 Dentistry and the VMSB COHAT guidelines clarify MWD dental procedures as well as supplies and equipment standards based on tier which can be found on the Army Veterinary Services' milSuite site and Remote Online Veterinary Record (ROVR) system.

f. Expose, process, and interpret radiographs. 300mAs/125kVP digital radiology machine (DR), dosimetry badges (or equivalent radiation monitoring program if required through local MTF), radio-opaque markers, radiolucent positioning devices, and personal protection apparel (lead-lined aprons, thyroid shield, gloves, partitions).

g. Confine MWDs for short-term hospitalization. Large cage and/or separate run in a climate- controlled room/kennel, which is separate from hospitalization areas for privately owned animals.

h. Provide emergency care. Emergency crash cart which contains emergency drugs and supplies to aid in hemorrhage control, airway management to include supplemental oxygen, intravenous access supplies, orogastric tube (foal-sized nasogastric tube), and wound management (casting material, cast cutter, splints, and bandage material). Additionally, crash carts fully stocked with emergency medications should be present before performing surgical procedures on MWDs. See 4-2.

i. Conduct necropsy. Exam light, table (prefer wet table), knives/scapels, scissors, forceps, electric bone saw, various sized-containers, 10% neutral buffered formalin, specimen cassettes, and a digital camera to capture pictures of lesions (See Chapter 12 and see TB Med 283).

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j. Maintain Veterinary Health Records. Internet connection to access the electronic veterinary medical record database, access to appropriate references, forms, documents, and policies for upkeep of the VHR.

2-4. Programs and Funds.

a. Medical equipment used in care of MWDs is purchased with appropriated funds. Usually such equipment (if it is of sufficient dollar value and durability) will also be entered on the supporting MTF or PHC Region Property Book and accounted for on the facility's hand-receipt. The PHC Region budget includes funding for medical equipment. Historically, Regional Commanders receive a share of the funding and must carefully prioritize the equipment requests submitted by their Public Health Activity (PHA) Commanders in order to purchase the most critical equipment first. Equipment requests should be well justified by documenting any significant clinical risks to personnel or compromise MWD care.

b. The most common mechanism to obtain medical equipment is the capital expense equipment program (CEEP). This program is a centralized program designed to approve and acquire equipment required to support health care activities. Thresholds for these particular programs are for items costing less than \$100,000 (CEEP), \$100-\$250,000 (Super-CEEP), and those items greater than \$250,000 (MEDCASE). Given that nuances may exist as per the specific steps for requesting equipment from one command to another, it is prudent to coordinate with the supporting command for further details. A generic description of steps the end user takes in this process is as follows:

- (1) End user identifies the need for equipment through equipment lifecycle replacement program
- (2) Research options through VMSB for equipment solutions.
- (3) Submit requirement through the CEEP process.
- (4) Send receiving documentation to command POC once items are received.

c. Non-Appropriated Fund (NAF) Equipment. Medical equipment that was purchased by the NAF for use on privately owned animal patients is also used for MWD care. In the past, some large equipment items (usually x-ray machines and anesthesia machines) that were originally justified for privately owned animal care and purchased by the NAF were transferred to the appropriated fund hand receipt so that the local MTF Logistics branch could more reliably accomplish ongoing medical maintenance. With the Global Veterinary Medical Practice (GVMP), certain equipment may be acquired through central contracts. With a central contract, durable equipment is leased and maintained by the vendor. This equipment will not be transferred to the APF hand receipt and will not be maintained by medical maintenance.

2-5. Special Considerations.

a. Equipment requests must include the specifications of a particular item of equipment and a suggested source. In some cases there may be unique requirements for installation of the equipment item in a facility. These include specific electrical power requirements (voltage and amperage which varies per country), other utilities requirements (water, drains, temperature range, etc.), minimum space requirements and necessary structural modifications that should also be addressed. Another important consideration is the anticipated maintenance requirements – will the MTF Medical Maintenance service the equipment or will a contractor service it? The latter requires budgeting for future maintenance costs. Also consider whether the equipment will need connection to the communications network. Coordinate with local Information Technology (IT) support elements to ensure necessary certificates of net worthiness are obtained. Coordinate with the command to determine the documentation requirements.

b. The supporting Region or MTF maintains the property book accounting for all equipment on the facility's hand receipt and also assumes responsibility for performing certain preventive maintenance and calibration procedures on medical equipment. Each item of equipment should be labeled with the equipment control number (ECN) and a due date for scheduled maintenance. Typically the facility's NCOIC assumes responsibility for both accountability of equipment as well as ensuring that scheduled maintenance is performed on time. Inhalant vaporizers typically must be shipped back to the manufacturer for annual calibration. For this reason, even small VTFs should have a minimum of two vaporizers on hand so that when one is shipped for maintenance, the remaining vaporizer will be available for use. Initial durable equipment necessary to meet the MWD mission is to be purchased with APFs. Associated expendable supplies and additional equipment may be purchased with NAFs.

c. All equipment items have an anticipated duration of serviceability. When formulating a list of equipment for purchase it is recommended to plan for turnover of equipment as a part of its life cycle. Example: if a dental unit is scheduled to reach its end date of serviceability, submitting for a replacement item prior to reaching that end date

would be prudent in ensuring there is no lapse in equipment coverage. Once items reach their anticipated end date, medical maintenance personnel will typically no longer repair or maintain these items. Equipment end date of serviceability information can be furnished by medical maintenance personnel.

2-6. Medical Supplies.

a. Medical supplies and commonly used pharmaceuticals are purchased and stocked in the VTF by NAF for POA care. When drugs and supplies are used for MWD care the NAF is reimbursed for their costs. Drugs and supplies used to treat a government-owned animal (GOA) must be linked to an individual treatment plan. Reimbursement is performed centrally. To ensure accurate accounting, a GOA transfer between activity (TBA) report must be completed and submitted to NAF Financial Services or Central Accounting Office at the end of each calendar month. GVMP furnishes guidance on performing this end of month report, but a summary of the steps involved are as follows:

- (1) On the first working day of the month, print a Transaction Summary Report in ROVR.
- (2) Open the GOA TBA excel spreadsheet to generate the report for each respective location.
- (3) Enter information from the report in the corresponding areas as applicable.
- (4) Review the report for accuracy.
- (5) Print, verify, and sign the TBA report.
- (6) Submit the report to NAF Management Analyst to get PHC Region approval.
- (7) Submit invoice to PHA supporting budget office for payment to GVMP.

b. Medical supplies (e.g. compounded medications, orthopedic devices) or services (specialized laboratory testing) used solely for the purpose of MWDs must be purchased with appropriated funds. These may either be obtained through the supporting MTF or PHA.

2-7. Textbooks. Below are the suggested reference materials that should be available to the VCO who is caring for MWDs listed in no particular order, alternatives are acceptable. These textbooks and periodicals listed as “Primary References” may be ordered with appropriated funds as essential references for MWD care. Reference books may also be ordered through the NAF, but they must be justified as supporting the privately owned animal mission. Additionally, consulting the “AMEDD Virtual Library” (<https://medlinet.amedd.army.mil/vetmed.htm>) is encouraged as this site contains electronic texts and journals that may be accessed with CAC log in.

a. Primary References (latest edition)

- (1) Veterinary Drug Handbook, Plumb (Iowa State University Press)
- (2) Atlas of Radiographic Anatomy of the Dog and Cat, Schebitz & Wilkens (Verlag/Saunders)
- (3) Atlas of Small Animal Ultrasonography, Penninck (Wiley)
- (4) Canine and Feline Cytology: A Color Atlas and Interpretation Guide, Raskin & Meyer (Elsevier)
- (5) Clinical Behavioral Medicine for Small Animals, Overall (Mosby)
- (6) Clinical Textbook for Veterinary Technicians, Miller & McCurmin (Saunders) FM 8-52
- (7) Control of Communicable Diseases in Man, Bennison (American Public Health Association) FM 8-33
- (8) Essentials of Veterinary Ophthalmology, Gelatt (Wiley)
- (9) Five-Minute Veterinary Consult, Tilley & Smith (Williams & Wilkins)
- (10) Handbook of Veterinary Anesthesia, Muir et al (Mosby)
- (11) Handbook of Veterinary Neurology, Lorenz & Kornegay (Saunders)
- (12) Handbook of Veterinary Procedures and Emergency Treatment, Kirk, Bistner, & Ford (Saunders)
- (13) Infectious Diseases of the Dog and Cat, Greene (Saunders)
- (14) Muller & Kirk’s Small Animal Dermatology. Scott, Miller & Griffin (Saunders)
- (15) Small Animal Clinical Diagnosis by Laboratory Methods, Willard, Tvedten & Turnwald (Saunders)
- (16) Small Animal Critical Care Medicine, Silverstein & Hopper (Elsevier)
- (17) Small Animal Dental Equipment, Materials and Techniques: A Primer, Bellows (Wiley-Blackwell)
- (18) Small Animal Internal Medicine, Nelson & Couto (Mosby)
- (19) Small Animal Surgery, Fossum (Mosby)

b. Additional Recommended References

- (1) Behavior Problems of the Dog and Cat, Landsberg & Huinhausen (Saunders)
- (2) Canine and Feline Skin Cytology, Albanese (Springer)
- (3) Canine Rehabilitation and Physical Therapy, Mills et al (Saunders)

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- (4) Manual of Small Animal Soft Tissue Surgery, Tobias (Wiley-Blackwell)
- (5) Merck Veterinary Manual
- (6) Miller's Anatomy of the Dog, Evans & de Lahunta (Elsevier)
- (7) Small Animal Clinical Nutrition; Hand, Thatcher, Remillard, & Roudebush (Mark Morris Institute)
- (8) Small Animal Clinical Pharmacology and Therapeutics, Boothe (Saunders)
- (9) Small Animal Oral Medicine and Surgery, Bojrab & Tholen (Lea & Febiger)
- (10) Small Animal Medical Diagnosis, Lorenz, Neer, DeMars (Lippincott Williams & Wilkins)
- (11) Textbook of Veterinary Internal Medicine, Ettinger & Feldman (Saunders)
- (12) Veterinary Dental Techniques for the Small Animal Practitioner, Holstrom, Frost & Eisner (Saunders)
- (13) Veterinary Surgery Small Animal, Johnston & Tobias (Elsevier)
- (14) Withrow & MacEwen's Small Animal Clinical Oncology, Withrow & Vail, (Saunders)

2-8. Periodicals. Like textbooks, subscriptions for periodicals may be obtained through the MTF library, many of these journals are accessible via the AMEDD Virtual Library (AVL), with a My Athens Account. The veterinary periodicals which contain articles on small animal clinical medicine with potential application to MWDs, include:

- a. Primary Periodical References
 - (1) Clinician's Brief
 - (2) Journal of the American Veterinary Medical Association
 - (3) Today's Veterinary Nurse
- b. Additional Recommended Periodicals
 - (1) American Journal of Veterinary Research
 - (2) BMC Veterinary Research
 - (3) Canine Practice
 - (4) CDC Emerging Diseases
 - (5) DVM 360
 - (6) FDA Veterinarian Newsletter
 - (7) Journal of the American Animal Hospital Association
 - (8) Journal of Small Animal Practice
 - (9) Journal of Veterinary Emergency & Critical Care
 - (10) Journal of Veterinary Internal Medicine
 - (11) Journal of Veterinary Medicine
 - (12) Journal of Veterinary Science
 - (13) Seminars in Veterinary Medicine & Surgery (Small Animal)
 - (14) Transboundary & Emerging Diseases
 - (15) Vector-Borne and Zoonotic Diseases
 - (16) Veterinary Clinical Digest
 - (17) Veterinary Clinics of North America: Exotic Animal Practice
 - (18) Veterinary Clinics of North America: Equine Practice
 - (19) Veterinary Clinics of North America: Food Animal Practice
 - (20) Veterinary Clinics of North America: Small Animal Practice
 - (21) Veterinary Medicine International
 - (22) Veterinary Pathology
 - (23) Veterinary Practice News
 - (24) Veterinary Radiology and Ultrasound
 - (25) Veterinary Surgery
 - (26) Veterinary Technician
 - (27) Zoonoses & Public Health

CHAPTER 3

PREVENTIVE MEDICINE, DEPLOYMENT ISSUES, AND STANDARD PROCEDURES

3-1. Handling of MWDs. All MWDs, regardless of breed or capabilities, should only be handled by individuals who have received handler training via an official military working dog handler course. All MWDs **MUST** be on leash and **MUST** be wearing a properly fitted and secured basket muzzle whenever they are in a Veterinary Facility unless hospitalized and impossible/impractical due to patient's medical condition. A certified handler will be present at all times in these cases. All handlers trained through JBSA - Lackland learn this practice as standard procedure. Bite incidents have occurred where dogs were able to extract themselves out of inadequate or poor-fitting muzzles. The fact that an MWD is not certified as a patrol dog does not mean that the dog will not bite or did not receive attack training. In fact, there are dogs in the inventory that did not certify as patrol dogs because they would not consistently release a bite or end an attack on command.

3-2. MWD Records

a. Electronic Veterinary Health Record (VHR). In the spring of 2014, the Remote Online Veterinary Record (ROVR) web based veterinary record application came online. As per DODVSA/DHA policy, its use is mandated for all MWDs. Be aware that under the "Web Help" tab under the left hand navigation pane there are several documents available and may serve as a useful resource for questions with ROVR. Whenever a specific form is mentioned throughout this document an electronic equivalent form is acceptable within the VHR.

b. When newly assigned MWDs arrive or return from deployment, the permanent hard copy record should be reviewed by the attending VCO or 68T and stored at the responsible VTF. The electronic VHR in ROVR must be updated to document the current status of the following items as described below:

- (1) Master problem list (MPL): all problems must be transcribed with start and end dates if available.
- (2) Current medications
- (3) Vaccination records: transcribe all vaccine history.
- (4) DD 1829, Record of Military Working Dog Physical Examination: transcribe most recent date into ROVR registry.
- (5) FAVN test results: transcribe most recent date and results into ROVR registry and import the lab report.
- (6) MWD monthly record review: performed and documented at time of arrival
- (7) Laboratory results: import most recent CBC, chemistry, urinalysis, etc.
- (8) Other documents associated with specific diagnosis, chronic illness or problem on MPL should be imported for electronic reference such as SF600s, SF519b for imaging results, and laboratory test results.
- (9) Deployment medical history (all documents related to a dog's deployment will be scanned into ROVR as necessary).

c. Once these items have been uploaded/transcribed into the dog's record in ROVR, the following statement will be entered into the last SF 600 entry: "From this date forward, medical information for this MWD is maintained in the ROVR". A signature will be entered by the provider following this statement.

d. Permanent VHR. With the advent of the ROVR and its mandated use for all privately-owned and government-owned animals, guidelines in this document relevant to hard copy MWD VHR are still relevant. Until the foreseeable future, MWDs coming out of procurement and initial training will still be assigned a hard copy, four part VHR (AF Form 2110A). Additionally, when MWDs transition to a new duty station, the permanent VHR will accompany that dog and will be maintained by the new responsible VTF. Another instance of utilization of the permanent VHR may be if an MWD is seen by a civilian veterinary provider who will not have access to ROVR.

(1) Sequence of forms should be adhered to as outlined in Appendix B. A copy of this sequence of forms document typically is placed in the back of part four of the VHR for reference.

(2) ALL documents in the VHR must be identified with the MWD's Name and tattoo number, and with the location that care was provided.

e. Forms should be completed to report results of clinical pathology testing (CBC, chemistry panel, etc.) clinical or histological pathology samples (SF 515 or equivalent), surgery reports (SF 516 or equivalent) and radiological or other imaging reports (SF 519b or equivalent). These should be filed appropriately in sections 3 or 4 of VHR and

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imported if not already a part of the electronic VHR and must be referenced/assessed in the ccSOAP on the SF 600s.

f. SF 600-Chronologic Record of Medical Care (eNote). As the title states, the SF 600 should describe all medical care. This means that all care must be assessed, or at least cross-referenced, on the SF 600. The objective evaluation of laboratory, imaging, and other support documents should be filed appropriately and must be initialed or signed by the responsible VCO, but the assessment and plan must be written on the SF 600. The existence of DD Form 1829s, or other support documents for a given date should also be noted on the SF 600. This allows a reviewer to identify when another document is present without requiring a complete rewrite of that document's contents on the SF 600. Key aspects of SF 600 use include: MWD identification, location of care, proper ccSOAP format, notation of all prescription medications provided including parasite control medications issued to the handler, notation of Temperature/Pulse Rate/Respiration Rate/Weight (TPRW), body condition score (BCS), MWD diet, fitness for duty and deployment status statement on all patient care entries, presence of a treatment plan with checklist or other means of recording when a plan item is completed, and signature and stamp identifying the provider of care.

g. DD 1829 (MWD SAPE eNote). A DD Form 1829 will be used for documentation of semiannual physical examinations (SAPE) of MWDs and when a dog is being considered for disposition. Utilization of the DD form 1829, Record of Military Working Dog Physical Examination was replaced by the MWD SAPE eNote template found on ROVR. Selection of the "DD Form 1829" links in the Exam/Assessment/Diagnosis section of the eNote will prompt the user to insert data historically captured on the hard copy DD 1829 such as diet, handler concerns, behavior/temperament, etc. Completion of this form is self-explanatory.

h. DD Form 2619 (Master Problem List) or electronic equivalent. Any illness or injury that is recurrent, severe, or has impact on MWD performance or fitness for duty should be listed on the MPL. A recurrent problem should retain the original number but be assigned a new "date entered" and "date resolved." If the nature of the problem is nonspecifically recurrent or permanent the "date resolved" block may be lined out or left blank. Problems may be renamed or combined as appropriate. Bite quarantines will be added to the MPL. Surgical procedures should be added to the MPL usually as a resolution to a medical problem. Review of a VHR may reveal that a problem that previously existed warrants listing on the MPL and in the Surgeries\Significant Interventions section; in these cases the "date entered" should reflect the date the problem is first reported on the SF 600 and/or DD Form 1829 not necessarily the date it is entered on the MPL. Problem numbers need not be in direct chronological order as record review may warrant addition of problems in a retroactive manner. The MWD Name and tattoo number must be entered on the MPL Form even though a designated space is not provided.

i. The Problem Oriented Medical Record or Chief Complaint, Subjective, Objective, Assessment, Plan (POMR/ccSOAP) System is used in MWD VHRs. The use of the ccSOAP format and POMR process is required by AR 40-905. Standardized ccSOAP format is necessary to promote quality and continuity of care, address special concerns, and fulfill records requirements for MWDs. While specific location and format may change in the eNote compared to the SF 600, these guidelines also apply to eNotes.

(1) Date and Vitals: When using a paper SF600 the date, weight, temperature, pulse and respirations will be recorded on the first line of each SF 600 VHR entry or under the date in the left column of the SF 600. When using ROVR a vital signs entry will be documented inside of the ccSOAP on the eNote when the MWD is physically examined.

(2) Chief Complaint (cc): The cc is brief identification of the reason that the patient was brought to the VTF by the handler. This section may be completed by the technician or clerk.

(3) Subjective (S): The technician may record the initial history from the handler before turning over the VHR and MWD to the VCO. The VCO will record additional history as appropriate, and brief observations of general progress, appearance, and mentation, e.g. BAR, dull, depressed.

(4) Objective (O): This section includes reports of significant findings, including body condition score and hydration status, from the VCO's physical examination. Normal status must be reported. In this section, a comment on all diagnostics performed and the primary findings, including negative tests and no clinical findings, will be completed. The technician should only make entries in the objective portion if they are transcribing for the VCO or no VCO is available to complete the examination.

(5) Assessment (A): This section must include a list of specific problems or a statement that there are none. Problems may be assessed individually or listed and then assessed as a group. Assessment may be in sentence format or in short bullets, but must identify the primary differential diagnosis for each problem along with key rule-outs and a brief explanation of each. If a definitive diagnosis is made, additional rule-outs need not be listed or

discussed. If no problems are noted this must be specifically noted, e.g. “appears healthy, no problems identified or reported.”

(6) Plan (P): The diagnostic and therapeutic plan for each problem must be updated or if no change is necessary, this must be stated. Actions taken at the time of examination and evaluation will also be recorded in this section, e.g. client education. (The use of check-boxes or other positive control measures are recommended to assure that plans are implemented correctly). The final entry in the plan for all MWDs must address fitness for duty (return to full, limited duty, or unfit) and medical deployment category.

(7) Addenda: will be dated and identified “Add:” and with the letter of the entry section being altered or completed. Addenda may only be used to report routine care previously prescribed, e.g. completion of a treatments or administration of heartworm medication, to modify the ccSOAP for that date, or to report routine monthly body weight reported by an MWD handler.

(8) Entries: will be signed and stamped with the signature block of the person making the entry. eNotes will be titled with type of note +/- chief complaint on signature page, ex. MWD Red SAPE or Sick Call Note – Diarrhea. This makes viewing specific eNotes regarding recurring problems easier in the future.

(9) Animal Care Specialists may complete entries, including ccSOAP format, if a VCO is unavailable. If this is necessary the technician should sign with his/her own signature block.

(10) Entries continued onto a second page will begin with the date and the word “continued.”

(11) Lines should not be skipped within an entry.

(12) Each SF 600 and the first entry from a new treating VTF must list the VTF by name.

j. Deployment VHR. Deployment VHRs were created in the wake of working dogs not returning from deployment with their VHR. The concept of having both a permanent and a deployment VHR is no longer relevant now that an online repository of the dog’s record can be found on ROVR. Updates to the deployment VHR should continue to be made in order to stay current with significant medical events in the life of the working dog. This is crucial so that the deployment VHR contains the most up to date medical information for that working dog. It should not be assumed that network connectivity will be sufficient in an austere, deployed setting and therefore the deployed military veterinary care team may not have access to ROVR. For this reason, the deployment VHR will be given to the handler for use in a deployed setting. Prior to giving the deployment VHR to the handler, ensure all sections of the record have been uploaded and/or transcribed into the dog’s electronic record.

(1) The more complete the VHR, the better equipped the deployed VCO will be when providing care for the MWD. The handler is not always aware of the complete medical history of the MWD. The minimum requirements in a deployment VHR include the following: an up-to-date MPL, most current SAPE medical note to include the DD1829 overlays, results of most recent FAVN, vaccine history, copy of the two most recent rabies immunization certificates with a signature in blue ink, all veterinary visits over the past 90 days to include all pre-deployment evaluation and documentation of current medications and management of any chronic conditions, and health certificate at time of departure.

(2) Upon redeployment, the permanent station’s veterinary team should ensure the MWD’s ROVR record is brought up to date by transcribing relevant medical information into the record. This includes transcribing all problems on the MPL that occurred while deployed and closing the deployment date in the deployment section.

(3) Documents completed during the deployment such as SF 600s, SF 519B, DD2208, etc. should be uploaded into the dog’s ROVR record and/or transcribed as applicable.

(4) Vaccine information (if any) should be transcribed into the immunizations history. If a rabies immunization is given during a deployment an original rabies certificate will be created by the attending VCO and signed in blue ink.

k. Elimination from Service. When an MWD has been eliminated from service through either adoption or death, the following steps should be performed in order to properly process the MWD’s VHR (both hard copy and ROVR records):

(1) The Green Hard Copy Medical Record (AF Form 2110A) will be forwarded to DODMWDVVS as described below in section 3-17, paragraph d. A copy of the adoption covenant or death certificate and necropsy report form (DD Form 1626, Veterinary Necropsy Report Checklist and Guidelines) will be placed in section II on top of the Master Problem List. Please ensure all forms are filed in the proper sections, chronologically, with newest on top as outlined in Appendix B.

(2) In the ROVR medical record, the following should be performed:

(a) WDMS Registry: enter EXCESS in the “WDMS Registry Comment” with effective date of the

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excess memo; also, enter the date the MWD was eliminated from service (due to adoption/euthanasia/death) in measure “Retirement Date.”

(b) Upload elimination documents, i.e., adoption covenant or death certificate and gross necropsy report forms.

(c) Mark MWD patient as “INACTIVE” and email DODMWDVS Records Repository (341TRS.SGV.MWDMedicalRecords@us.af.mil) the MWD Name, tattoo and new owner name or deceased. Once the hard copy records are received at DODMWDVS, then the record will be made “ACTIVE” to initiate the transfer of the electronic medical record to DOD Military Working Dog VS. Once transfer is complete the MWD will be marked as “INACTIVE”

(d) Consult the supporting 64F for further questions about this process.

1. Upon adoption, MWDs will not be converted from MWD (GOA) to POA as far as organization type is concerned. Once this rate plan is selected it cannot be undone. A new medical record will be created for this animal if the owner elects to take the retired MWD to a DOD veterinary facility. Relevant historical data from the former MWD’s record, such as vaccine information, MPL, and surgeries/significant interventions will be transcribed into the new record.

3-3. Preventive Medicine -Examination, Assessment, Vaccination, and Prophylactic Care. The most important part of a successful working dog health program is preventive medicine. Preventive medicine has the largest effect on MWD service life and performance by preventing disease and/or detecting conditions and diseases early in their course, often allowing more successful management of the disease. The ultimate goal is to ensure MWDs are medically fit for mission requirements and to remove unfit animals from the program. The different aspects of the preventive medicine program can be divided by frequency of care: daily to weekly, monthly, quarterly, semiannually, and annually. Maintenance of proper veterinary records should be a continuous activity to document the preventive medicine program.

a. Daily to Weekly Preventive Medicine Activities. These aspects of preventive medicine fall under the supervision of the KM and handlers to include appropriate care, feeding (see para 3-6), and work practices. The kennel should maintain a record of MWD feed intake and stool characteristics, and abnormal behavior if present. Kennels often record body weights on a weekly basis even though they report it to the VTF only monthly. Unless a problem occurs, the VCO generally does not need to worry about these functions, but should be aware of and review the kennel records when conducting quarterly inspections and when otherwise medically appropriate.

b. Monthly Preventive Medicine Activities. These aspects generally involve interaction of the MWD unit and VCO or 68T. Depending on local SOPs, the MWD may or may not be presented to the VTF for care, which includes parasite prophylaxis, body weight/nutrition reporting, and optional monthly handler training and kennel sanitary inspection. These activities can be combined into a “Spot Day” by having the veterinary team conduct the weight checks, administer the preventatives, and verify diet at the MWD kennels or VTF.

(1) All MWDs are required to be administered monthly heartworm, gastrointestinal (GI) parasite and ectoparasite (flea and tick) prevention. Monthly preventatives are prescribed by DODMWDVS and currently include oral ivermectin/pyrantel for heartworm prevention and topical imidacloprid/permethrin/pyriproxyfen. Use of insecticide products not approved by Director, DODMWDVS is NOT authorized for MWDs. The use of long-acting supplemental tick collars containing deltamethrin is recommended in areas of high tick infestation or Leishmaniasis-endemic areas and when deployed, but the collar may cause problems as a foreign body if ingested. Judgment should be used on whether or not to apply or not in dogs which appear bothered by the collar or demonstrate other characteristics which the VCO feels would put the dog at risk of losing/ingesting the collar. If prophylactic medications are dispensed to the MWD handler for administration, this prescription must be documented in the VHR and the handler or KM should keep a record of when the medications are administered, which should be reviewed by veterinary personnel at monthly visits to the kennel.

(2) Each month, the MWD’s body weight must be recorded and charted in the VHR. The KM may communicate this to the VTF, or the MWD may be presented for weighing and administration of the parasite preventatives at the VTF. Body weight is measured and recorded monthly in order to monitor body condition and detect important trends in weight loss/gain that may indicate illness or loss of condition. Body weight in MWDs can fluctuate dramatically due to various factors such as operational tempo, climate, life stage, or presence of gastrointestinal or metabolic disease. Periodic adjustment of type and quantity of rations is indicated to maintain an MWD within their ideal weight range (IWR). If an MWD is out of IWR a VCO must document a plan for weight

loss/gain or adjustment to IWR in the VHR. The KM/handler documents food intake, stool consistency, vomiting, etc. and notifies veterinary personnel as necessary.

(3) Monthly medical deployment category status will be provided by the VCO to the KM. Generally, categories will not change significantly month to month; however, at a minimum, monthly updates are necessary to ensure the KM has a record of all category changes when they do occur. There is no prescribed manner/format for category status updates, but there is a template that can be used in Appendix H.

(4) Monthly kennel inspections by a 68T or VCO are optional but highly recommended, as it helps identify problems early and develop a positive relationship between kennel and veterinary service personnel.

(5) Every month, each MWD's veterinary medical record should be opened and reviewed by a member of the supporting VTF's veterinary care team (68T/GS Vet Tech/VCO/VMO) and updated as well as checked for accuracy. Particular attention should be paid to ensure that the deployment category and status are correct. The Animal Medicine Division at the Army Public Health Center (APHC) regularly monitors the database and compiles the data for the Quarterly Portfolio Brief regarding: Deployability status, Semiannual Physical Exam, Record Review. Common problems in MWD records include:

- (a) Not reviewing electronic VHR every month.
- (b) Not updating MPL and closing out items as appropriate.
- (c) Not entering a reason in the "Comments" block for Category 3 or 4 status. Be brief but as specific as possible.
- (d) Not entering a date in an Estimated Release Date (ERD) from Category 3.
- (e) Current date is after the ERD from Category 3 date. Keep track of the estimated release date and update it as necessary. It is only estimated, so change it as the clinical situation warrants.
- (f) Not having correct dates and location entered when "Deployed" button is clicked. This is primarily a problem when the MWD has been previously deployed because when the "Deployed" button is clicked, the data from the previous deployment comes up and must be changed.
- (g) Entries in the "Comments" block with no date reference. All comments should be dated to aid reviewers in determining if the comment is current or not.
- (h) Past due for a semiannual physical without a comment. If the database shows an MWD as past due for its semiannual physical, make a comment as to the reason.
- (i) If an MWD's deployability category changes, make the change in the database immediately. Do not wait a couple days to update the database.
- (j) Verify that the MWD's sex is correct (particularly Male-Intact and Male-Castrated) and be sure to change it if the MWD is castrated at his duty location.

(6) Check for MWDs requiring Semi-Annual Physical Exam (SAPE).

c. Quarterly Preventive Medicine Activities.

(1) Mandated quarterly activities include the completion of a Kennel Sanitary Inspection using DD Form 2342 by the responsible VCO. A signed copy of the DD Form 2342 should be provided to the KM within 72 hours of conducting the inspection with a courtesy copy provided to the MWD unit commander. Recurrent findings should be addressed with the MWD unit commander.

(2) Quarterly handler training by the VCO/68T is required as it assures timely training of handlers after initial assignment to an MWD unit as well as providing new skills and sustainment of others. It is not necessary that all handlers attend each training event as they work shifts, are deployed, on leave or TDY. However, all handlers should attend at least one training event per year with focused training (e.g. pre-deployment, needs additional training for a particular topic, etc.) provided as needed. The DODMWDVS is the proponent for all veterinary medical training of MWD handlers and they have developed the Medical Care of MWDs by Handlers: Handler Training Manual and supporting training resources. Training resources and materials are available directly on the Army Veterinary Services milSuite webpage (<https://www.milsuite.mil/book/docs/DOC-580669>) and through supporting Veterinary Clinical Specialists (64F). KM and handlers can access the training via Working Dog Management System (WDMS) by logging onto WDMS website, selecting "Library" link at top center of page, and selecting "MWD Handler Training". Work with the KM to coordinate this type of training. The VMSB has established the state of the art Trauma FX Diesel dog or Hero dog medical trainer as the realistic MWD skills trainer which allows learners to perform critical life-saving tasks such as maintaining an airway, needle decompression, thoracocentesis, hemostasis, IV insertion, intraosseous infusion, CPR, tracheostomy, and bandaging on a simulator in addition to other procedures on an MWD. These mannequins should be used to train MWD handlers on the

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canine – tactical combat casualty care tasks, human healthcare providers on the Clinical Practice Guidelines, and veterinary personnel for sustainment of emergency skills.

d. The Semiannual Physical Examination (SAPE). A complete medical evaluation is performed every 6 months. At procurement, each MWD is assigned two months for semiannual physical examinations. Red and yellow stickers attached to the right side of the hard copy record indicate the months for each exam. Responsible VCOs have the authority to change/update SAPE when early exams are performed due to deployments or other circumstances. SAPEs are recorded on the MWD SAPE template in the electronic VHR or utilizing DD Form 1829. Taking a thorough history and performing an extensive physical examination are the most important procedures that are performed. Ensure the handlers know the importance of their input on such things as food and water intake, stool and urine production and character, lameness, behavioral changes, exercise intolerance, cough, and skin abnormalities. Ensure that a history is recorded and that all physical examination findings are appropriately assessed and recorded in the VHR. Every SAPE must include an assessment of MWD Fitness for Duty and Deployment Category (see below). The specific actions required during the Red and Yellow SAPE are summarized in Table 3-1. These are minimums; it is the VCO’s responsibility to assess the patient and perform additional examinations/diagnostic tests when appropriate.

Table 3-1. Semi-Annual Physical Examination and Health Evaluation

RED Semiannual Evaluation	YELLOW Semiannual Evaluation
Physical Examination (ROVR template or DD Form 1829)	Physical Examination (ROVR template or DD Form 1829)
Heartworm Antigen Test & Tick-transmitted pathogen tests such as SNAP 4Dx Plus®	
Vaccinations	
Fecal Flotation for parasite identification	
*Complete Blood Count: minimum of HCT, WBC with differential, Platelet Count or estimate	Will also be performed on dogs > 8 years of age and all dogs with chronic conditions or on chronic medications at YELLOW SAPE
*Comprehensive Serum Chemistry Panel: minimum of Creatinine, BUN, ALT, ALP, t.bili., glucose, Na+, K+, CL-, Calcium, Phosphorus, Albumin, Total Protein.	Will also be performed on dogs > 8 years of age and all dogs with chronic conditions or on chronic medications at YELLOW SAPE.**
*Urinalysis: Urine Specific Gravity by refractometer, dipstick, sediment examination	Will also be performed on dogs > 8 years of age and all dogs with chronic conditions or on chronic medications at YELLOW SAPE.
Blood and serum to FADL for Banking (see para 3-4)	
COHAT (if needed), ECG w/anesthesia	
Additional Exams/Tests as clinically appropriate (such as T. cruzi testing in endemic areas)	Additional Exams/Tests as clinically appropriate
Written Assessment, Plan and Fitness for Duty Statement (SF 600 and DD Form 1829)	Written Assessment, Plan and Fitness for Duty Statement (SF 600 and DD Form 1829, or equivalent)
*Clinical Pathology tests must be run in-house using veterinary-specific equipment, or submitted to a commercial veterinary clinical pathology laboratory. Use of a human commercial lab or human military MTF is not authorized except when veterinary lab facilities are not available ** Thyroid panel should not be performed unless clinical signs of hypothyroidism are present regardless of MWD age. Thyroid panel (if clinically indicated) must be submitted to a Veterinary Referral Clinical Pathology Laboratory as in-house equipment and human laboratories have been shown to provide invalid results for required indices. A thyroid panel consists of total T ₄ , free T ₄ , and thyroid stimulating hormone (TSH). Free T ₄ must be run by the equilibrium dialysis method as the RIA is not clinically valid.	

e. Annual Preventive Medicine Activities. In addition to the physical examination and assessment, the Red SAPE includes complete laboratory evaluation (CBC, chemistry panel, urinalysis, examination of feces for parasite ova, heartworm antigen test, and tick-transmitted pathogen tests such as SNAP 4Dx Plus), vaccination (See Section 3-7), serum and whole blood specimens for banking, and COHAT if required. The laboratory evaluations to include urinalysis sediment and fecal flotation, should be performed in the VTF unless there are no in-house lab capabilities

or specific lab values are being monitored. Use of MTF clinical laboratories is not endorsed unless no veterinary laboratory is available. Serum and whole blood in EDTA must be collected during the Red SAPE and submitted to the DOD Food Analysis Diagnostic Laboratory (FADL, see para 3-4). If a COHAT is warranted, it should be performed at the time of the Red SAPE, but only after assessment of the patient (exam and lab results) documents healthy status and fitness for general anesthesia. ECGs must be performed on all MWDs at every anesthesia, in accordance with VMSB Anesthesia and Pain Management Guidelines, and reviewed to detect abnormalities. ECG abnormalities should be documented and worked up appropriately to ensure the best standard of care for the MWD patient. As such, it is imperative that VCOs ensure they have working ECG equipment and know how to obtain a good trace without artifact.

3-4. Annual Submission of MWD Blood and Serum for Archival Banking

a. Sampling. Yearly specimens of both serum and EDTA whole blood will be drawn from each MWD at each Red SAPE. At least 2 mL aliquots of both serum and whole blood in EDTA should be collected and placed in either a 2.0 mL, externally threaded, polypropylene cryotube vial or a conventional vacutainer tube. Utilize FADL Form D-127, MWD Banked Annual Blood and Serum Submission, available on the FADL website

(<https://phc.amedd.army.mil/topics/labsciences/fad/Pages/FADLFormsandDocuments.aspx>) under the “DOD FADL Forms and Documents” tab. Vials must be clearly marked (using fine-point permanent marker) with MWD’s name, tattoo and date of draw. If a dog is deployed during the time it would normally have had a Red SAPE performed, sample collection will be deferred until the next Red SAPE is conducted. Specific sampling will not be done pre/post deployment as each Red SAPE sample will serve as pre/post deployment sampling respectively.

b. Packing samples. Both blood and serum samples should be shipped refrigerated, not frozen. The samples should be placed in plastic, zip lock bags, with the paperwork (see below) in a separate plastic bag. The bags should then be put in a Styrofoam container with ice packs.

c. Shipping. Military Working Dog Banked Sample Form, Vet Lab Sample Form D-127 should be filled out completely and annotated for each MWD. Samples will be stored at the FADL for future testing as necessary for periodic surveys and comparison with serum from sick dogs. Testing of dogs with illness suggestive of arthropod-borne diseases will be done on a case-by-case basis at the request of the attending VCO. Coordination with the lab prior to shipping samples would be indicated for patients that are critical and need their results quicker than samples submitted for surveillance purposes. For those MWDs showing clinical signs consistent with arthropod-borne infections, the DOD Food Analysis & Diagnostic Laboratory will retrieve and test the latest banked submission from that dog for comparison with the results from current submission from the sick dog when appropriate. The DODMWDVS may direct collection of samples in conjunction with major deployments. The completed form and packaged samples should be submitted to:

DOD Food Analysis and Diagnostic Laboratory
2899 Schofield RD, Suite 2630
Ft Sam Houston, TX 78234-7583
210-295-4605/4010/4387; DSN: 312-421-xxxx

3-5. Laboratory

a. General. Laboratory tests are routinely done as part of complete veterinary medical care provided to MWDs, either as part of an annual or semi-annual exam or clinical case. Complete blood counts (CBCs), blood chemistry panels, urinalyses (UAs), heartworm antigen tests, tick-transmitted pathogen tests, and fecal flotations for parasite identification are routinely performed. Other tests may be needed as part of a diagnostic work-up in sick animals. These tests can either be run in-house or sent to an outside laboratory. Generally, for best practices, in-house testing should be performed on all emergent patients, patients that the results would impact or change treatment plan and tests that are easily performed (i.e. fecal flotations, heartworm antigen tests, UAs, to include sediment exams, etc.) Those that require more technical expertise, specialized equipment or reagents can be sent to outside diagnostic laboratories specialized in these techniques. If the VCO sends tests out, the tests must be sent to a commercial veterinary diagnostic lab, unless one is unavailable or specific exemption is given through the command chain. Veterinary diagnostic labs have the advantage of equipment that has been calibrated, validated methodologies for animal species, and trained personnel in identifying changes and conditions unique to different animal species. Each lab will have established normal reference intervals for each species and will be able to provide these reference

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intervals with sample results. Reference intervals vary considerably from lab to lab, and are dependent on methodology, reagents and instrumentation utilized. Do not compare one laboratory's results to another laboratory's reference intervals.

(1) CBC. As a minimum, hematocrit, a WBC count with differential, platelet count or estimate and slide review.

(2) Serum chemistry panel. As a minimum, include measures of renal, liver, and endocrine function, gastrointestinal health, and electrolytes (BUN, creatinine, ALT, ALP, total bilirubin, albumin, total protein, blood glucose, calcium, phosphorus, sodium, chloride, and potassium).

(3) Urinalysis. As a minimum, include urine specific gravity by refractometer, visual assessment of turbidity and color, chemical reagent evaluation of urine glucose, bilirubin, ketone, hemoprotein, pH, protein; and a sediment examination.

b. In-house laboratory testing. Every VTF should have equipment and supplies to perform at least a minimal amount of laboratory tests. These include:

(1) Manual packed cell volume (PCV).

(2) Manual plasma total protein and urine specific gravity.

(3) Manual WBC estimate.

(4) Blood smear. When reviewing the blood smear be sure to evaluate all components of the CBC; hemogram including RBC morphology, leukogram to include differential and morphology, and thrombogram including count and morphology. Abnormalities include:

(a) RBC: Moderate poikilocytosis (any type or combination), reticulocytosis (require special staining techniques to perform in-house) ($>60,000/\mu\text{l}$), Heinz bodies, basophilic stippling, RBC parasites, nucleated RBCs >5 , anisocytosis, spherocytosis

(b) WBC: Left shift >1000 bands, or with metamyelocytes or myelocytes, leukocytosis ($>20,000/\mu\text{l}$), neutrophilia ($>15,000/\mu\text{l}$), lymphocytosis ($>5,000/\mu\text{l}$), monocytosis ($>2500/\mu\text{l}$), eosinophilia ($>2000/\mu\text{l}$), basophilia ($>500/\mu\text{l}$), unclassified cells

(c) PLATELETS: thrombocytopenia ($<200,000/\mu\text{l}$), thrombocytosis ($>500,000/\mu\text{l}$)

(d) BACKGROUND: Any odd discoloration or stippling

(5) Routine urinalysis to include visual assessment (color, turbidity, specific gravity by refractometry), chemical reagent strip ("dipstick") analysis (glucose, bilirubin, ketone, hemoprotein, pH, protein), and sediment examination (cells, casts, crystals, bacteria, other).

(a) Prolonged air exposure on the urine dipstick can result in false positive glucose test and false negative hemoprotein

(b) Alkaline urine can cause a false positive protein test (the dipstick mainly tests albumin)

(c) Protein greater than trace on a dipstick in concentrated urine (>1.045) or present at all in less concentrated urine (<1.030) should undergo additional diagnostic testing which may include, but is not limited to, a urine culture, sulfosalicylic acid test, or a urine protein-creatinine ratio

(6) Fecal flotation examinations and direct fecal smears.

c. External laboratory testing

(1) As previously mentioned, veterinary clinical laboratories are required unless unavailable. If the VCO does not have access to these facilities, the VCO may want to perform as much lab work as can be done in-house. The VCO can get a reasonable estimate of a CBC by doing a packed cell volume (PCV), total protein by refractometer, manual WBC, and by examining a blood smear to get a platelet estimate, manual WBC differential, and confirming RBC and WBC parameters visually by estimates. Also, by examining the blood smear, the VCO can evaluate RBC, WBC and platelet morphology, evaluate for hemoparasites or other inclusions. Complete reliance on human medical facilities in a deployed setting to meet all clinical pathology requirements, while forsaking use of organic laboratory equipment for a perceived convenience is entirely inappropriate, and utilizing human clinical laboratories should be performed only by exception.

(2) If sending samples to the local MTF is the only option, VCOs must be careful about interpreting the results.

(a) Hematology analyzers in human medical laboratories are not calibrated and validated for veterinary species and most medical technologists are not familiar with the unique morphological differences in normal and abnormal blood cells from different animal species. In general, cell counts from these analyzers in dogs (other species are variable) will be a reasonably good estimate. WBC differentials should not be used. The VCOs should

make a blood smear at the same time the sample is drawn and perform a manual WBC differential on the smear, then using differential percentages, apply the WBC count obtained from the lab to calculate the individual absolute WBC values. By reviewing a blood smear the VCO should also be able to verify whether the cell counts obtained from the lab seem reasonable (very low, low, normal, high, very high). Another caution, do not use "normal values" provided by the MTF; these are for humans and are not valid for dogs. The VCOs will need to use the more generic reference intervals provided in veterinary medicine textbooks for comparison.

(b) Blood chemistry panels are of even more concern. The VCO may be able to utilize in-house portable chemistry analyzers that can provide immediate partial chemistry panel results (electrolytes, some blood gas parameters, possibly BUN or creatinine). Again, samples should be submitted to the local MTF with caution. Methodologies and instrumentation will vary from hospital to hospital and not all methodologies have been validated for animal species. Certain methodologies have been recognized as not being valid in animals. For example, many human medical laboratories utilize bromcresol purple as a dye to measure albumin. Bromcresol purple does not reliably bind to animal albumin and results are therefore unreliable. Likewise, many antibody-based tests may have limited cross-species reactivity; this includes most thyroid function tests. These must be submitted to a veterinary diagnostic lab so that species specific tests can be run. Human thyroid tests are invalid in dogs. Also, the linearity of tests is designed for expected human values and may not accommodate values commonly obtained with animal species.

(c) UAs (to include sediment exams) can usually be performed in-house relatively easily and quickly. Use caution if sending UAs to the MTF for evaluation. Many crystals commonly found in animal urine are not common in human medicine and may not be properly identified.

(d) Microbiological cultures are often sent to the MTF; however, the preferred analytical laboratory would be a commercial veterinary lab offering microbiology/bacteriology services. Again, caution is advised if utilizing MTF laboratories. Many veterinary pathogens are not routine isolates in human labs, and the labs may not be familiar with them. Additionally, most human microbiological labs test sensitivity against commonly encountered human drugs but not for many of the commonly used veterinary drugs.

(3) If sending samples to The Joint Pathology Center see chapter 12 and TB Med 283 for complete details.

(a) The JPC does not accept fluid samples, any type of sample for culture, or stones.

(b) The JPC does accept the following diagnostic material: Formalin fixed tissue specimens, paraffin-embedded tissue specimens, stained histologic sections, cytologic preparations, metal fragments, radiographs, photographs, and other forms of digital imaging.

3-6. Nutrition Issues

a. Standard Diet. AR 40-905 requires that all MWDs be fed a standard diet unless a special diet is medically required. The standard diet selection is based on nutrition standards established by the DODMWDVS in consultation with veterinary nutrition specialists and is approved by the Joint Services MWD Committee. Though nutritional standards are set by DODMWDVS and the Joint Committee, the actual brand and manufacturer are based on solicitations to manufacturers for bid. A manufacturer must provide a diet that meets the criteria set, but the brand may change with each solicitation, which currently is every 5 years. The standard DLA MWD Diet is identified as NSN 8710-01-679-9480 with the nomenclature, "Dog Food"; the current standard diet is Hill's Science Diet Active. The 7-gallon pail, NSN 7240-01-411-0581, may be used for storage of food during deployment, but the food is delivered in bags. The use of the correct standard diet and appropriate means of procurement should be evaluated at each quarterly kennel sanitary inspection. MWD units are required to maintain a minimum one-month supply of food for their MWDs.

(1) Medical justification for a standard diet. Use of a standard diet (brand and type) minimizes the risk of diarrhea and gastroenteritis developing due to diet changes associated with deployments, TDYs, or PCSs. It also assures that healthy MWDs eat a diet appropriate for their athletic lifestyle, e.g. high digestibility, high energy density, fixed formula, American Association of Feed Control Officials (AAFCO) certified feeding trial, high protein content, high fat content, and controlled calcium: phosphorus ratio.

(2) Justification for purchase of the standard diet through DLA. In general, the DLA procurement will be least cost to the MWD unit. Even if the same food can be procured through other sources, DLA must be considered by regulation. DLA is likely the only option for contingency operations outside the US. Shipping costs through

DLA will likely be much less than if units use commercial shipping of food bought locally. Regardless of the source of procurement, the standard diet must be fed to MWDs unless otherwise required by medical condition (see below).

(3) Reporting Problems with DLA Supplied MWD Diet. Occasionally MWD units have problems with late, poor condition, or out-of-date (expired/close to expired) food deliveries. This food should not be accepted. MWD diet is required to be properly palletized and in good condition at the time of delivery. If problems occur (e.g. wet, clumped, abnormal color or consistency), the DLA Customer Service should be notified so that they can correct the problem. The responsible KM should notify the local Supply Officer and the DLA Customer Service Center: 1-877-352-2255, (269) 961-7766 (DSN 661), dlacontactcenter@dla.mil.

(4) Use of non-standard diets for medical conditions. The only reason a dog should be fed a nonstandard diet is a medical condition as determined by the VCO, on a case-by-case basis. Such conditions might include congestive heart failure, chronic kidney disease, food allergies, hepatic disease, or inflammatory bowel disease. Compliance with the requirement to feed only this diet must be checked at least quarterly during kennel sanitation visits, but should be confirmed monthly. It is the responsibility of the MWD unit to purchase and feed medical prescription diets IAW veterinary prescription after the initial period of approximately 30 days for all long-term diets.

(5) In general, MWDs on special diets should not automatically be categorized as Category 2 limited deployment. If an adequate supply of the special diet can be sent with the MWD at initial deployment and in quantity sufficient to last an entire deployment, or if the ration can be obtained in theater utilizing the established logistical channels, these “special diet” dogs may be deployed as Category 1, as long as the diet allows the animal to perform at a Category 1 level.

b. Quantity and Frequency of Feedings. The MWDs ideal weight range (IWR) and daily diet are set at the DODMWDVS at the time of procurement and observed throughout the training of the dog. Most MWDs at the DODMWDVS start with 2.5 cups standard diet twice daily. This diet is adjusted as appropriate throughout training to maintain the MWD in its IWR. The IWR and diet amount may be changed by the local VCO, if required. Energy requirements may be dramatically altered due to environment, different training and operational requirements, and as the dog’s metabolism changes throughout life. An estimate of a dog’s caloric requirements (kcal/day) can be calculated as shown:

Science Diet Active Formula contains 560 kcal/cup.
Basal Energy Requirement (BER) = 30 kcal/kg + 70
Maintenance Energy Requirement (MER) = BER X Stress Factor.

As an example, a 37kg GSD requires $(30 \text{ kcal/kg} \times 37 \text{ kg}) + 70 = 1,180 \text{ kcal}$ X stress factor 2.0 = 2,360 kcal/

Stress factors can be quite variable even among athletic dogs (1.8-11 X BER) and should be considered as a starting point. Most canine exercise studies relating to nutritional requirements have been performed with racing greyhounds or sled dogs, and MWDs should be considered intermediate athletes somewhere between these two extremes. Additionally, be advised of the different caloric density of the different rations. For example, when switching from Science Diet Active to Hill’s d/d[®] Potato and Duck formula, you are going from a diet with 560 kcal/cup to 368 kcal/cup, and the volume of food the handler is instructed to provide should be adjusted accordingly. Consult with the manufacturer to review relevant nutritional information for diets.

c. Body Condition and Ideal Weight Range. The IWR for MWDs is set based on a body condition score (BCS) using the Nestle-Purina BCS System. The IWR should be a 5-pound range centered at BCS 4-4.5/9. MWDs that become too thin (BCS <4) are at increased risk of skin disease (e.g. decubital ulcers), gastrointestinal disease, and may have decreased immune function and stamina. Working dogs with excessive body fat may be at higher risk of musculoskeletal injury resulting from a given level of work or exercise. In general, a valid IWR is established at DODMWDVS prior to a new MWDs first assignment, but the VCO can make adjustments when appropriate. MWD weight must be measured and recorded in the VHR at least once monthly. Observation of changes in weight and BCS can be a key signal to evaluate for illness or injury.

d. Monitoring and reporting of MWD food intake. It is important that the MWD's current diet (type and quantity per day) be noted at each semi-annual examination. Whenever an MWD presents with an illness or injury

associated with change in body weight or BCS or any changes are made in an MWD's diet, it must be recorded in the VHR. In most units the KM has authority to increase or decrease MWD diet quantity to keep a dog in IWR; the VCO should not interfere with this authority unless a clear problem exists; however, the KM must inform the VTF of any changes made so they can be recorded in the VHR. Be sure to get clear descriptions of how food is measured and make sure they measure in standard units, e.g. cups or ounces (from a measuring cup not a coffee cup, etc.), or ounces (from a scale). Do not let the kennels measure food as "scoops" or estimate weight; food must be portioned precisely and in standard units of measure.

e. Feeding Frequency and Gastric Dilatation Volvulus (GDV) prevention. The DODMWDVS mandates that MWDs be fed at least twice daily. Eating several smaller meals rather than one large meal decreases risk of GDV. This can be difficult as MWDs should also not be fed immediately before or immediately after strenuous exercise, but most MWD units can accommodate twice daily feeding. Meals need not be 12 hours apart. For example, at the Dog Center standard feeding times are at 1600 (roughly 4 hours after daily training ends) and at 2400 (4-6 hours before training begins). Once a day feeding must be avoided as this increases the risk of gastrointestinal disturbances.

3-7. Vaccination Protocols. Vaccination should be completed at the time of the Red SAPE. MWDs will be vaccinated with Core Vaccines (see below) to ensure they remain operationally ready. Additional vaccinations or altered immunization frequency may be required based on local risk, operational requirements, or to meet specific import/home station requirements. Approval of these alterations can be approved by the supporting 64F. The director of DODMWDVS will be notified of the use of non-core vaccines. **Country specific requirements supersede published MWD immunization guidelines.** It is the home station VCO's responsibility to ensure dogs are vaccinated appropriately prior to deployment. Location of vaccination is standardized and will be administered IAW guidelines published by the VMSB. Rabies immunizations will be administered in the right rear/hip area, and the distemper, adenovirus (type 2), parvovirus with or without leptospirosis combinations will be administered in the right shoulder. Leptospirosis alone will be given in the upper portion of the left front limb.

a. Core Vaccines. Core vaccines are typically considered to be those vaccines that all dogs should receive regardless of lifestyle. MWDs will receive core vaccination against rabies virus, canine distemper (CDV), canine adenovirus (CAV-2), and canine parvovirus (CPV-2) every three years, except in locations where local jurisdiction requires increased frequencies by law. The need to maintain worldwide operational readiness and for MWD units to respond rapidly to operational requirements far outweighs any other concerns regarding vaccination frequency, therefore, MWDs assigned to high OPTEMPO units may be vaccinated on an annual basis. Additionally, the lifestyle and working conditions of MWDs dictate that Leptospirosis (quadrivalent) be considered core and administered annually. The Leptospirosis vaccine may be administered more often than annually if deemed appropriate for a particular MWD or location and following consultation with the supporting 64F.

b. Non-core Vaccines. Given the lifestyle and living conditions of MWDs, these vaccines are not currently recommended or required for MWDs. In the event that a vaccine is believed to be necessary in a particular circumstance, the supporting 64F should be consulted. The director of DODMWDVS will be notified of their utilization.

(1) Parainfluenza, Coronavirus, Bordetella. These vaccines are not currently recommended or required for MWDs.

(2) Lyme Disease. Lyme disease (*Borrelia burgdorferi*) vaccines generally will not be used in MWDs without prior consultation with the supporting 64F. Preventive measures directed at prevention of tick exposure remain the cornerstone of Lyme disease prevention.

(3) Canine Influenza. Canine Influenza immunization of MWDs is not currently recommended for MWDs. Given the lifestyle and living conditions and the fact that a risk/benefit assessment does not justify immunization all make a case for currently withholding this vaccine from the MWD population. This may be subject to change if the epidemiology of this disease dictates that immunization is warranted.

(4) Other vaccinations. IAW AR 40-905, other vaccinations may be administered to prevent an epizootic. Authorization must be obtained from the Director, DODMWDVS. Request for authorization along with a justification statement should be sent through the supporting 64F to Director, DODMWDVS by email (dog.consult@us.af.mil) for review and approval.

3-8. Medication and MWD Performance. The true impact of anticonvulsant, antibiotic, steroid, and antihistamine drugs on MWD performance, particularly detection capabilities, is not fully known. A recent study demonstrated degradation in olfaction in 50% of trained explosives detection dogs after a 10-day trial of metronidazole, with affected dogs not returning to baseline detection capabilities until 10 days post cessation of the drug. Anecdotal reports, and clinical signs reported by people on these classes of medication, suggest that they may affect some MWDs' ability to perform, either through altered scent sensation or other neurologic mechanism. Be advised that not all MWDs taking these drugs will have altered performance and there is NOT a standard policy from the 341 TRS or DODMWDVS limiting duty status or certification of MWDs while on medication. VCOs should use metronidazole only when medically indicated (rather than prophylactic use), and use the lowest dose for the shortest duration necessary. With respect to ability to work, each MWD must be evaluated as an individual. If an individual dog "hits" the training aides while on medication and the KM allows, it can work. If another dog has decreased performance, the effect of the medication must be considered and the treatment should be altered or the dog's duty and certification changed; a 10-day washout period after cessation of metronidazole is recommended. The larger implication may be that dogs temporarily on these medications may experience a transient degradation in olfaction that could possibly put both the dog and Service members at risk while the MWD is on metronidazole.

a. Anticonvulsants. The most common reason to prescribe anticonvulsants to MWDs is to control idiopathic epilepsy. Appropriate medications for seizure control maintenance include but not limited to phenobarbital, zonisamide, levetiracetam (extended and non-extended release), and potassium bromide. New medications and formulation may be appropriate as developed or researched. Some human medications/formulations are inappropriate for veterinary patients, such as primidone and oral benzodiazepines. Consultation with the supporting 64F or DODMWDVS prior to initiating anticonvulsants is recommended. Although the few MWDs receiving medication for the control of seizures have seemingly retained the ability to maintain certification standards, there are no controlled studies to ascertain the potential quality or quantity of cognitive decrement. If anticonvulsants impair performance, the greatest risk to force protection is clearly in explosives detection. There is no policy from the 341 TRS which categorically states that trainers and KMs must decertify an explosives detector dog once placed on anticonvulsant medication; however, the DODMWDVS recommends that any MWD diagnosed with recurrent seizures be downgraded to at least Category 2.

b. Steroids and Antihistamines. The most common reason to prescribe steroids and antihistamines is to control signs of allergic dermatitis. Appropriate medications include oral prednisone (on a short term, tapering dose), dexamethasone, diphenhydramine, chlorpheniramine, trimeprazine, and hydroxyzine. Both anti-histamines and steroids are reported to cause degradation of olfaction in humans, but the impact on working dog performance is unclear. High doses of dexamethasone and hydrocortisone caused diminished olfactory performance in laboratory dogs after 7 days of use (without apparent clinical signs); effects of antihistamines on canine olfaction has not yet been studied. Prolonged utilization of immunosuppressive doses of systemic steroids may be justification to initiate the disposition process in certain MWDs. VCOs should consult with the supporting 64F for guidance with these cases. Inappropriate drugs for use in MWDs generally include ultra-long-acting preparations of steroids.

3-9. Medical Deployability Guidelines. MWDs are frequently deployed to austere environments with high operational tempos and limited veterinary care. Consequently, it is important that all VCOs and KMs continually evaluate and prepare MWDs in a consistent manner to meet medical readiness requirements. This ensures the MWD arrives fit for duty. It is the joint responsibility of the VCO and the KM to meet no less than quarterly to discuss medical conditions, training proficiency, and physical fitness status of each MWD. VCOs advise and support KMs and MWD unit commanders on MWD medical issues affecting readiness and fitness for duty; however, the dog-owning unit commander has final authority regarding deployment of their MWDs.

a. MWDs will be assigned a medical deployment category as defined herein by the attending VCO in consultation with the KM. This deployment categorization serves as a valuable management tool to define current medical readiness for each MWD and is intended for use by the KM, unit commanders, major commands, and Service Program Managers to apportion MWD assets based on medical readiness and fitness for duty. Only the attending VCO assigns the medical deployment category. The medical deployment category is a reflection of medical readiness only. Lack of an assigned handler, failure to certify, or other non-medical limitations will not be considered in assignment of deployment category. Frequent and open communication between the VCO and KM will ensure a medically ready MWD population. VCOs must ensure that the medical deployment categories of all MWDs are updated at least monthly, at every routine exam or sick call, or any time a medical condition develops

that warrants a change in the deployment category, and that this information is concurrently documented in the VHR and provided to the KM and MWD unit commander.

(1) Category 1 (CAT 1). Unrestricted Deployment :

- (a) Medically fit for any contingency or exercise.
- (b) Can handle extreme stresses and environments.
- (c) No limiting or compromising factors (lack of stamina, etc.).

(d) No existing or recurring medical problems that limit performance or will worsen by stress or increased demands. Note: The MWD may have chronic or minor medical problems currently undergoing treatment, but they do not limit performance nor do they require intensive monitoring. Medications or special diets are not considered limiting factors unless unavailable.

(e) Summary: This means that the MWD is healthy or has well-managed minor illness or injury that does not affect duty performance or stamina, and the current medical condition is not likely to be made worse by the stress of deployment. The MWD is certified and is maintained at a physical fitness level that will allow strenuous duty while deployed. A good rule of thumb is that if the handler can carry a 6-month supply of required medication in his cargo pocket, the MWD is probably category 1, e.g. dogs with minor or radiographic evidence of arthritis but with no lameness or pain while on NSAID and Glucosamine-Chondroitin or hypothyroid in good body condition on supplements.

(2) Category 2 (CAT 2). Restricted Deployment:

(a) Medically fit for regions/missions after consideration of known medical problems and consultation with KM.

- (b) No significant limiting or compromising factors.
- (c) Medical problems may exist which slightly limit performance but are controlled.
- (d) Reason for restriction must be reported in the Veterinary Health Record (VHR) and to the KM, MWD unit commander and program managers.

(e) Summary: This is generally considered a permanent status so a release date is not required, but a specific reason for CAT 2 status must be reported. Examples of CAT 2 dogs could include those on special diets or dogs with medical conditions requiring frequent monitoring by veterinary personnel. This category could also include dogs with mild arthritis, which improves with therapy, but is still clinically apparent and diminishes operational employment. In some cases in which the condition warranting CAT 2 status resolves, the VCO may consider returning the MWD to CAT 1 status as appropriate.

(3) Category 3 (CAT 3). Temporarily Nondeployable:

(a) Medical condition exists that precludes daily duty performance and is under diagnosis, observation, or treatment. MWD may still be allowed to work at home station, but in a limited capacity.

(b) Reason for non-deployability must be reported in the VHR and to the KM/MWD unit commander.

(c) Estimated Release Date (ERD) from CAT 3 must be reported in the VHR. ERDs will be no longer than 90 days from change to CAT 3 status. After the problem is identified and a diagnostic/therapeutic plan is implemented, the MWD will ultimately be assigned CAT 1, 2, or 4 status pending the outcome of the diagnostic/therapeutic plan. A physical examination is required on or before the ERD in order to release the dog or to extend the duration of the CAT 3 status. For cases where assigning the proper deployment category is ambiguous, consult the supporting 64F.

(d) An MWD in CAT 3 requires periodic follow-up exams, further consultation with clinical specialists and consistent reevaluation of the diagnostic and therapeutic plan for return to duty.

(e) Summary: There is no such thing as a permanent CAT 3 dog. A CAT 3 designation means the MWD cannot deploy because illness or injury significantly affects daily duty and is currently under evaluation & therapy. The MWD will eventually be upgraded to CAT 1 or 2, or downgraded to CAT 4. The MWD may still be capable of working in limited capacity at home station, but the VCO should be actively working up the medical problems so it can be moved to a permanent status. Additionally, a dog may not be considered CAT 3 due to non-medical issues, e.g. has not certified, has no handler, etc. Status will be determined solely on the dog's medical condition.

(4) Category 4 (CAT 4). Nondeployable:

(a) Unresolved medical or physical problems exist that frequently or regularly impede daily duty performance and ERD cannot be given. VCOs will obtain concurrence for CAT 4 status designation from the supporting 64F.

(b) Medical or physical conditions warrant submission to the MWD Disposition Process with subsequent replacement. CAT 4 MWDs are authorized to perform limited missions within their medical condition and training proficiency capabilities at the discretion of the KM and MWD unit commander.

(c) The reason for non-deployability must be reported in the VHR.

b. It should be noted that some determinations are and will remain subjective; thus there remains the need for prudent judgment by all individuals involved in these assessments. This is particularly true regarding the effect of age on an individual MWD. Old age is not a disease and MWDs are not downgraded solely due to age, but with increased age comes increased incidence of illness or disability. The concomitant problems that may arise with age (i.e., lack of stamina or drive, exacerbation of osteoarthritis, etc.) could warrant a change in deployability status.

c. The list of MWDs assessed as CAT 4 (nondeployable) serves as a management tool for program managers and KM in determining programmed replacements. Dogs that are in the CAT 4 status for >90 days need to have their records evaluated to determine why their disposition packet has not been processed completely. Note that temporarily nondeployable (CAT 3) MWDs must have an ERD to assist commanders and program managers in their planning, and CAT 2 MWDs must have the restrictive reason reported to assist program managers and the DODMWDVS in identifying problems among the deployable MWD population. Although criteria listed for assessment addresses medical conditions, evaluations of the MWD at work can be used to help determine a deployability category. For example a particular dog may be CAT 2 in that it is restricted from performing patrol work, but is unrestricted in detector work.

d. Medical readiness status is determined after the VCO examines the MWD. The KM determines training and proficiency status. The VCO and KM should discuss their findings and each dog's status should be forwarded through the KM to the unit commander. For example, an MWD who is medically ready (CAT 1 or 2) may not be certified and therefore is non-deployable. Updates to medical deployability status will be performed at least monthly or as changes occur in an individual dog's status. Anytime an MWD presents for "sick call" or has a SAPE, the medical deployability status must be addressed in the SOAP. Changes in the medical deployability status must also be updated in the registry section of the MWD electronic VHR. VCOs may utilize the template located in Appendix H for reporting to the KM and dog owning unit commander the monthly medical deployability status for all MWDs.

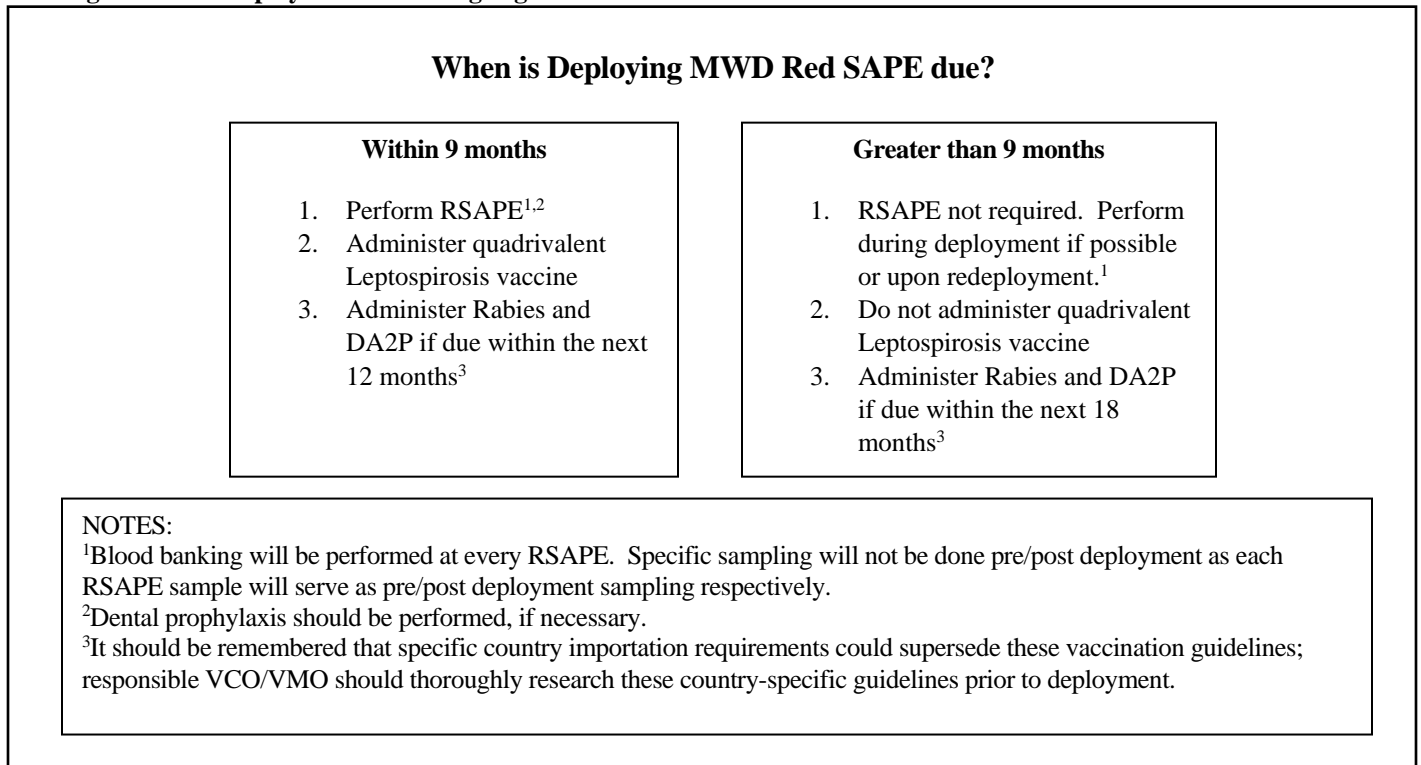
3-10. Deployment. Unlike civilian police dogs, MWDs are frequently called on to travel extensively. Current and anticipated future OPTEMPO has increased everyone's concern about deployment. We not only must maintain the dogs and their veterinary records in a condition fit for travel, but we must also be familiar with travel and disease risks in areas that are distant to our own area of responsibility.

a. Local diseases will vary, depending on the region and how well the country is developed, and administrative requirements for international travel varies country to country. Information regarding potential medical capabilities and disease threats within a foreign country may be obtained through the Operations Section of the National Center for Medical Intelligence (NCMI), DSN 343-7574, <https://www.intelink.gov/ncmi/index.php>; the theater veterinarian; or DODMWDVS. The DODMWDVS may publish definitive guidance for larger-scale or sustained deployment areas which would be distributed through command channels.

b. Deployment Category. MWDs should be in CAT 1 (or CAT 2 with consideration to theater capability) status to be eligible for deployment OCONUS or outside their home theater of operation. Final deployment authority resides with the MWD commander.

c. All MWDs must have physical examinations and evaluations prior to deployment or TDY in order to confirm fitness for duty and to issue a health certificate. The most important aspect of deployment medicine is keeping routine care and SAPEs up to date. If this is done well, there should be few surprises when MWDs arrive for pre-deployment evaluation or at their temporary duty station. See figure 3-1 for Predeployment Processing Algorithm.

Figure 3-1. Predeployment Processing Algorithm



(1) The ideal schedule is to perform a pre-deployment evaluation as soon as the KM and handler are notified of a possible deployment. This allows more time to correct problems that may have arisen (like dental cleaning) since the time of the last SAPE. If a SAPE has not been completed within the last three months, all routine medical care associated with the next scheduled SAPE should be completed at this time, to include any required vaccinations and COHAT. Dental cleaning prior to deployment is NOT an absolute requirement. Though desired, due to vagaries of deployment notification, personnel availability, etc., not all dogs will receive dental cleaning prior to deployment. Calculus in and of itself is NOT disqualifying for deployment unless the dog also has significant disease or dental/oral conditions which render the dog otherwise not deployable (CAT 3 or 4).

(2) In some cases this evaluation may occur too early for issuing the health certificate (HC). In those cases, a very brief second exam can be scheduled, just before departure, so the HC can be signed, giving maximum leeway for delays en-route. Key areas of concern for the pre-deployment examination include getting a good history of work performance and general health, updating the VHR to make sure everything is clear and legible for the receiving VCO, and checking that all vaccinations and SAPE are up to date. It is very important to research and understand importation requirements, as some countries require annual rabies vaccination and that the most recent vaccination to be at least 30 days old at time of arrival. Finally, the pre-deployment exam is also the VCO's opportunity to brief the handler on preventive medicine concerns in the anticipated AO, e.g. heat or cold injury, parasites and infectious diseases, and to issue preventative medications. A pre-departure examination must be completed within 10 days of DEPARTURE to issue a HC and make a final check for problems that may prevent deployment. However, be prepared for changes in schedules as MWD transport can take considerable time and delays in transit sometimes occur. If a HC is signed 10 days before departure, it may expire before the MWD reaches final destination. A rule of thumb is to issue the HC close to the actual departure date, but not more than 10 days before planned date of ARRIVAL at final destination.

d. Prophylactic therapy for vector-borne and parasitic diseases. Historically, the Army Veterinary Service has had a large concern with tick-borne infections and their effect on MWD health and performance. Many MWDs were lost to rickettsial infections during the Vietnam conflict and these infections continue to be a concern. Disease and vectors of most concern include: mosquitoes and heartworm disease, ticks and rickettsial disease, sand flies and

Leishmaniosis, gastrointestinal parasites, and ectoparasite-associated allergic or irritation related skin disease. The NCMI and DODMWDVS can be consulted to identify vector-borne disease risks for different areas of operation. If in doubt, err toward more cautious prophylaxis. Send enough medications with the dog team to last the duration of the anticipated deployment plus 1-2 additional months. Make sure all medications sent have an expiration date after the planned completion of the mission, and that the handler knows how to store and administer/apply each medication. The DODMWDVS recommends:

(1) Ectoparasite control

(a) Tick and Flea Control:

- Imidacloprid/permethrin/pyriproxyfen is the only approved “spot-on” formulation for MWDs at this time and should be re-applied every 30 days. The most common cause of medication failure is under-dosing. If the MWD is at the high end of the weight range for the application, the VCO should double the dose. One or more of the below supplemental treatments may also be warranted or necessary.

- Deltamethrin collar is recommended as an additional tick/leishmania preventive. The handler should be warned that the collar is a potential foreign body hazard if eaten.

- Permethrin Sprays and other insect repellants/insecticides should NOT be used on MWDs.

(b) Sand Fly (Leishmania) Control: Particularly important in Southern Europe, SW Asia, Africa, and South America. The use of a 4% Deltamethrin Collar is recommended in Leishmania endemic areas and should be maintained throughout their time in the endemic areas. Use of a collar may be discontinued for collar-intolerant MWDs after consultation with the assigned clinical consultant and the unit KM. The reason for discontinuation must be recorded in the VHR. The collar may pose a potential foreign body hazard if ingested.

(2) Endoparasite Control (heartworm and parasites). The use of a monthly heartworm preventative (ivermectin type) that also helps control GI parasites is required. It should be administered every 30 days throughout the year, regardless of climate or geographic location. MWDs with food allergies/dietary hypersensitivities should be supplied with the unflavored option. Handlers should be instructed to monitor for dogs that may spit out the preventative or vomit up to four hours post administration. It is important that the dog chew the preventative rather than swallow it whole.

(3) Prophylactic Antibiotics. The prophylactic administration of doxycycline is no longer authorized. Given concerns about antibiotic resistance, compliance, and more effective and easy to administer flea/tick preventatives, the benefits of prophylactic doxycycline administration do not merit continuation.

e. Other Medications. In addition to the prophylactic medications above, a supply of any other medication the MWD routinely receives (e.g. thyroid supplements, NSAIDs, chondroitin-glucosamine supplement, etc.) must be sent. Ensure potency-dated items have expiration dates good through the deployment period, and advise handlers as to proper storage and administration. Do not send more than a 30 day supply of any controlled drug with the handler. Have the handler notify the deployed VCO responsible for the MWD care that they will need to obtain refills to ensure the medication is available prior to running out.

f. Vaccinations. As noted above, if a Red SAPE has not been completed in the previous nine months it should be completed prior to deployment. This includes updating all appropriate vaccinations (see fig 3.1). Access to vaccines may be limited in deployment areas. MWDs' vaccinations must be current through the end of the planned deployment so they cover requirements for the return health certificate. It is the responsibility of the home station VCO to determine entry requirements of potential countries where the dog will work or transit through and ensure the dog has appropriate vaccinations to meet those requirements to avoid delays/problems with entry.

g. Handler Training. Handlers should be receiving training from the supporting VTF on a quarterly basis utilizing the Training Support Package (TSP). However, whenever possible, deploying handlers should receive refresher training on tasks considered most important for the particular handler and/or AO shortly before deployment. See paragraph 3-3c for more information.

h. MWD First Aid Kits. Historically, VCOs dispensed first aid supplies/equipment to deploying dog teams at their discretion. Efforts to standardize an MWD handler first aid kit have resulted in the adoption of a three-component MWD medical bag with a unique NSN that may be ordered by the MWD unit. The durable, expendable and potency dated components of the MWD Handler First Aid Kit are linked to the 36 tasks in the MWD Handler Veterinary Medicine Training Package. Simply stated, if an item is required to perform 1 of the 36 tasks, then it is listed in the kit contents, including specific medications that handlers are authorized to give and must be trained to administer to their MWD. The component packing list is a template for packing the three-component MWD medical bag (urban patrol chest rig, drop-leg kit and aid bag) in order of precedence for Canine-Tactical Combat

Casualty Care (cTCCC) and non-combat emergency medicine. Handlers, with VCOs, can adjust the packing template based on mission analysis and unit SOPs or TTPs. VTFs will provide resupply of expendable class VIII items consumed in treatment (medications, bandaging material, syringes/needles, etc.); however, units are responsible for replacement of durable and non-expendable items. Kit components are listed in the training manual at <https://www.milsuite.mil/book/docs/DOC-580710>. Kits are available through the logistics system, NSN: 3770-01-614-0683. All MWD handlers will be given a copy of the cTCCC card (see appendix I) to be utilized to record all combat medical care provided to the MWD at the point of injury through role II. This card will be filled out by the personnel performing the initial first aid which may be the handler or a combat medic. The cTCCC card (role I), along with the Canine Treatment and Resuscitation Record (role II/III), must be added to the MWD Trauma Registry (once development is completed) and the VHR. The completed cTCCC card and Canine Treatment and Resuscitation Record will be emailed to DODMWDVS until the MWD Trauma Registry is completed. Instructions on use and completion of these forms can be found on the JTS website, https://jts.amedd.army.mil/index.cfm/documents/forms_after_action and in the most current Clinical Practice Guidelines. See Chapter 4-1 for link to the Clinical Practice Guidelines.

i. For Deploying/Deployed Veterinary Staff.

(1) Work with theater/local aeromedical evacuation personnel to review evacuation policies for MWDs. MWDs are authorized evacuation on medical assets according to medical priority. Generally the theater 64F will facilitate Aeromedical Evacuation (AE) procedures for working dogs that may require transport to Veterinary Medical Center Europe in Germany or CONUS based veterinary facilities.

(2) It is beneficial to establish rapport with local MTFs in order to benefit from all the assets they can provide to include:

(a) Imaging, to include teleradiology capabilities, and advanced imaging such as CT, MR and ultrasound.

(b) Pharmacy services

(c) Central Material and Sterilization

(d) Medical maintenance

(e) Logistics (supply items)

(f) Surgical assistance

(g) Endoscopic assistance

(h) Dental assistance

(3) Reach back consultation. Utilize Advanced Virtual Support for Operational Forces (ADVISOR) by calling 1-833-238-7756 or DSN 312-429-9089 and select option 5 for Veterinary Consults. This will ensure your call is directed to the appropriate veterinary personnel. In the event that ADVISOR is not working you can contact the following:

Veterinary Medical Center Europe:

DSN: 314-493-4529/4444/4475 (during duty hours)

68T on call: +49(0)162-297-1228

VCO on call: +49(0)162-297-1231

DSN Operator to connect to commercial number: 314-480-1110

DODMWDVS, Holland Memorial MWD Hospital, JBSA-Lackland:

Comm: (+1) 210-671-3992/3; DSN: 312-473-3992/3993

VCO on call: Commercial (+1) 210-421-3879

dog.consult@us.af.mil

3-11. Exercise and the Obstacle Course. MWD activity levels will vary greatly depending on duty status and location. At home station, many MWDs spend most of their time in the kennel or in a patrol car. When deployed, many MWDs experience a rapid increase in activity. More of their time is spent patrolling on foot and doing frequent vehicle and structure searches. In order to maintain a fitness level that will accommodate this rapid change in duty requirements, MWDs need a physical training program just like other Service members. Physical conditioning should be integrated into daily training and duty, and guidelines for conditioning programs are discussed in Chapter 9. Although MWDs have sufficient drive that they may perform extended work without prior conditioning, maximum performance and minimal injury risk can only be achieved through conditioning the dog to a performance standard. VCOs should work with the

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KMs and canine training NCOs to identify work requirements expected during deployments and installation support.

a. Although usually considered an integral part of conditioning and training in most dogs, exercise on the obstacle course may exacerbate joint problems in some older dogs and therefore may need to be limited or omitted.

b. The responsible VCO has the authority to limit the MWD's activities on the obstacle course (such as "no A-frame"), yet still allow the dog to perform all other aspects of its mission. Contact the DODMWDVS if further guidance is required.

c. Training of MWD handlers is very important. In addition to appropriate information on diseases present in the region, such things as hot and cold weather injuries, exercise induced injuries, and administration of preventative medications should be discussed. For cold weather, tell the handler to ensure the dogs have plenty of water to drink when working outside, keep them dry, and get them into some type of protection (house, kennel, and building) if the weather becomes bad or if they are required to remain inactive for prolonged periods. For hot weather, they should ensure there is plenty of water to drink, provide shade, and ensure that they follow work/rest cycles. Some dogs may develop mild to moderate muscle and joint pain soon after arriving at busy overseas duty sites. The most likely reason is increased exertion while searching or patrolling. Remind the handler that the use of portable platforms, or ramps (vs. jumping in and out) will reduce MWD fatigue and injury when searching cargo trucks and other items/locations otherwise requiring the dog to jump up/down. Also remind them not to administer human medications to their MWD without talking to the responsible VCO for the deployment area.

3-12. Working Bite Quarantine.

a. If a skin puncture occurs due to an MWD bite, the person bitten should be referred to the local MTF for treatment. It is expected that the dog's rabies vaccination will be current. The dog should be examined as soon as possible after the bite and placed on a "working bite quarantine." During which the dog may be employed in the normal manner but is under close observation by the handler for any abnormal behavior or signs of illness. If practical, the MWD should not come in direct physical contact with other dogs during the quarantine period. The dog is then reexamined at the end of 10 days and released from the quarantine. In deployed settings where veterinary care teams are not co-located with the MWD, telephonic communication with the KM in addition to medical record documentation fulfills this requirement.

b. The MWD's record will be annotated regarding the bite incident, circumstances of the bite event, and examination findings (SF600/eNote and reflect on MPL). The bite should also be annotated in local bite report log after receiving the DD 2341, Report of Animal Bite, from local MTF emergency room personnel.

3-13. CBRN Considerations with MWDs. MWD Handler Medical Care Task #28, Perform Nuclear, Biological and Chemical Decontamination of a Military Working Dog specifies treatment steps necessary to decontaminate an MWD potentially exposed to nuclear, biological, and/or chemical agents. Also refer to the appropriate Army Techniques Publications regarding CBRN.

3-14. MWD Case Consultation with DODMWDVS. Case consultation for MWDs should always start with the local supporting 64F. However, if they are not available or none are assigned, consult with the DODMWDVS specialists. The clinical specialists provide a valuable resource when assistance is needed in the workup, management, or disposition of an MWD. The DODMWDVS has clinical specialists in surgery, internal medicine, emergency and critical care, radiology, sports medicine/rehabilitation, and animal behavior.

a. Consult requests may be made by telephone (DODMWDVS: 210-671-3992/3; DSN 312-473-3992/3) or e-mail. E-mail is the preferred route using dog.consult@us.af.mil. Please do not directly email one of the DODMWDVS 64Fs directly unless directed to do so as this may delay the response. Ensure MWD name and tattoo are included in subject line for each correspondence about the dog. If the consult is of an urgent nature please type URGENT in the subject line and follow up with a phone call. When consulting, the VCO must give: animal identification (name and tattoo number), signalment, chief complaint, appropriate medical/surgical and dietary history, synopsis of workup and results to date, and the specific questions. This information should be provided on the DODMWDVS referral form, DA Form 7593. Pertinent e-notes/SF 600s, test results/reports, images or other forms/documents will accompany the DA Form 7593. Use of AMRDEC SAFE should be used when large files need to be transferred. AMRDEC SAFE is a web based file transfer system available to all DOD email users, and can be found at the following web link: <https://safe.amrdec.army.mil/SAFE/>. See Appendix E for instructions for utilizing

AMRDEC SAFE. Always send the DA Form 7593 via email even if submitting other documentation through AMRDEC or mail to ensure the proper department receives the consult.

- b. Consultation is required prior to:
 - (1) Non-emergent euthanasia of all MWDs
 - (2) Non-emergent cases being referred to civilian facilities
 - (3) Referral of MWDs to DODMWDVS (see below)
- c. For radiology consultation and teleradiology consults see chapter 6-14.

3-15. MWD Referral to DODMWDVS.

a. Pre-Shipment Consultation. Telephone and/or e-mail consultation and approval of a DODMWDVS clinician is required prior to referral of an MWD (Medical TDY). A unique email address has been created for consultations and referrals: dog.consult@us.af.mil. The DODMWDVS may be able to assist the VCO in making a disposition/diagnosis without having to transport the dog. When an MWD is sent to JBSA-Lackland, the Veterinary Health Record and pertinent images (hard copy or electronic) must accompany the dog.

b. Completion of a DA Form 7593. A referral form summarizing the dog's problem for referral and including name of approving DODMWDVS Clinician (that is, the DODMWDVS clinician the referring VCO discussed the case with), local POCs with current DSN and civilian phone and FAX numbers must accompany the record. This form should be placed on the top of the MPL in the VHR.

c. When an MWD is referred to the DODMWDVS for medical evaluation or treatment, transportation arrangements are made by the owning unit for MWD travel at the owning unit's expense. The unit will contact their installation Transportation and Movement Office (TMO) and request arrangements be made to ship the MWD to the 341 TRS, JBSA-Lackland. When transportation is arranged, the itinerary is to be provided to the 341TRS at e-mail: mwd.transportation@us.af.mil; however, call the 341TRS MWD Shipping Manager at DSN 473-7166/3125 or Commercial (210) 671-7166/3125 first. All MWDs sent for referral are considered to be TDY and return. The owning unit is required to provide a transportation fund cite to the 341 TRS so return transport can be arranged.

d. Updates. Referring VCOs will be kept updated by DODMWDVS staff regarding status of their MWDs. However, it is not DODMWDVS responsibility to provide status updates to the MWD's KM/handler. Referring VCOs must ensure the MWD's KM and handler are kept updated of their dog's condition as well as expected return date, etc.

3-16. MWD Referral for Civilian Care. If the local VTF is unable to provide the needed emergency veterinary services, then a local civilian veterinary facility may be utilized IAW AR 40-3 and AR 40-1 and as described in MEDCOM Policy 17-062, Delivery of Veterinary Medical Care for GOAs 21 Dec 2017. This will be at no cost to the owning unit only with prior approval and coordination with the supporting PHA Command, or the owning unit risks responsibility for all civilian veterinary facility charges. Please refer to local SOP establishing policy for emergent and non-emergent civilian care. In general, the steps for approval and utilization of civilian care is as follows:

- a. Attending VCO communicates the MWD's relevant medical history and current condition to the supporting 64F.
- b. In the event that the 64F is unavailable or they determine that a higher echelon of care is required, the Director, DODMWDVS is contacted to discuss referral. If the DODMWDVS is unavailable to accept the referral or determines that care at a local civilian specialty hospital will be more beneficial, the 64F will refer the MWD.
- c. The attending VCO obtains a written estimate for care from the civilian facility and forwards that, along with the 64F's recommendation to the PHA approval authority. The VCO briefs both the PHA commander and the owning unit commander on the MWD's medical history, treatment, prognosis, and referral within two hours.
- d. If extended hospitalization for recovery is required, the MWD should be transferred to the responsible VTF as soon as appropriate for continued care by military personnel, dependent on capability and staffing. Care for hospitalized patients is a critical skill for all military veterinary personnel that should be exercised at every opportunity.
- e. While hospitalized under civilian care, the attending VCO will update the 64F on the MWD's condition daily to facilitate determination of appropriate care transfer or discharge.
- f. Once the MWD is discharged, the VCO will complete the online Civilian Care of DOD Animals survey at: <https://tiny.army.mil/r/1T2WJ/MWD CIVCARE>.

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- g. The VCO will ensure all documentation from the civilian facility are imported into the MWD's electronic VHR.
- h. An EXSUM will be completed for all admissions of MWDs to civilian facilities.
- i. The VCO will work closely with their command to ensure the invoice is promptly paid utilizing appropriated funds.

3-17. Euthanasia or Death of MWDs. Since the passage of Public Law 106-446 in 2000 (also known as "Robby's Law"), Congress now has the authority to request documentation and justification for all dogs not considered for adoption and reasons for euthanasia.

a. Emergent euthanasia. When an MWD is experiencing undue suffering, or in an emergency situation from which recovery is not expected, any veterinarian is authorized to euthanize the dog in the most humane manner possible in accordance with the most current AVMA Guidelines for the Euthanasia of Animals. Following an emergency euthanasia, a letter of explanation/EXSUM and copy of the death certificate (DD Form 1743) must be sent to the Provost Marshal, Chief of Security Forces, or appropriate authority. In the event of an unexpected or emergent MWD death or euthanasia, the veterinary unit commander and the supporting 64F will also need to be informed immediately. The DODMWDVS Director (dog.consult@us.af.mil) must be notified by the supporting 64F and the MWD electronic VHR updated by the attending VCO or VMO within 24 hours. The death certificate should clearly read, "Emergent euthanasia due to (state condition/situation)". A complete necropsy will be performed on all MWDs IAW AR40-905 and TB MED 283 with tissue specimens sent to the Joint Pathology Center.

b. Non-emergent euthanasia. Usually performed on CAT 4 dogs with significant non-lethal medical conditions (e.g. debilitating arthritis) or those that have a poor prognosis (e.g. metastatic neoplasia). Such euthanasia might also be performed on very aggressive dogs or those with other behavioral issues which render them unadoptable as determined by the unit commander. If the VCO in consultation with supporting 64F or DODMWDVS consultant decides that the dog is not medically eligible for adoption due to conditions as mentioned above, authorization for euthanasia is granted and may proceed after notification/coordination with the dog-owning unit. If however, the dog is not thought to be behaviorally eligible for adoption, a consultation with the DODMWDVS Behaviorist is indicated to complete the disposition process. A letter (MFR format) requesting/consenting euthanasia must be obtained from the owning unit commander and imported into the VHR. If after consultation the dog is deemed behaviorally ineligible, euthanasia can proceed. A complete necropsy will be performed on all MWDs IAW AR40-905 and TB MED 283 and tissue specimens sent to the Joint Pathology Center.

(1) It is imperative that all disposition and adoption documents be completed and filed in the VHR. This documentation includes copies of the following:

- (a) Disposition authorization letter declaring dog "excess" to the needs of the DOD.
- (b) Copy of the "Adoption Suitability Checklist" completed by the VCO and KM with the commander's signature.
- (c) Copy of the Regional Clinical Specialist Consultation Letter.
- (d) Copy of the Behavioral Testing Video consultation form.
- (e) Copy of the authorization letter from the MWD chain of command.

(2) If euthanasia and necropsy are to be performed locally, the dog must be euthanized with an approved euthanasia solution at the prescribed dosage. Premedication with a sedative prior to euthanasia is recommended.

c. DD Form 1743. The Death Certificate of a Military Dog (DD Form 1743) must contain a brief statement explaining the reason for euthanasia and whether the death resulted from fault or neglect. "Euthanasia" alone is not an acceptable reason for death on the DD Form 1743. Summarize the medical or behavioral conditions leading to euthanasia or removal from service and statement why dog was not adopted.

- (1) An example summary would be similar to the following:
 - (a) "Dog not fit for duty due to severe stifle arthritis and unmanageable pain, not an adoption candidate due to aggression."
 - (b) "Dog unfit for duty due to severe lumbosacral stenosis disease with neurological deficits, not considered for adoption due to medical condition."
 - (c) "Dog unfit for duty due to severe aggression, not considered for adoption due to aggressive behavior/temperament."
 - (d) "Dog found dead in kennel. Necropsy showed hemoabdomen secondary to ruptured splenic mass."

(e) "Euthanasia performed at time of surgery due to extensive intestinal necrosis secondary to mesenteric volvulus."

(2) Provide the original DD Form 1743 to the KM, retain a copy in the dog's medical record, and email a copy to the DODMWDVS with an EXSUM (dog.consult@us.af.mil).

d. Without awaiting necropsy histopathology results from the Joint Pathology Center (JPC), the following items are then forwarded to the DOD MWD VS Record Repository, DODMWDVS, 341TRS/SGV, 1219 Knight Street, Bldg 7602, JBSA-Lackland, TX 78236:

(1) Completed Veterinary Health Record (hard copy mailed and ROVR record electronically transferred).
Ensure all forms are filed in the proper sections, chronologically, with newest on top as outlined in Appendix B.

(2) Copy of the DD Form 1626, Gross Necropsy Report

(3) Copy of the DD Form 1743, Death Certificate

(4) Complete radiographic file clearly stating that dog is deceased

CHAPTER 4

EMERGENCY MEDICINE

4-1. Overview of Emergent and Critical Care. This section outlines treatment of common emergency situations that occur in MWDs.

a. The *Military Working Dog Clinical Practice Guidelines* (CPGs) provide quick reference for veterinary personnel regarding emergency and critical care management of MWDs. The CPGs were developed under the auspices of the Joint Trauma System to provide human healthcare providers (HCPs) specific and detailed medical and surgical management guidelines for deployed MWDs in austere situations, when veterinary personnel may not be available.

b. The CPGs are comprehensive, detailed, and directed towards human medical personnel, but also provide the essentials for emergent and critical care management for MWDs by veterinary personnel. Extensive use is made of treatment algorithms, charts, and photographs. Rather than repeat the CPGs here, veterinary personnel are directed to the JTS website for access. This serves two purposes. Firstly, it consolidates all guidance by veterinary personnel in a standard document used globally. Secondly, because veterinary personnel are required to provide training to HCPs on these CPGs, it enforces use of the definitive source document by veterinary personnel, which will additionally serve to reinforce familiarity with these guidelines.

c. The MWD CPGs are also open-source, and can be found at the Joint Trauma System website, at https://jts.amedd.army.mil/index.cfm/PI_CPGs/cpgs.

d. The MWD CPGs will be updated annually, with revisions released around January of each year. The CPGs are authored by military board-certified emergency and critical care specialists, and thus offer the most definitive source for MWD care in emergency and critical care medicine. The CPGs are extensively referenced with the most current information available for each topic. Veterinary personnel should have immediate access to the CPGs in the workplace.

e. The CPGs are best-practice clinical guidelines and do not serve to direct exact actions to be applied for every situation. Veterinary personnel should use sound clinical judgement when addressing each patient and modify management based on unique situations.

f. In addition to the select topics that will be addressed in this handbook, appendices are provided in the CPGs that discuss diagnostic imaging guidelines and protocols, and management of long bone fractures, wounds, traumatic brain and spinal cord injury, and canine post-traumatic stress disorder. Additional information is provided for management of blast, burn, and crush injuries, snake and scorpion envenomation, ocular injuries, and toxicoses.

4-2. Emergency Preparedness is Critical for Success.

a. Emergency care for MWDs is a mission priority. A rapid, appropriate response is essential to afford the MWD the best opportunity for return to duty. A VCO or 68T should be available at all times for handlers to contact for MWD emergencies.

b. Equipment and drugs to treat emergent ill or injured MWDs must be available at all duty sites where a VCO or technician is permanently assigned. Refer to the Veterinary Medical Standardization Board (VMSB), Formulary Section, Emergency Crash Cart Drugs for a list of emergency drugs that must be available in each VTF.

c. An organized method to store emergency drugs, equipment, and supplies is essential to facilitate response in an emergency. Emergency drug dosage and CPR charts should be readily available in high risk areas (e.g. surgery room/prep area). Conduct monthly inventory of emergency drugs and supplies. It is emphasized that emergency supplies are placed in an accessible location and are logically organized.

d. Emergency procedures and actions for common emergency situations must be in place and rehearsed. All veterinary personnel and MWD handlers must conduct periodic emergency training using likely scenarios. Animal Care Specialists (68T) assigned to duty sites that support MWDs but without direct supervision of an attending VCO should receive additional training that covers common emergency situations to ensure appropriate response and treatment are provided to the MWDs.

e. Standard Operating Procedures outlining MWD emergency procedures and how to obtain civilian veterinary care must be in place and be current.

f. In some circumstances, emergent or critical care measures may not be possible or may not be appropriate. Euthanasia should be considered in these situations, but only after careful assessment by the attending VCO in collaboration with the MWD handler, KM, and dog-owning unit commander. Follow procedures outlined in section 3-17.

4-3. Cardiopulmonary Resuscitation (CPR) Guidelines (*See MWD CPGs Chapter 5*).

a. Consider CPR of MWDs in cases of non-traumatic cardiopulmonary arrest (CPA) such as anesthesia-related, hypothermia, near drowning, and electrocution. If resources permit, consider CPR in MWDs with CPA due to blast injury, blunt trauma, or penetrating trauma, although successful resuscitation in these cases is unlikely. Overall, survival with acceptable function is about 5% for dogs.

b. A recent veterinary evidence-based review of CPR, The RECOVER Initiative, updates clinical recommendations and guides canine CPR. Initiate 2-person, closed-chest CPR if a dog is noted unresponsive or with apneic breathing. Immediately begin sustained, forceful chest compressions with the MWD in lateral recumbency at a rate of 100 compressions per minute. Sustain compressions for at least 2-3 minutes per cycle. Hand placement should be over the widest part of the chest for most MWDs (>15kg). Consider hand placement over the heart for small dogs (<15kg). Ensure adequate relief of downward pressure during the relaxation phase of the compressions to allow for complete chest recoil. As for humans, “PUSH HARD and PUSH FAST.” Establish an airway as rapidly as possible and as soon as possible; however, start chest compressions first. Intubate the MWD or perform an emergent tracheostomy. Ventilate the patient at a rate of 8-10 breaths per minute. Avoid hyperventilation. Oxygen is preferred when ventilating MWDs during CPR, but room air is acceptable if oxygen is not available.

c. Initiate advanced life support as soon as feasible, with ECG monitoring to guide actions. In the dog, sinus bradycardia often progresses to pathologic arrhythmias, and atropine is indicated if noted. The most common arrest rhythms in dogs are pulseless electrical activity (PEA) and ventricular asystole. Atropine or low-dose epinephrine are best choices for these rhythms or for empiric use if ECG capability is not available; vasopressin may be used instead of low-dose epinephrine. In most settings, there is no role for transthoracic pacing in MWDs with PEA or asystole. Ventricular fibrillation often develops during resuscitation, or may be the primary rhythm in some arrests. Perform external defibrillation if possible and as rapidly as possible if VF is noted; biphasic defibrillation is ideal. Apply paddles to either side of the chest at the level of the heart with the MWD in dorsal recumbency, or place a flat paddle under the MWD lying in lateral recumbency and a standard paddle on the upper chest wall. Defibrillate up to 3 times, performing aggressive chest compressions for at least 2 minutes between each subsequent defibrillation. Staff should be properly trained in the use of the defibrillator to ensure its safe and proper use. After each defibrillation attempt, wait 2-3 minutes (1 cycle) before reassessing the ECG. IV access is critical; place multiple peripheral or IO catheters or perform venous cut-downs. Follow all drugs with at least a 20 mL sterile saline push. Place a central venous catheter when feasible. Do not give large volumes of fluids to MWDs during CPR, unless severe hypovolemia is thought to be present; only give fluids during CPR to facilitate drug delivery.

d. Resuscitated dogs will require intensive care. Many dogs arrest again, and most do so in the first 4 hours after resuscitation. Successful resuscitation in subsequent arrests becomes less likely. Key management issues for MWDs in the post-resuscitation phase are summarized in the CPGs. Some unique aspects of care in dogs are detailed. There is a limited role for open-chest CPR in most situations, however, it may be necessary in cases of pleural space disease or thoracic trauma. In the absence of specialty care/consultation, euthanasia should be considered.

4-4. Gastric Dilatation-Volvulus (GDV) Syndrome (*See MWD CPGs Chapter 8*).

a. GDV, commonly called “bloat” by handlers, is a multifactorial, rapidly progressive, life-threatening surgical emergency, common in large breed dogs. The mechanism of action is poorly understood but under certain circumstances, the stomach will rapidly dilate with ingested air, food, and water. This dilatation predisposes to development of a volvulus, with the stomach ‘flipping’ on its long axis. Fermentation of food, retention of gastric secretions, and influx of fluid exacerbates the dilatation. Given the volvulus, there is no way to empty the stomach. The dilatation is dramatic and rapid, often progressing to life-threatening shock in less than 4 hours. Death in the short-term period is due to shock; the dilated stomach prevents venous return from the abdomen and hind limbs,

ultimately leading to decreased cardiac output. Death in the long-term period is due to the myriad of complications in this extreme form of ischemic shock.

b. GDV was a major cause of death in MWDs for decades; however, GDV is a rare occurrence in DOD MWDs now, since performance of a prophylactic gastropexy was instituted in 2009 for all new DOD MWDs. In this procedure, a permanent surgical adhesion between the stomach and inner peritoneal wall is created during an elective procedure that prevents volvulus and has dramatically reduced the incidence of GDV and gastric dilatation in the MWD population. However, veterinary personnel may still encounter emergently ill working dogs with GDV, because most Special Operations Forces, contractor and allied working dogs have not been prophylactically gastropexied. Although rare, failure of the surgical adhesion site after a gastropexy has been reported.

c. GDV is a surgical emergency and can be diagnosed based on a right lateral radiograph. Intervention is required, ideally within 4 hours of presentation, to correct the volvulus, assess gastric and splenic viability, and perform a gastropexy. In some cases, a partial gastrectomy or splenectomy may be necessary. Provide initial resuscitation and stabilization, and then prepare the dog for definitive surgical management. See section 7-6.

d. Initial management of a dog presenting with GDV centers on gaining intravenous catheter access to initiate immediate shock therapy, followed rapidly by gastric decompression, with intensive monitoring for and management of potential complications. The most rapid and effective method of gastric decompression for GDV is trocarization of the tympanic stomach using a large-bore over-the-needle catheter. Briefly, after the insertion point is identified and prepared for aseptic procedure, a 14-gauge decompression device (commonly used for needle thoracocentesis) is forcefully inserted through the skin and body wall and advanced firmly into the stomach lumen to relieve gas pressure. Decompression may need to be repeated if tympany recurs while the dog is prepared for evacuation or surgery.

e. Multiple complications can occur during GDV to include shock, cardiac arrhythmias, coagulopathy, electrolyte and acid-base disturbances, gastroparesis, gastric necrosis, gastric rupture, peritonitis, hypoproteinemia and hypoalbuminemia, and recurrent dilatation with or without volvulus. Thus, intensive monitoring is necessary.

4-5. Mesenteric Volvulus (See MWD CPGs Chapter 8).

a. Mesenteric or intestinal volvulus is a rare, often fatal condition that appears to be over-represented in MWDs. Several breeds are affected and the condition has been reported in all dog breeds currently employed by the DOD. German Shepherds appear over-represented in veterinary literature and a recent study examining risk factors in MWDs also found that German Shepherds have a higher risk for developing this condition. While the underlying cause is unknown, an increased risk of volvulus has been associated with concurrent GI disease including parvoviral enteritis, intussusception, exocrine pancreatic insufficiency, intestinal neoplasia, parasites and GDV. Dogs of virtually any age can be affected. Rapid presentation by the handler, diagnostics, stabilization and early surgical intervention are all related to survival. Dogs with mesenteric volvulus will decompensate within a matter of minutes, therefore emergent surgical intervention may be necessary (prior to full patient stabilization).

b. Clinical signs can vary from mild to severe depending on duration of the condition. Common signs are similar to many other acute abdomen cases, and include lethargy or collapse, persistent restlessness, abdominal pain, abdominal distension, tachycardia, hemoconcentration, severe hematochezia, and shock (tachycardia, hypotension, pale or injected mucous membranes, prolonged CRT). However, some of the recent MWD cases have presented with mild, nonspecific signs and were only diagnosed after radiographs and exploratory surgery. Body temperature can be variable with both hypo- and hyperthermia reported. Some patients are found dead. Differential diagnoses include any causes of acute abdomen, to include GDV, pancreatitis, acute hemorrhagic diarrhea syndrome (formerly HGE), GI foreign body, septic peritonitis, bile peritonitis, trauma, splenic torsion, urinary obstruction, and neoplasia.

c. The diagnostic workup for these cases includes blood biochemistry panel with electrolytes, complete blood count, lactate if available, fecal exam, abdominal radiographs, and an AFAST exam. While some animals have vague signs, the following signs are indicators for radiographs in all acute cases: severe or persistent abdominal pain or rigidity, abdominal distension, any indication of shock, hypothermia, hematochezia, and unexplained or refractory tachycardia with any abdominal discomfort.

d. Initial treatment is aimed at correcting shock. Upon diagnosis or suspicion of a surgical abdomen, anesthesia is initiated using the VMSB Compromised Patient protocol. Abdominal exploratory with resection of devitalized tissue and anastomosis is the definitive treatment. The necrosis can extend from distal to the left limb of the pancreas through much of the colon, but can also be less severe (i.e. segmental). The volvulus must first be derotated in order to fully assess the extent of the resection. This is a point where many toxic cytokines are released,

causing the dog to become more hemodynamically unstable. Be prepared to address significant hypotension and cardiac arrhythmias following derotation. Pre-emptively, a lidocaine bolus of 2 mg/kg IV, followed by 50 mcg/kg/min, should be implemented prior to derotation to mediate reperfusion injury.

e. Post-operative care is very laborious, and referral may be the best course of action. Maintain perfusion with appropriate fluid therapy, with balanced isotonic crystalloids as first choice. Often patients are severely hypoalbuminemic and nutritional support should be implemented as soon as possible. If plasma or albumin transfusion is necessary the supporting 64F should be consulted prior to transfusion. Patients may also become coagulopathic, monitor coagulation and platelet count and administer plasma or whole blood as needed. Monitor for ventricular arrhythmias, and treat if hemodynamic instability is present (heart rate >180, hypotension, pulse deficits, syncope). Pain management is critical. Gut protection is beneficial.

4-6. Heat Related Injuries (See MWD CPGs Chapter 9).

a. Heat injury is the leading non-trauma cause of death in deployed MWDs. Well-acclimated dogs working in hot, humid environments routinely have core body temperatures of $105^{\circ} \pm 1^{\circ}$ F. However, with cessation of work and access to shade and water, dogs that do not develop heat injury rapidly cool to normal body temperature (101-103⁰ F). Since dogs do not sweat significantly, panting is the most critical method for cooling, to expose the highly vascular tongue for evaporative cooling. There is no cut-off temperature that denotes heat injury; temperatures as low as 106⁰ F have been associated with pathology. However, dogs with moderate to severe heat injury usually have sustained rectal temperatures of 107⁰ F or higher. The ability to compensate is more readily overwhelmed if the ambient air is humid. Most dogs develop heat injury due to heavy exertion in hot, humid environments, especially if inadequately acclimated. Rarely, dogs are treated for heat injury secondary to partial airway obstruction or inadvertent enclosure in vehicles.

b. Heat injury in dogs is described as mild (“heat stress”), moderate (“heat exhaustion”), and severe (“heat stroke”). MWD handlers are trained to recognize and treat heat injury in the field; thus, dogs may be hypothermic on arrival if treated before presentation. Dogs with moderate to severe heat injury frequently develop multi-organ complications and have a high case fatality rate.

c. If poorly managed or untreated, heat injury is a progressive process. Distinguishing between *controlled* versus *uncontrolled* panting is a reliable means of crudely assessing severity of heat injury. *Controlled panting* means the dog retains some voluntary control over its breathing and will temporarily stop panting if exposed to a noxious stimulus (such as an alcohol-soaked cotton ball). A dog with *uncontrolled panting* will not stop breathing even in the face of noxious stimuli, because inherent survival mechanisms drive panting continuously.

d. The progression of heat injury in dogs is well-described. Dogs with mild heat injury have increased thirst, are reluctant to work, seem uncomfortable, seek shade, and have controlled panting. Dogs with moderate heat injury demonstrate the signs of mild injury, but also become weak and more distressed, and have uncontrolled panting; some may present with petechiae or ecchymosis (best noted on the ear pinna, mucous membranes of the mouth, and skin over the abdomen), and vomiting or diarrhea. Dogs with severe heat injury show all of the signs of moderate heat injury, but classically demonstrate some degree of central nervous system (CNS) involvement, collapse, and shock. The most common CNS signs are ataxia, blindness, seizures, and stupor or coma. Dehydration frequently accompanies heat injury, and many dogs will require volume resuscitation with IV crystalloids.

e. The fundamental treatment for any dog with signs consistent with moderate to severe heat injury is to cool the dog as rapidly as possible – without causing other problems – until the rectal temperature is 105⁰ F or lower. The best ways to emergently cool MWDs are to soak the dog to the skin with room temperature water (and continue soaking the dog until the temperature decreases), giving room temperature IV fluids, and directing fans on the dog. Do not use cold or iced IV fluids, ice water immersion, ice water enemas, peritoneal lavage, or surface cooling with ice packs or alcohol, as these methods cause peripheral vasoconstriction and shivering that actually may increase core temperature, and dogs appear very prone to rebound hypothermia that can be extremely difficult to correct. Reduce the rate of cooling when the rectal temperature reaches 105⁰ F; cease cooling efforts and dry the dog when the temperature reaches 103⁰ F to prevent rebound hypothermia. Be prepared to provide passive warming if the rectal temperature is less than 100⁰ F.

f. Monitor and manage common complications of heat injury, to include hypotension, glucose and electrolyte abnormalities, coagulopathy and thrombocytopenia, cardiac arrhythmias, and gastroenteritis.

4-7. Hemorrhagic Shock (*See MWD CPGs Chapter 6*).

a. The majority of MWDs managed for shock have trauma-induced hemorrhagic shock; some are managed for heat injury or severe dehydration. Treatment by handlers and combat medics may have been performed, with varying degrees of success; expect dogs to arrive with pressure dressings, hemostatic gauze packed into wounds, and improvised tourniquets. Expect inadequately controlled bleeding, and suspect “hidden” hemorrhage in the chest and abdomen. When managing severe limb injuries and traumatic amputations, note that dogs have excellent collateral circulation, and major vessels can be ligated without long term adverse consequences. Use TFAST and AFAST to rapidly screen for intracavitary hemorrhage; assume any intracavitary fluid in a traumatized dog is due to bleeding until proven otherwise.

b. Shock management in dogs is similar to that in people. Provide immediate fluid therapy targeted to specific endpoints, provide supplemental oxygen, and identify and treat the underlying cause. Use multiple large-bore IV or intraosseous (IO) catheters or venous cut-downs. Intraosseous catheters are reliably placed on the lateral proximal humerus or the medial proximal tibia. Crystalloid fluid challenges, as needed based on response to therapy, are better than large volume fluid administration. For simplicity, use the “10-20-10-20 Rule”. For example, a 40 kg MWD might need 3.6 L of fluids in the first hour to treat shock, but should be given “quarter-shock” volumes of 900 mL every 10-20 minutes during initial resuscitation, based on response. In most cases, MWDs in shock can be successfully stabilized with 2-3 bolus challenges.

c. Synthetic colloids and hypertonic saline can be used in dogs with refractory shock. While very limited data suggest increased risks, dogs do not seem to develop the many complications seen in people, so colloid use in dogs with refractory shock is warranted – the benefits are deemed to outweigh the risks in these cases. Hydroxyethyl starch (hetastarch, vetstarch, voluven, etc.) can be used as a bolus at 5 ml/kg IV, repeated as needed based on resuscitation endpoints up to 20 ml/kg/day. Hypertonic saline (HTS) can be used as a small volume resuscitation bolus, using 7.0-7.5% HTS at 4-6 ml/kg/bolus. No more than two HTS boluses should be given to correct intravascular volume deficits. Synthetic colloids and HTS should be used in conjunction with crystalloid fluid therapy. Do not use human serum albumin in dogs; although some reports suggest benefit in a very specific subset of canine patients with severe hypoalbuminemia, immediate and delayed life-threatening complications are reported, and the risks outweigh the benefits in the management of shock.

d. Canine blood products should be considered in cases of severe blood loss or hemolytic anemia. Prior planning and consultation is required to either have these products available when needed, or to develop a donor program locally. In most instances, plasma, packed red cell units, and whole blood cannot be ordered and delivered in time for true emergencies, and ‘walking blood donor’ programs are not available in a timely manner for emergent use. So, if deemed indicated, prior purchase and storage of blood components may be authorized. In most instances, however, veterinary personnel will have to manage hemorrhagic shock with crystalloid and colloid therapy.

e. There is limited, but promising, data to guide use of tranexamic acid (TXA) and epsilon aminocaproic acid (EACA) in dogs with severe hemorrhage or suspected acute traumatic coagulopathy. Doses and guidelines for use of TXA and EACA in dogs with refractory hemorrhagic shock, limb amputation, penetrating torso trauma, and ongoing severe bleeding are provided in the CPGs, but discussion with clinical specialists is critical before use.

4-8. Upper Airway Obstruction (*See MWD CPGs Chapter 3*).

a. While upper airway obstruction is an uncommon problem in MWDs, immediate action is required. The most common causes of obstruction are laryngeal paralysis, lodging of ‘rewards’ used by the handler (balls, Kongs™), and facial trauma.

b. Typically, dogs with upper airway obstruction present with severe respiratory distress with labored inspiration and abnormal upper airway noise (e.g., stertor, stridor). Dogs may be conscious but extremely agitated due to air hunger; thus, extreme care is necessary. Provide immediate oxygen therapy; however, because of the danger of working with an agitated dog, face mask or ‘blow by’ oxygen supplementation, in which the end of the oxygen tubing from the source is held as close to the face as possible at high oxygen flow rates, may be all that is possible. These methods are not ideal, but do provide inspired oxygen concentrations from 40-70% until the airway is secured.

c. Rapid sedation or general anesthesia is likely necessary for definitive management. If the obstruction can be removed, oral intubation is ideal. If the obstruction cannot be removed, emergent tracheostomy is indicated.

- d. Perform emergent tracheostomy if safe, rapid airway access cannot be obtained by orotracheal intubation.

4-9. Blunt Chest Trauma (See MWD CPGs Chapter 4).

a. Dogs in respiratory distress are fighting to get oxygen: they are anxious, have obvious labored breathing efforts, usually have their head and neck extended and elbows and upper legs held out from the chest, don't want to lie down, and fight restraint and handling. MWDs in respiratory distress typically have characteristic breathing patterns that help localize the problem; detailed descriptions of these patterns are provided in the CPGs.

b. Provide 100% oxygen to all trauma patients and any dog that is showing signs of respiratory distress, until proven unnecessary. Use a face mask or "blow by" technique for conscious dogs. Use orotracheal intubation or tracheostomy for unconscious, sedated, or anesthetized dogs. Thoracic radiography and serial TFAST are useful during management of the emergency patient, especially in the diagnosis and treatment of pneumothorax (PTX), hemothorax (HTX), pleural effusion, pulmonary contusions, and pulmonary edema.

c. Up to 50% of traumatized dogs have some form of thoracic injury. Pneumothorax and pulmonary contusions are most common. Rib cage trauma includes "flail chest," rib fractures, intercostal muscle rupture, and penetrating wounds. Usually the defect is obvious, especially if "paradoxical" chest wall motion is noted. Adequate management usually involves careful handling, laying the patient with affected side down (which may require sedation), minimizing restrictive chest bandaging, and providing analgesia. External splinting or surgical management is usually not necessary unless injury is severe or extensive or chest wall is compromised and prolonged interference with gas exchange and ventilation are evident. Pain can substantially interfere with gas exchange and ventilation. Alleviate pain once the patient is stabilized to improve oxygenation and ventilation, using systemic and local analgesia. Note that compared to humans, dogs are generally not overly sensitive to the respiratory depressant effects of opioids. Local nerve blocks and intrapleural analgesia administration work well and are readily accomplished; short-acting opioids as a constant rate infusion (CRI) also provide excellent analgesia.

d. Pleural space trauma includes open, closed, and tension PTX, HTX, and diaphragmatic hernia. Open PTX requires immediate action. Rapidly clip hair from around the wound, and apply an occlusive seal over the wound. Apply a chest bandage to secure the seal. Delay wound closure until the MWD is stable. The presence of decreased lung sounds in a trauma patient with signs of respiratory distress, or rapid clinical deterioration in an MWD with respiratory distress is sufficient justification for needle thoracocentesis. Thoracocentesis is rapidly performed and safe when performed properly – "*When in doubt, tap it!*" Use an 18-gauge, 1-1.5 inch hypodermic needle attached to sterile tubing, attached to a stopcock that is attached to large syringe to aspirate air and fluid. Do not use needle decompression devices typically used in humans (e.g., 3.25-inch over-the-needle catheters) or insert the needle deep into the chest, because dogs have narrow thoracic cavities, and use of these devices or deep insertion markedly increases the risk of internal major vessel and cardiac injury. With the dog in lateral or sternal recumbency, insert the needle on the mid-lateral thorax in the 6th - 7th or 7th - 8th intercostal space. Count forward from the last rib (#13) to locate the insertion site. The intercostal artery, vein, and nerve run on the caudal aspect of each rib; thus, thoracocentesis is obtained by inserting the needle or catheter in the center of the intercostal space or at the cranial aspect of a rib. The mediastinum in dogs is thin and typically ruptures; therefore, *always tap both sides of the chest*, even if a positive tap is achieved on one side of the chest, as air pockets and fluid can migrate. Record the amount of air/fluid removed and save fluid samples (EDTA, red top) for later analysis. Repeated thoracocenteses may be required to stabilize the patient. A negative chest tap doesn't always mean there's not an abnormal accumulation of air or fluid in the pleural space – it may mean you just couldn't find it! "*When in doubt, tap it again!*"

e. A thoracostomy tube is indicated if negative pressure cannot be achieved with needle thoracocentesis, if large amounts of blood are aspirated, or if repeated thoracocenteses are required to maintain negative pleural pressure. The tube should be the largest size that comfortably fits in the intercostal space. For most MWDs, use fenestrated tubes that are 24-36 Fr. As dogs are flattened laterally, compared to people, chest tubes are generally inserted through the skin high on the lateral chest wall at the 9th-11th intercostal space, tunneled cranioventrally toward the point of the elbow, and passed through the chest wall 2-3 intercostal spaces cranial to the skin insertion site. The chest tube will ideally be oriented cranioventrally in the pleural space, to maximize removal of air and fluid. Anesthesia or deep sedation and local anesthesia (intercostal nerve blocks) will likely be necessary for the thoracostomy procedure. Patients with chest tubes in place MUST be monitored continuously and intrapleural analgesia should be performed. Continuous suction or intermittent aspiration by personnel are management options.

f. There may be instances in which emergent thoracotomy is necessary. Thoracotomy in dogs is generally best done through a lateral thoracic wall approach, generally at the 4th - 5th or 5th - 6th intercostal space to afford optimal visualization. A median approach is more difficult and has higher incidence of post-operative complications.

g. Pulmonary contusions are common in traumatized dogs. Auscult the chest for decreased lung sounds, which suggest either fluid (blood) or air in the pleural space, or pulmonary contusions. A patchy distribution of altered lung sounds may be noted, which helps differentiate parenchymal injury from pleural space trauma. A negative thoracocentesis suggests the presence of pulmonary contusions. Radiographic signs (mixed interstitial-alveolar infiltrates) may lag by 12-24 hours. Hemoptysis, especially of arterialized blood suggests significant pulmonary vessel trauma that typically carries a very guarded prognosis. Management of pulmonary contusions in dogs involves minimizing stress (patient rest and restricted activity), providing oxygen supplementation, cautious intravenous fluid administration to prevent progression of contusions and/or development of pulmonary edema, and addition of colloids to fluid therapy plans to decrease the amount of pulmonary edema that may accumulate during shock resuscitation. Diuretics and steroids are not indicated in treatment of pulmonary contusions. Severe, life-threatening major pulmonary vessel hemorrhage may require resuscitative thoracotomy, as discussed. Ventilatory support may be required for animals that fail to respond to correction or stabilization of the primary respiratory problem and supplemental oxygen support.

4-10. Blunt and Penetrating Abdominal Trauma (*See MWD CPGs Chapter 7*).

a. Suspect significant intra-abdominal injury in any MWD that presents with abdominal rigidity or sensitivity to palpation, increasing abdominal size over time, visible bruising of the abdominal wall, or failure to respond to or deterioration in face of aggressive trauma resuscitation. Wounds involving more than the skin and superficial subcutaneous tissues dictate detailed examination to determine if the body wall was penetrated. Conservative medical management is usually indicated for MWDs with blunt abdominal trauma (BAT); most working dogs with BAT can be managed without surgery. Urgent exploratory surgery is recommended for MWDs with penetrating abdominal trauma (PAT) or ruptured viscus organs.

b. Perform an AFAST exam during the initial evaluation phase of every MWD presented for care with a history of trauma or acute collapse or weakness. AFAST is extremely reliable in detecting free abdominal fluid and can be performed rapidly during resuscitation. Refer to section 6-10f for a detailed description of AFAST examination technique. Examine all four quadrants. Perform serial AFAST exams every 4-6 hours and compare results: Exploratory surgery may be necessary for MWDs with progressive fluid accumulation, failure to respond, or clinical deterioration. Additional diagnostic tests that are helpful in differentiating abdominal injuries include abdominocentesis, diagnostic peritoneal lavage, computed tomography, and detailed ultrasonography.

c. The usual organs in MWDs subjected to blunt trauma are the spleen, liver, and urinary bladder, in this order of frequency. Most hemoperitoneum cases in MWDs suffering trauma are due to splenic and hepatic fractures, which can vary markedly in severity, with a significant difference in quantity of blood lost into the abdomen. The majority of MWDs with BAT and intra-abdominal hemorrhage that survive to admission can be successfully managed conservatively. These organ injuries usually will spontaneously cease bleeding given time and conservative fluid therapy. Monitor the MWD closely, as some will require exploratory laparotomy and surgical correction of hemorrhage, especially those that do not respond or deteriorate. Do not apply an abdominal counter-pressure bandage on an MWD. Patients with massive intra-abdominal bleeding need surgery to find the site of bleeding and surgically correct the loss of blood. There may be instances in which emergent laparotomy is necessary to afford a chance at patient survival.

d. Urinary bladder rupture, with uroperitoneum, is fairly common. Abdominocentesis fluid creatinine or potassium concentrations will be greater than serum values when uroperitoneum is present. MWDs with acute urologic trauma and uroperitoneum should be stabilized for other injuries and managed for shock. Repair of urologic injuries must wait until the patient stabilizes. In many cases, urologic injury is not apparent for several days after trauma, so a high index of suspicion must be maintained; ultrasound and excretory urography studies may be necessary. In patients with known urologic tears and urine leakage, an indwelling urinary catheter can facilitate safe management and even healing of the bladder. Strict aseptic technique as well as daily cleaning of the catheter are required to minimize the occurrence of urinary tract infections. Abdominal drains may be necessary for proximal or severe urinary tract damage. Some sort of drain is often indicated, especially if surgery is delayed for several days. This allows removal of urine, which will minimize chemical peritonitis and electrolyte and acid-base

imbalances. Fluid therapy to correct or prevent electrolyte and acid-base imbalances is often necessary, especially if several days have passed since traumatic injury.

e. Patients with a ruptured gastrointestinal viscus are candidates for emergent exploratory surgery. Broad-spectrum antibiotic therapy is vital, especially against anaerobic and gram negative bacteria. Shock management is of special importance. Every attempt must be made to stabilize the patient as much as possible before definitive repair.

f. Exploratory laparotomy as a diagnostic and therapeutic modality is clearly indicated in trauma patients if penetrating trauma is highly suspected or known, and if the patient's status deteriorates despite aggressive resuscitation attempts and major organ hemorrhage is suspected or known. Surgical management includes an approach through the ventral midline under general anesthesia, with the dog in dorsal recumbency, to expose the abdominal cavity. A complete abdominal exploratory is necessary to define all injuries. Surgical management will depend on the injuries noted.

4-11. Anaphylactic Shock. Anaphylactic shock is a medical emergency and typically occurs after exposure to insect and snake venoms, antimicrobial agents, NSAIDs, opiates, vaccines, blood-based products, radiocontrast agents, and food. Anaphylaxis usually involves the skin, respiratory system, cardiovascular system, and gastrointestinal system. Cutaneous signs – if noted – (e.g., urticaria, angioedema) tend to be precursors to more severe responses; these dermal signs may be absent in rapidly-progressing systemic anaphylaxis.

a. Clinical signs vary depending upon the severity of anaphylaxis. Signs may include angioedema, urticaria, dermal erythema, restlessness, vomiting, diarrhea, labored breathing, and signs of shock (e.g., hypothermia, hypotension, tachypnea, tachycardia, altered mentation); severe cases may progress to coma and death. The major organ system involved in acute anaphylaxis for dogs is the liver, specifically the hepatic veins, and the gastrointestinal tract. Dogs typically demonstrate initial excitement followed by vomiting, defecation, and urination. Constriction of the hepatic vein causes portal hypertension and pooling of blood in the viscera, associated with signs of shock. Bowel edema and fluid translocation often occur, resulting in diarrhea (which may be hemorrhagic). Note specifically that a biphasic response may be noted, in which the original clinical signs abate, only to be followed by recurrence of signs; this typically occurs within 8-10 hours.

b. Diagnosis. Clinical signs of shock with appropriate history.

c. Treatment of mild allergic reactions. Mild allergic reactions are typically characterized by urticaria, angioedema, restlessness, and pruritus. Use antihistamines; avoid glucocorticoids. Most cases resolve rapidly. The key to remember when treating mild cases is that these cases may represent early anaphylaxis; therefore, monitor closely for at least 12 hours for progression, and be prepared to intervene if progression is noted.

d. Treatment of systemic anaphylaxis. Anaphylaxis is a true medical emergency. Delay in treatment can be life-threatening.

(1) Administer epinephrine. Dose at 0.01 mg/kg using 1 mg/mL (1:1,000) epinephrine, given intramuscular initially. Current recommendations suggest a maximum dose of 0.5 mg in patients >40 kg and 0.3 mg in patients <40 kg. If signs persist, repeat this dose every 5-15 minutes as needed, based on response. In MWDs with clinical signs of shock on presentation, give epinephrine IV by slow infusion at 0.05 mcg/kg/min to effect.

(2) Aggressive fluid therapy: Following IV catheter placement, provide an isotonic crystalloid fluid bolus using graduated bolus challenges, as discussed under shock treatment earlier in this chapter. Consider hydroxyethyl starch if shock persists, as discussed for refractory shock.

(3) Give oxygen to any patient with respiratory signs or hypoxemia. Use a face mask, nasal cannulae, or an oxygen cage, or intubate or perform a tracheostomy if signs are severe.

(4) Use bronchodilators for patients with respiratory distress believed to be secondary to bronchoconstriction. Use aminophylline at 5-10 mg/kg IM or by slow IV administration, or albuterol at 0.5 mL of the 0.5% solution in 4 mL of saline by nebulizer every 6 hours; if appropriate equipment is available, use a metered-dose inhaler (90 mcg/puff) every 15 minutes for up to 3 doses (1-2 puffs).

(5) Do not give glucocorticoids. Current recommendations discourage use of glucocorticoids in severe shock.

(6) Refractory anaphylaxis may require vasopressor support.

4-12. Insect and Snake Envenomation (*See MWD CPGs Chapter 11*). MWDs are infrequently envenomated by spiders, scorpions, and snakes. Given the infrequent occurrence, detailed discussion of this topic is beyond the scope of this handbook; refer to the very detailed appendix in the MWD CPGs for guidance.

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- a. Clinical Signs. Severity is determined by amount of venom received and may develop within minutes.
 - (1) Heat, pain, puncture wounds, and swelling at envenomation site
 - (2) Persistent or heavy bleeding from bite wound
 - (3) Vomiting/ diarrhea
 - (4) Cardiovascular collapse/shock
 - (5) Snakebite associated coagulopathy – a typical DIC is not usually seen, but dog may experience coagulation delays and thrombocytopenia.
 - (6) Tissue necrosis at envenomation site
- b. Diagnosis. Clinical signs with appropriate history. Echinocytes may be detected on blood smears in venomous snake bite cases.
- c. Treatment. The majority of envenomations are mild, and supportive care is often all that is necessary. Arthropod bites especially may not be witnessed. An acute swelling of an extremity in the absence of trauma or fever may be the result of an insect/arthropod bite/sting. Treatment of mild insect and snake envenomations is not standardized, and references are often contradictory. Anecdotal use of antihistamines (diphenhydramine) is favored by some, while questioned by others. Likewise, use of corticosteroids and non-steroidal anti-inflammatory agents is also controversial; most recommend against their use, even in mild cases.
- d. In moderate-to-severe snake envenomation, however, aggressive therapy is recommended, and includes use of antivenin.
 - (1) Specific treatment with geographic area-specific antivenin is optimal for patients with moderate-to-severe clinical signs. Although data are limited, antivenin decreases morbidity and may reduce mortality (especially for bites to the trunk and upper limbs, which have the highest mortality rates).
 - (2) Antivenin supply may be problematic. VCOs should plan ahead and coordinate with local suppliers to ensure antivenin availability in areas in which envenomation is common. In deployed settings, antivenin is typically only available in select Role 2 and Role 3 facilities because antivenin use – for humans and dogs – is highly regulated and governed by theater policy; refer to theater policy for guidance, availability, and procedures to obtain antivenin.
 - (3) Antivenins, especially those that contain whole immunoglobulin components, must be used with caution, due to the potential to induce allergic reactions. Although dosing in dogs is empiric, if used, antivenins should be given to effect to control clinical signs.
 - (4) Most references suggest that corticosteroids and non-steroidal anti-inflammatories are contraindicated in the treatment of severe snake envenomation.

CHAPTER 5

COMMON MEDICAL PROBLEMS

Military Working Dogs are susceptible to the same illnesses as any other dog, but by virtue of travel, work, kennel and athletic stresses, they may be more prone to some injuries and illnesses than other non-working dogs. Rather than attempt to serve as a replacement for a textbook on canine disease, this section will attempt to outline some of the more common medical problems and appropriate therapies that may be unique or common to the MWD population. Clinicians should not hesitate to consult other resources in treating these conditions in MWDs, but this chapter may be a succinct starting point.

5-1. Skin. Skin lesions/infections anecdotally account for approximately 50 percent of all MWD sick call complaints. Most are minor and easily treated, but some may be signs of chronic or systemic illness that may affect duty or deployment status. Any of the below problems can occur in dogs not housed in a kennel, but a kennel environment (hard floors and walls, tendency toward moist surfaces and humidity) increases the risk in MWDs. In many cases, paying close attention to husbandry issues in the kennel environment and advising the KM accordingly can assist in mitigating such problems. Ensuring an appropriate air exchange (10-15/hour), “squeegeeing” kennel floors after hosing them out, and adhering to proper tenets of kennel sanitation are some of the major areas where kennels typically have deficiencies.

a. Superficial Pyoderma/“Hotspots”. Skin infections can be a primary problem, but most are secondary to another underlying disease that disrupts the skin or its defense mechanisms. This is especially true in the case of “hot spots” (acute moist dermatitis, superficial pyoderma), which are almost always secondary to some other irritation. Most of these cases are also complicated by secondary trauma as the dog scratches or bites at the affected area in an effort to relieve pruritus or pain. In MWDs, the most likely underlying problems are kennel moisture and heat, poor grooming and matted fur, or chronic abrasion against walls, gates, or fences. Other common primary problems may include inhalant (atopy) or food allergic dermatitis, primary seborrhea, and immune-mediated disease. In pets, ectoparasites, other infectious dermatopathy (esp. rickettsial) and flea allergy dermatitis (FAD) are common underlying causes of superficial pyodermas, but these should not be common problems in MWDs due to our aggressive preventive medicine program. Staphylococcal hypersensitivity and primary immunodeficiency disorders are rare causes. Primary endocrinopathies generally do not cause secondary superficial pyoderma.

(1) Diagnosis. Superficial pyoderma can generally be diagnosed based on history and appearance with confirmatory cytology.

(2) Treatment. The most important part of treatment is to identify the underlying insult and address it. This may require review of kennel sanitation and MWD grooming procedures. The affected area should be clipped and gently cleaned with dilute chlorhexidine solution and then treated with a drying agent. Daily treatment may be needed for a week or more. Some hotspots are quite painful and inflamed and treatment with a topical steroid or steroid-antibiotic combination cream may be necessary for 5-7 days. Systemic antibiotic therapy is generally not required.

b. Methicillin-Resistant *Staphylococcus pseudintermedius* (MRSP). MRSP infections are of major clinical importance in hospitalized patients as well as community-acquired pyoderma and otitis externa cases. These infections are becoming increasingly recognized in the MWD population, as well. The most significant implication in receiving a culture and susceptibility report with MRSP is the likelihood that this organism is resistant to our most commonly used antimicrobials, namely the beta-lactam antibiotics (penicillins and cephalosporins). Additionally these infections are often multi-drug resistant.

(1) Diagnosis. An in vitro culture and susceptibility report received on a patient with appropriate clinical signs from a veterinary commercial laboratory is ideal to confirm the diagnosis. MRSP does not appear to be any more virulent than Methicillin-Susceptible *Staphylococcus pseudintermedius* (MSSP) and it should be noted that a very large percentage of healthy dogs are colonized with MRSP yet show no clinical signs.

(2) Treatment. Many infections are secondary to an underlying primary disease which must be considered in the therapeutic plan for recurrent or persistent infections. For cutaneous infections, topical treatments are preferred over systemic antimicrobials to prevent multi-drug resistance. Examples include chlorhexidine, povidone iodine, benzoyl peroxides, fusidic acid, mupirocin and miconazole. Topical antimicrobials can be used in concentrations that overcome antimicrobial resistance associated with systemic therapies. Shampoos, lotions, rinses, sprays, and

conditioners are appropriate for generalized or extensive cutaneous disease. Gels, creams ointments, lotions, and wipes may be appropriate for more focal or localized infections. Topical therapy may also be used in conjunction with systemic antimicrobials only when deemed necessary. Systemic antimicrobial selection should be based on susceptibility patterns and only used in cases when topical therapy alone is either not deemed appropriate or is ineffective. Treatment should be continued for a minimum of 7 days beyond clinical signs. If rapid improvement is not seen within the first 2 weeks of therapy then the antimicrobial choice should be reevaluated. Empirical therapy should be reserved for first time infections and limited to first tier antimicrobials as defined by the International Society for Companion Animal Infectious Diseases (ISCAID). First tier antimicrobials include clindamycin, first generation cephalosporins, amoxicillin-clavulanate, and trimethoprim-and ormetoprim-potentiated sulphonamides. To help prevent the emergence of multidrug resistant strains the selection of second tier drugs should be based on antimicrobial resistance patterns. The use of third tier drugs; i.e., linezolid, teicoplanin, and vancomycin is strongly discouraged, due to their use in people for serious MRSA infections.

c. Elbow, hock, and sternal callus. Many MWDs develop cutaneous callus associated with living in a concrete kennel. These usually form along bony prominences of the lateral elbow and hock, but may also form on the sternum in deep-chested dogs. Callus development is not generally harmful to the dog and treatment is not necessary unless inflammation or infection occurs (Callus Dermatitis – see below). These lesions should be noted on DD Form 1829 or equivalent, and are mainly cosmetic issues.

(1) Diagnosis. Calluses can generally be diagnosed based on their appearance, alopecic, hyperpigmented, hyperkeratotic plaque (thickened “tough” skin) and is often unilateral but on both fore and hind limbs (e.g. the MWD tends to sleep lying on that side) and located over bony prominences.

(2) Treatment. Use of elevated covered kennel racks (pallet/crate/grill) or other soft bedding may reduce callus formation. Caution should be exercised in furnishing such bedding options as some MWDs will attempt to ingest these materials.

d. Callus Dermatitis and Pyoderma. In some MWDs, callus may become inflamed, ulcerated, or fistulated, and occasionally deeply infected. This may be due to abrasive ulceration and trauma or in many cases it occurs due to irritation from broken hair and damaged hair shafts. These calluses do require therapy.

(1) Diagnosis. Based on appearance. Diagnosis and response to therapy monitored with cytology.

(2) Therapy. The most important treatment is to try and relieve pressure by adding an elevated kennel rack plus padding or bedding to the kennel. Be aware that many MWDs will chew and destroy soft bedding and pads so they should be used cautiously and removed if the MWD is destructive. The use of hydrotherapy, especially with Epsom salts, is often beneficial to reduce irritation and inflammation. Topical cleansing, drying, and antibiotic-steroid ointments may be helpful (as with superficial pyoderma). If deep infection occurs, systemic antibiotic therapy for 4-6 weeks may be necessary. Antibiotic therapy should continue for 1-2 weeks beyond the time of clinical and cytologic resolution.

e. Elbow, hock, and sternal hygromas. Any pressure point susceptible to callus development may also develop hygroma. A hygroma is a fluid-filled false or acquired bursa that develops in the subcutis. They are initially soft to fluctuant but may become abscessed, granulomatous, or infected.

(1) Diagnosis. Based on appearance and location. Supportive cytology may be needed to rule out abscess and/or infection, although introducing a needle into a hygroma should be performed very cautiously under aseptic conditions. Aspiration should not be performed upon initial exam or on a repeated basis.

(2) Treatment. Ideal treatment includes the use of elevated kennel racks, bedding and padding the kennel, and application of padded bandages for 2-3 weeks. Commercially available neoprene leg wraps are another option which may be effective. Recurrent aspiration/drainage of the hygroma is not recommended. Surgical drainage and resection should NOT be attempted in MWDs, at least at the VTF level, as the risk of dehiscence and other complications is very high. Systemic antibiotics should be administered if infection is present. Many cases improve over time and become chronic lesions that pose no significant detriment to the MWD in the long run.

f. Tail Lesions. Some MWDs may suffer trauma to the tail tip or tail shaft due to circling or spinning in the kennel, or occasionally due to “aggressive” tail wagging in the transport cage/kennel. Typical lesions appear as a crack in the tail tip with bleeding; often blood is flung on the walls by the moving tail. Sometimes the tail tip will become alopecic and develop a thick callus which may crack and bleed less severely, heal, then crack again. Linear deep abrasions along the tail shaft may also be seen. Less common, but more serious conditions may include severe inflammation/fasciitis of the tail shaft.

(1) Diagnosis. Based on appearance.

(2) Treatment. Short-term management of tail lesions may include the use of topical antiseptic and “skin toughening”/artificial bandage medications, reducing the amount of time the dog is in the kennel by altering work and training shifts, moving the dog into a larger run or exercise area for temporary housing and use of environmental enrichment (e.g. bowling ball) to reduce spinning behavior. Additionally, moving the dog to a less trafficked area may decrease stimulation for the repetitive behavior. Shaving the tail tip and applying bandages often makes the problem worse. At DODMWDVS there has been some success with utilizing 0.75in foam plumbing pipe insulation which can be purchased at the local home improvement store in 6ft sections for only \$1-2. The tube should be cut to size (approximately 6in) and secured with elastic cloth tape beginning approximately 4.0in proximal to the tube. The tube should extend just distal to the tail tip with the end open to allow for air circulation. With some chronic cases, the tail tip may become infected thereby necessitating topical and systemic antimicrobial therapy. Severe or recurrent tail tip and shaft lesions should be addressed with amputation of the tail (caudectomy). When indicated, caudectomy should be completed so that the remaining tail is approximately 3-4 inches long, just enough to cover the anus and enough that the tail can be lifted to take a temperature (see section 7-2). Behavioral evaluation for hyperactivity or repetitive behavior may be appropriate in some of these MWDs.

g. Soft Foot Pads. The normal canine pad has a thick epidermis with a papillated and irregular surface, and a rough texture due to thick keratinization. In some dogs, especially those living or working on rough, hard surfaces or consistently damp surfaces, the keratinized layer of the pad may be worn down leaving a very soft, and often tender, pad surface. Spinning in the kennel may exacerbate this problem. On occasion the dog may actually wear the pad down thru the epidermis and in rare cases erosion and ulceration may occur into the subcutis.

(1) Diagnosis. Soft pads are easily recognized during physical examination because of their smooth, soft appearance. Many of these dogs will present with mild lameness, which may only be apparent on rough surfaces such as dry grass, gravel, or asphalt.

(2) Treatment. Treatment should be directed at toughening the pad using topical products such as tincture of benzoin, applied in small amounts for a 7-10 days, or commercially available pad tougheners. If the insulting surface can be identified, it should be avoided or repaired. Kennel surfaces with a highly abrasive surface can predispose to this problem.

h. Pododermatitis. There are many possible causes of pododermatitis, and, in many cases, more than one factor contributes to injury. Foot trauma, living or working on wet surfaces, stepping in irritating chemicals such as kennel sanitizer or spilled fuel and oil on roadways, and other injury or irritation are the most common factors in MWDs.

(1) Diagnosis. Based on appearance and clinical history. Extensive workups for allergic, immune mediated, and other systemic diseases may be appropriate in advanced or recurrent cases.

(2) Treatment. Once pododermatitis occurs, treatment must be aggressive and prolonged as the disease is often self-perpetuating. Systemic and topical antibiotics, daily cleaning and soaks in povidine-iodine or chlorhexidine solutions, and application of protective bandages may all be appropriate presumptive therapy.

i. Pad Laceration. Foot injuries are quite common in the MWD. They may include simple lacerations, bites, punctures, degloving injuries, pad avulsions, and fractures. The goals of therapy for foot injuries are proper diagnosis, prevention of infection, proper wound care striving for rapid healing, and early return to duty. To establish a diagnosis, thorough examination of the foot is necessary. Examination also aids in determining the extent of injury, a diagnostic protocol, and a treatment plan.

(1) Realistically, it takes 14 to 21 days for abrasions or lacerations of the foot to completely heal. Suturing of lacerations and especially pads can be very challenging and frustrating. The tension placed on sutures during normal ambulation, not to mention running and jumping, along with a damp environment make a perfect situation for failure. Keeping the foot and wound clean and dry along with the use of proper bandaging techniques and ancillary medications are extremely important for a rapid, successful resolution. Many times a splint is required to decrease motion and allow for healing. All foot wounds should be thoroughly cleaned and flushed (debrided if necessary) prior to definitive treatment.

(2) When a flap is present upon presentation, but viability is questionable, it may be necessary to suture the flap in place and monitor the viability daily each time the foot is cleaned. The flap may be excised later if necessary and then allow second intention healing to take place. Suturing of any laceration on the foot or pad will bring tissue planes into apposition and a bandage will aid in decreasing the contamination of the injury while acting as an aid to preventing tension on the sutures.

(3) After the injury has been assessed and cleaned, the DODMWDVS uses two different topical medications to provide scaffolds for cellular matrix, to form a seal to prevent contamination, provide cellular stimulation, and in

general provide an environment to enhance the healing process. Current topical medications used are a medical hydrolysate of type I collagen, and maltodextrin N.F, a hydrophilic compound.

(a) Medical hydrolysate of type I collagen acts as a matrix in the wound. Because collagen is used as a matrix for fibroblast movement into a wound, it is probably most effective in the late inflammatory and early repair stages. It should be applied, allowed to dry, and then bandaged with a non-adherent bandage. It is absolutely necessary to change foot bandages anytime they become wet.

(b) Maltodextrin N.F. The mode of action of maltodextrin is as a hydrophilic compound. Following wound debridement and lavage, the powder should be applied over the wound to a depth of approximately ¼ inch. A nonadherent primary bandage pad should be placed over the powder, followed by an absorbent wrap and an outer tertiary bandage layer, and changed daily. Based on its modes of action, the powder will have an effect from the early inflammatory through the repair stages of healing.

(c) Foot injuries are a challenge to manage and bandage but with monitoring and proper care, a successful outcome can be accomplished.

j. Scrotal Dermatitis. The condition has been associated with infectious and immune mediated disease, especially Lyme disease and other vasculitides, but in MWDs it is almost exclusively a disease due to chronic moisture or contact irritation in the kennel. It may appear as mild erythema, swelling, and pain on palpation of small sections of scrotal skin. More severe cases may involve severe erythema, erosions and ulcerations, and exudation of serous and serosanguinous fluid. Serum adhering to the irritated skin creates a self-perpetuating irritation and propagation of the injury.

(1) Diagnosis. Based on appearance.

(2) Treatment. Focus is on keeping the scrotum clean and dry with gentle antimicrobial and drying agents (pre-mixed otic solutions work very well). Short-term (3-7 day) treatment with topical antibiotic-steroid creams may be necessary to reduce painful inflammation in severe cases. Kennel sanitation procedures should be addressed as part of therapy. Severe or recurrent cases should be addressed through castration and scrotal ablation (see section 7-3). Systemic antibiotics may be needed for particularly severe cases.

k. Allergic Dermatitis. MWDs may develop allergic dermatitis and secondary pyodermas. These reactions may be triggered by due environmental, food, and/or microbial allergens. An organized, systemic diagnostic and therapeutic plan is essential to the proper treatment and management of these dogs. The International Committee on Allergic Diseases of Animals publishes guidelines for the diagnosis, treatment, and management of canine atopic dermatitis and is a valuable resource. Common signs include pruritus, recurrent or seasonal dermatitis and pyodermas, recurrent otitis externa, and self-trauma due to pruritus.

(1) Diagnosis. Diagnosis of canine allergic dermatitis is based on the patient's history, clinical signs, and disease history, not the results of a laboratory test. Diagnostic criteria are further described in the above mentioned guidelines. It is important to rule out other dermatoses that can mimic atopic dermatitis through appropriate diagnostic tests and treatment trials. Regarding food hypersensitivity, enzyme-linked immunosorbent assays (ELISA), radioallergosorbent tests (RAST), and intradermal skin testing are not recommended. Dietary elimination trials are often a key component in workup of allergic dermatitis. Given that both Labrador Retrievers and German Shepherds have an increased predilection for food allergy, an appropriate food trial with a hypoallergenic (hydrolyzed or novel protein) diet is indicated to rule out food hypersensitivity as a cause of allergic dermatitis. Food trials should be performed for a minimum of 8 weeks (and in some cases 10-12 weeks) and it should be stressed that no other food items be furnished to the dog other than the prescribed ration. This includes beef flavored heartworm preventive products; monthly subcutaneous ivermectin injection (0.1mL/dog of 1% solution) or administration of a non-flavored oral heartworm preventive is indicated for these dogs. For atopic dermatitis, if based on seasonal nature of the dermatitis and/or if a food trial proves to be ineffective, empiric therapy should be performed. Hyposensitization has arbitrarily been considered the gold standard and most preferred therapy for allergic skin disease when skin testing indicates efficacy. Anywhere from 50-80 percent of patients benefit from this therapeutic option. Commercial *in vitro* serum allergy testing is most likely inferior to skin testing performed by a veterinary dermatologist, however, in the absence of referral and if empiric therapy has failed to achieve an acceptable response, this option is viable. MWDs requiring chronic hyposensitization therapy should be placed in CAT 2.

(2) Treatment/Therapy. The goal of therapy is to reduce inflammation, pruritus, and self-trauma such that secondary infections and scratching do not impact MWD work performance or systemic health. The principles of therapy for allergic dermatitis in MWDs are the same as in other dogs, e.g. use of medicated or soothing antipruritic

shampoos, topical corticosteroids for localized disease, antibiotic therapy of secondary pyodermas, supplementation of vitamin E and fatty acids, antihistamines, and ultimately hyposensitization. Supplementation of above therapies with the short-term administration of a steroidal anti-inflammatory, generally prednisone at 0.5 – 1.0 mg/kg q24 to q48 hours, may be necessary for limited duration. While cyclosporine certainly has a role in atopic dermatitis, newer therapies such as oclacitinib and monoclonal antibody therapy can rapidly reduce skin lesions and pruritis in dogs and may replace the need for glucocorticoids in many patients. See the above referenced guidelines for more information regarding treatment in acute and chronic cases.

l. Cutaneous Neoplasia. MWDs are susceptible to the same cutaneous neoplasias as other dogs. Superficial masses are common; a few can be diagnosed by their appearance. Most superficial tumors should be examined cytologically, aspirated or impression smear, prior to excision and must be submitted for histopathology after excision to the Joint Pathology Center. Human MTFs should NOT be relied on to diagnose veterinary cytologic lesions as most MD pathologists are not trained to identify or assess specific lesions in nonhuman species.

m. Bacterial Dermatitis/ Pyoderma. Generalized bacterial dermatitis/pyoderma should be considered a sign of some primary/underlying cutaneous, metabolic or immunologic disease. Principles of diagnosis and therapy are the same as in pet dogs with the following exceptions: kennel environment must be considered a risk factor, aggressive ectoparasite control reduces risk of flea allergy or irritation as a component, MWDs travel and may be exposed to infectious agents that cause atypical cutaneous disease and which must be added to the normal list of differential diagnoses, e.g. Leishmaniasis.

(1) Diagnosis. Must include good history of seasonality of signs, travel history, physical examination with special attention to evidence of pruritis, alopecia, seborrhea, etc. Skin scrapes, dermatophyte culture, skin cytology and biopsy, allergy testing and endocrine testing may be necessary.

(2) Treatment. In general, the therapy for bacterial dermatitis includes systemic antibiotics, and topical shampoos. The underlying disorder must be identified and addressed.

5-2. Ears.

a. Otitis externa. Three factors are associated with otitis externa: primary, predisposing, and perpetuating. The following lists are limited to those factors that are common in MWDs. Other factors (see textbook references) should also be considered in atypical, nonresponsive or severe cases. Primary factors include foreign bodies or other ear trauma, allergies, endocrine disease and idiopathic seborrhea. Common predisposing factors include increased environmental temperature and moisture, thermal insult due to exercise induced hyperthermia or associated with fever, iatrogenic irritation (e.g. overzealous ear cleaning), obstructive lesions associated with muzzle use or past ear injury. Common perpetuating factors include bacterial infections (*Staphylococcus spp*, *Streptococcus spp*, *Pseudomonas aeruginosa*), yeast infections (*Malassezia pachydermatis*), otitis media, proliferative changes due to chronicity, and treatment error or lack of treatment compliance.

(1) Diagnostics. Most otitis externa is relatively routine and will respond to trial therapy with ear cleaning and drying agents and or topical antibiotic-antimycotic-steroid solutions. Diagnostic workup should include: history, physical examination, and ear cytology.

(a) Superficial and otoscopic exam. Assess type of exudates (color, moisture, smell) and presence or absence of inflammation, blood, visible parasites, or foreign bodies, and integrity and appearance of tympanic membrane. If the dog is too painful and fights otoscopic evaluation, consider sedation or short-acting anesthesia. Additionally, for swollen, painful ears, a short tapering course of an anti-inflammatory dose of prednisone could be prescribed in order to lessen inflammation and pain prior to commencing treatment.

(b) Ear swabs (two types): 1) mix with mineral oil to look for mites; 2) dry, heat fix and stain with Wright-type stain to look for inflammatory cells, bacteria, yeast.

(c) Culture (if it does not respond to standard therapy, the VCO should culture).

(2) Treatment.

(a) Clean and dry the canal. If the ear canal is not too inflamed or occluded by debris and exudates, treatment can be initiated without extensive cleaning of the ear canal, but in many MWDs sedation or anesthesia for thorough canal cleaning and debridement is required.

(b) Initial cleaning. The canal must be thoroughly cleaned and dried (cotton tipped applicators, suction) to allow topical medication to reach the affected tissue. The job is not complete until the tympanic membrane can be visualized. The best cleaning solutions are pre-mixed chlorhexidine, acetic acid, boric acid, and/or salicylic acid solutions. Dilute betadine or chlorhexidine solution [NOT scrub], 1:10 with water, may also be used.

(c) Maintenance cleaning. Long term: Application of ear cleaning and drying agents by the handler and/or 68T two to three times per week may be necessary to maintain the health of the ear canal in dogs with unresolved primary or perpetuating factors. Treatment should be tapered to the minimum effective frequency once efficacy has been shown and a healthy ear is obtained.

(d) Topical medication. Usually a combination of antibiotics, antifungals, and steroids. Treatment with these medications is generally only required for 3-10 days and newer formations only require one application. If results are not obtained in this time it is likely that underlying factors have not been adequately addressed, that treatment compliance is suspect, or that an inappropriate medication was selected.

(e) Systemic therapy. If the lesions are very severe, systemic therapy is advised. Indications for systemic treatment include marked canal changes (if it's already calcified then there is evidence of chronic change that will not resolve with medical therapy), otitis media, and severe acute problems. Systemic therapy may include: antibiotics- use for marked changes, otitis media, antifungals – use for nonresponsive yeast infection, and less commonly anti-inflammatory dose of steroids – use for marked changes, or severe acute problems.

(f) Surgery. If there are severe changes in the ear canal, total ear canal ablation and lateral bulla osteotomy is indicated. MWDs that have undergone this procedure retain some hearing via bone conduction and do not have significant problems in responding to commands. This is probably because hearing via the tympanic membrane and internal acoustic window has been gradually diminished by chronic otitis externa/media. Consult with the supporting 64F for consultation/referral.

5-3. Eyes.

a. Pannus. Refers to the specific clinical syndrome of chronic superficial pigmentary keratitis primarily seen in German Shepherd Dogs. An immune-mediated basis is suggested, and the disorder has a positive correlation to increased altitude and ultraviolet radiation. It involves superficial corneal vascularization and infiltration of granulation tissue. The condition is progressive, usually bilateral and may result in blindness if left untreated. Clinical signs include corneal edema, corneal vascularization and corneal pigmentation.

(1) Diagnosis. Signalment and bilateral lesions of neovascularization and/or pigmentation originating at temporal limbus are usually sufficient to warrant the diagnosis.

(2) Treatment. With any pannus, treatment must be continued for life. If the treatment is stopped, it will recur and handler compliance with medication administration is crucial. If the pannus is not under control within 2 weeks, call the supporting 64F or the DODMWDVS for suggestions. Once it is under control and the dog is able to work, decrease to the lowest frequency needed to keep it under control.

(a) Corticosteroids. Potent corticosteroids such as 0.1% dexamethasone, 1% prednisolone acetate and 1% prednisolone sodium phosphate are preferred. Medication must be applied 4-6 times per day during initial therapy. After medication takes effect, frequency of administration may be decreased to every 8-12 hours if this frequency is still effective.

(b) Commercially available Cyclosporine A ophthalmic ointment is inadequate for most pannus cases as it is in a fairly low concentration (0.2%). A veterinary compounding pharmacy's 1-2% ophthalmic cyclosporine product is indicated in cases that do not respond to corticosteroids alone. The dose is 1-2 drops per eye every 6-8 hours until remission, then reducing to the lowest effective daily dose. Pay close attention to the expiration date of these preparations, as they can have fairly short shelf lives. Use gloves, as this is a chemotherapeutic agent. Subconjunctival injection may be applied for advanced cases or those where topical is not working or is not possible due to MWD behavior. Sedation and topical anesthesia is usually enough for subconjunctival injection, although short general anesthesia can be used. Injectable medications and doses include methylprednisone 5 mg per eye; betamethasone 1 mg per eye; triamcinolone 5 mg per eye. VCOs should discuss this method of treatment with their supporting 64F prior to administering to the MWD. Follow with topical treatment every 8 hours; this should be effective for 1-6 months, then repeat as needed.

b. Corneal Abrasions/Lacerations. Although primary corneal defects occur, most corneal problems are secondary to trauma, foreign body, entropion or other lid defects, and keratoconjunctivitis sicca. Clinical signs include blepharospasm, epiphora, and mucopurulent ocular discharge.

(1) Diagnosis. A comprehensive ophthalmic exam will give the diagnosis, however, it may require topical anesthesia. A Schirmer tear test should be conducted first followed by fluorescein dye stain of the cornea.

(2) Treatment. Topical broad spectrum antibiotics are applied every 8-12 hours. One percent atropine drops at 8-12 hours (generally required for no more than 72 hours) are instilled if the pupil is miotic (i.e. pain). Use e-collar if needed and recheck in 1 week. Do not use steroids.

(3) If the lesion is not healing, or a deep or extensive ulcer develops, carefully debride the ulcer utilizing sterile cotton swab. If surgical intervention may be necessary, consult supporting 64F for guidance.

5-4. Infectious Diseases of Military Working Dogs. Historically Ehrlichiosis was a disease of major importance in working dogs during and immediately after the Vietnam conflict. With the advent of easy to administer, effective topical ectoparasite products, this disease is less of a concern in the MWD population of today. However, there are certain diseases of significance that can affect MWDs that are unique to this population that VCOs should be aware of. Any MWDs that have tested positive for a blood-borne infectious disease should not be used as blood donors even if treatment was completed. Their Deployment VHR and electronic VHR should be clearly marked with “DO NOT USE AS BLOOD DONOR”.

a. American Trypanosomiasis (Chagas disease). Chagas disease is caused by the organism, *Trypanosoma cruzi*. This parasite is primarily spread through fecal deposition into an open wound or mucous membrane by Triatomine species of bugs (reduviid, "kissing", "assassin" or "cone-nosed" bugs). These bugs are endemic to Bexar County, Texas in which the Dog Center is located and research indicates that the disease is spreading throughout the southern United States and affecting approximately 2% of the MWD population.

(1) Transmission to MWDs is thought to be primarily through ingestion of the insect vector, the reduviid bug. Transmission also occurs congenitally, via blood transfusion, or by deposition of the vector's fecal products onto mucous membranes, breaks in the skin, etc. Infection with *T. cruzi* is life-long, and avoiding contact with an infected MWD's blood through needle stick, cut with a necropsy knife, etc. should be a precaution the veterinary team should take care to implement.

(2) Dogs infected with *T. Cruzi* can be asymptomatic or develop acute or chronic infections. Once infected, a dog may exhibit symptoms during the acute phase, including lethargy, fever, inappetance, and lymphadenopathy, as the parasite replicates within its new host. Specifically in dogs, there have been cases of sudden death, acute myocarditis, and congestive heart failure associated with new infection. However, these cases are rare.

(3) Both acute and chronic forms of Chagas disease exist in the dog with typically younger dogs suffering from the acute form. In most cases of infection, the parasite enters a chronic phase during which the individual may not experience any clinical signs. If signs materialize, they may not appear for years after initial infection. Clinical signs of chronic trypanosomiasis are indistinguishable from those signs associated with other cardiac disease including DCM, CHF, and other primary cardiac disease. MWDs in endemic areas should be screened annually (*T. cruzi* IFA and PCR) during the RSAPE. The DOD FADL conducts testing for *T. cruzi*. The cardiac form of Chagas disease in dogs can remain silent, but generally leads to clinical signs in some dogs such as lethargy, exercise intolerance, weakness, fainting, inappetance, abnormal cardiac rhythms, congestive heart failure, and sudden death. Ultimately, the cardiac form of Chagas disease in dogs results in DCM. A *T. cruzi* IFA and PCR should both be submitted in any MWD that exhibits signs clinical signs listed above and has resided in an endemic area.

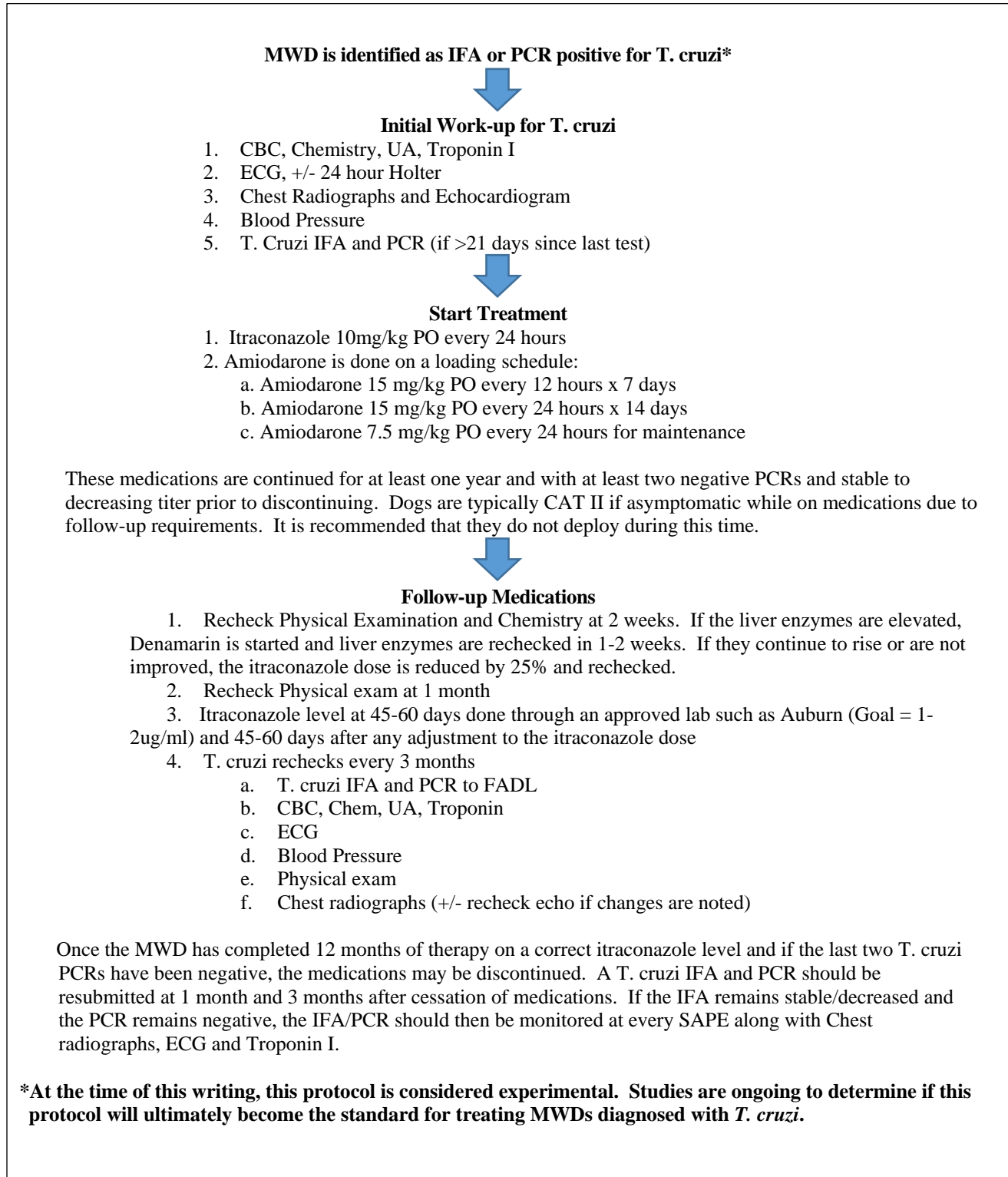
(4) Dogs that develop the cardiac form of Chagas disease will be considered Unfit for Duty and processed for elimination from the MWD Program. Asymptomatic MWDs will undergo treatment and monitoring for *T. cruzi* with Itraconazole and Amiodarone (See protocol). MWDs that remain asymptomatic will be retained and continue to work.

(5) *T. cruzi* Treatment Protocol. See Figure 5-1. This protocol outlines the care and follow-up for asymptomatic *T. cruzi* dogs. Dogs with clinical signs will need to have more frequent assessment and management and will likely require additional therapy. Please contact the supporting 64F who will notify the Medicine Clinic at DODMWDVS when an MWD tests positive for *T. cruzi*.

b. Leishmaniasis. To date there have been very few cases of Leishmaniasis. However, given the worldwide deployability of working dogs, the fact that dogs serve as a reservoir for this organism, and the near global distribution of the disease, Leishmaniasis is a disease of concern in the MWD population.

(1) Dogs are considered the main reservoir for *Leishmania infantum*, the causative agent of Leishmaniasis. Although other species of *Leishmania* have been known to infect the dog, *L. infantum* is the primary organism of interest in canine leishmaniasis.

Figure 5-1. *T. cruzi* Treatment Protocol.



(2) The Mediterranean basin, deserts in western Asia and the Middle East and rainforests in Central and South America are the primary geographic areas of concern.

(3) Transmission occurs through the bite of an infected phlebotomine sand fly which is most active at dusk and dawn (crepuscular) and at night (nocturnal). Transmission by other means, such as blood transfusion, in utero, venereal, etc. are possible, however, sand fly vector borne transmission is the most common, natural form of transmission.

(4) The degree to which Leishmaniasis is manifest in the infected host is dependent on such factors as nutritional support, stress levels, and immune competency. Dogs typically display both cutaneous and visceral components of infection with clinical signs such as:

(a) Skin lesions such as ulcers (especially over bony prominences) and exuberant scale/crusts especially on the face and limbs, or generalized

(b) Localized/generalized lymphadenopathy

(c) Splenomegaly

(d) Emaciation/muscle atrophy

(e) Polyuria/polydipsia

(f) Epistaxis

(5) Diagnosis usually starts with performing Leishmania antibody titers when clinical signs are consistent with the disease. The titers are available through FADL. A cut-off titer for positive samples is considered 1:64, if positive this is diagnostic for the disease. Cytology of skin lesions, fine needle aspirates of organs, histopathology of organs or lesions and whole blood PCR are other diagnostics that can be performed in conjunction or if titers are negative and still highly suspicious of the diagnosis. If titers are negative, it is very unlikely that the MWD is infected with Leishmania.

(6) Prevention is primarily through the use of vector avoidance and implementation of deltamethrin-impregnated flea/tick collars as well as spot-on products containing permethrin. These factors play heavily in the decision to utilize deltamethrin collars and imidacloprid/permethrin/pyriproxyfen spot-on products for MWDs.

(7) The USDA and CDC do not prohibit patients with positive Leishmania titers from entry to the USA. If they have external clinical signs of Leishmania (skin lesions, uveitis, epistaxis...) then it would preclude the health certificate because they have clinical signs of an infectious or contagious disease.

c. Infective endocarditis (IE). Historically referred to as bacterial endocarditis, this infection of the endothelial surface of the heart valves (primarily aortic and mitral) in dogs is a particularly devastating disease. MWDs are rarely affected with infective endocarditis.

(1) Prerequisites for the disease are a transient or persistent bacteremia (due to cystitis, prostatitis, periodontal disease, pyoderma, etc.) coupled with damage to the endothelial surface of the heart valves. Colonization of the affected heart valve(s) ensues with sequelae such as immune-mediated polyarthritis and glomerulonephritis, thromboemboli formation, and sepsis culminating in acute congestive heart failure.

(2) The typical signalment of a patient suffering from IE is a young, large breed dog. German Shepherds have shown a predisposition toward this disease.

(3) Clinical signs include acute onset of a heart murmur, with a diastolic component being especially typical if the aortic valve is involved. Most common signs that a handler would notice are lethargy, inappetance, and lameness. Lameness can be a common presenting complaint for working dogs but the presence of a fever coupled with these other signs should increase the clinician's suspicion for IE.

(4) Diagnosis is made by the presence of clinical signs in conjunction with aerobic and anaerobic blood culture (venous samples collected aseptically from a minimum of three different sites in an amount of 5-10 ml each) prior to administration of any antibiotics and 16S PCR. Samples should be collected 30 minutes to one hour apart, and ideally timed with a fever spike if possible. Negative culture rates even in positively affected cases of IE are fairly common (up to 70%), and this could result from previous antibiotic administration or difficult to culture organisms such as *Bartonella*. Both serology and PCR testing for *Bartonella* should be performed concurrent with blood culture. Laboratory samples may be submitted to Galaxy Diagnostics (<http://www.galaxydx.com>). Their testing method includes proprietary enrichment culture [BAPGM (Bartonella Alpha Proteobacteria Growth Medium)] with highly sensitive PCR methods to increase the sensitivity of *Bartonella* spp. detection.

(5) Treatment consists of long term bactericidal intravenous antibiotics ideally based on culture and susceptibility results and minimum inhibitory concentration testing. Symptomatic treatment of the secondary signs of congestive heart failure is also indicated.

(6) Prognosis with IE is notoriously poor and is typically contingent on which heart valve is affected. Consultation with the supporting 64F is recommended for guidance on which cases may benefit from long term therapy, and which cases should receive humane euthanasia.

d. Ebola Virus. Much attention is being directed to the role (if any) that domestic animals may have played in the Ebola Virus outbreak in West Africa in 2014 after the disease spread to other continents/countries. At this point there is no evidence to show that dogs are susceptible to the disease, but their role as to the potential to spread the virus either through fomite transmission or directly through viral shedding is unknown. The Centers for Disease Control and Prevention report that there have been no reports of dogs becoming sick with Ebola or developing a capability to transmit the virus to people or animals. The following recommendations have been published through Defense Health Agency Veterinary Services (DHAVS) regarding deployment and redeployment of MWDs from Ebola outbreak areas:

- (1) DHAVS does not endorse the deployment of MWDs into Ebola outbreak areas.
- (2) If MWD-owning units do deploy MWDs to Ebola outbreak areas, these units should be prepared for the possibility that animal importation requirements may preclude the ability to redeploy these assets from endemic areas.
- (3) MWDs should not be utilized in locations where there is a possibility of coming into contact with infected carcasses (human or animal). Positive control should be maintained with all dogs being on leash. MWDs should not be employed in hospitals, morgues, body collection points, etc.
- (4) Physical exams are required upon redeployment.
- (5) Upon redeployment, MWDs will be quarantined in isolation for 21 days under the supervision of a veterinarian.

5-5. Gastrointestinal Disease. Non-GDV gastrointestinal disease is the cause of approximately 10% of MWD sick calls.

a. Apparently healthy MWD with weight loss and or anorexia. Weight loss or a lack of appetite are common reasons that MWD handlers seek veterinary care. Most of these dogs are not sick; in fact they are often in excellent health. Common causes of weight loss in an otherwise healthy MWD include:

- (1) Anorexia may occur due to hot/humid weather, stress, travel or a new environment, and diet changes or poor food quality (should not happen with standardized diet). Mild transient anorexia associated with these problems should not be of sufficient severity or duration (less than a few days) to cause clinically significant weight loss (more than a few pounds). If anorexia persists more than a few days or significant weight loss occurs, assess the dog as outlined in section 5-5b.
- (2) Increased energy expenditure associated with increased work or environmental extremes (e.g. cold weather), or activity in the kennel, e.g. agitation and more movement or “spinning” due to stress with PCS/TDY/Deployment. These dogs will generally be eating all the food provided, not anorectic, but some MWDs that are VERY active (or possibly clinically hyperactive) will not eat due to agitation and kennel activity or behavioral disorders.
- (3) Inappropriate Feeding due to miscalculation of dietary needs and inadequate meal size (See 3-6), or incorrect measurement of the specified meal size. Science Diet Active (SDA) is very high in calories. When using prescription diets such as Hill’s Z/D, bear in mind that the caloric density of these rations is much less than SDA and the volume of ration fed needs to be adjusted accordingly.

(4) Behavioral disease. Some hyperactive or repetitive activity MWDs may be so “distracted” by their behavior that they spill their food and can’t eat it or essentially “forget” to eat.

b. Apparently sick dogs with weight loss and/or anorexia. If the animal is sick, more aggressive workup is warranted. A very important first step is determination of whether the dog is losing weight and not eating well (inability to eat or anorexia), or losing weight despite good appetite and food intake. Specific categories of illness are discussed in more detail in later sections. The following rule-outs and diagnostic approaches are provided to help direct the workup:

- (1) Weight loss plus not eating well/poor appetite. It is often difficult to tell if a dog wants to eat, but cannot or if it has true anorexia, a lack of desire to eat. A careful history from the handler may be helpful, but observation of the dog during feeding is often necessary.

(2) Weight loss plus wants to eat but can't/doesn't due to:

(a) Orofacial disease – won't eat due to dental pain (esp. fractured teeth), other oral trauma, or inability to prehend and chew food (e.g. tongue disease/injury, masticatory myositis). Of these, dental pain or mild oral pain associated with bite wrap use is most likely. Masticatory myositis should be suspected if MWD was recently anesthetized. A good cranial nerve, oral, and dental exam should aid diagnosis.

(b) Oropharyngeal disease – tries to eat but has difficulty swallowing and possibly prehending food. This may occur after oral or neck trauma (including heat injury, excessive choke chain use, other) and may be associated with upper respiratory tract distress or stridor. These problems are uncommon in MWDs but may occur. A good cranial nerve exam and observation of oropharyngeal function under anesthesia and or with fluoroscopy may be needed for diagnosis, as examination of the oropharynx of awake MWDs is hazardous to the VCO.

(c) Esophageal disease – Megaesophagus, esophagitis, and esophageal stricture are all uncommon causes of poor food intake in dogs. Most of these dogs will be hungry and want to eat but have signs of pain during swallowing or history of desire to eat/adequate food intake followed by regurgitation of undigested food. Esophagitis should be of particular concern in MWDs receiving tetracycline medications. These medications must be taken with food and water as they are potent esophageal irritants (they may also cause anorexia due to gastritis). Presumptive diagnosis may be made by observation and history and physical examination, but endoscopic and or fluoroscopic examination may be needed for definitive diagnosis.

(3) Weight Loss and Anorexia. There are too many causes of anorexia to specifically discuss in this document. Most problems likely to cause anorexic weight loss in MWDs will be associated with other signs of gastrointestinal disease, e.g. nausea and vomiting, diarrhea, etc. General causes may include inflammatory gastroenteritis (e.g. primary Inflammatory Bowel Disease (IBD), food allergy/intolerance, Antibiotic Responsive Enteritis (ARE), infectious), pancreatitis, hepatobiliary disease, and large bowel inflammatory disease (primary IBD, antibiotic responsive colitis/stress colitis), gastric ulceration and neoplasia. Some specific differential diagnoses are discussed in later sections. The key to diagnosis lays in getting a good history and physical examination, assessment of appropriate clinical pathologic indices, and trying to identify which area is most likely the problem. Trial therapy is often a key part of the diagnostic process. As with allergic dermatitis, trial hypoallergenic diet use is often a key to diagnosis but long-term use may compromise deployability and this must be a consideration in management of MWD gastrointestinal disease if other therapeutic options are present.

(a) Gastric and Small Intestinal Disease. Most MWDs with these problems will have anorexia, vomiting, weight loss, and small bowel diarrhea. Most will respond to basic GI management of no food for 24 hours, and non-antimicrobial treatment (e.g. Diagal®, Endosorb® or loperamide). If the dog is febrile, or showing signs of general malaise diagnostics are warranted prior to considering treatment with antibiotics (e.g. amoxicillin, doxycycline, tylosin, metronidazole), gastric protectants and antacids, and short term easily digested diet. If signs persist beyond 48 hours or recur, extensive workup is needed.

(b) Large Bowel Disease. Most MWDs with these problems will have signs of large bowel diarrhea, straining during defecation, hematochezia, etc. but not weight loss and anorexia. If majority of signs are related to large bowel disease but anorexia or weight loss are present, additional problems are likely. Most of these cases will resolve with non-antimicrobial therapy (e.g. Diagal®, Endosorb® or loperamide). However if clinical signs persist, short-term antibiotic therapy and addition of dietary fiber are indicated.

(c) Hepatobiliary and pancreatic disease will often be associated with enteritis. It is often difficult to identify which problem is primary and which is secondary; however, in MWDs enteric disease is more commonly the underlying problem. Careful abdominal palpation and clinical pathology evaluation may help identify hepatic disease (acute vs. chronic/failure) and signs of pancreatitis.

(d) Other. Renal failure, neoplasia, heart disease, infection and other systemic disease may cause anorexia associated with nausea, vomiting, etc. Physical and clinical pathologic examination should help identify these problems if they are present.

(4) Weight loss plus eating well. In general the causes of weight loss despite adequate food intake are due to (NOTE: these are often multifactorial):

(a) Inadequate absorption/utilization of consumed nutrients: Maldigestion/Malabsorption disorders such as Exocrine Pancreatic Insufficiency (EPI), ARE, intestinal inflammation (as above), etc.

(b) Excessive caloric expenditure: Increased metabolic rate due to behavioral hyperactivity, fever, infection/sepsis, malignancy, congestive heart failure, post-operative or post-trauma recovery.

(c) Loss of ingested nutrients: due to Protein Losing Nephropathy (PLN – glomerulonephritis with less likely amyloidosis), Protein Losing Enteropathy (PLE – inflammatory, infectious, lymphangiectasia or neoplasia), or Protein Losing Dermatopathy, diabetes mellitus, parasite infestation, chronic blood loss, etc.

c. Gastroduodenal ulcers (GDU). GDU are fairly uncommon in MWDs but may occur, especially when associated with NSAID therapy (inappropriate dosing or combination of different NSAIDs) or glucocorticoid administration, foreign body ingestion, hypotension, and liver disease. Other potential causes include primary gastroduodenal neoplasia, gastrinomas or mast cell tumors. *Helicobacter* infection is an unlikely cause of GDU in dogs, but may be a concern in some. Only NSAIDs approved for use in dogs should be used in MWDs.

(1) Clinical signs. These signs may include melena, abdominal pain, hematemesis, anorexia, weight loss, decreased exercise tolerance, pale mucous membranes.

(2) Diagnosis. Clinical signs, CBC/chemistry panel/UA, gross fecal and vomitus exam, radiology (barium series), endoscopy. Chronic gastrointestinal blood loss typically results in nonregenerative anemia with hypochromic and microcytic RBC indices.

(3) Treatment options and deployability. The standard treatment should be use of an antacid combined with sucralfate for 1-2 weeks. Sucralfate may be discontinued 3-5 days prior to the antacid. If longer therapy is needed to control signs the supporting 64F should be consulted. During evaluation MWDs should be placed in CAT 3.

(a) Mucosal binding protectants such as sucralfate bind to damage at the site of ulceration/developing ulcer in the acidic stomach. It should be administered at 1 gram/dose (MWD under 20 kg 500 mg per dose) at least every 12 hours, and every 8 hours may be optimal. Avoid giving with other medications as it may hinder absorption.

(b) Acid reducers including H₂ receptor antagonists or proton-pump inhibitors. Omeprazole a proton pump inhibitor is the preferred medication for acid reduction. Famotidine is the preferred H₂-blocker, however, this medication should be reserved for cases in which only short term use is required. Famotidine and Omeprazole should not be used concurrently.

(c) Misoprostol is a synthetic prostaglandin analog which can be used as a potent anti-ulcer medication in MWDs with history/risk of NSAID toxicity or severe or chronic ulceration not responsive to other medication. It is expensive and very hazardous to female personnel as it is a potent abortifacient and may cause severe uterine contractions. If used, it must be handled in the same manner as a chemotherapy drug and latex gloves must be worn. Due to the potential for adverse effects, it should generally not be the first choice for a newly diagnosed patient with GDU. This medication is better used as a preventative rather than a treatment of GDU.

d. Diarrhea. Diarrhea is a very common presenting complaint with MWDs. Large bowel signs include hematochezia, mucus, tenesmus, small amounts of stool, and frequent bowel movements. Small bowel signs include weight loss, large volumes of stool, melena, and vomiting. Potential etiologies include stress, dietary intolerance, bacterial overgrowth or imbalance (dysbiosis), inflammatory bowel disease (IBD), obstruction (foreign body, mass, etc.), parasites, and neoplasia. Parasitic diarrhea should be uncommon in MWDs as they receive monthly preventatives and have a standard diet but remain a concern (e.g. whipworms).

(1) Large bowel vs. Small bowel. Large bowel vs. Small bowel differentiation is integral to developing a diagnostic and therapeutic approach to the problem of diarrhea.

(a) Large bowel differentials include bacterial (*Clostridium* spp. especially), stress colitis, IBD, neoplasia, parasites and fungal. Diagnostics and treatment includes fecal parasite examination, empiric deworming, non-antimicrobial therapy (e.g. Diagal®, Endosorb® or loperamide) in addition to dietary fiber are often all that is needed. If these do not resolve the problem, or if it recurs frequently and the MWD appears clinically ill then more aggressive workup is appropriate including: CBC/chemistry/UA, rectal exam, cytology, stool culture (usually not helpful unless really sick), colonoscopy, and radiographs.

(b) Small bowel differentials include IBD, obstruction/intussusception, EPI or other malabsorption/maldigestion conditions, neoplasia, fungal, and parasites. If mild and no weight loss has occurred, fecal examinations, short-term bland/easily digestible diet and non-antimicrobial therapy (e.g. Diagal®, Endosorb® or loperamide) are often all that is needed. If these do not resolve the problem, it recurs frequently and/or the MWD appears clinically ill more aggressive workup is appropriate including: CBC/chemistry/UA, Pancreatic and Trypsin-like immunoreactivity (PLI and TLI), serum fasting cobalamin and folate levels, abdominal radiographs/abdominal ultrasound, and endoscopy or abdominal exploratory with biopsies (consult with supporting 64F).

(2) Treatment options and deployability. During evaluation MWDs should be placed in CAT 3.

(a) Diet-standard GI upset treatments. Rest the gut for 24 hours; feed easily digestible, low residue diet for 3-5 days such as I/d or I/d Low fat. Long-term use of a hypoallergenic diet (at least 8-12 weeks) may be necessary

to rule out diet allergy or inflammatory bowel disease as a source of inflammatory enteritis.

(b) Fiber. Psyllium (1-3 tsp/20 lb every 12 hours with food) or high fiber diet (W/D, R/D) or add canned pumpkin to the current diet (1-4 tsp per meal).

(c) Non-antimicrobial therapy (e.g. Diagel®, Endosorb®) – anti-microbial resistance is a significant challenge for the human and veterinary medical fields. Overzealous prescribing of antibiotics for conditions that either have alternative non-antimicrobial therapies (stress colitis) or antimicrobials are not indicated (viral infections) are leading contributors to the evolution of antimicrobial resistant bacterial strains. Diagel® (Van Beek Natural Science) and Endosorb® (PRN Pharmacal) are two examples of veterinary products that can be used in cases of simple diarrhea. Antibiotics should be reserved for non-responsive cases and for situations where an antimicrobial is clearly indicated.

(d) Motility modifiers - increase segmental contractions. Loperamide HCL 0.1-0.2 mg/kg PO every 8-12 hours. Use motility modifiers only if significant GI disease has been ruled out and if the diarrhea is duty or comfort limiting for the MWD and/or handler. Keep in mind that these drugs will stop almost all diarrhea but does not treat the underlying disease, and it should not be used to merely mask the diarrhea without investigating and treating the underlying problem. They should only be used for 1-3 days and concurrent workup should be initiated.

(e) Antibiotics – 7-14 day trial therapy is appropriate to help determine the contribution of Small Intestinal Dysbiosis/Antibiotic Responsive Diarrhea and bacterial enteritides. Appropriate antibiotics include: metronidazole (10 mg/kg PO every 12 hours), and tylosin (25-44 mg/kg PO every 12 hours). Trial therapy is the most accurate means of diagnosing bacterial colitis, although the immune modulating effects of some antibiotics may complicate the true cause of enteritis in certain cases. If bacterial enteritis is the only problem it should resolve quickly on antibiotic trial therapy. If it does not improve, or frequently recurs look for other causes of disease as well.

(f) Anti-inflammatories - without biopsies, use the ones with least systemic effects first such as sulfasalazine (10-30 mg/kg every 8-12 hours) or olsalazine (5-10 mg/kg every 6-12 hours). If there is histopathological evidence of inflammatory infiltrates, steroid therapy (prednisone 1-2 mg/kg every 12 hours tapering to lowest effective dose) may be necessary to control IBD. Alternative immunosuppressive options to control IBD are azathioprine, cyclosporine, leflunomide and budesonide. Consult with the supporting 64F in treating these cases.

5-6. Cardiac Disease. Although a major concern, cardiac disease is an infrequent cause of MWD morbidity and mortality. It is uncommon to encounter an MWD with a congenital cardiac defect due to the screening examinations performed on these dogs at procurement and the fact that many MWDs are purchased at approximately two years of age.

a. Chagas' Disease. Chagas' disease is caused by the hemoflagellate protozoan, *Trypanosoma cruzi*. See Section 5-4a, American Trypanosomiasis (Chagas Disease) for more information regarding epidemiology, transmission, and treatment of asymptomatic MWDs.

(1) Clinical signs generally follow either an acute or chronic course. The majority of patients suffering from acute signs are young dogs and can consist of sudden death, generalized lymphadenopathy, anorexia and diarrhea. Dogs that survive acute stage may become clinically normal, or undergo an indeterminate period of "latency" with no untoward effects. Some dogs with signs of chronic disease typically develop arrhythmias (ventricular premature contractions, heart block, etc.). Signs of congestive failure develop in many dogs and may be clinically indistinguishable from dilated cardiomyopathy. Any MWD presenting with signs of right sided heart failure, cardiomegaly, and/or ECG abnormalities should have current *T. cruzi* serology performed.

(2) Diagnosis. Serology via IFA may be performed through the FADL. Older methodologies to test for Chagas cross-reacted with *Leishmania spp*, however newer methodologies employed by the FADL are much more specific for Chagas. In addition, the FADL also has the ability to run PCR testing on whole blood samples. Theoretically, the higher titer denotes the incriminating organism; however, performing PCR analysis for Leishmaniasis may be indicated to further rule it out. Given that most MWDs begin their working lives at JBSA-Lackland in San Antonio, TX (an endemic area for Chagas' disease) most cases that are positive for *T. cruzi* represent true exposure to this organism.

(3) Treatment. Two components of therapy are critical: control of arrhythmia and managing signs of dilated cardiomyopathy (DCM). Anti-arrhythmic medication options include sotalol (as a monotherapy if effective) or in conjunction with mexilitine (if available) or amiodarone. Currently the DODMWDVS is treating Chagas patients with amiodarone and itraconazole. Consult the supporting 64F or the DODMWDVS for guidance on management of individual Chagas patients. Obtaining a holter monitor analysis prior to and approximately one month after

initiation of therapy are indicated to assess response to therapy. Regarding controlling signs of DCM, see section below.

b. Congestive Heart Failure. Congestive heart failure (CHF) may occur secondary to myocardial disease (Dilated Cardiomyopathy, Chagas-induced myocarditis), valvular disease, conduction disturbance, or pericardial disease. The most common cause in the aged MWD is mitral valve insufficiency (MVI). Although acute CHF may occur due to a ruptured chordae tendinae, or acute pericardial effusion, the most common presentation is one of slowly progressive weakness or exercise intolerance.

(1) Clinical signs. These include weakness (often primarily evident in the hind limbs) exercise intolerance, cough, respiratory distress, ascites, hepatosplenomegaly, and syncope.

(2) Diagnosis. Diagnosis is made by auscultation, pulse quality/rate, venous distention, jugular pulse, three view thoracic radiographs (essential for complete diagnosis), ECG, and blood pressure. Other diagnostic procedures that may be required to make a diagnosis include echocardiography, pericardiocentesis, CBC, chemistry profile and urinalysis.

(3) Treatment and Deployability. CHF is a progressive disorder with the hallmark of decreased cardiac output and commensurate degradation in exercise capacity. Given the exercise demands of MWDs, the long term utility of an MWD even in the early stages of CHF is questionable at best. Consultation with supporting 64F should be performed to assess deployability status of these patients as well as whether or not disposition should be considered.

(4) Because of breed dispositions both for right atrial hemangiosarcoma and idiopathic pericardial effusion, MWDs presenting with signs of CHF should be screened for pericardial effusion leading to cardiac tamponade. All MWDs with evidence of a transudate abdominal effusion should be screened for cardiac tamponade. Other clinical signs include tachycardia and jugular venous distension. Treatment consists of pericardiocentesis to relieve the tamponade. Samples should be submitted for cytology.

(5) Standard treatment guidelines are shown in Table 5-1. MWDs diagnosed with Stage B CHF should be placed in CAT 2, but as previously mentioned, strong consideration should be given to proceeding with disposition in these dogs. Those with Stage C or D CHF should be placed in CAT 4 with limited or no duty and submitted to the MWD disposition process. In reality, stage D patients are those who are refractory to standard outpatient therapy. Humane euthanasia is the most appropriate approach. Contact the supporting 64F or the DODMWDVS for consultation.

c. Cardiomyopathy. Dilated Cardiomyopathy (DCM) is a potential concern in MWDs. As previously stated, obtaining a current *T. cruzi* titer and PCR on any DCM suspect is important to assess the possible involvement of this organism as an inciting cause.

(1) Clinical Signs. DCM may present due to a wide variety of signs from mild CHF and exercise intolerance, weakness and collapse or syncope, ascites or pleural effusion, or occasionally sudden death. Associated arrhythmias, heart murmur, or abnormal pulse quality may be detected in some dogs prior to onset of other clinical signs. A grade 1-3/6 systolic murmur is typically ausculted over the left and/or right atrioventricular valve(s), a progressive increase in grade may be noted if decreased coaptation of valves secondary to heart enlargement occurs.

(2) Diagnosis. Diagnosis should be made based on radiographic evidence of cardiomegaly with or without pulmonary edema and pleural effusion and echocardiographic evidence of reduced systolic function (decreased ejection fraction, fractional shortening) as well as cardiomegaly (left atrial and ventricular enlargement as well as decreased thickness of interventricular septum/left ventricular free wall). All MWDs with suspected DCM should be evaluated with an ECG study (minimum Lead II but six lead preferred). Arrhythmias noted clinically, or on auscultation and pulse palpation should be better characterized with the ECG. Diagnosis in asymptomatic MWDs must be made with care, and after consultation with a supporting 64F and/or a radiologist at DODMWDVS, as the resting athletic heart may bear some resemblance to mild DCM. Specific radiographic and echocardiographic indices for assessment of MWDs are available to aid in diagnosis.

Treatment and Deployability. Treatment of DCM is directed at improving cardiac contraction with positive inotropes, control of associated arrhythmias, treatment of associated CHF (as above) and treatment of underlying disease (if identified). Any working dog receiving medical care for clinically apparent signs of cardiac disease should be placed in a CAT 4 status and undergo the disposition process. Given the relatively rapid progression of DCM in most dogs, even in the absence of significant clinical signs (i.e., early DCM) MWDs diagnosed with DCM should immediately be placed in a CAT 4 status and undergo the disposition process.

TABLE 5-1. MWD Treatment and Deployment Guidelines for CHF.

Heart Failure Stage	Clinical Signs	Radiographic Changes	Treatment	Deployment Category
A – Asymptomatic (dogs predisposed to cardiac disease)	None; based on signalment	None	None	1
B – Structural heart disease in absence of signs Substage B1: no imaging changes Substage B2: echo/x-ray changes	Murmur	+/- LA, LV enlargement; generalized cardiomegaly	Substage B1: none; recheck q3-6 months Substage B2: ACEI, +/- beta blocker, special diet	2 or 4
C – Past or current signs present of failure	Same as B + dyspnea, cough, jugular venous distension, ascites, tachycardia	Same as B +/- pulmonary venous distension	CE, ACEI, diuretic, special diet, positive inotrope; light duty	4, initiate disposition
D - End-stage disease	Same as C, refractory to therapy, require hospitalization	Above plus pleural effusion/ascites	CE, ACEI, diuretic, special diet, positive inotrope, O ₂ supplementation, topical nitroglycerin; No Duty	4, initiate disposition, or more likely humane euthanasia

Key: LA = left atrium,
 LV = left ventricle,
 RV = right ventricle,
 Diuretic = Furosemide
 CE = client education, tell handler what they should look for if the condition is progressing,
 ACEI = Angiotensin Converting Enzyme Inhibitor,
 Inotrope = Pimobendan
 Special Diet = mildly sodium restricted; adequate protein

5-7. Respiratory Tract Disease. Respiratory tract disease is not common in the MWD (less than 5% of expected sick call and less than 2% of historic mortality), but deserves mention due to its potential severity and because it must be differentiated from CHF as a cause of weakness, exercise intolerance, and cough. Remember that these two disease conditions may occur together, as one predisposes to the other. Potential causes of respiratory tract disease include infection (bacterial, viral, mycotic, parasitic), neoplasia, conformational problems (i.e. laryngeal paralysis, bronchiectasis, collapsing trachea), and allergic bronchitis.

a. Upper Respiratory Tract (URT) Disease. Diseases of the nares and nasal passages, mouth, nasopharynx, larynx, trachea and bronchi may occur in MWDs due to trauma (e.g. heat injury or excessive use of a choke chain), infection, neoplasia, or due to anatomic abnormality. These problems are rare in MWDs as those with predispositions are generally excluded from purchase and training at the DOD Dog Center, and because infectious upper respiratory disease is uncommon in adult healthy dogs. Kennel cough (*Bordetella*) and canine influenza vaccinations of MWDs are not authorized at the time of this writing. It is not uncommon to be presented with a working dog with harsh upper airway sounds associated with working on the collar/choke chain. Some dogs (especially Labrador Retrievers) experience transient laryngeal paralysis due to presumed damage to the recurrent laryngeal nerve with either excessive pulling on the lead or overzealous corrective measures on the part of the

handler. Absence of signs off lead are supportive of this problem. Attempts to utilize the dog on a harness may be employed by the handler in an effort to salvage the working dog, however, be advised that most handlers and trainers are loath to switch to this system.

(1) Clinical signs. Dogs with URT disease may have signs including mild to progressive, or acute respiratory distress (especially inspiratory), cough, oculonasal discharge, altered bark, weakness or exercise intolerance, and signs of associated systemic and or lower respiratory tract illness.

(2) Diagnosis. Minimum diagnostic evaluation for the MWD with URT disease includes a good history, observation of respiratory patterns (generally slow deep obstructive) and auscultation (e.g. stertor, stridor, rhonchus), systemic evaluation with CBC, chemistry panel, urinalysis and heartworm test. Additional workup may include three view thoracic and cervical radiographs, rhinoscopy, larngotracheoscopy, fluoroscopy, transtracheal wash, Baermann sedimentation fecal examination and trial therapy.

(3) Treatment and Deployability. MWDs under evaluation or treatment for URT disease should be placed in CAT 3. Permanent reduction to CAT 2 is uncommon except in MWDs with neoplastic or traumatic URT disease. Treatment must address primary and underlying disease.

b. Lower Respiratory Tract (LRT) Disease. Diseases of the small airways and pulmonary parenchyma are uncommon in MWDs for reasons similar to URT disease. General causes of LRT disease include immune mediated, infectious, allergic, cardiac and neoplastic disease. Viral, bacterial, and parasitic pneumonias are of limited concern in MWDs due to aggressive prophylactic care and good general health. Bacterial pneumonia should be of increased concern if MWD was recently anesthetized, has a history of vomiting or regurgitation, or episodes of collapse or syncope.

(1) Clinical Signs. Common signs of LRT disease include mild to progressive or acute severe respiratory distress, coughing, mucopurulent nasal discharge, weakness, and an orthopneic stance with neck extended and forelegs bowed (elbow abduction) to facilitate respiration. Associated signs of systemic or associated URT disease may also be present.

(2) Diagnosis. The minimum evaluation for MWD with LRT disease includes a good history, observation (generally shallow fast restrictive respiratory patterns) and auscultation (e.g. crackles, wheezes, rales), and three view thoracic radiographs. Other diagnostic procedures may include fecal exam (parasite migration), serology (fungal), urine fungal antigen screen, arterial blood gas, transtracheal wash (TTW) or bronchoalveolar lavage with fluid culture and susceptibility plus cytology.

(3) Treatment and Deployability. Treatment is dictated by definitive diagnosis of LRT and underlying diseases and may include special attention to maintaining good hydration; cough suppressants (contraindicated in patients with a productive cough) and bronchodilators, anti-inflammatories and antihistamines, and antibiotics. More acute cases may require confinement, oxygen support, nebulization and coupage. Treatment should continue until adequate oxygenation can be maintained on room air and a minimum of one week past resolution of clinical signs. MWDs with clinical signs of LRT disease should be placed in CAT 3 during evaluation and treatment. Some with chronic recurrent problems may need to be maintained in CAT 2, or patients with predisposing problems such as bronchiectasis, disposition should be strongly considered.

5-8. Urogenital Disease

a. Cystitis and Prostatitis. Prostatitis, and therefore cystitis, is a common problem in the intact male MWD. Given the anatomic proximity between these two structures, co-infection is common. Etiology is usually bacterial though infections can be secondary to predisposing causes such as calculi, outflow obstruction, infection elsewhere in the urinary/reproductive tract, indwelling catheters, immunosuppressive disease, trauma to the bladder, glucosuria, or anatomic abnormality. Thorough rectal examinations are imperative at all semiannual exams to identify problems early. Normal prostate palpation should reveal a smooth, non-painful, symmetrical organ. With progressive age and development of benign prostatic hypertrophy (BPH), a common disease in intact male dogs, the prostate typically gravitates over the brim of the pelvis and can make thorough digital rectal exam challenging. Utilizing the non-dominant hand to place caudodorsal pressure on the abdomen can facilitate a caudal displacement of the prostate into the pelvic canal and enhance the clinician's ability to better evaluate the organ via rectal examination.

(1) Clinical Signs. Clinical signs typically consist of lower urinary tract signs such as hematuria, dysuria, stranguria, pollakiuria, polyuria, or systemic illness (acute bacterial prostatitis or pyelonephritis), straining to

defecate (secondary to prostatomegaly) and, abdominal pain, that may mimic lower back pain (differential for DLSS) or hind limb lameness.

(2) Diagnosis. Diagnosis is established by a number of methods and tests including physical exam, rectal exam, urinalysis, urine culture and susceptibility, CBC, chemistry profile, abdominal radiographs (with or without contrast), urinary tract ultrasound, thoracic radiographs (neoplasia), ejaculate - cytology, culture, prostatic wash - cytology, culture, fine needle aspirate, biopsy of prostate. It is important to rule out other prostatic conditions such as prostatic adenocarcinoma (fixed, painful, asymmetric, firm), prostatic/paraprostatic cysts, benign prostatic hyperplasia, and abscess. See Table 5-2.

TABLE 5-2. Prostatic Conditions and Findings.

	Fixed	Painful	Symmetrical	Consistency
BPH	N	N	Y	Normal, but enlarged
Cyst	N	Y/N	N	Fluctuant/Firm
Abscess	N	Y	N	Soft/Firm
Prostatitis	N	Y-acute	Y or N	Normal
		N-chronic		
Adenocarcinoma	Y	N/Y	N	Firm and Irregular Texture

(3) Treatment. For an uncomplicated UTI in a female dog, presumptive therapy with an amoxicillin or other first line antibiotic for 5-7 days is appropriate. For an initial urinary tract infection in an intact male dog, treat with an appropriate antibiotic (based on culture and susceptibility testing) for a minimum of 3 weeks while also verifying that sterile urine is achieved both during therapy and within 5-7 days upon cessation of therapy. If the dog is intact and signs are consistent with acute or chronic bacterial prostatitis, then orchiectomy is indicated concurrent with antibiotic therapy. Dogs with prostatitis should be placed on appropriate antibiotics for at least 4-6 weeks. Antibiotics that penetrate the prostate are indicated (i.e., enrofloxacin, TMS, etc.). Initial drug selection should take into account the blood/prostate barrier and definitive therapy should be based upon urine culture and sensitivity. Prostatic abscessation may be chronic and subtle or can present as an acute life threatening sepsis. Surgical drainage and “omentization” of the abscess cavity (or large paraprostatic cysts) appears to offer improved survival over more traditional methods of surgical therapy (marsupialization or drainage through the abdominal wall). Patients with sepsis or a ruptured prostatic abscess are too unstable for transport to DODMWDVS for surgical care. Because they require immediate critical care and skilled surgical intervention, referral to appropriate veterinary specialists in the local area is the preferred course of action. For clinically significant benign prostatic hyperplasia and acute/chronic bacterial prostatitis, neutering is the first line of therapy. According to the MEDCOM MWD Medical Readiness Policy, MWDs will only be neutered for clinically relevant, medically-related problems, such as testicular neoplasia, significant benign prostatic hyperplasia/hypertrophy, intractable scrotal dermatitis, perianal adenoma, or other problems that are clearly and directly attributable to the dog being intact. An enlarged prostate, in the absence of clinical manifestations which degrade the dog’s performance or quality of life, is not sufficient reason to perform orchiectomy. VCOs should consult with their supporting 64F regarding cases in which they are uncertain of the appropriate action regarding neutering of MWDs. MWDs will be neutered as part of the final processing for adoption as a pet; however, this may be waived if being transferred to civilian law enforcement or other non-DOD federal agencies. VCOs will not neuter male MWDs as a prophylactic procedure or for surgical practice.

CHAPTER 6

DIAGNOSTIC IMAGING

6-1. Radiation Safety. Procedures to minimize radiation exposure for all personnel will follow the ALARA (As Low As Reasonably Achievable) principle and will include the following:

- a. All unnecessary personnel will leave the radiology room prior to any radiographic exposures being made.
- b. All personnel who are restraining or positioning dogs for radiographic exposures must wear protective clothing. Protective clothing includes lead (0.5 mm thick) aprons, gloves, and thyroid shields.
- c. Contact the supporting MTF's health physics/radiation safety officer for guidance regarding need for dosimetry badging. Depending on number of exposures made at a facility, dosimetry may not be deemed necessary; however, that determination must be made by supporting health physics/radiation safety personnel. When required, dosimetry badges must be worn by all personnel in the radiology room during exposures IAW health physics/radiation safety guidance.
- d. Under NO circumstance should personnel ever have any part of their body within the primary beam of radiation, whether it is shielded or not. The primary beam is within the area outlined by the collimator light. Gloves and aprons are only designed to protect from scatter radiation and will not protect the wearer from exposure to primary beam radiation. Collimation of the primary beam will be used for every exposure.
- e. Prior to an exposure being made, it is the responsibility of all personnel within the radiology room to ensure they and all others are properly protected from radiation. The basic tenets of time, distance, and shielding should be constantly employed.
- f. Assistants and animal restrainers will be positioned as far away from the primary beam as possible (preferably at the ends of the table).
- g. Radiographic procedures should be performed with adequate restraint (i.e. sedation and/or anesthesia if necessary) to ensure proper radiation safety practices, enable proper positioning, and avoid re-takes.
- h. An exposure log (date, person holding animal or cassette, type of procedure, kilovolt peak [kVp] and milliamperes second [mAs]) will be maintained for each radiographic exposure to help minimize re-takes and calculate radiation workload or exposure history if necessary. This log also allows the VCO to tailor repeated techniques for an individual patient on follow-up exams.
- i. A veterinary facility radiation safety SOP specific to the clinic is required by and helps assure adherence to AAHA practice standards.

6-2. Digital Radiography. Few aspects of veterinary medicine have changed more than the development and rapid rise of digital radiography since the early 2000s. Even though film radiography is still a viable option, most veterinary schools do not continue to incorporate film radiography in their curricula. Digital radiography holds several advantages over film radiology, with the largest including faster development, time/patient throughput, the ability to post-process images via software reducing the need to repeat images and overall radiation exposure, and the lack of need for a dark room and hazardous chemical use. The term "digital radiography" incorporates both computed radiography (CR) and digital radiography (DR) systems, and is important to understand the basic fundamentals and differences of each system if involved in purchasing, maintenance, or troubleshooting/development of artifacts involved with image generation of these units. It is beyond the scope of this handbook to discuss individual brands/units as multiple types are currently in use in the Army, each with their own proprietary software and equipment variation. If the VCO has more specific questions regarding the digital radiography equipment that the equipment manuals cannot answer, please contact the local medical maintenance staff and/or digital equipment service representative.

a. **Computed Radiography.** CR uses a cassette which holds a bendable phosphor plate that captures the latent image after patient exposure. After the x-ray exposure has been made, the plate must be transferred from the x-ray table and placed into a processor to generate the image. Depending on the type of phosphor within the plate, the latent image may only be stable for minutes to hours so it is important to process quickly after exposure to ensure no loss of data occurs. Once the cassette has been placed into the processor, the plate within the cassette is ejected and a laser activates the stored energy within the plate. This stored energy is released as visible light/photons, which is captured by the processor, amplified/enhanced and further transformed into the image displayed on the computer monitor. After the image on the plate has been read, the plate is exposed to white light in order to effectively

“erase” any stray energy left within the phosphor and then returned to the cassette for the next image. It is normal for wear and tear to occur on these plates as they are bent over time and can eventually create image artifacts due to this wear and tear. These plates are much less expensive than DR, so if dropped, kicked, or broken are much less expensive to replace. Routine maintenance will need to be performed at least annually on these units as dust/debris accumulation within the processors can lead to artifact formation and/or poor image generation. High radiography throughput is not often a major concern with most of our facilities, CR systems are generally less expensive than DR systems, and if parts break CR systems are usually more cost-effective to replace.

b. Digital Radiography. DR (direct, indirect, and charged coupled detector) uses a plate which directly converts the captured x-rays into an electrical image via semiconducting material, transistors, or detector chips (respectively), which is then transferred to the computer for further initial processing before eventual display on the monitor. These plates are generally similar to CR in terms of image resolution, however, afford greater latitude for image post-processing, require less patient exposure to create a diagnostic image, and do not require the extra step for transfer to a processor as advantages over CR. Dependent on the x-ray system and technique chart, the plate may never have to leave the Bucky of the x-ray table unless special techniques (such as horizontal beam imaging) are employed. The transfer of data from the plate to computer/monitor usually involves a thick cable (however wireless plate transfer is available) which is often the “weak point” of the system, and can be broken if stepped on, therefore this must to be guarded. The plates are fairly durable but also can be broken if kicked/dropped and must be protected as well. As the DR plate processes the image, the plate may need to be routinely calibrated per manufacturer’s guidelines in order to account for loss of pixels involved in electrical conversion of the x-rays over time. Additionally, certain types of plates do not function well in high temperature situations, so be sure to discuss this problem before purchase if the unit is planned for deployment use.

c. Digital Imaging Worklist (VTF). All software viewers require the patient data to be entered prior to making an image. As the worklist grows on the computer’s hard drive, it is of vital importance that the VTF adopt a standardized format for entering patient data; otherwise it may become difficult to find all of the studies listed for one patient as the case files grow. For MWDs, it has become important to adopt the following standardized protocol for entry: Last Name should be “MWD”, First Name should be the actual name of the MWD (i.e. “Rex”), and the Patient I.D. category should contain their tattoo number. The rest of the patient data (sex, date of birth, etc.) still needs to be entered as well. By this means, it will be easier to find the images in the system, easier for the radiologists to locate on their end if receiving the referral, and easier to transfer over the hospital internet when deployed.

d. Digital Imaging Worklist (MEDCEN/MTF). Many VCOs radiograph, MR, or CT MWDs with the help of the local MTF. DODMWDVS has developed a naming convention to enter MWDs properly into Composite Health Care System (CHCS); this convention should be applied at all MTFs. The exams can then be properly stored in the Picture Archiving and Communication System (PACS) and the non-human patients do not appear on physician’s worklists within the hospital. The VCO must communicate with the MTF network or CHCS office personnel to assure that these recommendations are applicable to the local situation. The VCO or the technologists in the department (CR, CT, MRI, etc.), must be given access to the non-human registration (NHR) field within CHCS. Last Name should be “MWD0G”, First Name should be the actual name of the MWD (i.e. “Rex”), followed by a space and the tattoo number. Enter sex and date of birth. Under SSN, enter the final 9 digits of the microchip number. Patient Category should be listed as K99 (patient not elsewhere classified). This non-human patient can now be “arrived” and procedures selected as with a normal patient. The study can be entered as “procedure only” so that MWD exams do not appear as “unspecified exams” on radiologist or other physician worklists over the hospital network. Alternatively, an MWD imaging study list can be created in the system by the MTF PACS Manager. Discuss this with the technologist when scheduling the study.

e. Digital Image Processing. Once the image appears on a computer screen, it has already undergone multiple pre-processing and processing protocols in order to display the largest number of shades of grey, improve contrast and spatial resolution, and suppress unnecessary noise. These protocols should have been optimized to work with the x-ray unit by the customer service representative. If the image cannot completely process to diagnostic satisfaction following image generation and the radiographic technique chart was correctly utilized, consulting with the service representative/medical maintenance personnel is indicated.

f. Digital Image Post-Processing. Post-processing an image allows the VCO to further fine-tune/manipulate the contrast and overall brightness of the generated image through a concept called windowing/leveling. Windowing refers to changing the overall numbers of shades of grey available based on the pixel values and leveling refers to

the mid-point of those pixel values. The mouse cursor often changes to the shape of a half-moon or curly line when altering these values. Depending on the software available for use with the system, there are numerous other post-processing functions that can use to manipulate the image (common ones include zoom, pan, measuring, labeling, etc.), however are too vast of a topic to include all options here. Refer to the viewing software manual to determine all of the capable functions available for use.

g. Digital Radiography Monitors. The standard of practice for medical imaging is a monochrome or grey-scale LCD monitor display. While medical-grade grey scale monitors are ideal, consumer grade monitors have been found to be adequate for diagnosis if appropriate post-processing techniques are used and are much more cost-effective. Consumer grade monitors are usually color monitors with fewer capabilities (decreased brightness, smaller pixel matrices, and smaller graphics cards) for observing the generated image. Color monitors are also not usually calibrated to the grayscale display function standards set forth by the Digital Imaging and Communications in Medicine (DICOM) standard (further discussed below), however, the service representative may be able to calibrate the monitors. Calibrating the monitors is not required, but is a quality assurance measure to conform uniformity of the grayscale within the display and between monitors. Ensure that the area where the images on the monitor(s) are viewed has low, indirect ambient lighting, as light pollution can cause misdiagnoses.

h. Digital Imaging Formats. The raw, unaltered/uncompressed digital image created should be able to be saved in a universally accepted format called DICOM. This format is the appropriate form for saving the image for medical record documentation and submitting to radiologists for consultation. There are several other formats that images may be saved in (common ones include .jpg, .tiff, .bmp, and .png), but these formats will often compress the actual image which decreases the overall resolution and information is lost which might have been diagnostic. Also, compressible files can also be altered or “photo shopped”, which deems them inappropriate for medical documentation. This does not mean that if an image is sent for referral to the DODMWDVS in a .jpg format that it will not be provided a consult (example is a camera picture of a film radiograph), but understand that the DODMWDVS may request the DICOM images to confirm the diagnosis.

i. Digital Storage. Storage of digital images can be performed by several means. The images will be stored on the computer hard drive associated with the digital radiography system, but it is important to backup these files as computer crashes are not uncommon. The most cost-effective method for storage of individual radiographic case files is through the use of CDs/DVDs. CDs/DVDs have a good deal of memory for storage capability; one CD (normally 700 MB capacity) can normally hold all radiographic studies for one patient over the course of their life. Ultrasound, CT and MRI studies are larger and need more memory capacity than routine radiographic studies, but usually one of these studies can be entirely contained on a single CD. DVDs can normally hold up to 4.7 GB of data, so can be used in rare cases when needed. External computer hard drives are also becoming rapidly more affordable and should easily backup all of the images with a 500 GB – 1TB external hard drive capacity.

j. Digital Radiography Technique Chart and Artifacts. It is often incorrectly assumed that a technique chart does not need to be developed for a digital radiography system as post-processing affords the ability to correct the overexposure/underexposure of the image. A radiation safety hazard may be created by not producing a technique chart by unnecessarily overexposing the patient to the primary x-ray beam, and overexposing the personnel handling the dog to scatter radiation. Additionally, artifacts may be generated through underexposure and overexposure of the patient which may not be able to be corrected through post-processing and will require more radiation exposure to create another image. Examples of exposure artifacts and other common digital radiography artifacts can be found in standard radiography texts. The procedure for appropriate development of a technique chart is within section 6-3.

6-3. Technique Charts. A technique chart is a table with predetermined x-ray machine settings for each body part, depending on the thickness of the tissue and the part of the body to be radiographed. Technique charts provide an organized approach to radiography based on anatomy, tissue thickness and specific film/screen cassettes to be used. Use of a technique chart is a radiation safety precaution that prevents unnecessary radiation exposure. Technique charts are also helpful with digital radiography systems to help maintain consistency between studies and limit re-takes due to over- and underexposure.

a. References. The AMEDD C&S uses McCurnin’s *Clinical Textbook for Veterinary Technicians* and *Radiography in Veterinary Technology* by Lavin when training 68T Animal Care Specialists. *Techniques in Veterinary Radiography* by Morgan and Thrall’s *Veterinary Diagnostic Radiology* texts are also excellent resources.

For a concise overview, we recommend: Lavin, *The Imaging Chain: Links to High Quality Radiography*. Vet Tech 22(5), May 2001.

b. General rules for technique charts. Technique charts need to be developed for every x-ray unit in order to obtain the highest quality diagnostic radiographs. Many manufacturers have already developed a veterinary technique chart specific for use with their equipment. It is recommended that the manufacturer is contacted before creating a technique chart to aid with the creation of based on the components of the entire system. Before beginning a technique chart, a medical physicist should calibrate the x-ray equipment and the film processor, if required, should be thoroughly evaluated for proper function (PMCS, quality assurance, consistency). For digital systems, technical support should facilitate initial system settings of protocols and processing algorithms. For body parts measuring over 10 cm, a Bucky or stationary grid should be used to block scatter radiation, which otherwise would severely degrade the quality of the image, potentially rendering them non-diagnostic.

c. Making a technique chart. Once the initial calculations are made, a cooperative animal will be required for several test exposures. An estimate of the proper kVp for the exam is obtained using Sante's Rule: $(2 \times \text{tissue thickness in cm}) + \text{Source-to-Image-Distance (40 in)} + \text{grid factor} = \text{kVp}$. Grid factor is the first number in the grid ratio (for example, 10:1) for the machines which can be found in the operator or service manual. If the grid ratio is unknown but x-rays are shot to the bucky then the default grid factor is 10. If a grid is not used with the system (never shoot x-rays to a table bucky or lay a grid on the cassette) then a grid factor is not included in the equation. An estimate of proper mAs is obtained by consulting the reference texts mentioned above. In general, higher mAs settings (5-15) are used for radiography of the abdomen, pelvis and spine. Lower mAs settings (2.5 – 5) are used for exams of the thorax and extremities. Higher mA settings, if adjustable on the x-ray tube, will minimize the length of exposure (seconds) for the same mAs and must be a consideration for procedures prone to motion artifact (e.g. thorax). Now obtain three different exposures (calculated value, +2 to 4 kVp, and -2 to 4 kVp) and select the best of those exposures. If none of these exposures are optimal, the technique must be adjusted using the principles of radiology technique evaluation mentioned below. After determining the best exposure technique for the thickness of the test patient, create a variable kVp technique chart by adding or subtracting 2 kVp for each cm change in thickness up to 80, then add 3 kVp from 80-100, and finally add 4 kVp above 100 until the chart is complete. As the maximum/minimum kVp range for the x-ray equipment is reached, one can also vary the mAs by either doubling the mAs and subtracting 10 kVp or halving the mAs and adding 10 kVp to stay within the limits of the x-ray tube while maintaining the same film density. Use the basic rules above to complete the technique chart within the capabilities of the x-ray tube and required patient exams (e.g. there is usually no need for a 20 cm extremity technique or 2 cm thorax exam).

d. Radiology Technique Evaluation. When evaluating the suitability of the technique used to produce a radiograph, three questions must be answered.

(1) Is the film too light? An underexposed image is defined as an overall lack of or poor gross detail of the anatomic structures on one or more areas of the radiograph due to the image being overall too white or has a more mottled/pixelated appearance. We most commonly see this in obese patients along the thorax where radiographic technique charts were not made to deal with the increased amount of fat along the thoracic walls, or in cases where increased amounts of fluid are present within a body cavity or the surrounding soft tissues like we can see with trauma. The peripheral background of underexposed images may also be more of a hazy gray rather than the typical uniform black appearance we should see. If most of the margins of the soft tissue structures cannot be visualized, then this is likely attributed to the fact that the majority of the x-rays used were not powerful enough to make it all the way through the patient to create a diagnostic image. Attempt to correct this by increasing the kVp value by 10-15%. If most of the soft tissue anatomic margins can be visualized well and the issue largely extends into the peripheral background of the image where it is more gray in appearance than black, then there is likely not a high enough quantity of x-rays available (mAs) to make a diagnostic image. Attempt to correct this by doubling the mAs value and repeat the image. For some studies, increase both kVp and mAs values in order to obtain a diagnostic image. One final point to make is that some tables have x-ray tubes which allow for manual height adjustment based on whether the plate is either resting on the tabletop or within the bucky. If the x-ray tube is set to shoot to the tabletop and the imaging plate is underneath the table in the bucky, this may cause an underexposed image to occur.

(2) Is the film too dark? This is by far the most common technique issue seen in veterinary radiology where the image(s) are overall far too black with loss of soft tissue detail. For digital radiography, overexposure can also be identified by the presence of planking in the areas surrounding the patient and appears as a rectangular pattern in the background. Additionally, clipping may have occurred such that no amount of image adjustment will bring out

an image in the thinnest portions of the patient (e.g. no vascular markings in lung, absent ventral body wall, absent musculature surrounding bones on a limb). If the image is overexposed then assess for any loss of the expected margins of the skin or soft tissues (or even small, thin bones if present in the image). If the margins of these structures are clearly noted but the overall image appears to be too dark then the mAs is too high as there are too many x-rays bombarding the patient. To correct this reduce the mAs to half of its original value and retake the image. If, instead, the margins or structure of the skin/soft tissues/small bones are significantly darkened or absent then the kVp is too high with too many high intensity x-rays penetrating through this region of the patient. Reduce the original kVp value by 10-15%. If the image is significantly overexposed reduce kVp and/or mAs multiple times in order to create a diagnostic image.

(3) Is adequate contrast present? The gray scale displayed on the film equals *contrast*. Evaluate the *quality* of x-rays (kVp) used to create the image and the amount of contrast that is desirable for the exam. The overall contrast of the soft tissue structures in the image can either be too high (image is too “black and white” in appearance) or too low (too many “shades of gray”). As the kVp values decrease between images, the amount of radiographic contrast will increase as the image will appear more “black and white” with less shades of gray. This is due to the fact there is less variety of kV values of the x-rays associated with the primary beam that can penetrate through the patient to reach the imaging plate. If instead the kVp values increase between images, this decreases the overall contrast of the image as it creates more variety of x-ray kV values that can penetrate through the patient in the primary beam, and therefore creates more shades of gray in the image. As opposed to over/underexposure issues, both kVp and mAs will ALWAYS change with contrast issues to keep the same level of radiographic exposure in the image. Therefore, if the image has too much contrast and it needs to decrease, INCREASE the kVp by 10-15% but also HALVE the mAs value at the same time in order to maintain the same level of radiation exposure in the image. If the image needs more contrast as it has too many shades of gray involved then DECREASE the kVp by 10-15% and DOUBLE the mAs value.

e. For a complete review of radiology technique evaluation, we recommend the information contained in the references. In most cases, the answers to these basic questions will lead to the proper adjustments of mAs and/or kVp necessary to produce the highest quality radiograph at the best possible technique.

f. Technique chart failure. In some circumstances, a technique chart that has been established will fail to produce a diagnostic, quality radiograph. Rarely is the x-ray tube malfunctioning (especially if recently calibrated). More often there has been an error in measurement or selection of exposure settings. There also may have been an error in film/screen selection or inconsistent film processing. This may also be the result of a disease process, which produces a greater or lesser radiographic density than expected. For example, these diseases can produce less radiographic density than expected: pneumothorax, megaesophagus, aerophagia, GDV, negative contrast (pneumocolon), focal destructive bone disease or generalized bone disease. Other diseases may produce a greater than expected radiographic density. Some examples include: pleural effusion, pericardial effusion, ascites, pulmonary hemorrhage, pneumonia, or administration of a positive contrast medium. Altering the exposure settings IAW with radiology technique evaluation guidelines mentioned above will assist in producing the best quality image possible without masking naturally occurring signs of pathology in the patient.

6-4. Abdominal Radiography of MWDs. Abdominal radiographs are usually made with the MWD awake when possible. Sedation (tranquilization or general anesthesia) can cause splenomegaly and can potentially cause ileus. However, sedation should be used when required to enable proper positioning and radiation safety in obtaining a diagnostic study. Lack of proper preparation of the abdomen is the most common problem with abdominal radiography. Ingesta, fluid, and fecal material frequently obscure the area of interest in an unprepared abdomen. For routine scheduled exams, the MWD should be fasted for 12 hours prior to making radiographs and enemas administered as needed. If a contrast study such as an upper GI or excretory urogram is being done, preparation of the abdomen is essential, and may include one or more enemas 3-4 hours prior to the procedure. Proper preparation for specials studies should be researched and planned on a per case basis.

a. Emergent situations. In an emergency, preparation is not required or recommended. For example, if GDV is suspected, one right lateral view is likely all that is required. Another example of a situation requiring no preparation is in a dog that has been vomiting or has diarrhea. If the dog is being radiographed to rule out ileus or obstruction, no preparation is necessary. If a positive contrast cystogram is being performed after trauma to rule out bladder rupture, no preparation is necessary.

b. Diagnostic quality radiographs of the abdomen. A minimum of two views are generally required for evaluation of the abdomen. The ventrodorsal and right lateral projections are preferred for most routine studies. The right lateral is usually preferred because it allows gas to move into the fundus of the stomach, permitting good visualization of the stomach and liver. If the pylorus and proximal duodenum need to be evaluated, a left lateral may be also be made. Three view abdominal studies (including both right and left laterals) are recommended in vomiting cases, especially if foreign body ingestion is suspected. The foreign body may only be visible on one view. The ventrodorsal view is diagnostically preferred to the dorsoventral view. Positioning of the radiograph is often determined by the area of interest. In large dogs, two overlapping films will likely be required for each view in order to get a diagnostic study of the entire abdomen. An abdominal study needs to include the entire diaphragm through the pelvic inlet with the legs fully extended caudally. In contrast to the lateral technique, an additional 6-8 kVp needs to be added to the ventrodorsal or dorsoventral view in order to properly expose the radiograph. Poor positioning, overexposure or underexposure can create false results or simulate disease.

c. Presence of abdominal fluid. Depending on the amount of peritoneal fluid, it may be necessary to increase the mAs 50% to produce a quality radiograph. In cases that require a shorter exposure time, the kVp can be increased 10-15% instead of increasing the mAs. Remember, that even with proper exposure, the serosal detail will be poor because of the summation of fluid with soft tissue structures.

d. Presence of free abdominal air (pneumoperitoneum). Positional radiography can be very useful in confirming the presence of a pneumoperitoneum. The x-ray table needs to have the capability to make horizontal beam radiographs. Alternatively, a portable x-ray unit (e.g. MinXray unit) can be used. The patient is placed in left lateral recumbency for 10-15 minutes. Gentle ballotment of the abdomen can be performed during this time to assist in shifting any free air to the dorsal body wall. An image is then made collimated to the dorsal (right) abdominal body wall centered just behind the diaphragm. The cassette or plate is placed behind the patient perpendicular to the table. The x-ray beam is directed parallel to the table in a ventrodorsal plane. The abdominal radiographic technique will need to be decreased. Free peritoneal air will accumulate along the dorsal abdominal wall. Care must be made not to mistake gas located within loops of intestine for free air.

6-5. Elbow Radiography of MWDs. Radiography of elbow joints of MWDs should be performed under appropriate sedation or general anesthesia. After induction, the dog can be intubated and then maintained on gas anesthesia if necessary. Anesthetic protocols should be tailored to the patient and the clinical situation. Several protocols and recommendations are found in other sections of this handbook.

a. Flexed lateral radiographs of the elbow joints. For diagnostic flexed lateral elbow radiographs, the elbow joint needs to be flexed as much as possible. To avoid rotation of the elbow, keep the elbow joint and the carpus in a true lateral position. The beam center should be directly on the elbow joint. We recommend positioning the dog in lateral recumbency, flexing the elbow on the down side as much as possible, and then tucking the dog's foot underneath his neck to hold it in position. For example, if the left elbow is being radiographed, the dog would be in left lateral recumbency, the left elbow flexed, and the left foot placed underneath the neck. The right leg is held out of the beam (caudally) with a sandbag or by an assistant.

b. Technique problems for flexed lateral elbow radiography. For diagnostic technique in the flexed lateral view, the elbow must be flexed far enough so that the medial epicondyle of the humerus is not superimposed over the anconeal process. Underexposure and obliquity are the most common technical errors.

c. Craniocaudal and oblique radiographs of the elbow joints. Place the dog in sternal recumbency and extend the limb cranially. Raise the head, and place it on positioning sponges facing the opposite leg. Measure over the thickest area (distal humerus). Center the beam over the elbow joint. The most common technical problem is incomplete extension of the leg resulting in foreshortening of the humerus and obliquity of the elbow joint. For oblique views, start by positioning the dog the same as for a craniocaudal view. Next, roll the leg approximately 10-15 degrees medially or laterally depending on which oblique view is being performed.

6-6. Pelvic Radiography of MWDs. Pelvic radiography of MWDs should be performed under appropriate sedation or general anesthesia. The anesthetic protocol should be tailored to the patient's needs and clinical situation.

a. Diagnostic quality radiographs of the pelvis. For diagnostic ventrodorsal pelvis radiographs, the pelvis needs to be well positioned. Both obturator foramina should be of equal size. Both legs should be parallel and fully, equally extended and internally rotated with both patellae centered over the femurs. If the pelvis is tilted, the "up" side will appear to have the larger (or more round) obturator foramen, the narrower ilium and better coverage of the

femoral head by the dorsal acetabular rim. Lateral views of the pelvis and lumbosacral junction are discussed below.

b. Techniques for standard pelvic radiography. The VD view must include the lumbosacral junction and stifles. Ideally, the last two lumbar vertebrae are also included. In the VD view, the rims of the acetabula should be visible through the femoral heads. In the lateral view, the ilia and the transverse processes should summate and the “down” leg should be pulled slightly forward. Proper radiographic technique for the lateral pelvis will overexpose the stifles. Specific radiographic examination of the stifles must be performed separately. Underexposure and poor positioning are the most common errors leading to non-diagnostic radiographs or misdiagnoses.

c. Stress radiography of the lumbosacral junction. Lateral views of the lumbosacral junction obtained with the hind limbs in flexed, neutral and hyperextended positions will aid in the identification of intervertebral disc space collapse and subluxation of the first sacral vertebra. Dynamic positioning has also been used in multiple imaging modalities (radiography, myelography, epidurography, computed tomography, magnetic resonance) to assist in the diagnosis of intervertebral disc protrusion or extrusion and identify the site of extradural compression.

6-7. Thoracic Radiography of MWDs. MWDs should be awake if possible for thoracic radiography. If adequate restraint is not possible while the MWD is awake, general anesthesia or sedation, if deemed safe, may be used. If general anesthesia is used, several additional procedures need to be followed to obtain diagnostic radiographs (see section below on radiographing the thorax while under anesthesia).

a. Standard thoracic study. A minimum of two views are required for evaluation of the thorax. A right lateral and ventrodorsal (VD) view are preferred. However, a dyspneic patient should not be placed in dorsal recumbency. A dorsoventral (DV) projection should be made instead. Three view thoracic studies are ideal and recommended. Making both the right and left lateral projections improves detection of focal pulmonary abnormalities, including pneumonia and nodules. If the study is being performed to assess for pulmonary metastasis, a three view study including both laterals and a VD is imperative. Remember, as with abdominal studies, our MWDs often have long bodies. Two overlapping images may be required to include the entire thorax in the study for each view. Images need to include the thoracic inlet to the caudal margin of the lungs (a portion on inflated lung is usually superimposed over the cranial liver) and from the dorsal margin of the thoracic vertebrae to the ventral aspect of the sternum.

b. Diagnostic quality radiographs of the thorax. Thoracic radiographs should be made at full inspiration. In an awake dog, films should be made as close to the *end* of inspiration as possible. Radiographs made at full expiration superimpose the diaphragm on the caudal border of the heart, creating the false appearance of cardiac enlargement and increased pulmonary opacity. Atelectic lung can mimic pneumonia. Therefore, it is always important to evaluate the phase of respiration when interpreting thoracic radiographs. If an MWD is panting, blowing into the nose or placing an alcohol-soaked cotton ball close to the nose may briefly stop the panting. If panting is not interrupted during the exposure, the resulting radiograph must be interpreted with consideration given to artifacts produced by patient motion and the expiratory phase of respiration. Some conditions of the trachea require that both inspiratory and expiratory views be made. Timing of exposures is important to achieve a maximum difference between the two films.

c. Exposure times and techniques. In order to adequately stop motion, exposure times should be 1/30 of a second or less. The need for a relatively low mAs necessitates a high kVp technique. A grid will be needed for any dog whose thorax measures more than 10 cm. High kVp techniques and thicker patients produce more scatter radiation, so a grid is necessary to reduce the amount of scattered radiation reaching the film. A tabletop technique can be used for dogs that measure 10 cm or less. Pulmonary disease may be magnified by underexposure or masked by overexposure.

d. Thoracic radiography while under anesthesia. Several additional procedures need to be followed in order to achieve diagnostic quality films. There will always be some amount of collapse of the “down” lung lobes if the dog lies on one side for 3 to 5 minutes or longer. The anesthetized MWD will need to be bagged several times prior to an exposure being made in order to better inflate the “down” lungs. The anesthetist should pause at the apex of the inspiratory “breath” while the exposure is being made to simulate a deep inspiration. Bagging while under general anesthesia will deepen the plane of anesthesia of the patient. Diligent monitoring of the patient and proper adjustment of the inhalant anesthetic agent is imperative. The bag should not be held at an abnormally deep inspiration during the exposure or the lungs may appear abnormally radiolucent due to overinflation. If the MWD is not bagged prior to taking the radiograph, the lung lobes on the “down” side will have less volume (from mild

atelectasis) and a mediastinal shift of the cardiac silhouette will result. Occasionally, even after adequate bagging, a mediastinal shift to the side of the thorax that was previously down will be seen. If this occurs, the dog should be rolled over to the other side of the thorax for approximately three minutes. Following this, the dog should again be rolled into position for a ventrodorsal view and then bagged several times.

e. Positioning for thoracic radiographs. The most common positioning artifact in the lateral view is oblique positioning (rotation of the thorax). This is caused by failure to elevate the sternum from the table-top. One wedge-shaped sponge placed under the sternum is usually sufficient to straighten the thorax. Positioning for the ventrodorsal or dorsoventral view is much more difficult in an awake dog. Use of a padded positioning trough will be helpful. The x-ray beam should be centered just behind the caudal border of the scapula for most thoracic views. Special projections can also be done, such as the skyline view of the trachea at the thoracic inlet or oblique views to investigate a rib mass.

f. Presence of pleural fluid. Increase mAs 50% or kVp 10-15%. In severe cases, an exposure similar to the abdominal techniques as measured from the clinic's technique chart may provide the best quality radiograph for the situation. Radiography needs to be performed with care. Make an effort to minimally stress the dog. If the MWD is dyspneic, pleural fluid should be removed prior to radiographing the thorax. A ventrodorsal view will provide the most diagnostic information (when choosing between a VD or DV view). The DV view can be used to detect a small amount of fluid, but when a large amount of fluid is present, the cardiac silhouette will be obscured in the DV view. Remember that dyspneic patients should not be placed in dorsal recumbency. A DV projection will be used in these cases until the patient's respiratory status has improved.

6-8. Spine Radiography of MWDs. Radiography of the spine of MWDs should be performed under general anesthesia or appropriate sedation. Emergent, acute spinal injuries are exceptions where heavy sedation and patient stabilization (back-board) may necessitate altered, positional views or horizontal beam radiography. If the dog is going to be radiographed at a site other than a Veterinary Treatment Facility, an intravenous catheter should be placed and the dog may need to be pre-medicated prior to transport. The dog can then be induced with a rapid-acting intravenous drug combination at the other location. After induction, the dog can be intubated and then maintained on gas anesthesia if necessary.

a. Indications for spinal radiography in the MWD. Radiography of the spine of MWDs is often performed to rule out several disease conditions. Degenerative Lumbosacral Stenosis is commonly diagnosed in both the Belgian Malinois and the German Shepherd Dog, and the initial diagnostic work-up includes good lumbar spine radiographs. Neoplasia, degenerative myelopathy and discospondylitis are also potential rule-outs that are occasionally diagnosed in MWDs. Degenerative myelopathy is generally diagnosed only after ruling out other diseases of the spine. There is a genetic screening test available for DM which will identify carrier status, however, definitive confirmation of degenerative myelopathy is only possible through examination of spinal cord sections submitted at necropsy.

b. Diagnostic quality radiographs of the spine. Accurate positioning is essential. Various positioning aids are necessary to properly position the spine: roll cotton, foam sponges, foam wedges, tape and sandbags. As an example, for proper lateral cervical spine positioning, a foam wedge needs to be placed under the nose to straighten the head, and another flat sponge under the middle part of the neck to prevent sagging of the neck toward the table. Layered, roll cotton works very well in lieu of positioning sponges. For lateral thoracic and lumbar spine radiographs, a foam wedge under the sternum and foam blocks between the upper and lower front and hind limbs will help prevent rotation.

c. Techniques for spinal radiography. For diagnostic technique, the x-ray beam should be centered on the area of interest. The beam should be collimated as closely as possible. A complete spine study will be made in at least five views: cervical, cervicothoracic, thoracic, thoracolumbar, and lumbar spine. Underexposure is one of the most common technical errors. Improper positioning also results in diagnostic errors. For example, in a lateral film that is not positioned properly, intervertebral disc spaces will appear to be narrower than normal. This can usually be recognized because all of the disc spaces are affected, not just one or two spaces. Assessment of intervertebral disc space narrowing cannot be made accurately on radiographs made on the non-anesthetized patient.

d. Myelography of the spine. A myelogram should not be performed on MWDs without first consulting with the supporting 64F or the DODMWDVS staff. There are many patient considerations that determine the diagnostic necessity of this procedure.

6-9. Radiographic Contrast/Special Procedures. Contrast procedures often require special equipment and planning in

order to make a diagnostic study. Contrast procedures should only be done after the appropriate clinical examinations, radiographs, and other diagnostic tests have been performed.

a. Local imaging studies vs. MWD/Handler team referral. The advantages of coordinating special procedures at the installation is the ability to use telemedicine consultation to provide learning and mentoring opportunities and unequalled medical care for MWDs. This will save time and money that would otherwise have been expended to transport the MWD/Handler Team to a District/Region VTF or the DODMWDVS. However, we do not recommend the performance of specialized, invasive procedures without absolute medical necessity, proper training, and prior consultation with a 64F or the DODMWDVS staff (e.g. myelography).

b. Myelography and epidurography. The necessity of these invasive procedures must be tempered by good clinical judgment and consultation with a 64F. In most cases, we recommend referral to DODMWDVS or coordination with the local MTF or local veterinary specialty practice to obtain Magnetic Resonance Imaging (MRI) and/or Computed Tomography (CT).

c. Barium enema. This procedure is not recommended due to severe complications (rupture of the colon) that can occur. The barium enema has been replaced by endoscopy/colonoscopy/ultrasonography.

d. Esophagram. Esophagography is the radiographic examination performed to evaluate the morphology and function of the esophagus. Esophagrams are performed without anesthesia or sedation to evaluate the motility of the esophagus and generally require fluoroscopy. If an MWD will not allow administration of barium sulfate or other contrast materials without sedation, do NOT do the esophagram. If the study is done with sedation or anesthesia, it likely will be non-diagnostic. In the worst possible case, aspiration and death can occur. If an esophagram is indicated, but cannot be done because of the dog's temperament, call the DODMWDVS to discuss further diagnostic options. Contrast agents used include liquid barium sulfate, barium sulfate paste, and barium sulfate liquid or paste mixed with dry and soft food. Iohexol, a non-ionic iodinated contrast medium, is the contrast agent of choice for a dog with a suspected esophageal rupture. Gastrografin (an iodinated contrast media) should not be used. In cases where aspiration occurs during administration, severe pulmonary edema and death can occur.

(1) Indications for an esophagram. Indications include regurgitation of undigested food, acute gagging or retching, dysphagia, excessive salivation, suspected esophageal foreign body, mediastinal mass, and esophageal dysfunction.

(2) Preparation. Survey radiographs are required to evaluate for a radiopaque foreign body, fluid-filled esophagus, diverticulum, megaesophagus, or pneumomediastinum. If the esophagus is distended and filled with food or evidence of aspiration pneumonia already exists, do not administer barium or other contrast materials due to the increased danger of aspiration. No patient preparation is required for most esophagrams.

(3) Technique. Usually an esophageal study is done in a sequential manner, starting with liquid agents and proceeding to thicker agents (or barium solution mixed with canned food) that require and will demonstrate normal esophageal distention for the bolus to reach the stomach. Place a 10-15 mL bolus of commercial liquid preparation of barium into the buccal pouch with a dose syringe while the MWD is in lateral recumbency. Some disorders (dysphagia, altered motility) are difficult to diagnose without fluoroscopy, but an esophagram can still be done without fluoroscopy in some cases. Several radiographs will need to be taken during the swallowing process after passage of the bolus of contrast medium through the esophagus. With radiographs alone, it is impossible to diagnose esophageal disease caused by different forms of megaesophagus. Following administration of liquid barium, linear streaks of barium can be seen extending the length of the esophagus in normal dogs. Paste should be given after liquid barium if more mucosal detail of the esophagus is needed. 5-10 mls of barium paste should be given orally to the MWD via syringe, and the dog given one to two minutes to swallow the paste. Lateral and ventrodorsal radiographs of the cervical and thoracic region should then be obtained. The paste can then be followed by a small amount of food mixed with the barium paste, which most MWDs will eat voluntarily.

(4) Complications. Aspiration of barium into the alveoli can cause granulomatous pneumonia but generally, aspiration of a small volume of barium will not cause respiratory disease aside from any compromise caused by the aspiration of the volume of liquid. Aspiration of hypertonic water-soluble iodinated contrast agents (Gastrografin) into the alveoli can cause rapid, fulminate pulmonary edema and death. Perforation of the esophagus may be present, which can allow barium to leak into the mediastinum. This can cause mediastinal granuloma formation and may require surgical intervention if it occurs. Cases of perforation should only be pursued if non-ionic, iodinated contrast agents (e.g. Iohexol) are available.

e. Upper Gastrointestinal (GI) Study. The upper GI study should be conducted when diagnosis or appropriate treatment cannot be determined from survey radiographs and other clinical information. The upper GI is generally reserved for chronic or persistent disorders, like those listed under the specific indications section. The upper GI study must be performed without anesthesia or sedation to evaluate the motility of the GI tract. If an MWD will not allow administration of barium sulfate or other contrast materials without sedation, do NOT do the upper GI study. If the study is done with sedation or anesthesia, GI motility will not be able to be evaluated. Evaluation for obstruction may still be possible in these cases but a 64F should be consulted first. If the upper GI study is indicated, but cannot be done because of the dog's temperament, call the DODMWDVS for further diagnostic options. Contrast agents used include liquid barium sulfate suspensions, barium mixed with food and Iohexol.

(1) Suspected GI perforation. Iohexol (Omnipaque; 300 mg Iodine/mL) is the contrast agent of choice for a dog with a suspected GI perforation. Gastrografin (an iodinated contrast media) was used for these cases previously. However, in many cases Gastrografin causes intestinal distention and worsening of dehydration due to its hypertonicity.

(2) Indications for an upper GI study. Indications include recurrent non-responsive vomiting, abdominal pain, abdominal masses, abdominal distention, small bowel diarrhea, melena, weight loss, suspected GI foreign body or obstruction (from history or survey radiographs), abdominal organ displacement, and hernia.

(3) Preparation. Unless emergent, fast for 12-24 hours prior to study. Enemas are recommended at least 2-4 hours prior to the upper GI study to ensure removal of all residual ingesta. Large-volume warm water enemas are adequate to empty the digestive tract without causing bowel distention by gas. Enemas should be administered the night before the procedure if possible. Survey radiographs prior to the study are required to ensure the abdomen has been properly prepared and to evaluate for a radiopaque foreign body or obvious radiographic signs of gastrointestinal obstruction that would eliminate the need for the exam.

(4) Technique. The dose rate for barium sulfate is 6 ml/lb. The dose rate for Iohexol (Omnipaque; 300 mg Iodine/ml) is 5 ml/lb, using Iohexol diluted with sterile water at a 1:1 dilution rate. Iohexol should be used as the contrast agent in cases of suspected GI perforation as barium will cause a granulomatous reaction in the peritoneum. Administration of the full dose is essential to fully distend the stomach and to stimulate gastric emptying. If a gastric foreign body is suspected, a negative or double contrast gastrogram should be considered as an alternative study. This is to avoid obscuring the foreign body in a large pool of barium. The form of barium used should be a commercial grade liquid that is already in suspension. Barium should be administered preferably by a stomach tube. Assure proper placement of stomach tube prior to contrast administration. A dose syringe can be used to give barium orally, but aspiration can also occur with this method. A Kong with a portion of the small end cut off makes a great MWD mouth speculum.

(5) Timing of sequential radiographs. For barium, take films immediately after administration, 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, etc. until contrast reaches the colon. When Iohexol is used as the contrast agent, radiographs should be taken immediately, at 15 minutes, 30 minutes, and 1 hour after administration. An upper GI study is not complete (i.e. images should continue to be made at regular time intervals) until a diagnosis is obtained and/or the contrast medium has reached the colon and the stomach is empty.

(6) Positioning. Ventrodorsal, dorsoventral, right and left lateral views should be made immediately after contrast administration for best evaluation of the barium-filled stomach. Ventrodorsal and right lateral projections should be made at each following time interval with additional views made as indicated. Additional DV and oblique views, as well as fluoroscopy, may be helpful in evaluating the pyloric antrum and proximal duodenum.

(7) Transit times. When the stomach is well distended with barium, gastric emptying is stimulated. Exact time of stomach emptying varies but is considered normal if there is a steady and uninterrupted progression of barium into the small intestine. With liquid contrast medium (no food), the stomach should be empty in 4 hours. The small intestine should appear as a continuous radiopaque ribbon. Most of the jejunum should be filled at one hour. The leading edge of barium usually reaches the cecum in one and a half to two hours. Much of the barium will be in the colon within 3-4 hours. The uniform progression of barium through the GI tract is a more important assessment of normal GI motility than exact transit time. Iohexol has a much more rapid transit time of 30-60 minutes; however, mucosal coating is not as good.

(8) Contraindications. Do NOT use barium sulfate suspension in cases of suspected perforation, rupture, or laceration of the stomach or intestine. Do not use oral organic iodine solution (Gastrografin, oral Hypaque). Dehydration, electrolyte imbalance and shock have occurred following usage of these hyperosmolar agents. Diluted non-ionic iodinated contrast medium (i.e. Iohexol) is less hypertonic and much safer. Do not use any contrast agents

if the clinical examination or survey radiographs are diagnostic for a specific disease or show the need for immediate surgery. In the event an upper GI study is performed and a perforation is discovered, DO NOT PANIC. Although micropulverized barium particles can result in a granulomatous reaction, the real threat to the patient is the bowel contents. Copious peritoneal lavage during surgery is required with or without the presence of barium.

f. Excretory Urography. An excretory urogram is a qualitative test of renal function that allows for comparison of function between kidneys. There are now test methods for quantitative analysis of Iohexol excretion (plasma clearance = estimated Glomerular Filtration Rate) as well.

(1) Indications for excretory urography. Chronic hematuria or pyuria, abnormal findings detected during abdominal palpation and suspected hydronephrosis. Excretory urography enhances visualization of the size, shape, and location of each kidney and allows visualization of the size and shape of the renal pelvis. It also identifies the location, patency, and size of the ureters and the position of the urinary bladder as well as providing a rough estimate of renal function.

(2) Preparation. Patient preparation includes 12-24 hour fast, but do not withhold water and cleansing enema given 2-4 hours prior. Renal function must also be determined (contrast agent dose increases if renal function is reduced). It is important to assess hydration status. Always obtain survey films prior to contrast administration.

(3) Technique for excretory urography. Give the full dose as a rapid IV bolus through an indwelling catheter. Any of the water-soluble contrast agents are suitable due to the fact that they are excreted through the urinary system after IV administration (i.e. Conray, Conray 400, Hypaque 50, Renovist, Renografin-76, Iohexol). Routine study: 400 mg Iodine/lb (800 mg Iodine/kg). The entire bolus should be given within 1-3 minutes. Maximum dose is 35 grams. With impaired renal function, 800 mg Iodine/lb is administered.

(4) Timing of sequential radiographs. Immediately after administration, at 5 minutes, 15 minutes, 30 minutes, and 40 minutes. Animals with poor renal function may require additional radiographs at 45, 60, 90 and 180 minutes due to delayed urinary system opacification. VD and lateral projections are made at each time period. Oblique lateral or VD projections are made as necessary. Abdominal compression can be used if necessary but should be performed with caution.

(5) Contraindications. Dehydration is the primary risk factor for contrast-induced acute renal failure. Proper physiologic hydration of the patient must be performed prior to excretory urography.

(6) Complications. Perivascular injection of contrast media can cause sloughing of the tissues. Nausea and emesis immediately following the contrast injection can occur, so MWDs should not be muzzled or be prepared to remove the muzzle rapidly. Dogs under anesthesia must have an endotracheal tube with a fully inflated cuff in place. Anaphylaxis is reported in humans, but is considered to be rare in the dog.

g. Retrograde Contrast Cystography. A fast, simple, and relatively safe procedure that allows evaluation of bladder size, shape or location.

(1) Indications for contrast cystography. Evaluation of abnormal bladder shape or location. Non-visualization of urinary bladder after trauma. Evaluation of caudal abdominal masses adjacent to the urinary bladder (prostate, paraprostatic cyst, neoplasia, etc.). Frequent urination or dysuria. Intermittent or chronic hematuria. Hematuria that occurs throughout or in the later stages of voiding. Persistent post-traumatic hematuria. Urinary incontinence.

(a) For bladder rupture or urinary bladder localization, perform positive contrast cystography.

(b) For urinary bladder mucosa and wall evaluation, assessment for cystic calculi and evaluation of cystitis, perform double contrast cystography.

(2) Preparation. Fast the patient 12-24 hours prior to the procedure. Do not withhold water. Administer a cleansing enema 2-4 hours prior to the procedure. Take survey radiographs. Equipment needed includes sterile lubricant, sterile urinary catheters, syringes, speculum for female dogs, positive and negative contrast media.

(a) Positive contrast media include any of the water-soluble iodinated contrast medium (i.e. Iohexol, Conray, Hypaque) diluted to a 20-33% iodine concentration. If bladder rupture is suspected, positive contrast cystography using undiluted iodinated contrast medium is recommended (i.e. Iohexol 240 mgI/ml). Retrograde urethrography can also be performed at the same time if urethral rupture is suspected. Barium should NEVER be used.

(b) Negative contrast agents include nitrous oxide and carbon dioxide (CO₂). Room air is occasionally used; however, nitrous oxide and CO₂ are preferred due to the decreased risk for air embolism.

(3) Technique for contrast cystography. Many references are available with detailed techniques for these procedures. The following is meant only as a basic guide and refresher. Contact the supporting 64F and/or a radiologist for guidance *prior* to performing the study.

(a) Sedation or anesthesia is strongly recommended, but is not required.

(b) Preliminary ventrodorsal and lateral caudal abdominal radiographs need to be performed to ensure adequate abdominal preparation. If fecal material remains present in the colon or within loops of intestine overlying the urinary bladder, additional enemas should be administered and survey radiographs repeated.

(c) Clean the external genitalia. A sterile urinary catheter is aseptically placed. The urinary bladder is emptied. A sterile urine sample should be collected. Once iodinated contrast medium is placed in the urinary bladder, urine culture results will be altered. If a retrograde urethrogram is to be performed, contrast medium is infused after passing the urinary catheter into the tip of the urethra – before advancing the catheter into the urinary bladder and removing urine.

(d) In awake or sedated dogs with dysuria and/or stranguria, infusing 3-5 mL 2% lidocaine (without epinephrine) into the bladder via the urinary catheter is recommended to reduce pain and spasms.

(e) Place the patient in left lateral recumbency.

(f) For *positive or negative contrast cystography*, inject contrast medium slowly and with constant palpation of the urinary bladder to avoid over distention. An estimated 4-10 mL/kg can usually be administered for full bladder distention. Be cautious about bladder distention in known severe and/or chronic cystitis cases as bladder wall integrity may be decreased.

(g) Obtain lateral, VD, and 45 VD oblique views once bladder distention is achieved. Sequential lateral radiographs can be made during bladder distention to assess progress if necessary. Increase mAs 50% from the survey radiographs for positive contrast studies.

(h) For *double contrast cystography*, a negative contrast cystogram is followed by administration of 5-10 mL undiluted iodinated contrast medium. Five mL is recommended as a starting volume. Roll the patient from side to side to coat the bladder mucosa with positive contrast. Obtain at least right and left lateral and a VD view. A DV and 45 VD oblique views should be obtained if the initial images are within normal limits. Administer an additional 5 mL of positive contrast if mucosa coating is poor or the contrast pool is minimal, and repeat all images.

(4) Technical errors during cystograms. Incomplete bladder distention. Excessive concentration of positive contrast medium which obscures intraluminal-filling defects. Creating air bubbles in contrast media. Failure to remove urine before instilling positive contrast. Kinked or knotted catheter.

(5) Contraindications. Negative contrast should not be used for cases of suspected bladder rupture. A positive contrast cystogram should not be used in cases of suspected calculi or other free luminal filling defects; double contrast cystography should be performed instead.

(6) Complications.

(a) Air embolism can be fatal and results from air entering the venous system and travelling to the main pulmonary artery causing a block in pulmonary circulation. Patients are always placed in left lateral recumbency so air will be trapped in the right ventricle. Prevent by injecting slowly, avoiding over distention, and using CO₂ or nitrous oxide.

(b) Suspect if systemic BP falls and/or pulse becomes rapid and weak. Air may be visible in caudal abdominal veins on images. A rumble may be audible on cardiac auscultation.

(c) Immediately place the patient in left lateral recumbency and lower the head. Clamp the urinary catheter. Maintain this position for 60 minutes.

(d) Additional therapy: Intubate and administer 100% oxygen if respiratory distress and/or hypoxemia occur. If circulatory collapse is present, external chest compressions may help disperse the air from the pulmonary outflow tract. Administer IV fluids and beta-adrenergic agents (epinephrine) as indicated.

(e) Rupture of the urinary bladder or traumatic catheterization.

(f) Iatrogenic infection.

(g) Anaphylaxis or allergic reactions due to iodine administration are rare.

6-10. Ultrasound. Diagnostic medical ultrasound is only second to radiography in terms of imaging studies produced in veterinary medicine, and is of greatest benefit in assessing soft tissue structures which are not surrounded by bone or gas; primarily the abdominal organs and ligaments/musculature in our MWDs. However, most VCOs lack the training and experience to optimally use ultrasound and many times will miss/not recognize significant findings or will incorrectly

ascribe importance to normal findings. Obtain training to be able to comfortably use and interpret ultrasound images. It is also imperative that once training and some familiarization has been gained, the VCO must regularly perform sonograms to maintain what skills they have. It is recommended that VCOs perform scans when MWDs are presented even if not indicated in an attempt to maintain some competency.

a. **Transducer Selection.** In order to be able to perform basic conventional (B mode) ultrasound in MWDs, two multi-frequency transducers are primarily utilized for imaging. A curvilinear or sector transducer with a frequency range of approximately 5-8 MHz is recommended for abdominal scanning. A linear transducer with a frequency range of approximately 5-12 MHz is recommended for assessing musculoskeletal soft tissue structures, and may also be used in the abdomen for higher frequency scanning if required. With echocardiography, a 1-5 MHz sector probe with the ability to perform continuous Doppler is recommended (usually only performed by experienced ultrasonographers).

b. **Image optimization.** Diagnostic ultrasound is all about being able to perform constant, continual image optimization in order to be able to produce an effective diagnostic study. One must be able to continually monitor multiple factors within the image being created by the ultrasound beam in order to be able to produce the image to standard. Being able to appropriately adjust each of these components: frequency (spatial resolution), focus (lateral resolution), gain, depth, angle of incidence, and degree of manual pressure is critical. Also remember that appropriately labeling images is extremely important for documentation and for consultants to provide feedback on the organ/structure imaged. If any of these terms are unfamiliar, consult a standard veterinary ultrasound text for review.

c. **VCO Expectations.** Veterinary schools greatly differ on the degree of ultrasound experience they provide to their students during their training. For this reason, most VCOs are not expected to be able to competently perform a complete abdominal ultrasound examination. It takes a great deal of practice and/or mentoring to become proficient. However, there are some basic ultrasound examinations that every VCO is expected to be able to provide for MWDs. These studies include ultrasound-guided cystocentesis and Focused Assessment with Sonography for Trauma of the thorax and abdomen (FAST exams).

d. **Ultrasound-Guided Cystocentesis.** In order to perform cystocentesis, the urinary bladder must first be located either by manual palpation or ultrasound guidance. The patient may be placed in dorsal recumbency, lateral recumbency, or standing. The normal ultrasound appearance for the urinary bladder is to have a thin, echogenic wall (typically less than 2 mm thick when distended) and the lumen distended with anechoic fluid. It should be fairly easy to find this structure adjacent to midline within the caudoventral abdomen when distended. If the urinary bladder subjectively appears very small and has a thick, undulating wall then it is likely that the patient has recently urinated and is usually prudent to place the MWD in a cage and wait a couple hours until the urinary bladder is distended again prior to attempt. Use of a 22 gauge, 1” to 1.5” needle with an attached 5 or 10 mL syringe is recommended for urine aspiration/collection. Prior to needle insertion into the abdomen, ensure there are no organs (usually small intestinal loops or spleen) between the urinary bladder and abdominal wall on the image. If organs are present, move the transducer to another site where the organs are not present. Aligning the needle with midline of either end of the transducer, place the needle tip through the skin adjacent to (but not directly on) the head of the transducer. Extend the needle through the abdominal and urinary bladder walls into the bladder lumen. One should be able to see the needle on the image (the tip being most important) in the bladder lumen if on midline of the transducer. If using a curvilinear transducer, insert the needle more parallel to the transducer to see the needle tip. If using a linear transducer, angle the needle underneath the transducer head after skin penetration in order to be able to see the needle enter the lumen. If the needle tip cannot be seen and the needle is through the abdominal wall, stop any movement of the needle and re-align the transducer with the needle before proceeding. After the lumen is entered, aspirate enough urine and release the pressure on the syringe before pulling the needle out of the abdomen.

e. **Common errors with US-Guided cystocentesis.** One would think ultrasound-guided cystocentesis to be a fairly benign procedure but common errors include: not visualizing the needle during insertion and extending through the opposite bladder wall, laceration of the bladder wall or other organs while attempting to find the needle tip, or inserting the needle too close to the transducer head, creating costly damage to the equipment. Use of gelatin molds containing fruit, pasta, or other similar items to practice ultrasound-guided needle insertion and tracking of the needle can be an effective training tool prior to performing in a live patient if needed.

f. **FAST Examinations.** Thoracic and abdominal FAST (Focused Assessment with Sonography for Trauma) examinations (TFAST and AFAST, respectively) have been developed for veterinary medicine in order to have a fast, sensitive and reliable method for early detection of free intra-abdominal or intrathoracic fluid (hemorrhage,

peritonitis/pleuritis, ascites, etc.) and pneumothorax. These ultrasound techniques have been found to be very beneficial for expediting diagnosis and prompting life-saving procedures for patients with internal injuries, are relatively simple to perform, and can be effectively completed within minutes so are important techniques for every VCO to learn. These exams are not meant to replace more comprehensive ultrasound exams, but to provide guidance with early resuscitation efforts and patient management.

(1) AFAST Exam – Technique. The AFAST exam is based in the fact that there are four primary sites within the peritoneal space which small accumulations of fluid will initially gravitate towards and accumulate. These sites are (listed in order of significance): the diaphragmatico-hepatic region (DH), the cysto-colic region (CC), the hepato-renal region (HR), and the spleno-renal region (SR). The DH region is located along the ventral diaphragm and adjacent liver lobes, just caudal to the xiphoid process (subxiphoid). The CC region is located on the caudoventral abdominal midline at the apex of the urinary bladder. The HR and SR regions are located along the right and left abdominal walls (respectively), just caudal to their adjacent costal arches where the organs they are named after are located. For each of these four sites, the patient is scanned from medial to lateral in the craniocaudal plane (transducer oriented longitudinally) and then scanned from cranial to caudal in the lateromedial plane (transducer oriented in transverse). While scanning, the patient can be placed in right or left lateral recumbency, whichever is safer or more comfortable for the patient. Right lateral recumbency has been advocated more than left as it is the standard position for ECG evaluation and echocardiography. When scanning these four sites, always start with the DH site (most common for fluid accumulation), and after completion proceed to scan the remaining sites either in a clockwise or counterclockwise manner with the last scanned site being the most gravity-dependent to allow for fluid to accumulate during the exam (either HR or SR). After performing the initial AFAST exam, at least one more serial AFAST exam should be conducted four hours later in order to prevent missing a serious, life-threatening injury that may have been slow to develop.

(2) AFAST Exam – Aspiration. If peritoneal fluid is detected and the fluid pocket is large enough for the comfort level of the ultrasonographer conducting the exam, it should be aspirated in order to determine the fluid type (see cystocentesis section above on how to perform fluid aspiration).

(3) AFAST Exam – Scoring System. A scoring system has been developed to assist with demonstrating progression of fluid accumulation (0=negative and 1=positive per site). An abdominal fluid score (AFS) of 0 equals negative for all quadrants, and an AFS of 4 is the maximal score possible. This scoring system may be of benefit for demonstration of progression and/or resolving cases during serial FAST exams q 4-12 hours, with higher scores clinically associated with severity of injury.

(4) TFAST Exam – Technique. TFAST exams were similarly developed using four primary regions along the thorax to come up with a rapid, effective method for detection of pneumothorax, pleural fluid, or pericardial fluid. There are only two names for these four sites as they are bilaterally symmetric. The chest tube sites (CTS) are defined as the 7th-9th intercostal space on the dorsolateral thoracic wall. The pericardial sites (PCS) are defined as the 5th-6th intercostal space on the ventrolateral thoracic wall. In contrast to the AFAST exam, the patient is initially placed in either lateral recumbency for examination of the upwards CTS site and both PCS sites, but is then moved to sternal recumbency for examination of the previous downward or opposite CTS site. For the CTS sites, a curvilinear transducer is placed and held in longitudinal orientation into one of the intercostal spaces at this level in order to observe the appearance of the gas within the thorax for a minimum of 5 respiratory cycles. Normally, the pleural space is only a potential space with negative pressure and absence of gas. Therefore, the gas interface appreciated is actually due to gas within the lungs and this gas-pleura interface should glide forwards and backwards along the thoracic wall during normal respiration. If this “glide sign” does not appear to be present, this is diagnostic of pneumothorax as gas has now accumulated within the pleural space, preventing visualization of the lung margin. In order to semi quantitate the degree of pneumothorax, the transducer is then moved ventrally until the “glide sign” is appreciated. If a “glide sign” is initially present, but does not have a normal linear to mildly curved appearance to the lung-pleura interface, this is considered to be associated with probable thoracic injury and is referred to as a “step sign”. For evaluation of the TFAST PCS sites, the curvilinear transducer is placed in both longitudinal and transverse views sweeping through this region, similar to the sites of the AFAST exam. Becoming proficient at TFAST exams is considered more difficult than AFAST exams. Practice the TFAST examination on normal patients to gain a better appreciation of normal appearances (don’t forget the global utility of radiology).

(5) TFAST Exam – Aspiration. If sufficient quantities of fluid are found that are deemed to be large enough for aspiration, thoracocentesis and/or pericardiocentesis may be considered, keeping in mind the importance of the structures adjacent to these sites (lungs, heart, etc.).

6-11. Computed Tomography (CT) vs. Magnetic Resonance Imaging (MRI).

a. Often the question is posed as to whether a patient needs a CT or MRI conducted for further advanced imaging workup. In general, CT is often superior and used for assessment of margins of osseous/mineralized structures compared to MRI. CT can assess soft tissue changes/differences fairly well by narrowing windows and levels under standard algorithms to see differences of attenuation of the x-rays, but cannot manipulate the soft tissues due to their molecular structure as MRI can in order to enhance or null their differences. Therefore, MRI is often far superior to CT at assessing for subtle changes within soft tissues due to the dramatic contrast enhancement. MRI is most often utilized in veterinary medicine and is the modality of choice when trying to assess soft tissue structures not easily accessed by an ultrasound probe or are looking for diseases that may not be appreciated via any other modality. MRI is used primarily for neurologic (brain and spine) imaging and joint imaging concerning cartilage, ligaments, and/or menisci. Keeping those general statements in mind, either study may be adequate for diagnosis (DLSS, for example). Ultimately, when in doubt as to whether a CT or MRI is needed contact the supporting 64F for further guidance. In the event the supporting 64F is unavailable, contact the DODMWDVS. For GOA patients obtaining advanced imaging studies at MTFs, CT should always be utilized first whenever both modalities are likely to be equally useful in obtaining the suspected diagnosis.

b. If the VCO has a case that requires a CT or MRI, consultation with at least the supporting 64F is indicated to ensure they concur with the case workup and assessment. Sometimes the MWD may need to wait for weeks before the local MTF is able to schedule/coordinate the CT or MRI, so it is important to confirm with a 64F that the study needs to be done (e.g. MRI is not required to make a diagnosis of cruciate tear/rupture).

c. Over the past decade, Army veterinary radiologists have commonly received MRI studies for interpretation that were either non-diagnostic (inappropriately performed) or likely would have also resulted in a diagnosis utilizing CT. This consequently results in excessive or wasted efforts and time on all sides and/or unnecessarily placing the patient under anesthesia in an MRI suite which is often a compromising situation due to limited monitoring capabilities available. Overall, CT is a much safer and easier advanced imaging modality to obtain diagnostic studies at MTFs for our MWDs due to the following factors:

(1) Most MWD CT protocols only require heavy sedation of the patient instead of general anesthesia; converse is true with MRI.

(2) The time needed to complete a CT study is typically much shorter than it is to complete an MRI, resulting in less time the patient is under sedation/anesthesia.

(3) Numerous incompatible VTF anesthetic and monitoring equipment limitations within MRI suites exist, compromising our ability to adequately monitor MWDs.

(4) MTFs may lack capabilities or willingness to provide MRI-compatible anesthetic and monitoring equipment for our MWDs.

d. Due to the above facts, relative inexperience of the vast majority of 64As and VTF staff with conducting MRI studies, and complexity of the situation involved with safely performing TIVA in a foreign location (MTF) while concurrently obtaining a diagnostic study, MRIs are only allowed to be performed for MWDs at an MTF while under the direct supervision of a 64F. The 64F will validate the need that the study is absolutely indicated as well as ensure that all requirements for a safe anesthetic event are met. For cases where the supporting 64F agrees that MRI is indicated but the study cannot be performed at the MTF, coordination with a local specialty referral center or DODMWDVS will be performed. If the study may be performed locally, most MTFs are able to work the patient in within a week or two from the request. If unable to schedule an appointment with the MTF for over 6 weeks from the date it was requested, then consultation with the radiologist at the DODMWDVS is indicated in order to refer the MWD to JBSA-Lackland or a local civilian facility to have the study performed. If the case has a more urgent or emergent need, the 64F and/or the DODMWDVS will do everything they can to assist with expediting the case or referral to a civilian facility.

6-12. Computed Tomography. CT is similar to radiography in that x-rays are used to generate the images made within the study. The main difference between CT and radiography is that instead of generating a 2D image with superimposition of all osseous and soft tissue structures on top of one another due to a stationary x-ray tube as in

radiography, the x-ray tube now rotates around the patient in the transverse plane. The patient is able to be divided up into separate individual 3D transverse slices of data. With each slice through the patient being assigned a finite distance (varies between 0.5 – 8 mm thick). The computer is then able to take this raw data within each slice and process/filter the data through different assigned “algorithms” to enhance the margins and contrast levels to make a certain tissue type stand out compared to the others. These algorithms are named by the tissue types they are trying to best enhance; bone algorithms enhance bone, standard algorithms enhance soft tissues, lung algorithms enhance lung tissue, and so on. The concept of windowing and leveling (previously discussed in the digital radiography section) is also important in these algorithms in order to make each tissue type stand out, and the window and level can be altered as in digital radiography during post-processing of a study to assist with diagnoses.

a. Sedation/Anesthesia. Just as in radiography, patients must lay perfectly still while CT images are being generated. Therefore, the patient must be either heavily sedated or anesthetized while the study is taking place. Many CT exams can be conducted quickly. While someone may suggest attempting to complete the study on an awake MWD, this is not possible and not authorized under any circumstance. The noise of the gantry and table movement will startle the MWD sufficiently to result in a non-diagnostic study and risks injury to the dog. Placing a handler in the room during the study also constitutes unnecessary human exposure to ionizing radiation. Patient motion becomes even more important during a study of the thorax and abdomen, as respiratory motion will blur/alter the margins of several soft tissue structures if not controlled. Therefore, CT studies of the thorax and abdomen often require anesthesia and intubation of the patient with use of the pop-off valve and manual respiration to create a temporary breath-hold during the study. Depending on the type of CT machine and slice thickness required for the study, this may or may not be a problem for the patient as the breath hold may have to last for seconds to minutes. It is important to coordinate and discuss with the CT technician prior to arrival at the hospital to conduct the study. This is also important in order to determine what supplies and equipment may need to be brought to the hospital to assist with anesthesia and patient monitoring.

b. Contrast Administration. Intravenous iodinated contrast may be used during a CT study in order to further enhance margins of soft tissue structures or enhance pathology. If a CT is being conducted to assess an abnormal soft tissue mass or structure, intravenous iodinated contrast should be administered after acquisition of routine images for comparison purposes. This contrast administration allows for further characterization of the abnormal soft tissue as only the vascular portions of the structure will enhance. The current standard for use of contrast during CT is non-ionic iodinated contrast media, with the two most common types being Iohexol and Iopamidol. The DODMWDVS and most MTFs use and have the most experience with use of Iohexol. For a vial of Iohexol at a concentration of 240mg/mL, the intravenous contrast dose is 400 mg/kg (rule of thumb is 1 mL per lb of body weight, not to exceed 60 mls). IV catheterization of the patient is required for contrast administration, and the contrast is a thick, sticky solution which needs to be bolused to the patient, so use of 18 gauge catheters and syringe needles is recommended. After bolusing the contrast to the patient, only the study in the standard algorithm needs to be repeated. If the VCO has doubts/concerns as to whether IV contrast is necessary for the CT study or if the patient has had any evidence of renal disease during its lifetime, contact the supporting 64F and/or radiologist at the DODMWDVS to discuss how to best handle and monitor the case. If the patient is dehydrated, the patient should be rehydrated prior to the CT study if possible or at least on IV fluids to correct the problem if unavoidable. Adverse/side effects are rare with non-ionic contrast media in correctly hydrated patients but familiarization with them is necessary prior to injection.

c. CT Protocols. CT protocols will vary per region being imaged; patient positioning, slice thickness, algorithms, and whether or not contrast will be used are all key factors to consider and discuss with the CT technician prior to arrival at the hospital to conduct the study. It cannot be stressed enough that each of these factors are critical to producing a diagnostic study, and the most commonly overlooked factor is patient positioning. Ensuring the region of the patient being imaged is straight and symmetrically positioned on midline of the CT table is very important (have the CT tech use the laser guides), as subtle changes in obliquity may make structures appear abnormal when they are not. Use positional aids/sponges or troughs if needed, and ensure that all metallic or other unnecessary objects (collars, ECG leads, etc.) have been removed from the imaging region. Place the patient either head-first or hind limb-first into the gantry depending on which will be closest to the region for imaging. The following are commonly used protocols at the DODMWDVS for different body regions based on common problems we may see in MWDs. If additional protocols are needed on a case-by-case basis, please contact the radiologist at the DODMWDVS for further guidance.

(1) CT Skull. Patient positioning should be in sternal recumbency with the hard palate parallel to the CT table. Studies should extend from the tip of the nose to C2-C3. Images should be acquired in bone and standard algorithm with a 1.25 mm slice thickness. The bone algorithm images need to be reconstructed (or acquired) in 0.625 mm slices as well (if available). Sagittal and dorsal reconstructions should also be made.

(2) CT Nasal. Patient positioning should be in sternal recumbency, with the hard palate parallel to the CT table. Studies should extend from the tip of the nose to larynx. A bone algorithm with slice thicknesses of 2.5 mm and 0.625 mm (or equivalent) and a standard algorithm with slice thickness of 1.25 mm should be performed. IV contrast should be administered and the standard algorithm with 1.25 mm thick slices repeated. Dorsal reconstructions are required. Sagittal reconstructions should be made as needed.

(3) CT Brain. Patient positioning should be in sternal recumbency, with the hard palate parallel to the CT table. Studies should extend from mid-muzzle to C2-C3. Bone, standard, and brain algorithms with slice thicknesses of 2.5 mm, 1.25 mm, and 1.25 mm should be performed, respectively. IV contrast should be administered and brain and standard algorithms repeated. Sagittal and dorsal reconstructions of the standard algorithms are required.

(4) CT Tympanic Bullae. Patient positioning should be in sternal recumbency, with the hard palate parallel to the CT table. Studies should extend from the orbits to C2-C3. Bone and standard algorithms with slice thicknesses of 0.625 mm (or equivalent) and 1.25 mm should be performed, respectively. Sagittal and dorsal reconstructions should be made as needed.

(5) CT Spine. Patient should be positioned in dorsal recumbency, with the hind limbs maximally extended caudally (like for a hip-extended VD pelvic view in radiography). Study should extend through necessary vertebral regions based on pain and/or neurolocalization. More specifically for the hind limbs, if UMN signs are present extend from T8-T9 through sacrum and if LMN signs present, from T12-T13 through sacrum. CT slices should be acquired perpendicular to vertebral canal (may require gantry rotation). Bone and standard algorithms with slice thicknesses of 2.5 mm and 1.25 mm each should be performed, respectively. Additionally, for suspect lumbosacral disease, a bone algorithm with 0.625 mm (or equivalent) thick slices should be included to better visualize the neuroforamina. Sagittal and dorsal reconstructions of bone and standard algorithms are required.

(6) CT Thorax. Anesthesia and breath holds required (see above). Patient should be positioned in ventral recumbency. Study should extend from thoracic inlet through caudal aspect of liver (ensure extent of all lungs imaged). Bone, standard, and lung algorithms should be performed with slice thicknesses at 5.0 mm, 2.5 mm, and 1.25 mm, respectively. Sagittal and dorsal reconstructions of lung and standard algorithms are required.

(7) CT Abdomen. Anesthesia and breath holds required (see above). Patient should be positioned in dorsal recumbency. Study should extend from caudal margin of cardiac silhouette through pelvic canal (or prostate if male). Bone and standard algorithms should be performed with slice thicknesses at 5.0 mm and 2.5 mm, respectively. Sagittal and dorsal reconstructions of bone and standard algorithms are required.

(8) CT Extremity/ Joint: Patient positioning dependent on whether imaging forelimbs of hind limbs. For forelimbs, the patient is in ventral recumbency. The forelimbs should be extended cranially, resting the forelimbs and paws on the table and elbows and shoulders bent at a normal resting position. If the hind limbs are the focus of the study, the patient is usually placed in dorsal recumbency. The hind limbs should be placed in maximal caudal extension. Keep both limbs symmetric and include both in the study for comparison purposes (use tape, sponges, or other positional aids). CT slices should be acquired perpendicular to joint spaces (may require gantry rotation) if the joint is the focus of the study. Bone and standard algorithms should be performed along the affected regions/joints with slice thicknesses each of 1.25 mm. If a joint is the focus of the study, conducting an additional bone algorithm sequence with a slice thickness of 0.625 mm (or equivalent) is required. Sagittal and dorsal reconstructions of the affected limb only are required.

6-13. Magnetic Resonance Imaging. It is far beyond the scope of this technical guide to discuss the theory and physics behind MRI and those interested should consult a text on the subject. This modality is based on the magnetic properties of every molecule containing hydrogen (and other) atoms within the body, which boils down to manipulation/alteration of these properties in order to achieve various T1-weighted and T2-weighted sequences for interpretation and eventual diagnosis. Of the commonly used imaging modalities, the overall spatial resolution of generated images is worst with MRI, but it is this ability to detect changes on the molecular level and high soft tissue contrast that allows us to see diseases or anatomical details that we could not otherwise appreciate via other modalities. T1-weighted imaging sequences are typically considered “anatomy scans” (lesions often iso- to hypointense) and T2-weighted imaging

sequences are typically considered “pathology scans” (lesions usually more hyperintense) as the majority of soft tissue lesions found within the body are considered to be associated with fluid, regardless of whether this fluid is at intra- or extracellular locations.

a. Although not all inclusive, our current protocols are overall adequate in assessing for the majority of diseases we are attempting to find. MRI is most often utilized in veterinary medicine, and is the modality of choice, when trying to assess soft tissue structures not easily accessed by an ultrasound probe or are looking for diseases that may not be appreciated via any other modality (primarily for central nervous system and joint imaging). This does not mean that MRI should not be used at a later point if an ultrasound or CT examination is unremarkable and an abnormality persists, as MRI may be able to detect changes the other modalities could not readily find.

b. MRI Coordination. MRIs are only allowed to be performed for MWDs at an MTF while under the direct supervision of a 64F. Once the 64F has confirmed an MRI study is required, coordination where and when the MRI is to take place will be required. After scheduling, communicate with the MRI technician about how anesthesia will be performed/monitored and what MRI protocol, sequences, and patient positioning will be indicated for the case. This is of paramount importance as MRI studies take much longer to complete compared to CT. Each MRI sequence needs its own individual study performed and they cannot be further created from initial scans like CT reconstructions. MRI appointments have a finite amount of time available and therefore only a limited number of scans can be run, so prioritize what is necessary. Having basic protocols set up and in place are of great benefit as there will likely be less time involved repeating studies/modifying protocols and less overall anesthetic time for the patient. If the MRI study will take place at an MTF, entering the MWD into the hospital records system (see paragraph 6-2 d.), discussing what coils will be available for use, and patient positioning are additional factors that may need to be discussed as all of the equipment is designed for human use. Bring positional aids from the VTF. Patient positioning is still important in the MRI suite, but largely depends on whether the area of interest has been appropriately positioned within the coil. Despite this, there is recommended positioning which should be followed (especially for the spine; see listed protocols below).

c. Anesthesia. As the MTF is unlikely to have an MRI-safe anesthetic machine available for use in MWDs, be prepared to perform total intravenous anesthesia (TIVA) in order to complete the study. The VMSB Anesthesia/Pain Management guidelines contain guidance regarding TIVA procedures and protocol/monitoring recommendations. It is prudent to have the animal technician accumulate all of the necessary medications and equipment needed to take the day before the MRI appointment in order to ensure everything is on hand. It is also critically important to prepare for any and all anesthetic complications that may arise and have classic “crash cart” medications and equipment readily on hand as most MTFs will not have these items available in MRI suites. See Appendix D for a step-wise list of the typical steps performed on the day of leading up to the exam and the necessary equipment to bring to the MTF. Patient monitoring presents challenges in the MR gantry due to increased noise, greater chance of hypothermia, and overall decreased patient accessibility, making proper training imperative. Possessing an ability to provide supplemental oxygen via flow by, BVM or MRI-compatible anesthesia machine is absolutely paramount in order to intervene if the patient becomes hypoxemic due to hypoventilation. At a minimum, all MWDs will be intubated while anesthetized and provided supplemental oxygen during MRI studies. Additionally, monitoring the patient’s ventilatory status, ETCO₂, and circulatory status are critical in ensuring that the patient is adequately supported. The above recommendations are based on VMSB Anesthesia/Pain Management Standards. Lastly, it is important to familiarize oneself with the layout of the MRI suite prior to the day of the procedure. Appreciating the limitations that may exist may result in abandoning the procedure if it cannot be done safely. In these circumstances, outside referral (civilian or military) to an experienced team would be superior to performing this elective procedure when the patient cannot be adequately monitored or supported.

d. MRI Safety. Ensure that whenever anyone enters the MR suite, they have removed all metal objects from their person or have been approved by the MR tech for entry. It is easy to forget a needle that rolled underneath the dog’s body or thermometer left on the table. These objects become dangerous projectiles flying into the magnet in the MR suite. Other considerations of MR safety on include whether any stray metal, metallic implants (plates, screws, pins), or pacemakers are present in the patient or on the patient (e.g. collar/harness). If any anesthetic monitoring equipment is available for use, ensure these wires are not placed in a coiled state as the magnet can induce currents and burn patients. Make sure everyone in the MRI suite is provided hearing protection to include the MWD.

e. MRI Technician Assistance. It is very important for the VCO to be with the MR tech outside of the suite during image acquisition at MTFs, helping the MR technician determine the beginning and end points (range) of the study in each plane as they are not familiar with canine anatomy (humans have five lumbar vertebrae compared to dogs seven, for instance). Defining the start and end points is very important as less time will be needed for each sequence, allowing for additional sequences or reduce patient anesthesia time. For example, the whole thoracic and lumbar spine need not be imaged in every thoracolumbar spine case; the beginning and end points for the study should be based off of the neurolocalization findings (UMN vs. LMN signs). As a quick comparative anatomy terms review: axial (human) = transverse (veterinary), coronal (human) = dorsal/ventral plane (veterinary), and sagittal = sagittal. Review the scans with the MR tech as they are completed, otherwise the scan may need to be repeated later after a radiologist reviews the images and deems them inadequate for diagnosis. It may help to look at images of MR studies before the day of the exam to know how these images should be appropriately centered and collimated; even bringing an example to the MR tech may be of benefit. Let the animal technician monitor the anesthetic depth unless the patient really needs a VCO right there in the MR suite due to the complexity of the case.

f. MRI Contrast Administration. Paramagnetic contrast agents are commonly used during MRI. Contrast agent administration is always required when imaging the brain, and may be necessary for other exams dependent on the case. For example, if neoplasia or discospondylitis of the spine is suspected, then administration of contrast during a spinal exam is warranted. The MTF should be able to supply this contrast agent, but please ensure it is available prior to committing to the procedure. All pre-contrast sequences must be performed prior to contrast bolus administration. The contrast agent most often used in our MTFs for MRI is gadolinium-based, and the dose for IV bolus use in the dog is 0.1 mmol/kg (0.2ml/kg).

g. MRI Protocols. The basic MRI protocols commonly used by the DODMWDVS are listed below. However, if a veterinary radiologist is contacted prior to the MRI they can also help fine-tune what sequences should be performed as one case will vary to the next. Diagnoses may be unfortunately missed as a consequence of not consulting with a radiologist prior to study completion. For instance, if hemorrhage is suspected a gradient echo study may be added to the protocol, but it does not have to be included in every study if trauma or infarction is not on the differential list. If a case requiring MRI of another body region not listed below, consultation with the DODMWDVS for protocol development is indicated.

(1) MRI Brain. The patient should be positioned in dorsal or ventral recumbency depending on the coil used. The head is often encased within a head coil but an alternative may be used. The MRI technician will be the best guide in this decision. Within the coil, it is best if the hard palate is parallel to the gantry and table with the tip of the nose and occiput in a horizontal line with each other along a standard imaging axis. Studies should extend from the most cranial limit of the orbits/eyes to the level of C2-C3. Slice thicknesses of 3-5 mm should be used; dependent on how many sequences are performed. The following sequences in each respective plane should be performed:

- (a) Axial/Transverse Plane. T1-weighted, T2-weighted, FLAIR, T1-weighted with contrast.
- (b) Sagittal Plane. T1-weighted, T2-weighted, T1-weighted with contrast.
- (c) Coronal/Dorsoventral Plane. T2-weighted, T1-weighted with contrast (T1-weighted pre-contrast also if time allows).

(2) MRI Spine. The patient should be positioned in dorsal recumbency, and the coil within the table will likely be used. Study should extend through necessary vertebral regions based on pain and/or neurolocalization. More specifically for the hind limbs, if UMN signs are present extend from T8-T9 through sacrum and if LMN signs present, from T12-T13 through sacrum unless otherwise directed. Slice thicknesses of 2-4 mm should be used; dependent on how many sequences performed. The following sequences within each respective plane should be performed:

- (a) Axial/Transverse Plane. T1-weighted, T2-weighted (T1-weighted with contrast if indicated).
- (b) Sagittal Plane. T1-weighted, T2-weighted, STIR (T1-weighted with contrast if indicated).
- (c) Coronal/Dorsoventral Plane. T2-weighted (T1-weighted pre and post- contrast administration if indicated).

(3) MRI Stifle/Joint Imaging. The patient should be placed in lateral recumbency (affected limb up) with the stifle placed in neutral to moderate extension. Study should at least extend from distal femoral diaphysis to the proximal tibial diaphysis, distal to the tibial crest. A wrist coil is preferable, however if the joint/region to be imaged is too large then cardiac or other similar coils may be used. Slice thicknesses of 2-3 mm should be used;

dependent on how much time is available to complete the study. The following sequences within each respective plane should be performed:

- (a) Axial/Transverse Plane. Proton Density (PD)-weighted (+/- fat sat).
- (b) Sagittal Plane. PD-weighted (+/- fat sat), T1-weighted, T2-weighted (+/- fat sat).
- (c) Coronal/Dorsoventral Plane. PD-weighted (=/- fat sat), T2-weighted (+/- fat sat).

6-14. Radiographic Referral Procedures and Practical Teleradiology. Email dog_consult@us.af.mil or call DODMWDVS at (210) 671-3992/3 or DSN 312-473-3992/3 for questions. All consults should be sent to the following address:

DOD MILITARY WORKING DOG VETERINARY SERVICE
ATTENTION: DIAGNOSTIC IMAGING DEPT
1219 KNIGHT STREET, BLDG 7602
JBSA-LACKLAND, TX 78236-5519

a. Referrals via mail. All referral materials (films, CDs) must be accompanied by a DODMWDVS Consultation Form and a completely filled out SF 519B (Radiologic Consultation Request) as well as the referring VCO's interpretation. (*NOTE: DODMWDVS is not intended to be every VCO's personal radiologist and it is expected that VCOs endeavor to interpret their own imaging studies. If the VCO needs assistance, their supporting 64F should be engaged first. If the 64F cannot comfortably interpret the images, the VCO should then contact DODMWDVS for consult.) In the absence of access to these standard forms, provide a letter detailing MWD signalment, relevant clinical history, and contact information for the referring VCO, supporting 64F, and any other applicable POCs. When sending follow-up images on a case, be sure to include copies of prior correspondence and previous images for comparison, if available. All radiographs need to be clearly labeled to include MWD name and tattoo, date, positional markers and radiology facility. When the images are received at the DODMWDVS, the referring VCO will typically receive an email or phone call with a response. A copy of the completed report will be emailed to the referring VCO for inclusion in the permanent veterinary medical record. If sending films, a complete address should be included so that the completed SF 519B and films can be mailed back to the sending unit to be placed in the MWD's permanent record. Privately-owned animal images can also be referred, but MWDs and other government-owned animals have priority.

b. Teleradiology – Referrals via email and internet. Telemedicine enables each VCO to provide unequaled medical care to MWDs worldwide through informal and formal consultations. Telemedicine also facilitates learning, mentoring and networking within the Veterinary Corps and can save time and money while working up difficult cases at remote duty sites.

(1) DICOM is the industry standard for transfer of radiologic images and other medical information between computers for diagnostic purposes. If using a digital imaging system, there should be a method for exporting the images in DICOM format and packaging them for writing to a CD or storing on a hard drive. These files can then be mailed or emailed for consultation. DICOM images should be submitted for consultation whenever possible. DICOM files will be large (several MBs each) so may not be transferrable with all email accounts. See Appendix E for information on AMRDEC Safe Access File Exchange, a military website for the sharing of large electronic files. (<https://safe.amrdec.army.mil/SAFE/>)

(2) An alternative method for sending images is to export them from the digital system as a JPEG or PNG file (the format of most digital photographs). These images are no longer true diagnostic quality due to compression and data loss but are often still sufficient to consult on a case. If this is the only option available, these images can be submitted for consultation.

(3) If consultation is needed on radiographic films, the best method will always be to mail the actual films. The local MTF may have a digitizer/scanner which can convert traditional films into digital images for sending/viewing as above. High quality radiographs will often scan/digitize in sufficient quality for diagnosis. As a last resort, photographs of the films can be made using a digital camera.

(a) High contrast images are often effectively photographed and transmit well (i.e. musculoskeletal radiographs). Photographs of thoracic and abdominal radiographs may not be as diagnostic. In particular, interpretation of digitized thoracic radiographs for detection of pulmonary metastasis has been shown to be of limited accuracy. Poor quality radiographs will not be made better through photographic manipulation!

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(b) When photographing radiographs, darken the room, block the excess light from the view box with cardboard, and set the camera for “black & white” photography. Disable the automatic flash and select the macro option if available. Also, check the owner’s manual for high-resolution settings that may be included as menu options. Images should be saved in JPEG or PNG format.

(c) Provide one photo of the entire radiograph for orientation and magnified photos of specific areas of interest. These and any additional photos (i.e. gross anatomical lesions) can be sent as email attachments.

c. Equipment

(1) Imaging equipment information and recommendations are available through the Veterinary Medical Standardization Board (VMSB). These standards should be reviewed prior to equipment purchase for further information.

(2) When purchasing or upgrading the digital camera, the number of megapixels, lens quality, optical zoom, and dynamic range are the most important factors in overall image quality.

CHAPTER 7

SURGERY

7-1. Overview of Common Surgical Procedures for the MWD. The following chapter lists several elective and emergent surgical procedures that may be encountered when caring for an MWD population. Each procedure is covered in detail in a number of excellent veterinary surgical texts, and the wise surgeon will review the procedure and any associated anatomy prior to undertaking any surgery. This list serves to provide guidance for avoiding some of the most common errors and pitfalls associated with the procedures. Surgeons must consult the most current version of the VMSB Anesthesia/Pain Management guidelines for further information regarding anesthetic aspects of surgery. Any deviation from these guidelines should only be performed after approval from the supporting 64F. All tissue specimens (or a sample thereof) obtained from an MWD during a surgical procedure, elective and/or emergent, should be submitted to the Joint Pathology Center for histopathologic analysis and tissue archiving.

7-2. Tail Amputation (Caudectomy).

a. Indications. Usually performed on MWDs that are "spinners" or otherwise overactive within the confines of a run or kennel. Chronic trauma of the tail tip against walls or fencing often results in open lesions that will not heal. However, every attempt should be made for behavioral and medical management through bandaging to alleviate the lesions prior to surgery being performed. More severe lesions and infections, chronic non-healing fractures, and/or the visualization of bone is grounds for removal in an urgent manner.

b. Preparation. Epidural anesthesia or ring block is mandatory. A wide clip is performed and sterile prep made with the tail hung/elevated. The remainder of the tail is wrapped in sterile self-adherent bandaging material. Be sure to position the patient in a way that will minimize strain on the surgeon and provide good visualization, recommend dorsal recumbency with tail hanging off the table. A purse-string suture and/or gauze sponge in the anus may be useful to minimize contamination. Purse string must be annotated on surgical checklists to ensure that it is removed post operatively. This should be considered a clean-contaminated procedure due to the proximity to the anus, and prophylactic peri-operative antibiotics with increased susceptibility for gram negative organisms (higher generation cephalosporins) are advised.

c. Methods. Make the tail short enough that the dog will not traumatize it further. A good rule of thumb is to place the tail against the perineum and determine the length required to cover the anus and long enough that the tail can be lifted to take a temperature. Amputate between coccygeal vertebrae, not through one. A hypodermic needle can be used as a probe to identify the intervertebral space at which to amputate. A wide Penrose drain (1/2 to 5/8 inch) or sterile self-adherent wrap can be used as a tourniquet at the tail base to help control bleeding. If a tourniquet is used, release it every 30-45 minutes for 5 minutes then reapply. The tourniquet should be released prior to skin closure to ensure all bleeding is controlled. Try to reflect muscle off the vertebra distal to the amputation site to allow for closure over the stump later. Creating a skin and muscular flap that is long enough for a tension-free closure ventral to the vertebrae is the biggest key to success (i.e. the dorsal flap wraps over the end of the stump and meets the ventral flap at a point ventral to the vertebra). The first closure layer is muscle over the vertebra, second is subcutaneous layer and finally skin. A continuous skin suture of non-absorbable monofilament material may be advantageous since it will bring a better seal and does not have the many knots/suture ends which could irritate the dog and cause licking/rubbing. Along with maintaining a tension-free closure, it is also important to obliterate dead space during closure to help prevent complications later, such as a seroma.

d. Post-operative care. Always use an E-collar, bucket, "no-bite" type collar, side braces or a combination of these to prevent chewing at the tail stump. Some surgeons like to place a soft compressive bandage on the stump for 24-48 hours to minimize edema formation. Analgesics and non-steroidal anti-inflammatory medications should be provided for 3-5 days post-surgery. Use of gabapentin in the pre- and post-operative period has been associated with improved management of so called "phantom pain" and associated self-trauma.

e. Complications. The main complication is dehiscence from chewing or licking the tail stump which can usually be averted by ensuring meticulous closure and using a preventive measure as advised above. Despite best efforts, some dogs will still traumatize the stump by rubbing it against a fence or wall. Hematoma at the surgical site can lead to delayed healing, excessive scar formation or result in dehiscence with or without infection. Also, the tail may have been left too long and further amputation may be required if trauma continues.

7-3. Scrotal Ablation.

a. Indications. Scrotal dermatitis of a chronic nature that is not responsive to medical management. Mature male dogs which have large pendulous scrotums may be subject to increased morbidity from chronic irritation or seroma/hematoma formation if castration is performed without scrotal ablation.

b. Preparation. Similar to a castration, however, include the scrotum and perineum to the ventral aspect of the anus in the clip and scrub. Testicular block can be performed as described in the VMSB Anesthesia/Pain Management guidelines. Epidural anesthesia is advised when the staff is proficient in its application but is not mandatory. A purse-string suture and/or gauze sponge in the anus may be useful to minimize contamination.

c. Methods. This procedure is adequately described in common surgery texts. Once on the table, place a sterile urethral catheter to help identify the penis and urethra and prevent inadvertent disruption during surgery and closure. Use a sterile surgical marker to outline the proposed incision. Exaggerate the curvilinear incisions toward the scrotum as this will help assure enough skin for closure without tension, however, try not to include the dark pigmented portion of the scrotum in the final incision. The scrotum is probably inflamed and making the incisions with electrocautery is useful to control hemorrhage from the skin. Hemostasis in general is important to avoid hematomas. To help control bleeding, make a small incision, control bleeding, incise, control, etc.; this is where the incision outline is helpful. Once the skin is incised full-thickness through the scrotal base, dissect it from the testes, and perform routine orchietomies. Remember that the dog is upside down, most likely with its hind limbs tied laterally and caudally; this adds tension to the surgical site. Do not panic if the incision is under too much tension at first; simply have an assistant untie the hind limbs and continue the closure. Alternatively, attempt surgery without having the limbs tied down. Make sure to obliterate as much dead space as possible, particularly at the cranial aspect of the incision, but avoid the penis and urethra. Minimize trauma/handling of skin edges, as they are thin and prone to excessive bruising and edema, which can delay healing. Buried intradermal/subcuticular closure of skin is preferable so as to avoid suture knots that might irritate the area and cause the dog to attempt to lick the incision.

d. Post-operative care. No special care is needed, except an E-collar or bucket and appropriate post-operative analgesia.

e. Complications. Dehiscence may occur, and is usually secondary to self-trauma or too much tension. It is usually advisable to allow the incision to heal by second-intention if this situation arises. Substantial bruising and edema can occur if the surgeon leaves excessive dead space.

7-4. Exploratory Laparotomy.

a. Indications. Exploration of the abdomen may be employed for diagnostic procedures, such as visualization and biopsy of organs or for a variety of therapeutic procedures related to trauma, volvulus, foreign material ingestion, neoplasia or other causes.

b. Preparation. Clip and prep the patient's ventral abdomen generously, expecting to make an incision from xyphoid to pubis if required. Also prep far enough lateral to midline in the event that feeding or drainage tubes need to be placed. In males, do not forget to perform an adequate preputial prep and flush. Depending on the reason for the laparotomy it could be considered a clean-contaminated or contaminated procedure and prophylactic peri-operative antibiotics are advised. Ensure biopsy supplies (formalin, cassettes, biopsy instruments, etc.) are ready and available prior to procedure. Biopsy of target organs should always be performed.

c. Methods. Perform sponge/gauze count prior to the procedure and reconcile prior to closure. Ensure that the linea alba is visualized well prior to entry into the abdominal cavity to avoid injury to the rectus abdominus muscle. It is most apparent at the umbilicus, and tapers to a small strip caudally. The falciform ligament will need to be removed with electrocautery and/or ligated cranially. In males, the skin and subcutis incision are curved 1-2 centimeters (cm) lateral to midline just cranial to the prepuce; the preputialis muscle and vascular branches from the caudal superficial epigastric vessel will be encountered. Perform the exploration in a systematic and consistent manner every time to avoid missing lesions or abnormalities. Use moistened laparotomy sponges to prevent tissues from drying and for packing off organs. After the procedure(s) are performed, lavage the abdomen with 1 liter (L) warm, sterile saline solution per 10 kilograms body weight and evacuate the flush solution. Adequate closure of the abdominal wall depends on appropriate sized and spaced bites within the linea and/or external rectus sheath, and on adequate sized suture with appropriate knot construction.

d. Post-operative care. Post-operative care is generally dictated by the underlying cause for the abdominal exploration. Appropriate post-operative analgesia, including local incisional blocks are paramount for a speedy recovery.

e. Complications. Major complication is dehiscence of the body wall closure, most commonly related to suture pull-through due to inappropriate technique. Seroma formation due to dead space in the subcutis is a common complication for novice surgeons and can be mitigated by minimal dissection of the subcutaneous tissue off the external fascia and meticulous closure. Dehiscence of biopsy sites can also occur when poor techniques (inappropriate needle choice, suture spacing, inappropriate vessel ligatures, etc.) are utilized.

7-5. Intestinal Resection and Anastomosis.

a. Indications. Removal of perforated, ischemic, neoplastic, or necrotic bowel. Causes of ischemic or necrotic bowel include intestinal obstruction, intussusception, adhesions, and segmental bowel strangulation/volvulus.

b. Preparation. Same as for exploratory laparotomy. Considered a clean-contaminated or contaminated procedure and prophylactic peri-operative antibiotics should be used.

c. Methods. Common surgical texts are replete with descriptions. Ensure ligation sites of vasa recta and jejunal vasculature are chosen wisely to avoid hindering vascular flow to the site of anastomosis. Eversion of mucosa is a common problem that can lead to poor apposition of sutured edges of bowel. Everted mucosa can be trimmed with curved Metzenbaum scissors prior to anastomosis. Use 3-0 or smaller suture on a taper needle, spacing sutures 2-3 millimeters (mm) from cut edge and 2-3 mm apart. Continuous or interrupted techniques have both been shown to be appropriate as long as the submucosa is incorporated in the bite. "GIA" (GastroIntestinal Anastomosis) and "TA" (ThoracoAbdominal) staplers may be useful for this procedure. Stapling can significantly decrease surgical time and are especially useful if the dog is not doing well under anesthesia. Once the anastomosis is complete check its integrity by occluding the bowel about 3-4 cm from the surgical site and inject saline or lactated Ringer's solution via 25 gauge needle. Carefully close the defect in the mesentery to avoid damaging the vascular supply to the anastomosis site. Copiously lavage (1L+/10kg) the abdomen and suction, then wrap the repair in omentum and close.

d. Post-operative care. Most uncomplicated procedures performed in dogs that were not particularly compromised do very well after surgery and require little special care. Care is generally dictated by the underlying condition. Feeding can begin immediately after surgery, but start with small meals of enteric-formulated canned food frequently. Current literature cautions that judicious use of anti-microbials and anti-emetics is indicated post-operatively as these drug therapies may obscure signs of acute complications such as peritonitis. All tissues that are removed should be submitted to JPC for histological evaluation.

e. Complications. Peritonitis is a concern in dogs with a perforated bowel or with major intra-operative contamination. Patients generally decline in clinical status (inappetent, vomiting, lethargy, etc.) 2-5 days after surgery if the repair has dehisced. Longer-term complications can include adhesions creating an obstruction, abscessation, short-bowel syndrome and neoplastic recurrence.

7-6. Gastropexy.

a. Indications. Until the implementation of prophylactic gastropexies for MWDs, multiple MWDs died each year as a result of GDV. Performing a gastropexy either as a prophylactic measure or at the time of an abdominal exploration incited by GDV occurrence is paramount for any VCO working with MWDs. GDV is most likely encountered on deployment as many MPCs, CWDs, or allied nation MWDs are not gastropexied. It is recommended to gastropexy MWDs at the time of abdominal exploration performed for any reason.

b. Preparation. Pre-operative evaluation and stabilization of patients with GDV should be performed rapidly and aggressively as described elsewhere in this text. Evacuation of air and ingesta from the stomach is performed with an orogastric tube or via trocharization. Research has proven that proper hemodynamic stabilization prior to anesthesia and surgery improves outcomes, and surgery should not be rushed in an unstable patient.

c. Methods. Rapid surgical decompression and derotation of the stomach is the main goal of surgical therapy. A ventral midline laparotomy is performed carefully to avoid injury to the gas-distended stomach. The stomach is returned to its normal position by grasping the stomach wall adjacent to the left body wall (pyloric antrum) with right hand and pulling while pushing dorsally on the stomach wall that lies adjacent to the right body wall (fundus). An orogastric tube can be passed once under general anesthesia to aid in evacuating the stomach and accessing gastric viability. Initial assessment of gastric integrity is performed including the cardia; a complete abdominal

exploration is performed, followed by re-evaluation of the stomach. Partial gastrectomy, short gastric artery ligation, and/or splenectomy may be required (see following sections). The next step is to perform a gastropexy. An incisional gastropexy is the preferred method due to its ease, rapid application, strength, and minimal specialized supplies required to perform. A 4-6 cm incision is made in the ventral pyloric antrum with a correspondent incision in the transversus abdominus muscle just caudal to the last rib. The incisions are then apposed and closed in two suture lines with slowly-absorbing monofilament suture material on a taper needle (2-0 size). The gastropexy should not alter the normal gastric axis location, pull the stomach too far caudally as evidenced by excessive tension on the gastro-splenic ligament, or encroach upon the diaphragm.

d. If the gastropexy is performed in a non-emergent situation such as a prophylactic procedure, it should be accomplished using a right lateral paracostal, laparoscopic-assisted technique, or traditional incisional gastropexy. Additional training and credentialing are required before performing the right lateral paracostal technique. An instructional DVD showing the right lateral paracostal approach is available from the Defense Visual Information Directorate. See sections 7-9.

e. Post-operative care. Immediate post-operative care is dictated on the indication for performing the gastropexy. Post-GDV patients require moderate to intensive post-operative care and monitoring to include continuous ECG. Elective patients require standard incisional care.

f. Complications. Arrhythmias, disseminated intravascular coagulopathy (DIC), sepsis, hypokalemia, hemorrhage, and peritonitis are all very common post-surgical complications for dogs recovering from GDV. Therapy and monitoring are dictated by clinical findings. It has been noted that seroma formation is common with surgeons that are initially learning to perform the right paracostal gastropexy technique. This can be mitigated by meticulous closure of all tissue layers, and in particular the space between internal and external abdominal oblique muscles.

7-7. Partial Gastrectomy.

a. Indications. Resection of a portion of the left margin of the fundus and body may be required in association with GDV. Partial gastrectomy may also be performed from extensive gastric trauma or in association with neoplasia.

b. Preparation. Pre-operative evaluation and therapy are similar for all GDV patients. Free intra-abdominal gas (pneumoperitoneum) may be evident on pre-operative radiographs in patients with gastric necrosis and rupture. No proven objective evaluation measure for determination of viability of the gastric wall has been reported; clinical assessment is the most valuable tool. Color of green to black, palpable thinness of the wall with loss of the characteristic mucosal “slip”, absence of peristalsis, absence of hemorrhage when serosal surface is incised with scalpel, and loss of pulsatile flow from gastric and gastroepiploic arteries are all indicators of likely segmental necrosis. Allow 5-10 minutes after de-rotation to make a final determination, as restoration of vascular supply can improve the character of the stomach wall. Fifty to eighty percent of the stomach may be removed, but if the cardia is non-viable, resection is not possible and euthanasia should be elected.

c. Methods. Partial gastrectomy requires a scrubbed surgical assistant for retraction, and extreme care to avoid contamination of the peritoneal cavity with ingesta. The procedure can either be performed with the cut-and-suture method, or with the aid of a linear stapling device (TA 55 or 90). Incorporation of a stapling device will generally decrease surgical time, as well as the risk of contamination of the abdominal cavity and is advisable, particularly for novice surgeons. Gastric invagination of necrotic portions of the stomach wall is another technique that is less technically dependent but is not recommended and the supporting 64F should be consulted as this technique is considered as a last option.

d. Post-operative care. As for GDV patients, patients with gastric necrosis will always require intensive post-operative therapy and monitoring. Transfer to a 24-hour care facility post-operatively is appropriate when possible. Mortality of patients surgically treated for GDV increases with the presence of gastric necrosis.

e. Complications. Arrhythmias, DIC, sepsis, hypokalemia, hemorrhage, and peritonitis are all common post-surgical complications for dogs recovering from GDV. Therapy and monitoring are dictated by clinical findings.

7-8. Splenectomy.

a. Indications. Neoplasia, loss of vascularity (thrombi) secondary to GDV, splenic torsion, trauma, generalized splenic disorders.

b. Preparation. Splenectomy is commonly performed as an emergent procedure, with concomitant hemoabdomen and persistent intra-abdominal blood loss due to a (often large) bleeding splenic mass. It is advisable to be familiar with the anatomy of the spleen in normal patients to help recognize vascular structures in these emergent patients. Peri-operative blood product administration may be required.

c. Methods. Arcade ligation of the splenic artery and vein, short gastric arteries, left gastroepiploic artery, and omental attachments provides a method for rapid and safe removal of the spleen. Mass ligation of segments of omentum and specific ligation or stapling (LDS stapler) of larger individual vessels is the preferred technique for most surgeons. Care must be taken to avoid excessive manipulation or trauma to the distal aspect of the left limb of the pancreas due to its close association with the splenic artery and vein. Splenic torsions should not be derotated prior to splenectomy due to release of thrombi and cellular breakdown products. Liver biopsy should always be performed in cases of suspected splenic hemangiosarcoma. Prophylactic gastropexy using an incisional method should be performed at time of splenectomy secondary to large splenic masses if the patient is stable.

d. Post-operative care. Dictated by the reason for performing the splenectomy, and the post-operative condition. Continuous ECG monitoring is advisable for the first 24-48 hours.

e. Complications. Hemorrhage, arrhythmias, and DIC are the most common complications. Arrhythmias (VPCs) may not occur for 12-24 hours post-operatively, and only need to be treated if they are hemodynamically significant.

7-9. Guide to Ordering MWD Videos. MWD instructional videos are available through the Defense Imagery Management Operations Center (DIMOC). The website is: <http://www.dimoc.mil/customer/contact.html>. The website no longer allows searching for individual videos. Videos can be ordered using the online contact form, select "Digital Fulfillment" as the subject and then complete the required information. In the comments section, include the video name(s) and pin(s), number required and physical address for shipping as orders are shipped via commercial carrier and not the United States Postal Service.

a. The following surgical videos are available:

- (1) PIN 615365 - COMMON MILITARY WORKING DOG SURGICAL PROCEDURES (Includes Right Paracostal Gastropexy, castration with scrotal ablation and caudectomy made by DODMWDVS)
- (2) PIN 615356 - CANINE RIGHT-SIDED PARACOSTAL GASTROPEXY
- (3) PIN 615360 - CANINE CAUDECTOMY
- (4) PIN 615361 - CANINE SCROTAL ABLATION

b. The following exam videos are also available:

- (1) PIN 614575 - MILITARY WORKING DOG NEUROLOGIC EXAM
- (2) PIN 614576 - MILITARY WORKING DOG ORTHOPEDIC EXAM

c. DIMOC contact information:

Toll free: 1-888-PH-DIMOC (743-4662)

DSN: 795-9872

Commercial: 570-615-9872

Email: dvicustomerservice@defense.gov

CHAPTER 8

DENTISTRY

8-1. Overview of Dental Care for MWDs. Dental disease is common in MWDs due to the nature of these animals and their work. If untreated, dental disease can lead to performance degradation, tooth loss, and systemic illness. Severe dental disease can require the retirement of a dog from active service. The most common conditions encountered are dental attrition, dental fractures, and periodontal disease. Because of safety concerns, a complete oral exam is often impossible without sedation or general anesthesia. In addition, follow up treatments, whether by veterinary or kennel personnel, are difficult to provide. Therefore, careful considerations must be given when formulating a dental treatment plan. If an MWD requires advanced dental procedures (i.e. endodontics or oral surgery) consultation with the DODMWDVS or supporting 64F is recommended. Often excellent dental support for MWDs can be obtained through interaction with the local military dental activity and it is highly recommended that a good working relationship be established with these personnel. Importantly, the attending VCO remains entirely responsible for making therapeutic decisions regarding the MWD patient and IAW veterinary policies and the VMSB Comprehensive Oral Health Assessment and Treatment (COHAT) Guidelines.

8-2. Dental Examinations. An oral exam should be performed at least twice yearly in conjunction with the semi-annual physical examination. Every time an MWD is anesthetized, a careful dental/oral exam should be performed. A complete dental prophylaxis should be performed as needed which is typically about once a year and cleaning should be considered any time an MWD is anesthetized. Special priority should be given to MWDs prior to deployment. Routine and prophylactic procedures should be done by supporting home station personnel prior to deployment of MWD. Although a dental prophylaxis should be performed prior to deployment, it should be noted that dental calculi without associated periodontal disease does not equate to dental disease. Significant dental disease or oral conditions which render the dog otherwise not deployable must be addressed prior to deployment.

8-3. Dental Records. Any dental problems should be annotated in the record and on the master problem list (e.g. fractures, missing teeth, advanced gingival recession). However, calculus that accumulates between cleanings and prophylactic procedures should not be placed on the master problem list. All dental treatments, including routine prophylaxis should be recorded in the MWDs medical record (SF 600, or equivalent) and on an attached or separate dental chart in accordance with American Veterinary Dental College (AVDC) standards. A standardized dental chart is available in the VMSB COHAT Guidelines and within the electronic veterinary medical record system.

8-4. Dental Fractures. Dental fractures are frequently noted in military working dogs. Because of their large size and rostral positioning, the canine teeth are most frequently affected. Common causes of coronal fractures include aggression training, kennel vices (pan or fence chewing), and overzealous reward retrieval. Clinical signs of bite avoidance, oral bleeding, reluctance to eat or facial swelling are occasionally reported. However, the majority of coronal fractures are identified as incidental findings during an oral exam or dental prophylaxis. Canine teeth may be partially avulsed from the alveolus. In these cases, the tooth is intact but the surrounding bone is fractured. Such teeth can be salvaged by timely and appropriate therapy. Avulsed teeth require a root canal and some form of intra-oral support during healing of the alveolar bone. Consultation with the supporting 64F, local military dentists, and/or the DODMWDVS is recommended.

a. Treatment Decisions. A tooth with a fractured crown should be treated endodontically if the pulp chamber is exposed. These teeth must be distinguished from viable teeth with chronic wear, which have produced tertiary restorative dentin. The latter teeth will have a brownish spot where the pulp has receded, but will not allow penetration of a dental probe and the surface shines and feels as smooth as glass when the surface is probed with a dental explorer. Over time, an open pulp chamber may fill in with necrotic debris, dental calculi or other foreign material. In that case, the surface will appear dull and feel rough when probed with a dental explorer; these latter teeth require endodontics or extraction. After a tooth fracture, bacteria from the oral cavity contaminate the pulp. This infection leads to pulpitis and then death of the tooth. (A tooth may be illuminated with a transilluminator, a viable tooth will light up, while a dead tooth will be noticeably dark in the area of the pulp cavity). The infection

can spread through the apex causing a periapical abscess, which can progress to osteomyelitis, severe pain, and tooth loss. Because of the morbidity that can occur when fractured teeth are not treated, all teeth with coronal or enamel fractures should be treated endodontically or extracted. Bonded dental sealants should be used for protection of recently exposed dentin secondary to dental fracture that does not involve the pulp chamber. The canines, third maxillary incisors and carnassial teeth are saved whenever possible. Radiographs may further document necrosis with the pulp cavity of a dead tooth appearing wider on radiographs than a viable tooth. Likewise, there may be concurrent widening of the periodontal ligament space and/or resorption of the alveolar bone. If tooth extraction is performed, the entire tooth root needs to be elevated and removed and verified by radiography.

b. Endodontic Therapy (Root Canal). Endodontic therapy is treatment of the tooth pulp. The pulp includes the blood vessels, nerves, and connective tissues that internally support each tooth. Because the periodontium has an independent neurovascular supply from the pulp, it is possible for a mature tooth to be dead and yet remain fully functional and firmly supported. This is the basis of endodontic therapy. The purpose of a root canal procedure is to remove the necrotic pulp from a tooth and seal that tooth to prevent apical spread of bacterial infection. This procedure will eliminate the source of pain and preserve the function of the tooth. Hands-on training of VCOs in endodontic therapy continues to be a part of the Basic Officer Leadership Course (BOLC) and Veterinary Services in Theater of Operations (VSTO) Course. With the proper equipment (listed in the COHAT Guidelines), and a little practice, one can master the techniques. Contact the supporting 64F or DODMWDVS for consultation in specific cases. The following steps are followed when performing a standard root canal:

- (1) Dental Prophylaxis if needed
- (2) Pre-operative Radiography
- (3) Endodontic Access
- (4) Canal Debridement
- (5) Canal Irrigation/Disinfection
- (6) Drying
- (7) Obturation (filling of the pulp chamber with an inert substance i.e. IRM, Gutta Percha, etc.)
- (8) Restoration of the Access Site (amalgam or light-cured resin)
- (9) Post-Operative Radiography

c. Dental Restoration. As a general rule, dental restorations (crowns) are discouraged in military working dogs. Most MWDs will continue to have an effective bite as long as the source of pain is eliminated by endodontic therapy. In addition, when a crown is placed, the remaining tooth structure is weakened, and thus the failure rate for these implants is high in working dogs and may result in more serious injury.

8-5. Periodontal Disease. Periodontal disease is inflammation and/or infection of the tissues that support the teeth. Clinical signs of periodontal disease vary from patient to patient and from mild to severe. Common signs include: inflammation of the gingiva (gums) with or without recession, halitosis, ulceration, bleeding, pyorrhea, tooth mobility, and tooth loss.

a. Periodontal disease is staged based on clinical evaluation, which coincides with the pathologic state. Periodontal probing and dental radiography (where available) are important diagnostic techniques that assist in staging periodontal disease. Healthy gingiva is pink or pigmented in color. The gingival sulcus is shallow and the gingival edge is firm and tapered.

(1) Stage I periodontal disease is gingivitis. This stage is recognized by gingival edema and inflammation without deterioration of the support structures.

(2) Stage II is advanced gingivitis. The gums bleed easily on probing and the inflammation is increased. These teeth remain stable.

(3) Stage III patients have established periodontitis. In addition to the above clinical signs, these patients have deep periodontal pockets (>3mm probe depth) with 10-30% loss of bone support. Stage III teeth are slightly mobile.

(4) Stage IV, or advanced periodontitis is an advanced breakdown of the periodontium with deep pockets and >30% loss of alveolar bone and significant tooth mobility. When staging a patient's periodontal disease, each tooth is considered individually. An average score can then be given for the entire mouth.

b. Most MWDs will fall into Stage I or II periodontal disease when evaluated during a dental prophylaxis. Most dogs will not advance beyond advanced gingivitis with regular and thorough dental examinations and cleanings. Attempts should be made to save Stage III teeth with careful, but complete cleaning, paying special attention to the

subgingival component with root planing, subgingival curettage, and the application of barrier sealants. Doxycycline gel can be instilled subgingivally into the pocket after cleaning and slowly releases antibiotic locally to help stem further bone destruction and allow repair. Stage IV periodontitis requires heroic procedures to save the tooth and may require placement of an osteoconductive bioglass or graft material after surgical exposure and debridement. Oral antibiotics (clindamycin and others) can also be given to treat alveolar bone infection. Extraction is typically preferred, however, every effort is made to save canine, third maxillary incisor, and carnassial teeth. As continued oral health maintenance is difficult in MWDs, Stage III and IV treatments can easily fail so it is best to conduct regular oral examinations and thorough prophylaxis.

8-6. Dental Prophylaxis. A complete dental prophylaxis is important to maintain general health. Every MWD should have a complete prophylaxis performed annually or semi-annually as needed. Depending on the handler's rapport with the dog, he or she should attempt monthly oral checks even if it is only a quick look at the buccal surfaces of the teeth and any changes should be reported to the VCO or 68T. Dogs with Stage III or IV periodontitis need more than a routine prophylaxis. These teeth need periodontal therapy directed at the specific lesion. Periodontal therapy techniques include barrier sealants, subgingival curettage, root planing, periodontal surgery, or extraction. Most MWDs can function with missing teeth. In fact, due to the difficulty in providing oral treatments in MWDs, the decision is sometimes made to sacrifice a nonessential tooth in an MWD. It is important to annotate procedures and findings in the dental chart and medical record.

a. A complete dental prophylaxis includes the following steps:

- (1) General anesthesia (using VMSB guidelines)
- (2) Examination and dental charting
- (3) Dental scaling
 - (a) Rinse the mouth with a very dilute chlorhexidine solution (0.12%).
 - (b) Thick calculus can be broken off the teeth (usually most heavy on the maxillary 4th premolars) with extraction forceps or rongeurs, but be careful not to fracture the tooth.
 - (c) Proceed to the ultrasonic scaler.
 - (d) Use a hand scaler to remove subgingival calculus.
- (4) Periodontal probing
- (5) Dental polishing
- (6) Dental radiographs
- (7) Additional procedures as necessary to treat dental disease.
- (8) Application of a barrier sealant product should be considered.

b. Antibiotics with efficacy against anaerobic bacteria (lincosamide or aminopenicillin with or without β -lactamase inhibitor) should be initiated several days prior to a dental cleaning in any dog with a heart murmur, kidney or other heart disease, severe oral infection, or if concurrent surgery is planned or possible. Dogs not meeting these criteria generally do not require antibiotics for routine dental cleaning. When indicated, antibiotics should be continued for several days after the dental cleaning.

8-7. Handler level dental care. The best treatment is prevention. MWD Handlers should be trained in how to open their MWD's mouth for oral exam, how to do a brief visual oral exam, and how to brush their MWD's teeth or utilize an oral rinse. As with human dental care, brushing daily is paramount in preventing periodontal disease and tartar/calculus build-up. If a handler is able to brush the MWD's teeth no less frequently than every other day, there should be significant improvement in overall dental health and the interval at which prophylactic cleanings are needed can be increased in order to prevent repeated anesthetic events. For MWDs that are too aggressive to allow brushing, a viable alternative is a daily rinse with chlorhexidine solution.

CHAPTER 9

PHYSICAL CONDITIONING

9-1. Overview. Police dogs and MWDs are career athletes presented with a unique set of performance challenges. Stakes are high for these dogs as their safety and that of many people depends on their ability to carry out their duties with speed and agility. The dogs must often be called upon in a moment's notice to engage in pursuit at sprinting speeds or to navigate varied terrain in a search exercise. Furthermore, intensive resources are involved in the training of these specialized dogs, so there is much incentive to maximizing the time at which they are at peak performance. Ensuring these dogs are appropriately conditioned is a critical aspect of their care and of preparation for any event that may call upon their services. The following is a discussion of the nature of police and military working dog duties, as well as recommendations for conditioning based on the evidence existing in human exercise physiology.

9-2. Physical Demands on MWDs. The development of an appropriate conditioning program for military and police dogs requires a thorough understanding of the physiological and biomechanical demands placed on them in their regular activities. Most MWDs are certified to perform a combination of patrol and detection duties. These activities fall in between high-intensity sports such as greyhound racing and extreme endurance events like sled-dog competitions. Patrol activities are conducted mainly for the purpose of pursuing a suspect or intruder. Therefore, dogs will be required to sprint, jump obstacles, turn sharply at top speed, scale walls and fences, and withstand potentially severe compressive and bending forces to the spinal column when apprehending an individual. Detection of either explosives or narcotics requires searching of rooms, vehicles and other areas, sometimes in places that may require crawling or navigating unstable terrain without fatiguing. Therefore strength, endurance, flexibility, proprioception and balance are necessary for peak performance of patrol and detection activities. Additionally, MWDs in particular, may be asked to conduct their duties in environmental extremes, presenting a risk of heat or cold injury.

9-3. Musculoskeletal Injuries. Knowledge of the types and frequencies of injuries sustained by military and police dogs in the line of duty allows incorporation of preventative strategies into a training program. There is information in the literature with regard to musculoskeletal injuries sustained by police and MWDs, although some of the evidence has relied on handler recall rather than documented diagnosis by a VCO.

a. Musculoskeletal Injuries in MWDs. 14.3% of non-combat related injuries or illness occurring in MWDs in a combat zone were musculoskeletal related (Takara, 2014). Evans and others (2007) retrospectively evaluated 245 military working dog records to determine reasons for discharge from service. Dogs were separated into two age groups: 1 to less than 5 years of age and 5 years of age or older. The most common cause of discharge by far in the younger group was behavior (82.3% of dogs under 5 years), distantly followed by heat injury (8.2%). Spinal cord diseases (30%) were the most common causes of discharge in dogs 5 years of age or older, followed by behavior (14.4%), degenerative joint disease (DJD, 13.8%) and a combination of spinal cord diseases and DJD (12.5%). Similarly, in an earlier retrospective study of records from 927 MWDs, appendicular DJD (19.2%) and spinal cord/cauda equina disease (15.6%) were two of the top three reasons for death or euthanasia, along with neoplasia (Moore, 2001). The musculoskeletal problem most commonly responsible for MWD discharge from duty appears to have shifted from hip dysplasia/osteoarthritis to degenerative lumbosacral stenosis in the past several decades, but current prevalence among working dogs is unknown for either condition. Regardless, musculoskeletal injuries and diseases appear to play a key role in early release from duty of MWDs.

b. Musculoskeletal Injuries in Police Dogs. In a comparison between police and pet German Shepherd Dog emergency visits, the study found that police dogs were more likely to be seen for orthopedic injuries than the pet population, comprising over 25% of the reasons for police dog emergency visits. Most orthopedic injuries among police dogs were appendicular rather than axial. Police dogs were seen at a younger age than pets; orthopedic injuries were thus postulated to be work-related. Authors indicated the data is suggestive of a need for preventative conditioning programs in police dogs, though specific orthopedic injuries were not discussed (Parr, 2013). Another study investigating 151 police dogs in Egypt found a lower prevalence of orthopedic diseases than in the police dogs of the previous study, with 2.6% having skeletal disorders and an additional 1.4% having muscular disorders (Haithem, 2011).

9-4. Physiological Responses to Conditioning. The body's response to conditioning is multi-systemic, and can be manipulated to some degree in order to develop physiological changes optimized to a particular sport or activity. A great deal of information exists about conditioning of human athletes, which contributes substantially to the practice of veterinary sports medicine. There is a limited amount of evidence available in dogs as well, allowing the practitioner to develop an understanding of some of the key differences between the species. The following discussion highlights the human physiological responses to training, addressing specific differences in canine athletes when known.

a. **Musculoskeletal System.** The human muscular system is comprised of two main muscle fiber types. Type I, commonly referred to as "slow twitch" fibers, are muscles designed to sustain persistent, low-level activation. These fibers predominate in postural muscles and in those required to perform prolonged endurance activities, particularly in trained athletes. Type I fibers are thus resistant to fatigue, containing higher levels of oxidative enzymes mitochondria and myoglobin to support aerobic metabolism. Type II, or "fast-twitch", fibers, are more suited to anaerobic metabolism, have low resistance to fatigue, and predominate in muscles of individuals trained in high-intensity strength-related exercises. These fibers contain higher numbers of glycolytic enzymes, and are capable of achieving higher tensile strength and shortening velocity. Dogs, however, have a muscle type and distribution more suited to endurance activity. Their "fast-twitch" fibers (Type IIA, Type IIX and several hybrid) fibers differ substantially from human Type II fibers in that they are capable of much greater oxidative metabolism. The only highly anaerobic fibers known to exist in the canine body are within laryngeal muscles. As a result, canine skeletal muscles do not appear to make significant adaptations in response to endurance training regarding capillary content or mitochondrial number and efficiency. However, resistance training can elicit hypertrophy or reverse atrophy in the dog as in the human, as well as altering the distribution of muscle fiber types. There are also breed-related differences in muscle fiber type distribution. Greyhounds, for example, have a larger proportion of Type II muscle fibers than other breeds, which facilitates their high-power, high-speed sprinting activity.

b. **Cardiovascular System.** The cardiovascular system of both humans and dogs also undergoes a number of adaptations in response to aerobic training, though large species differences exist as with the muscular system. In humans, endurance training lowers the heart rate during rest and at a given intensity of submaximal exercise. Bradycardia and cardiac hypertrophy, induced by training, allow for an increased end-diastolic volume and greater contractility via the Frank-Starling mechanism, therefore enhancing stroke volume and cardiac output.

(1) Aerobic conditioning in humans also increases arteriolar oxygen extraction at the level of working muscles (McArdle, 2015). In people, cardiac output and oxygen extraction contribute nearly equally to enhancing maximum oxygen consumption (VO_2 max), the most reliable indicator of an individual's fitness. Cardiac hypertrophy and lower heart rate at rest and submaximal exercise are induced by training in canine athletes as with humans. Dogs in one study demonstrated a drop of approximately 14 beats per minute after a period of conditioning (Musch, 1985). Unlike humans, however, increase in VO_2 max as a result of endurance training in dogs is mostly due to cardiac output (96%) and stroke volume in particular, rather than oxygen extraction (4%) (Musch, 1987). This is supported by the lack of substantial evidence for muscle biochemical and histochemical adaptations to endurance training in dogs. Conditioning may increase a dog's VO_2 max by anywhere from 31% in foxhounds running on a treadmill (Musch, 1985) to almost 300% in trained endurance sled dogs (Pierce, 2013).

(2) As athletes' performance and resistance to fatigue increase with VO_2 max, conditioning contributes substantially to both. Training also improves canine lipid oxidation and efficiency of substrate utilization to support prolonged endurance activity. This may increase efficiency of nutrient use from the higher-fat performance diet that is standard for most MWDs (Pierce, 2013).

c. **Thermoregulation.** Conditioning improves the ability of an individual to thermoregulate, by reducing the proportion of energy produced as heat and increasing the proportion utilized for work, otherwise known as the energy efficiency. The energy efficiency of an untrained dog is less than 17%, which means that 83% of the energy spent is lost as heat. A conditioned dog can have an energy efficiency of up to 27%, with 73% produced as heat, which is very similar to the efficiency level of certain machines such as car engines. The decreased amount of metabolic energy lost as heat means that the core body temperature will not rise as readily with exercise. This is critical in the MWD, in which heat injury can have significant adverse effects ranging from loss of performance to death. Providing adequate conditioning programs to working dogs may reduce the incidence of heat injuries, and also improve detection performance by reducing the threshold for panting, which interferes with sniffing ability.

9-5. Principles of Conditioning.

a. **Overload.** The principle of overload describes that the intensity of exercise must be above a certain threshold in order to effect physiologic changes, such as increased VO₂ max and muscle hypertrophy (ACSM, 2013). Individual factors such as age, genetics, concurrent illness, and level of fitness influence this threshold. Training will increase the threshold required to elicit changes in physiologic parameters; an elite human athlete requires exercise at intensities of 95-100% VO₂ max in order to achieve further alterations in physiologic responses. Interval training is one technique that may assist an individual in producing physiologic gains beyond those achieved by high intensity exercise alone. Interval training for up to 3 months may be equivalent or superior to purely high-intensity activity for the healthy human adult (ACSM, 2013).

b. **Specificity.** The principle of specificity defines that, in order to improve performance in a given activity, training must involve specific recapitulations of that activity. Therefore if a working dog needs to be able to navigate unstable terrain or leap while turning in a chase, training should include exercises that address balance on unstable surfaces and jumping power during a change in direction. Repetition of the activity to be trained is commonly the extent of preparation among individuals participating in canine sports and in the MWD training community. However, exclusively focusing on skills-specific training falls short of ultimate performance improvement as it overlooks other components of the complete athlete. The five most important components of a balanced exercise program include: endurance, strength, preparation and recovery, proprioception and balance, and skill-specific training. Examples of exercises in each category (with some overlap) that are beneficial to MWDs are included in this document.

c. **Strength/Power.** Measurement of strength of individual muscles or muscle groups is very difficult or would require invasive procedures in dogs. There are proposed strength tests for core, pelvic limbs and forelimbs in dogs, but these are highly subjective and generalized. The most clinically applicable estimation of muscle strength in dogs can be achieved by indirect assessment of muscle mass. When muscle hypertrophy is the desired outcome, the practitioner must understand the timeline along which this type of physiological adaptation can take place. This has not been specifically assessed in dogs, but in people there is an initial period of neuromuscular adaptation in which the motor unit coordination improves execution of commands from the CNS, allowing for an early increase in muscle activation efficiency and strength that precedes hypertrophy of muscle fibers. In human kinesiology, it is generally accepted that muscle hypertrophy requires an 8-12 week program consisting of exercises that elicit muscle overload. Muscle mass changes can be estimated with evaluation of circumference of thighs and other areas. Subjective strength assessments can be made at intervals as well. Similar to humans, it must be understood that as dogs age, muscle tissue is gradually replaced with fat, in conjunction with age-induced muscle atrophy (sarcopenia).

(1) The use of resistance bands and asymmetric weight loading are useful in building muscle mass and strength preferentially on a specific limb or with a specific group. Keep in mind that more distal placement of a resistance band will lengthen the moment arm of the limb, thereby increasing the torque and increasing the muscle's workload. Working dogs can be trained to perform a variety of maneuvers, with or without additional weight or resistance, to strengthen specific muscle groups.

(2) Table 9-1 lists examples of strengthening exercises for the thoracic limbs, pelvic limbs and core muscles designed to lead to improved performance of required duties of working dogs.

d. **Endurance.** MWDs are considered "intermediate-level" athletes and are not truly engaging in endurance activities as are sled dogs undergoing many miles of running for multiple days in a row. However, it's important to build physical endurance within the range of activities that MWDs are expected to perform, and improving physical endurance also reduces olfactory fatigue for dogs performing detection duties. Aerobic endurance can be helpful in preventing heat injury, as dogs that are aerobically conditioned are more energy-efficient and produce less body heat for a given amount of work performed, as described above. Building endurance requires exercise at a submaximal level (less than 80%-90% maximal effort) for a given duration, generally at least 20-30 minutes. However, interval training with high-intensity intervals at near-maximum effort may actually be more effective than continuous submaximal exercise in building endurance. A 1:1 or 2:1 ratio of lower to higher intensity activity is recommended. Having a land treadmill designed for dogs (at least 6 feet of working belt length for the average MWD) is more suited to a graded endurance conditioning program, as the speed and intensity (incline) can be controlled and altered within accurate interval periods. An endurance program should build over 7-8 weeks at a frequency of 4-5 times per week before reducing to a maintenance level of 3 times per week.

Table 9-1. Strengthening Exercises

<i>Thoracic Limbs</i>	<i>Pelvic Limbs</i>	<i>Core Muscles</i>
“Shake a paw” with reach at various heights, with or without weights on the carpus	Sit-to-stand. Sit with rump only on an elevated surface and feet on ground (easy) to entire hind end on an unstable surface (hard). Facing downhill (easier) to facing uphill (harder)	Balancing with forelimbs, hindlimbs or whole body on one or more unstable objects (peanut, physioroll, donut, balance disk)
“Pushups” or sit/stand to down facing downhill shifting weight to forelimbs	Pivoting around in a circle with hindlimbs (with or without resistance band hobbles, or with or without stepping over obstacles in between) while forelimbs remain on a small target area	Walking with hindlimbs on a treadmill while forelimbs are in front of the treadmill balancing on an unstable object (or vice-versa)
Stepping up and down (shoulder and elbow flexors and extensors) and off the sides (shoulder adductors and abductors) of an aerobic step with weights above the carpus.	Walking in tall grass, sand or snow (strengthens thoracic and pelvic limbs and their stabilizers)	Navigating over a series of unstable objects (trampoline, balance balls, discs, physiorolls and peanuts, swaying bridges on a child’s playground, balancing and turning on a plank)
Digging (contraindicated for explosives detection dogs)	Jumping up to place forelimbs or whole body on an elevated surface. Can alternate with crawling or have the dog explode up from a sit for a more plyometric exercise when safe to challenge	Three-legged standing (easy, best if elevates limb voluntarily to touch a target) to “supermans” with contralateral forelimb and hindlimb elevated. Even more challenging if performed on an unstable surface
Tunnel crawl or “limbo”	Tunnel crawl or “limbo”	Transitions (e.g. sit to stand, sit to down) with forelimbs, hindlimbs or whole body on an unstable surface (balance discs or a physio-peanut)
Cavaletti Rails with or without weighted forelimb(s)	Cavaletti Rails with or without weighted pelvic limb(s)	Planks or plank pushups with forelimbs on a physioball/peanut
Balance with forelimbs on an unstable object and forelimbs elevated (easy) to hindlimbs elevated (challenging)	Balance with hindlimbs on an unstable object and hindlimbs elevated (easy) to forelimbs elevated (challenging)	Standing on a raft floating in water or on a wagon or other wheeled object (always being spotted by a handler) rolled over uneven terrain
Wheelbarrowing	Dancing or walking forward/backward with forelimbs (antebrachii or feet) on a physioroll or rolling stool	Repetitions moving from lateral to sternal recumbency on an unstable surface such as a mattress (targeting transversus abdominus)
Ascending Stairs	Descending Stairs	Sit-to-beg position and hold.

e. **Proprioception and Balance.** Proprioception and balance can be greatly enhanced by improving core stability, so there is considerable overlap in the exercises for each. Navigating obstacles such as ladder rungs, tires, Cavaletti rails, and unstable terrain will improve proprioception. These exercises are best performed slowly, allowing the dog time to make adjustments and shift weight, without relying as much on momentum to adjust to the change in position. In MWDs with poor core strength and balance, weight shifting may be performed with the dog in a static standing position. The handler can rock the patient's shoulders or flanks to one side or to both sides, allowing the dog to adjust. Additionally, applying some dorso-ventral motion to the dog's body elicits rhythmic stabilization of the muscles to maintain standing posture, contributing to standing strength and balance as well. Whenever possible, normal posture should be encouraged such that the forelimb-to-hindlimb distance and left-to-right limb distance approach that achieved on a normal, flat surface. Standing weight-shifting can be performed on surfaces of gradually increasing instability (wobble boards, discs, Bosu balls) as the MWD's proprioception improves, in conjunction with exercises performed while the dog is in motion. One advantage of proprioceptive exercises is that they are ideally suited to begin employment in young puppies. These activities are not high-impact and thus minimal risk to growth plates. In working dog puppies, introducing them to unfamiliar and varied surfaces will improve proprioception and environmental confidence which are both desirable in dogs that perform any type of search and rescue, tracking or detection. Neuromuscular adaptation programs in young human athletes have been shown to reduce the rate of injury in a variety of sports activities.

f. **Flexibility and Agility**

(1) Flexibility can be improved passively or actively through stretching and range of motion activities. Passive range of motion and stretching are performed with the MWD in a relaxed state and without their voluntary muscle movement. This type of range of motion is performed by the trained handler or veterinary personnel, and can be provided globally for a limb or may target a specific joint. Active stretching and range of motion of joints is elicited by the MWD's own voluntary muscle contractions, and may involve either closed-kinetic-chain or open-kinetic-chain activity. Closed-chain activity typically occurs in weight-bearing and the range of motion of one joint is connected to that of adjacent joints on the limb segments. For example, moving from a stand to a sit-position addresses range of motion of the major joints of the pelvic limbs; appropriate sitting posture requires considerable flexion of the hip, stifle and tarsus. Open-chain active range of motion occurs in non-weight-bearing and may or may not involve multiple joints. Stepping over Cavaletti rails and "shake a paw" are examples of open-chain active range of motion exercises. A high "hup" provides an excellent active stretch for the hip and stifle flexors. Having the dog stand with the hindlimbs on an elevated surface such as a stair step and flexing down to a reward between the front legs can replicate a "forward bend" in humans and provide a stretch to the hamstrings. Range of motion and stretching exercises can also be introduced for the spinal column. These maneuvers (dorsal, ventral, and lateral flexion) are likely most effective when the dog voluntarily performs them, such as in following a treat up, down, or to touch the nose to the ribs, flank, limbs, etc.

(2) In order for MWDs to be comprehensive athletes, they must be equally conditioned and capable to move through multiple planes. Often the sagittal plane is the specific focus of training, which consists of movement in a cranial-caudal direction and mainly involves flexion and extension of the limbs. However, it's also critical to ensure MWDs are equally functional in the transverse plane (within which the torso rotates and limbs adduct and abduct) and in the dorsal plane (within which the body laterally flexes and limbs rotate internally and externally). The agile dog is able to move fluidly from plane to plane with greater skill and reduced risk of injury, so training in all planes and with transitions is important. MWDs will frequently move through various planes during patrol and detection work.

9-6. Exercise Prescription: Duration, Frequency, Intensity and Progression. The following are determinants of exercise program progression from the American College of Sports Medicine Exercise Testing and Prescription Guidelines, as well as recommendations tailored to canine athletes.

a. **Exercise Prescription in MWD Athletes.** There is little published information about recommendations for intensity, frequency and duration of exercise for dogs. From one study (Tipton, 1974), 20 minutes of aerobic exercise per day for five days per week (100 minutes per week) appears to induce a trained state in dogs, characterized by a lower heart rate at a given exercise intensity as is seen in humans. Most of the adaptations were lost after 4-5 weeks of de-conditioning. Another evaluation of Australian Herding Dogs demonstrated that success rates were significantly influenced by the frequency of exercise provided to the dogs during off-peak season times. As exercise frequency during these time periods decreased, the percentage of owners reporting success rates of 80%

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or greater decreased, with a large drop in success rate between dogs that exercised once weekly compared to twice weekly (Arnott, 2014). Additionally, puppies professionally exercised for five days per week had significantly higher scores for tasks evaluated by the TSA (e.g., retrieve, possession, hidden search, energy) than those exercised once per week under the same circumstances (Otto, 2012). The following recommendations for MWDs are extrapolated from the ACSM guidelines for humans and from the limited research evaluating exercise programs in dogs.

b. Aerobic Exercise:

- (1) 5 days per week aerobic exercise of moderate intensity, minimum 40 minutes per session (McArdle, 2015, ACSM consensus)
- (2) Intensity: Should be fast walking pace (3-3.5 mph) or intervals with walking (2.5 mph) and trotting (4.5-5.0 mph)
- (3) Moderate intensity = brisk walking or trotting pace, centerline drills/ball play at a lope but not maximum-intensity sprinting
- (4) 5 minute warm-up and 5 minute cool-down required within each aerobic exercise session
- (5) 5 days per week, 20 minutes per day of aerobic exercise increased dogs to a trained state (decreased heart rates at a given exercise intensity, decreased post-exercise lactate) – Tipton *et al* 1974
- (6) 3 days per week endurance, 2 days per week power-related (sprints, low grades)

c. Strengthening and Flexibility Exercises:

- (1) 2 days per week for each major region (core, forelimbs, pelvic limbs); minimum 48 hours between sessions for a given muscle group necessary except for core.
- (2) 12 reps, 2 sets
- (3) Stretching 2 days per week or after intense activity
- (4) 3 sets X 10-15 second holds for each major muscle group, for a total of 60 seconds of stretching time for each muscle group.

d. Neuromuscular Training:

- (1) 2 days per week of neuromuscular training
- (2) Includes exercises that stimulate proprioception, plyometrics, agility, balance, dynamic stability and core stability
- (3) 20 minutes per session

e. Exercise Monitoring in MWD Athletes. Evaluation of markers of fatigue and the approach of maximal aerobic and anaerobic effort have guided exercise prescriptions for specific individuals as well as general recommendations for human athletes. Markers of fatigue may be subjective, such as the record of perceived exertion reported by the athlete, or objective, such as lactate, oxygen consumption, and heart rate. These measures have been less reliable indicators (as is the case with heart rate) or are very challenging to obtain in dogs. Additionally, there is a significant psychological component of fatigue in humans, which may also be true in dogs. However, many MWDs will ignore physiological cues in order to keep on task as a result of their high drive. Research is underway to further investigate markers of fatigue in dogs, but current qualitative cues that can be evaluated include reduced interest in work or in reward, slowing down voluntarily, panting with heavy respiratory effort, decreased alertness and elevated heart rate.

f. Exercise Progression in MWD Athletes.

- (1) Frequency, intensity and duration are the main factors.
- (2) Increase duration by 5-10 min per session every 1-2 weeks over 4-6 weeks initially.
- (3) Physiologic adaptations will plateau after this time without progression of intensity and frequency.
- (4) Increase intensity and frequency q 1-2 weeks additionally after this initial period.
- (5) Resistance/strength training: increase load by 2-10% after two consecutive sessions of comfortable performance at 1-2 reps above current level. Weights on distal limbs of dogs should begin at 1-3% of body weight. Initial dragging weight should be equal to about 10% of the weight of the dog.
- (6) Individuals with higher fitness levels can benefit from longer, less frequent sessions.
- (7) Intensity of exercise is highly dependent upon individual factors, including cardiorespiratory fitness status, genetic profile, presence or absence of concurrent diseases, and age.
- (8) Moderately-trained athletes may require training at 70-80% VO₂ max to achieve physiological gains, based on the overload principle.
- (9) Highly-trained athletes may require training at the near-maximal level (95-100% VO₂ max).

9-7. Conditioning and Injury Prevention in MWDs. The two most common serious orthopedic and neurologic injuries in MWDs evaluated at DODMWDVS are cranial cruciate ligament rupture and degenerative lumbosacral stenosis. Limited information is available to specifically demonstrate the effects of conditioning on working dogs to prevent these injuries; however some evidence is beginning to emerge. There is significant evidence suggesting a role of conditioning in prevention of similar conditions in humans, although one must take pathophysiological differences between the species into consideration. Evidence demonstrates that conditioning may improve and prevent reoccurrence of low back pain in humans. Core strengthening exercises also were shown to improve function at specific working tasks and reduce pain in MWDs with mild lumbosacral pain (Henderson, 2014). Additionally, muscle involvement and conditioning has been an effective means of preventing other injuries in human athletes.

CHAPTER 10

BEHAVIORAL MEDICINE

10-1. Background. Although behavioral medicine is a relatively new addition to specialty diagnosis and treatment in animals, behavioral pathology and treatment are by no means “new” or of minor significance clinically. For example, it has been estimated that of all dogs surrendered for euthanasia by pet owners, over 50 percent cited behavior problems as the major factor in their decision. Nationwide, this accounts for over 4,000,000 canine deaths annually, making behavioral pathology the single most significant cause of canine mortality. From another perspective, consider that eighty percent of dog owners polled reported behavioral problems with their pet.

a. Behavioral Problems in MWDs. Behavioral problems are one of the greatest causes of death and disability in MWDs. During the years 1990 through 1994, 131 MWDs were euthanized for the primary complaint of behavioral problems (cause of death cited on DD Form 1743). This accounted for over 10 percent of all euthanasia (greater than mortality attributed to all cancers). It is interesting to note that during this period, another 316 dogs were euthanized because of primary complaints of “age” and/or “performance”. It might be noted that “age” is not a disease, and “performance” often did not accompany fatal or debilitating medical disease demonstrated at necropsy.

b. Lost Service Attributable to Behavioral Problems. In addition to mortality, behavioral complaints also produce losses in availability of MWDs, in decrements and unreliability of MWD performance, and in increased training and retraining requirements for affected dogs. The scope of this loss has not yet been reliably estimated, but would include (for example) losses due to non-medically related self-trauma, prolonged kenneling of an MWD due to inability to safely handle a dog, and restriction of duty due to loss of certification or inability to work in a particular situation due to fearfulness, over-aggression, or inability to focus on task.

10-2. Overview of Diagnosis and Treatment of Behavior Disorders. Like other medical problems, behavioral problems may be diagnosed and treated with varying degrees of success, and just as there are preventive medical procedures available for infectious and environmentally related disease and parasitism, there are also predictive tools and preventive techniques available to decrease the incidence of behavioral pathology. For the purposes of an MWD, behavioral problems may be divided into four major categories. These categories are useful because they suggest etiology, diagnostic techniques, and potentially successful treatment options based on the category to which the behavioral difficulty belongs.

a. Normal behaviors which are unacceptable to people. Behaviors of this kind are species-typical and appropriate for the animal in context. An example of this type of behavioral problem would be an intact male dog, which displays urine marking inside a building. Urine marking is a normal behavior for an intact adult male dog, and requires no contact with people or significant learning in order for it to be displayed. Behaviors, which fall into this category, are often sexually dimorphic, but almost always reflect strategies, which would be expected to be adaptive for survival, procreation, and/or feeding in a “wild” state (and so might be described as “instinctual” or “prepared” behaviors). These behaviors are often “released” (produced) by a particular stimulus or situation, but may be significantly strengthened, weakened, or modified through learning and experience. Diagnosis for these problems would rule-out any medical condition modifying the expression of normal behaviors (an example would be testicular tumors or prostatitis affecting aggression or urine marking).

b. Behaviors, which occur as the result of a social learning and/or incomplete, ineffective, or inappropriate task-related training. These animals learn unacceptable behavioral strategies other than those, which would be expected as the norm. An example of a behavior problem, which might be the result of learning, would be “hand shyness”, where an MWD would be presented for “fearfulness” of being touched or handled (may be the result of an association of handling with pain). Another example would be an MWD, which appeared to be able to detect a trained target odor, but would not reliably sit when it appeared to detect that odor (this behavioral problem might be produced by confusion produced during the initial training of the task or by insufficient training of the task to a point of mastery). Diagnosis for these problems would emphasize sensory or motor dysfunction, neurological or systemic disease that could all affect the performance of learned behavior or interfere with learning. Treatment for aberrant social behavior is often slow, and unrewarding (because of the presumed influence of inborn factors and the special nature of very early social learning). However, incomplete or unusual task-related learning may often be reversed with a slow, systematic retraining of the desired behaviors in conflict with the unacceptable response.

c. Behaviors produced by the presence of a primary medical disease. This third category of behavioral complaints would include primary neuroanatomical (trauma, vascular, mass-lesion), neurochemical (toxic, other), and neurophysiological (epileptiform, infectious) diseases, which would produce typical behavioral changes (especially changes in level of consciousness, motor activity, sensory ability, performance of learned behaviors, temperament), and might have localizing (lateral) signs. Other primary medical disease processes which could affect performance and produce typical or exaggerated behaviors would include metabolic disease, endocrinopathies, functional liver, kidney, or pancreatic disease, neoplasia, sensory degeneration, musculoskeletal disease (any painful process), nutritional and gastrointestinal diseases. A classic example is hepatic encephalopathy that can produce temperament changes, decreased level of consciousness, bizarre behavioral patterns, and apparent loss memory and recognition of familiar people, places, and tasks. Diagnosis for these problems involves a complete systemic evaluation with ancillary studies as indicated. Prognosis varies with the etiology and ability to treat or ameliorate the primary medical problem(s).

d. Atypical behaviors. There are two sub-categories of atypical (or pathological) behaviors: those, which occur secondarily to another behavioral problem, and those, which are “primary” in nature (have no identifiable medical or behavioral cause). Although these behaviors are often identified by exclusion from the other three categories, there are some general similarities in these behaviors. Pathological behaviors are usually not seen with any regularity in the “normal” dog, and would not normally be considered to be adaptive to survival, reproduction, or feeding. However, these behaviors may have an increased presence in a particular breed or line of dogs (suggesting an inherited component). Self-traumatic biting of an animal’s flank in the absence of undercurrent medical disease or reinforced practice might be considered a pathological behavior. It might be primary, or it could be secondary to some other behavioral process such as boredom or anxiety. Likewise, spontaneous episodic non-selective aggression in the absence of epilepsy or other medical condition might also be included as a pathological behavior. Like idiopathic medical disease, it is reasonable to assume that most primary unlearned non-medical behavioral pathology probably is the result of real, but unidentified processes that are different in affected and unaffected animals. Pathological behaviors may be static, progressive, or episodic. Primary pathological behaviors are usually not significantly modified by experience or learning, and often have a guarded to poor prognosis. Secondary pathological behaviors may benefit significantly from training, medical therapy, and environmental changes which alter the primary behavioral problem and teach the animal new coping strategies.

10-3. Common Problems. Behavior problems in MWDs can be similar in many ways to the behavioral problems seen in a pet dog. However, some behavior problems appear to be more frequently encountered than others in MWDs. Common behavioral complaints with working dogs include:

- a. Self-trauma to tail, lick granulomas, injured teeth (from chewing), self-trauma to skin.
- b. Environmentally destructive behaviors such as digging and destructive chewing.
- c. Reactivity, escape and avoidance (fearfulness) in response to sounds, situations, people, things.
- d. Over-aggressiveness on task, to the handler, at kennel or other location or indiscriminate aggressiveness.
- e. Under-aggressiveness during controlled aggression.
- f. Performance failure (examples include poor behavioral control, poor basic obedience, poor control while on task, poor response to reward, poor substance discrimination).
- g. Repetitive behaviors (may overlap self-trauma and over-activity) such as circling, pacing, and barking.
- h. Over-activity affecting patient well-being and/or task performance.
- i. Under-activity affecting patient well-being and/or task performance.
- j. Poor attention negatively impacting task performance.
- k. Adverse behavioral or cognitive changes such as loss of ability to perform tasks with previously demonstrated proficiency.
 - l. Failure to release reward objects or bite equipment on command.
 - m. Forging or excessive pulling on leash.
 - n. Canine Post-Traumatic Stress Disorder (C-PTSD). This collection of behavior problems is named separately, even though elements of the condition may include a range of behavioral problems. This diagnosis was created to account for adverse behavioral changes occurring during or after prolonged deployment to a combat environment; this factor is inclusionary. Excluded from the diagnosis of C-PTSD are those MWDs that either have behavioral signs historically before deployment or those that develop signs in the absence of deployment and a combat

environment. Inclusionary behavioral signs are hyper-reactivity to environmental events (such as sounds, locations, people) and hyper-vigilance, attempts to escape and/or avoid situations that were previously neutral or positive, changes in rapport with the handler (positive or negative), and disruption of normal task performance. These behavioral signs are usually static or progressive; the presence of signs that improve significantly over time is normally an exclusionary factor. Please note that all patients suspected of having C-PTSD need to be referred to DODMWDVS Behavioral Medicine Service for evaluation, but this does not obviate the need for timely treatment.

10-4. Evaluation of Behavioral Disorders. These behavior complaints, like any physical complaint should first be evaluated medically. The minimum database for a behavioral complaint should include a medical and behavioral history (including a documented interview with the handler and supervisor, and review of the training record), a complete description (brief narrative, onset, progression) of the problem behavior(s), a current physical examination (including a mental status evaluation), complete neurological examination, and current hematology and blood chemistries. Behavioral history and descriptions of problem behaviors are best kept at a descriptive level. When possible, avoid using diagnostic terms or “jargon” to describe behaviors and the observations (e.g., “patient bit handler on hand when removed from home kennel” is much preferred for our use than, “kennel-protective behavior” - the latter does not specify the object of the aggressive behavior or the time of occurrence but does imply a diagnosis which may or may not be accurate).

10-5. Medical Causes for Behavior Problems. Remember that unless proven otherwise, it is always wise to assume a medical condition underlies behavioral pathology. The following list is by no means exhaustive, but is presented to provide a starting point for behavioral diagnosis. Medical conditions that may produce behavioral changes include:

- a. Neuroanatomical disease: traumatic, vascular, degenerative, neoplastic
- b. Neurophysiological disease: epileptiform, neurochemical, functional
- c. Toxicities: especially lead
- d. Trauma: cranial, muscular
- e. Endocrine disorders: thyroid, pancreatic, adrenal (e.g. hyperglycemia, hypoglycemia)
- f. Hepatic disease
- g. Renal disease
- h. Meningoencephalopathies: especially steroid-responsive
- i. Neoplasia
- j. Metabolic and storage diseases
- k. Infectious disease: bacterial, fungal, viral
- l. Musculoskeletal disorders.
- m. Any painful process

10-6. Diagnosis and Initial Treatment. Creating a working diagnosis and creating an initial treatment plan may or may not be beyond the scope of non-specialty care. However, case management for any behavioral case is usually accomplished by the attending VCO, so understanding of the basic principles of case management is highly beneficial. The working diagnosis usually identifies problem behavior(s) and desired behaviors for a problem. Case management involves four main principles.

a. Behavior modification involves identifying problem behaviors and making them less possible and less attractive, while identifying specific desired behaviors and increasing the probability of their production by selective reinforcement. A special case of behavior modification is Desensitization and Counter-Conditioning (DSCC), used to replace escape behaviors with rewarded alternatives. One example of a behavior modification program would be the use of “Clicker Training” to better gain and maintain an MWD’s attention and increasing the reward behavior of a targeted trained behavior (such as, “heel”).

b. Environmental changes (often enrichment) are physical steps taken to reduce the production and attractiveness of undesirable behaviors while at the same time making desired alternative behaviors more attractive. An important environmental management change is one that modifies the facility or interaction in order to mitigate any safety risks or welfare issues to the MWD or anyone interacting with the MWD. Examples of environmental change include the simple addition of environmental enrichment to MWD housing to help redirect destructive behavior and the use of taste and odor attractants and repellants to alter MWD focus on items in its environment.

c. Medical and adjunctive treatments are often used in a behavioral plan to address internal motivation of an MWD. For example, benzodiazepine and non-benzodiazepine anxiolytics may be used acutely to reduce apparent distress in an MWD experiencing moderate to severe signs of C-PTSD. For a moderate to severely distressed MWD that is incompletely managed by an anxiolytic, the use of a drug such as a beta blocker (e.g. propranolol) may benefit the patient by blunting the physiological component of a distress response. Less severely distressed patients may be treated with other anxiolytics and may also benefit from adjunctive therapy with nutraceutical products such as L-Theanine or pheromone products such as Dog Appeasing Pheromone. Likewise, chronically distressed patients and those displaying non-adaptive repetitive behaviors may benefit from the use of a tricyclic antidepressant (TCA) or selective serotonin reuptake inhibitor (SSRI). Dispositionally overactive and inattentive MWDs may see marked improvement using CNS stimulants, and reactively aggressive MWDs may benefit from a serotonin reuptake inhibitor. A chart of commonly used medications for behavioral care along with indications and dosage guidance follows.

d. Follow-up and treatment modification. It is most beneficial to establish a desired outcome when the treatment plan is developed, using the increase or decrease of observable behaviors as indicators of progress. The use of progress sheets completed by the MWD handler serve not only to monitor progress but also to remind the handler of the specific objectives and training and environmental modifications in effect and why they are being used. Regular rechecks and review of progress are recommended. Treatment plan modifications and transition from active treatment to maintenance can better be accomplished if more objective behavioral outcomes are used to assess progress.

10-7. Preventative Strategies. Behavior problems or disorders may not be preventable, but there are strategies that can be incorporated into the daily schedule of an MWD with the purpose of increasing overall well-being and welfare, as well as take a proactive approach to some commonly seen issues. The kennel environment is not a natural, species-typical situation for a canine, nor are the tasks that MWDs are asked to perform. Additionally, MWDs receive a lot of

Table 10-1. Some Drugs Commonly used in the Treatment of Behavioral Problems in MWDs

Generic Name	Trade Name	Drug Class	Dosage
Antidepressants- Depression, reactivity, repetitive behavior, chronic distress			
Amitriptyline	Elavil	Tricyclic Antidepressant	1.0-2.0 mg/kg PO q12h
Buspirone	Buspar	Azapirone	0.5-2.0 mg/kg PO q12h to start
Clomipramine	Anafranil, Clomicalm*	Tricyclic Antidepressant	1.0-3.0 mg/kg PO q12h
Fluoxetine	Reconcile*	Selective Serotonin Reuptake Inhibitor	1.0-2.0 mg/kg PO q24h
Paroxetine	Paxil	Selective Serotonin Reuptake Inhibitor	1.0-1.5 mg/kg PO q24h
Sertraline	Zoloft	Selective Serotonin Reuptake Inhibitor	0.5-4.0 mg/kg PO q24h
Trazodone	Desyrel	Serotonin Antagonist & Reuptake Inhibitor	3.0-5.0 mg/kg PO q12h or PRN 1h before stressor exposure
Venlafaxine	Effexor	Selective Serotonin & Norepinephrine Reuptake Inhibitor	4.0-6.0 mg/kg PO q24h, then q 12h
Anxiolytics- Moderate to severe distress; panic episodes			
Alprazolam	Xanax	Benzodiazepine	0.02-0.1 mg/kg PO q4h (not to exceed 4mg q24h)
Lorazepam	Ativan	Benzodiazepine	0.02-0.5mg/kg q8-12h
Flumazenil (REVERSAL)	Anexate	Benzodiazepine antagonist	0.5 mg/kg IV

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CNS Depressants- Adjunctive for agitation, distress, neuropathic pain, phantom limb, seizure-related behavior problems			
Gabapentin	Neurontin	Alpha-2 Ligand	3-10 mg/kg PO q 8-12h
Phenobarbital	Luminal	Barbiturate	2.0-6.0 mg/kg PO q8-12h
Pregabalin	Lyrica	Anticonvulsant	2.0 mg/kg PO q12h
CNS Stimulants-Overactivity with inattention			
d-Amphetamine	Dexedrine		0.5-1.5 mg/kg PO am and noon
Methylphenidate	Ritalin		0.5-1.5 mg/kg PO am and noon
Cognitive Agents- Adjunct for compulsive disorder, Pain, Cognitive Dysfunction/Impairment			
Memantine	Namenda	NMDA receptor antagonist	0.5 mg/kg q24h
Selegiline	Anipryl	MAOI	1.0 mg/kg PO q24h
Cyproheptadine (REVERSAL)	Periactin	Anticholinergic, antihistamine, antiserotonergic	0.3-2.0 mg/kg q12h
Supplements- Mild distress, Situational stress and environmentally-induced problems, Adjunct			
Dog Appeasing Pheromone	Adaptil	Pheromone	As directed per collar, diffuser or spray
Alpha-casozepine	Zylkene	Nutraceutical	15 mg/kg divided, up to 25-30 mg/kg q24h
L-Theanine	Anxitane	Nutraceutical	100 mg/MWD PO q12h
L-Theanine and magnolia/philodendron/hey protein concentrate	Solliquin	Nutraceutical	10 mg/kg q12h
S-Adenosyl Methionine (SAME)	Novifit	Nutraceutical	100 mg PO q24hr to q12h
Other Adjuncts- Decrease motor activity, reduce physiological distress, other			
Acetylpromazine	Acepromazine	Phenothiazine neuroleptic	0.1-0.2 mg/kg PO q12h
Clonidine	Catapres	Alpha-2 Agonist	0.01-0.05 mg/kg PO PRN 1h before stressor exposure
Dexmedetomidine	Sileo*	Alpha-2 Agonist	125 mcg/m ² (syringe dose by weight) to buccal mucosa 1h before stressor exposure
Diphenhydramine	Benadryl	Antihistamine	1.0-2.0 mg/kg PO q12h PRN
Hydroxyzine	Atarax	Antihistamine	1.0 mg/kg PO q8h PRN
Propranolol	Inderal	Beta-Blocker	10-20 mg/MWD PO q8-12h

*FDA Approved Medications for: Canine Separation Anxiety (Clomicalm®, Reconcile®), Canine Cognitive Dysfunction (Anipryl®), Canine Noise Phobia (Sileo®)

handling and veterinary care, whether it is biannual physicals, health certificates, specialty care, or general husbandry through the MWD kennel. Due to the frequency of these interactions, and the history of how we train and house the MWDs, it is important not to become complacent with these practices and to continually strive to assess and address MWD well-being and welfare. The following information serves to provide AVS personnel with strategies for prevention or reduction of behavior problems specific to the MWD environment and exposure.

a. **Environmental Enrichment.** The ASPCA defines enrichment as “additions to an animal’s environment with which the animal voluntarily interacts and, as a result, experiences improved physical and/or psychological health.” Keeping this definition in mind, designing an enrichment program for an MWD kennel must be specific to each MWD’s preferences and personality, which may take trial and error and creativity to develop an appropriate plan. Aside from MWD preference, key factors when considering enrichment items are: safety, sanitation, appropriateness, and novelty. An enrichment item must be safe for the MWD to manipulate and interact with, and is not going to cause a physical injury or medical emergency. For example, some MWDs can chew through a Jolly Ball, and they can cause cuts and scrapes from the chewed edges as well as foreign body obstruction when the pieces are swallowed. Sanitation is also a key consideration. Enrichment items that are used for tactile manipulation by MWDs must be adequately sanitized between uses and between MWDs. Appropriateness of the enrichment item relates to safety, but also to the age and personality of the MWD. For example, a highly focused MWD should not have a laser pointer used as an enrichment item. Laser pointers are not appropriate because they build frustration and fixation in an already high-drive canine, and historically have caused MWDs to develop compulsive disorders. Additionally, a MWD with a history of food sensitivity should have any gustatory enrichment items approved as appropriate through their veterinarian. The last consideration is novelty. Rotation of enrichment strategies and combinations is important, to maintain the MWD’s interest as well as provide cognitive challenges. Infrequent rotation or lack of novel item introduction will result in lack of interaction or interest in the enrichment. The main categories of enrichment and some examples of each are listed below. These are not all-inclusive and many can be combined:

(1) **Social:** Handler interaction through exercise, physical conditioning, and husbandry training. Conspecific interaction (dog to dog) is not a typical practice currently, but is possible if care and supervision is performed with any introductions or interactions (*Conspecific interaction as enrichment MUST be approved through appropriate veterinary and kennel chains of command, and should not be performed without a thorough safety assessment).

(2) **Cognitive:** aka “Brain Games”. Cognitive enrichment includes any task-related games, such as Find It, commercial puzzle toys or feeders, as well as the MWDs daily working tasks.

(3) **Sensory**

(a) **Olfactory:** Use of spices, scents/extracts, or synthetic animal scents as distractors during training or in the kennel are interesting for MWDs and can amplify the difficulty level of their training tasks by requiring that they continue to search for aids despite the interesting scents. Scents can also be used for calming effects, such as peppermint, lavender, or chamomile.

(b) **Pheromone:** Synthetic pheromones are available to promote calming, and come in multiple forms (collars, diffusers, wipes, sprays).

(c) **Visual:** Bubbles, animations, wall colors, and even the kennel setup and how the MWD visualizes their surroundings and neighbors can be used as enrichment. As stated before, avoidance of reflections or focused light is recommended.

(d) **Auditory:** Music or structured sounds can be used for desensitization, to drown out external noise (e.g., nighttime exercises on the installation when the MWD needs rest), and for general relaxation. Examples include soft classical music, canine-specific music, nature sounds, etc.

(e) **Gustatory:** Dental chews (brittle, crumbly and easily digestible), food-stuffed tactile objects, ice-blocks (layered frozen treat items), frozen popsicle treats (canned food or other approved items such as peanut butter, yogurt, canned pumpkin, appropriate fruits or vegetables), and food-reward training. Be creative for patients with motility issues or ingredient-specific diets. Many times, mini marshmallows, carrots, toasted oat cereal, or specialty commercial treats can be used and are palatable.

(f) **Tactile:** Balls, tugs, tires, pools, digging pits, brushes, and petting

b. **Cooperative Care.** The idea of cooperative care is not new, and is widely used throughout zoo and marine mammal medicine, as well as with the Fear FreeSM movement in veterinary practices. The overall purpose is to improve the way we handle MWDs to reduce fear, anxiety, and stress in the veterinary clinic. The reduction of the physiological and emotional arousal in the MWDs leads to reduced aggression, increased safety, and overall improvement in MWD and personnel welfare. Knowledge of canine body language, how to mitigate our human body language, and tools and techniques to make veterinary care positive, predictable, and low-stress are all important aspects of cooperative care. Examples of cooperative care techniques are: training staff to recognize fear and stress, creating a pre-visit plan for historically fearful/aggressive MWDs, using safe but low-stress restraint, and teaching voluntary procedures that aid in husbandry tasks and veterinary procedures. Husbandry tasks include

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voluntary muzzle placement, offering specific body parts for nail trims or ear cleanings, or simply a relaxed “wait” during a bath. Veterinary procedures, such as blood draws, ultrasound, and physical exams can be facilitated by teaching body targeting and voluntary presentations, such as presenting a leg for blood draw or opening the mouth for visual exam.

c. Cruelty, Abuse, or Neglect of a MWD. Veterinary personnel are advocates for the humane care of animals, and MWDs are no exception. Animal abuse, neglect, abandonment, and bestiality are punishable under UCMJ.

(1) The primary recommended method for MWD training is inductive training (encouragement of desirable behaviors), and is not compulsive training (verbal or physical force to coerce a desirable behavior or to discourage an undesirable behavior). The MWD Handler training program does, however, include the use of compulsive training methods. These rules are outlined for MWD Handlers in their curriculum, and it is important for them to understand what that entails and when its use is not appropriate, and veterinary personnel can use our knowledge of canine behavior and welfare, to assist in advocating for the MWDs if these rules are not followed.

(2) If a Veterinary Services employee (Active Duty, NAF, GS, etc) witnesses or highly suspects an act of intentional cruelty, abuse, or neglect in an MWD, it must be reported through the appropriate channels. For minor concerns regarding poor husbandry, inappropriate handling, failure to comply with veterinary care, inappropriate feeding or housing, etc., the VCO should be notified in order to attempt resolution of the issue directly with VTF staff, handlers, or Kennel Masters. For major concerns, or for lack of resolution with minor concerns, the commander and supporting 64F should be notified, as well as the MWD chain of command. For urgent and severe incidents, the commander and installation law enforcement should be immediately contacted.

(3) If there is ever a question regarding appropriate handling or care of a MWD, or possible handling-related injuries, keep in mind that as veterinary professionals, you are mandated to take action on any suspicion of neglect, abuse, or mistreatment of any animal.

10-8. Consultation and Referral Information. Consultation for behavior problems may be accomplished with the Behavioral Medicine Section at the DODMWDVS (dog.consult@us.af.mil) or individually through a 64F Veterinary Behaviorist.

a. Consultation. The consultation service provides diagnostic assistance and the setup of a field treatment plan for a behavioral problem. The diagnostic plan might include further medical evaluation and ancillary studies which may be performed by the referring VCO. The process involves review of the above materials, interview with the referring VCO, handler, and KM, assessment and recommendations for further medical evaluation and or treatment, and a written behavioral plan for incorporation in the medical records, the patient’s training record and for use by the handler and KM. Behavioral consultation should be considered an ongoing process. Documentation of diagnosis, treatment plans, ability to implement the plans, and efficacy estimates are all crucial in providing feedback to improve the process.

b. Referrals may be accepted for select behavior problems which cannot be resolved in the field, and which require further evaluation and/or treatment attempts at JBSA Lackland. Referrals are accepted only with pre-approval on a TDY basis. The primary reason for referral is to obtain ancillary studies not available in the field, better observational diagnosis and evaluation by medical and training staff, and for the evaluation of more complex treatment modalities. Coordination with training staff at the 341 TRS and TDY for the handler is normally required for referrals. Referrals to 64F Veterinary Behaviorists in other locations can be coordinated based on local policies.

c. In order to expedite the process, it is useful to provide the following information before the consultation is accomplished:

(1) DA Form 7593 with behavioral history summary for MWD from dog handler and KM with a listing of problems, duration and progression of each, correction attempts and detail of success and failure.

(2) Pertinent e-notes/SF 600s

(3) Digital video of problem behavior, if possible

(4) Copy of last periodic physical.

(5) Copies of recent blood work, to include: CBC, blood chemistry profile, baseline cortisol, thyroid profile.

(6) Copy of Master Problem List.

(7) Copy of the recent SF 600 entries regarding consultation with history, diagnostic steps, treatment attempted and evaluation, working assessment, patient status and current plan.

d. Point of contact for further information is:

Chief, Behavioral Medicine
LTC Daniel E Holland MWD Hospital
1219 Knight Street, Bldg 7602
JBSA-Lackland, TX 78236-5631
Phone: (210) 671-7101
Fax: (210) 671-2308
DSN Prefix 473
E-mail: dog.consult@us.af.mil

CHAPTER 11

DISPOSITION

11-1. Definition. Disposition encompasses all aspects of evaluating an MWD to determine if it should be declared excess to the needs of the DOD. An MWD may be declared excess because of training deficiencies, medical problems, or both. If an MWD is declared excess to DOD requirements, it will be adopted, transferred to a non-DOD law enforcement agency, or euthanized. Elimination of MWDs from DOD service requires careful evaluation of the reasons for elimination by the owning unit commander, KM and supporting VCO. Disposition requires a detailed physical examination of the MWD, diagnostic testing as appropriate to confirm clinical suspicions, detailed documentation of existing medical problems by the supporting VCO, formal review of medical documents by the supporting 64F, and timely submission of the disposition packet through all echelons involved.

11-2. Process. Applicable regulations for MWDs are AFI 31-126(IP)/AR700-81/OPNAVINST 5585.3A/MCO 10570.1A (Military Working Dog Program) and AR 40-905/AFI 48-131/SECNAVINST 6401.1A (Veterinary Health Services). Implementation of these regulations was modified by Public Law 106-446, amendment to Title 10 United States Code Section 2583, which requires evaluation of excess MWDs for possible adoption or law enforcement transfer.

a. Initiation of the disposition process is the responsibility of the KM. Veterinary Corps Officers and supporting 64Fs have key roles and are required to provide medical evaluations for all MWDs under consideration for elimination, even when the MWD is being submitted for non-medical reasons.

b. Training related dispositions can be evaluated and initiated at any time during an MWD's service. This is initiated by the KM and does require VCO evaluation to ensure there is not an underlying medical condition likely causing the training failure. See section 11-3 for required documentation.

c. When a VCO identifies a medical condition that they feel requires medical disposition, they should consult their supporting 64F. After it is determined that a recommendation for medical disposition is warranted, the attending VCO will, in writing, notify the KM and owning unit commander of the recommendation and make the MWD CAT 4. The kennel is generally expected to begin the disposition process once an MWD has been designated as CAT 4. There are rare instances when an MWD that is CAT 4 may be retained in service such as at locations where there is a shortage of MWDs or at installations from which MWDs do not deploy (e.g., USMC dogs not assigned to Marine Expeditionary Forces). If there is a health and welfare concern for continued service, this will be discussed with the owning unit command.

d. Age-related performance decrement. Evaluation of aging MWDs with performance decrement is challenging. As expected, as MWDs age, they become less capable of performing at the same level of energy and stamina. VCOs must objectively evaluate aging MWDs to determine if there are bona fide medical reasons for performance decrement or if performance is deteriorating simply because the dog is aging. Note that MWDs are never eliminated from DOD service simply based on age. Recent changes within the DOD MWD program now permit KMs to submit MILSTRIP requisitions for any MWD when it reaches 9 years of age. However, this is not equivalent to downgrading a medical deployment category or for automatically beginning the disposition process. It is simply a logistical tool to alert Service and major subordinate command Program Managers of possible replacement needs (this change led to cessation of use of the "12-month veterinarian memorandum"). As it is more difficult for KMs to remove dogs with training issues than for medical reasons, a common practice is for MWD unit personnel to convince a VCO to recommend medical elimination for an MWD that is developing problems detecting or completing patrol duties. To mitigate this 'short cut' tendency, evaluate MWDs carefully over time and objectively. If definitive medical issues develop that truly make an MWD unfit for duty or warrant changing its medical deployment category to CAT 4, initiation of medical elimination is warranted. Proceed with medical elimination if the VCO diagnoses the performance decrement as due to specific medical issues (e.g., heart disease, degenerative lumbosacral disease). Recommend the KM consider training elimination for dogs that have performance decrement believed due to aging, but that lack bona fide medical issues as the cause. Do not support requests for medical elimination simply because the dog is not performing to standard unless true underlying medical causes are detected.

e. The decision to begin the disposition process should be made after discussion and agreement between the owning unit commander, KM and supporting VCO, though such mutual consent is not a requirement. Note that VCOs may not impede the disposition process if they do not agree with the KM or accountable unit commander. There will be times when a KM and VCO disagree as to fitness for duty. In such cases, VCOs will simply provide their required portions to the KM for submission, ensuring their duty to reflect their professional objective medical opinion in their memorandum to the commander and other supporting documents. VCOs are expected to objectively evaluate MWDs medically, and are the sole authority for assessing medical fitness for duty. VCOs should not be unduly influenced by KMs or handlers when making medical assessments. Objectively evaluate the dog, in conjunction with the history from the dog's handler and KM, and make a determination of fitness for duty based on this information.

f. Regardless of the underlying reason for elimination, there is a standardized process for routing disposition requests.

(1) Initially, at the unit level, the KM and VCO prepare specific documents, defined in section 11-3.

(2) These documents are then forwarded and reviewed by the supporting 64F, who assesses suitability for adoption and completes a 64F disposition MFR.

(3) All supporting disposition documents are then returned to the KM, who forwards the packet through the MWD unit's chain of command and program managers.

(a) The Major Command (MACOM/MAJCOM) MWD Program Manager (e.g., Pacific Command, Central Command) reviews the request and forwards approved recommendation for elimination to the Service MWD Program Manager (Army, Air Force, Navy, Marine Corps).

(b) The Service Program Manager then forwards approved requests for elimination to the DOD MWD Disposition Board for review.

(4) The Disposition Board evaluates the packet, and forwards its recommendation to the 341 TRS Commander for review. An MWD can only be declared excess to DOD requirements by the 341 TRS Commander. The 341 TRS Commander will declare the MWD:

(a) Excess to DOD requirements (unable to perform in any capacity as a military working dog),

(b) Not excess to DOD requirements (retained by the unit or transferred to another DOD unit that may be able to use the dog)

(c) Suitable for use as a Training Aid (returned to the 341 TRS for use in training student handlers).

g. Once an MWD has been declared excess, the accountable MWD unit commander is authorized to make final disposition decision (i.e., adoption, transfer, euthanasia). VCOs must understand that the final decision for adoption, law enforcement transfer, or euthanasia is made by the accountable MWD unit commander.

11-3. Documentation requirements. Disposition packet requests must contain the following documents, provided by the responsible parties listed as follows:

a. Kennel Master:

(1) Behavioral Testing Video (formerly Bite Muzzle Video). Part 1 is required of all MWDs and part 2 is required of aggression trained MWDs.

(2) Observation Form for Video Behavioral Testing

(3) Adoption Suitability Checklist (completed in conjunction with the VCO).

(4) Disposition Recommendation Letter signed by the Accountable Unit Commander.

b. Supporting Veterinary Corps Officer:

(1) Training elimination. The only document required from the VCO to support a training elimination is a formal memorandum for record addressed to the MWD unit commander. This memorandum must: 1) state the current fitness for duty (e.g., fit for duty, unfit for duty) and deployment category of the MWD, 2) include an assessment of adoptability based on experiences in the VTF when handling the MWD, 3) list all active medical problems (whether contributing to training elimination or not), 4) summarize training deficiencies based on input by the KM, and 5) include contact information for the supporting VCO, to include a valid e-mail address. They must also get a SF 513 (modified), Bite Muzzle Video/Adoption Suitability Consult Form from their supporting 64F. If medical problems are identified that could reasonably be expected to contribute to training deficiencies in any major way, then the VCO will submit all documents required for medical elimination, as described below, even if the KM is submitting the elimination request due to training deficiencies. Note that MWDs with confirmed or suspected C-PTSD or other atypical behavior problems will be processed as medical eliminations.

(2) Medical elimination.

(a) Memorandum for Record. This memorandum will contain the following information: 1) statement clarifying reasons for medical elimination, with specific diagnosis listed and results of major medical diagnostic procedures that support elimination; 2) statement of fitness for duty and medical deployment category; 3) assessment of adoption suitability based on VCO's experience; 4) listing of all active medical problems (whether or not they contribute to the overall medical problem for which dog is being recommended for elimination); 5) a statement that they have consulted with a 64F (with that specialists' name included); and 6) a valid .mil email address for the VCO. See Appendix F for an example memorandum.

(b) DD Form 1829, Report of Physical Examination or electronic equivalent. Once a decision is made between the KM and the supporting VCO that medical elimination will be requested, a formal elimination medical examination will be performed and documented on DD Form 1829, with Block 5 checked for OTHER and MEDICAL ELIMINATION entered in the block as the purpose of the exam. VCOs will examine the MWD to document the full extent of all medical problems and to provide an overall assessment of medical fitness for duty and suitability for adoption. Note that only this DD Form 1829 should be included; prior DD Forms 1829 are no longer required. All medical problems must be clearly addressed on the form, especially the problem for which medical elimination is being recommended.

(c) DD Form 2619, Master Problem List or electronic equivalent. The MPL will list all active problems, especially the problem for which medical elimination is being recommended.

(d) SF Form 600, Chronological Record of Medical Care or e-notes. Only from the 6-month period preceding packet submission. SF 600s describing working bite quarantines throughout the MWDs service are also required.

(e) Any relevant supporting laboratory tests, imaging reports, pathology reports, behavior consults, or other significant diagnostic test results. Only those reports with direct relevance to the active problem for which medical elimination is being recommended should be included. Do not include other documents.

c. Veterinary Clinical Specialist (64F):

(1) SF 513 (modified), Adoption Suitability Consult Form based on the Behavioral Testing Video.

(2) Memorandum for Record (for dogs being recommended for medical elimination only). This memorandum will contain the following information: 1) statement clarifying reasons for medical elimination, with specific diagnosis listed and results of major medical diagnostic procedures that support elimination; 2) statement of fitness for duty and medical deployment category; 3) assessment of adoption suitability based on VCO's experience; 4) a statement concurring or not concurring with the supporting VCO's recommendation and for or against elimination for medical reasons; and 5) a valid .mil email address for the 64F. See Appendix G for an example memorandum.

d. Disposition packet submission:

(1) VCOs should not send their portions of the packet directly to the Disposition Coordinator or the DODMWDVS. It is incumbent upon the VCO to work closely with the KM to ensure all required parts of the packet are assembled and forwarded in a single submission through the owning MWD program chain of command.

(2) VCOs, supporting 64Fs, and KMs should utilize the AMRDEC SAFE website (<https://safe.amrdec.army.mil/safe2/Default.aspx>) to forward information to each other.

e. Suspenses. Once the decision has been made to initiate disposition proceedings on an MWD, veterinary personnel must promptly complete the following requirements. The VCOs will be consulting with supporting 64Fs during the medical evaluation for elimination such that delays for additional diagnostics will not be necessary once the decision is made to recommend medical elimination.

(1) Supporting VCO recommended medical elimination to owning unit and/or received notification from the KM of request for elimination, within 15 calendar days:

(a) Conduct an examination of the MWD and complete a DD 1829.

(b) Prepare the Memorandum for Record to the unit commander.

(c) Complete the veterinary portion of the Adoption Suitability Checklist.

(d) Review all required forms and videos for completeness.

(e) Upload MFR and Adoption Suitability Checklist to the electronic VHR.

(f) Forward all documents and videos to the supporting 64F.

(2) Veterinary Clinical Specialist (64F), upon receipt of documents from the supporting VCO, within 15 calendar days:

- (a) Prepare the Memorandum for Record and upload into the electronic VHR.
- (b) Review the Behavioral Testing Video and prepare the Adoption Suitability Consult Form.
- (c) Upload MFR and Consult Form to the electronic VHR.
- (d) Forward all documents to the supporting VCO.

(3) Supporting VCO, upon receipt of the SF 513 (modified), Adoption Suitability Consult Form and Memorandum for Record from the supporting 64F will forward all documents to the KM within 5 calendar days.

(4) Supporting VCO or 68T follow-ups with KM monthly on routing status of medical elimination packet.

11-4. MWD Transfer/Adoption Guidelines. MWD transfer and adoption was authorized by legislation late in 2000, known as “The Robby Law.” Now as part of Title 10, United States Code, Section 2583, the DOD may declare excess MWDs available for adoption to former handlers of particular MWDs or other individuals capable of humanely caring for these animals or for transfer to law enforcement agencies outside DOD.

a. To be eligible for transfer/adoption, an MWD must first be declared excess to the needs of DOD as determined by the 341 TRS commander, not just the local installation.

b. In order to assist the local commander’s decision to transfer/adopt or not transfer/adopt a dog out, the supporting VCO completes the veterinary portion of the Adoption Suitability Checklist. This checklist allows the VCO and KM to make an overall assessment as to the adoptability of the MWD. The KM forwards the completed checklist to the unit commander for their review to assist in making a determination regarding adoptability.

c. MWDs are considered medically ineligible for transfer or adoption when they have a condition that is substantially debilitating and/or threatens life or limb. Mild to moderate degenerative arthritis, mild ataxia/discomfort associated with lumbosacral stenosis or compensated renal, cardiac or hepatic disease are not disqualifying. MWDs are considered behaviorally ineligible if they exhibit aggressive behavior that poses an obvious and substantial threat to people or other animals. Consult supporting 64Fs or DODMWDVS for clarification in specific cases.

d. The owning unit commander or designee interviews potential transferring/adopting individuals to ensure that they understand the responsibility for proper and humane care for a former MWD. This includes but is not limited to: medical care, proper feeding, housing, animal husbandry and adequate supervised exercise. The transferring/adopting individual must also be able to physically control the dog for its own safety and that of other animals and humans. Prospective transferring/adopting persons must understand the potential for an MWD to inflict severe physical injury with minimal warning due to a lifetime of training. The individual must then sign a liability release (covenant not to sue) taking full responsibility for any and all actions of the former MWD and accepting financial responsibility for veterinary medical care of any existing and future conditions.

e. Once the owning unit commander authorizes transfer/adoption of the MWD, the VCO:

- (1) In case of adoption only, neuters the MWD; transfers to law enforcement can waive the neuter.
- (2) Completes a dental prophylaxis if needed.
- (3) Administers or dispenses one month’s worth of heartworm and flea & tick control treatment/products.
- (4) Updates immunizations if necessary.
- (5) Prepares one month’s worth of medication (if dog is on chronic administration, i.e. thyroid supplement, anti-inflammatory prescription drug, etc.) for new owner. These medications will be considered the same as for an active MWD (i.e. reimbursement to NAF from appropriated funds). A written prescription may also be given to allow for refills if clinically indicated.
- (6) Close out the medical record. The VCO enters the transferring agency or adopter identity, address and telephone number as the final entry to the SF 600. In addition, copies of all supporting disposition documentation should be placed in the medical record.

(7) Prepares a transfer/ adoption medical record for the new owner. At a minimum, it should include copies of the most current: DD1829, at least the previous six months SF 600, DD 1741 (Immunization Record), and DD 2619 (Master Problem List) or electronic equivalents. Also include, any medical documentation regarding the MWDs pertinent medical condition to include the latest diagnostic results and radiographic images. The deployment VHR can be used as the adoption medical record.

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(8) Mails the Permanent VHR and supporting radiographs/media to the DODMWDVS immediately. DOD MWD Record Repository, 1219 Knight Street, Bldg 7602, JBSA-Lackland, TX 78236. Shipment of records via routine/ground methods. Transfers the completed electronic medical record to DODMWDVS (see section 3-21.).

f. Former MWDs belonging to eligible DOD health care beneficiaries (i.e. personnel that may be cared for within DOD MTFs) are eligible to receive the same level of care as other POAs through US Army VTFs. Charges will be applied and become due just as occurs in the care of other POAs. Former MWDs belonging to persons not eligible for DOD health care within DOD MTFs are not eligible for care at VTFs. If euthanasia is performed on a retired MWDs within a VTF it is highly recommended that a complete or cosmetic necropsy be performed and the samples submitted to JPC as outlined in chapter 12. This will allow the Veterinary Corps the ability to gather valuable information from these canine heroes that could be utilized for future medical developments to enhance care for both MWDs as well as Service members.

g. Disposition and adoption inquiries to veterinary personnel. The responsibility for the overall disposition and adoption process lies within the owning MWD unit and branch of service. As such, veterinary personnel receiving questions regarding MWDs and adoptions should redirect queries to the 341 Disposition Coordinator at JBSA-Lackland, TX, mwd.adoptions@us.af.mil or 210-671-3153 (DSN: 473).

CHAPTER 12

NECROPSY AND PATHOLOGY SUPPORT

12-1. Actions Prior to Necropsy. Regardless of cause (e.g, naturally, due to disease, or via euthanasia) MWDs will undergo a complete necropsy as soon as possible IAW AR 40-905 and TB MED 283. MWD necropsy and surgical specimens will be submitted to the Joint Pathology Center (JPC) for diagnosis, database entry and archiving; all samples must be submitted with a Veterinary Consultation Request Form. Prior to elective/non-emergent euthanasia the Veterinary Health Record MUST document appropriate workup and assessment of problems to support euthanasia. Prior to non-emergent euthanasia the supporting 64F MUST be consulted. Documentation of the 64F consult should be placed in the VHR. Ensure the final SF 600 or e-note entry states the specific reason for death or euthanasia and also list this as the final entry on the Master Problem List.

a. MWD necropsy and surgical specimens must be submitted to the JPC or Public Health Command-Europe, Laboratory Sciences, Biological Analysis Division. Should a civilian veterinarian perform an MWD necropsy, the protocol described in the TB MED 283 should be followed. Relevant clinical information and/or treatments, medications, and summaries provided by the civilian veterinarian will be transferred into the electronic VHR as soon as possible following death.

b. Know what to look for before starting the necropsy. A thorough review of the clinical findings and history are prerequisites for an intelligently planned necropsy. Enter all clinically relevant data to include laboratory test results, radiographic interpretations, and a medical summary into the DD Form 1626. When applicable, gross necropsy lesions should be captured via digital photography and images submitted along with the tissues.

c. A list of instruments, equipment and supplies for an MWD postmortem examination is located in TB MED 283. Timely necropsy and specimen collection cannot be performed without the proper equipment (e.g. bone saw for spinal cord removal). Acquire this equipment through the appropriate chain of command or arrange for use of equipment through the local MTF. It may be possible to establish a MOU with the local MTF to use their fully equipped autopsy room for MWD necropsies. Otherwise, select an adequate facility and/or location with the ability to keep formalin fumes to a minimum.

d. Verify the identification of the MWD scheduled for euthanasia. Microchip scan is the most accurate method of identification as tattoos can often become illegible over time.

e. Prepare DD Form 1743, Death Certificate of a Military Dog and DD Form 1626, Veterinary Necropsy Report. Also complete the current JPC Veterinary Consultation Request Form (JPC VET Form), currently available at http://www.jpc.capmed.mil/docs/vet_consultation_request_form.pdf. Enter a summary of the medical or behavioral problems leading to death or euthanasia. "Euthanasia" is NOT acceptable as the only cause of death on the death certificate. In addition to euthanasia, the condition(s) leading to the decision to euthanize the dog must also be listed in the cause of death area of the DD Form 1743.

f. Blood and urine specimens must be taken prior to any euthanasia IAW TB MED 283. Process these samples locally, as with any other clinical specimen. Do NOT send fluids (e.g., whole blood, serum, urine), fecal samples, bacterial culture samples, uro/choleliths (stones), and the like for processing at the JPC. Do NOT send brain tissue for rabies testing to JPC. Rabies testing is performed at the FADL and most state veterinary diagnostic laboratories.

g. Enclose a copy of the laboratory findings with the necropsy report. For animals found dead, enclose a copy of the most recent ante-mortem laboratory findings. Blood and urine may be sampled and evaluated from recently dead animals, although it must be clearly noted in the record that the samples were taken post-mortem.

h. If the MWD is euthanized, verify death. Compliance with the most recent set of AVMA Guidelines for the Euthanasia of Animals is required. Be mindful of using drugs that may alter clinicopathologic data prior to necropsy. Do not euthanize an animal in the same room that necropsies or autopsies are routinely performed as the residual smell of blood and formalin may cause undue distress to the animal.

12-2. Necropsy. TB MED 283 is the guideline for prescribed necropsy method. A necropsy is performed to identify cause of death and to identify incidence and severity of disease processes in all MWDs.

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a. Forms. The forms used and regulations governing necropsy of the MWD are:

(1) TB MED 283, Veterinary Necropsy Protocol for Military Working Dogs and Submission Guidelines for Necropsy and Surgical Biopsy Specimens.

(2) DD Form 1626, Veterinary Necropsy Report.

(3) DD Form 1743, Death Certificate of a Military Working Dog.

(4) JPC VET Form/or online entry form, Joint Pathology Center Veterinary Consultation Request Form.

(5) Downloadable versions of current forms are available at the JPC website,

<http://www.jpc.capmed.mil/consultation.asp>.

b. Equipment and supplies required for necropsy.

(1) Necropsy instruments, equipment and supplies - see TB MED 283 for complete list.

(2) Approximately 12 liters of fresh 10% neutral buffered formalin.

(3) Always wear appropriate personal protective equipment (PPE) to include gowns, gloves, and eye protection; avoid exposure to formalin fumes via the use of fume hoods and/or portable respirators (e.g.; PAPR).

c. Specimen Collection. The proper handling of the animal and tissues before, during, and after the necropsy is imperative to ensure accurate histopathologic results. Refrigerate the carcass if necropsy will be delayed more than 1-2 hours after death. Freeze remains as a last resort and only if refrigeration is not an option. Be prepared to collect and submit to the appropriate laboratory a variety of specimens for histology, cytology, microbiology, and toxicology.

(1) Regardless of the type of specimen collected, all specimen containers must be properly labelled with the MWD's name and alphanumeric tattoo identification.

(2) Collection and fixation of tissue specimens for histologic examination.

(a) Collect a complete set of tissues for histology (see TB MED 283 for list of tissues).

(b) In addition to tissues listed, collect tissue specimens from all lesions and/or suspected lesions. Note additional tissues collected in the Remarks section of block 36 of the DD 1626.

(c) Avoid mishandling tissues which may result in artifacts.

(d) Collect thin (0.5 cm thick) tissue specimens to ensure adequate fixation. Bread loaf larger specimens to allow thorough fixation while retaining overall tissue architecture.

(e) Collect and fix eyes, brain, spinal cord and heart in their entirety. Open the chambers of the heart as outlined in TB MED 283 to allow for proper fixation. At minimum, perfuse the right cranial lung lobe (along with any other affected lobes) with formalin and submit (see TB MED 283 for instructions on specific tissues).

(f) Collect eyes and bone marrow samples early in the necropsy procedure as these tissues are especially sensitive to autolysis. A small amount of formalin (0.25 mL) may be injected into the vitreous humor to aid in fixation.

d. Cytology

(1) Bone marrow smears and cytology specimens must be thoroughly air dried before methanol fixation. If methanol fixation is not available, unfixed, air-dried specimens should be submitted.

(2) Always prepare and submit at least two stained and two unstained specimens.

(3) Never expose cytologic specimens to formalin, as artifactual alteration will result which may preclude definitive diagnoses.

(4) When submitting bone marrow specimens for evaluation, it is helpful to include cytological specimens of peripheral blood (i.e. blood smears) collected at the same time as the bone marrow.

e. Microbiology and Toxicology

(1) If applicable, collect samples for culture and/or toxicologic analysis IAW TB MED 283.

(2) Samples collected for culture and toxicological analysis must be processed by civilian veterinary diagnostic laboratories.

(3) Do NOT send samples for microbiology or toxicology to the JPC as delays may strongly influence results.

f. Photography. All necropsies should be accompanied with digital photographs. Photographs taken during the necropsy with a digital camera can be submitted through ROVR, on CD/DVD, or printed in color.

g. Tissue fixation procedures.

(1) Fix all tissues in large, wide-mouth containers.

(2) It is not necessary to separately label all submitted tissues; however, small tissues and/or tissues with similar appearances (e.g.; lymph nodes), tissues requiring left and right identification (e.g.; kidney), and other tissues requiring specific identification (masses) should be labeled separately.

(3) Use a ratio of 10 times the volume of fixative to volume of tissue.

(4) Change formalin after 24 hrs. Formalin fix tissues for a minimum of 48 hours, prior to packaging for shipment to the JPC; formalin fix brain samples for a minimum of 1 week prior to shipping.

h. Tissue packaging and shipment procedures. Package the specimens IAW TB MED 283 to prevent leakage or breakage. Do not ship tissues immersed in formalin inside plastic (e.g., ziplock bags) or glass (e.g., food jars) containers.

(1) After adequate fixation, wrap tissues in formalin-soaked gauze sponges, and double-bag in heavy-duty plastic bags and, if available, vacuum/heat-seal wrapped tissue specimens. Ensure proper vacuum sealing to prevent the crushing of tissue.

(2) Ship materials in a sturdy cardboard box lined with two heavy-duty plastic bags. Use adequate packing material to ensure that specimens remain stable during shipment and do not contact the walls of the box. Close each plastic bag securely and seal the box with strapping or shipping tape.

(3) Label all specimens IAW TB MED 283. When shipping specimens from more than one dog, ensure that each specimen is clearly labeled and correlates with the respective included paperwork.

(4) Do not ship cytological specimens (e.g. bone marrow smears, fine needle aspirates) with formalin-fixed tissues. Formalin fumes may render cytological samples non-diagnostic. Ship samples in a separate package using cardboard or plastic microscope slide mailers. Ensure to annotate on the JPC VET Form, Veterinary Consultation Request that two separate packages have been sent (i.e. part 1 or 2 and part 2 of 2). Include a copy of the paperwork (tracking numbers) for both shipments on the Veterinary Consultation Request Form.

(5) Send fixed tissue specimens, the completed and signed Necropsy Report (DD Form 1626), a Veterinary Consultation Request Form (JPC VET Form), photocopies of any lab work or photos taken at time of necropsy, and a photocopy of the dog's master problem list and assignment history to the JPC Veterinary Pathology Service immediately upon fixation of the tissues. Do NOT send fluids (e.g., whole blood, serum, urine), fecal, culture, uro/choleliths (stones), and/or culture samples to the JPC for processing. Do NOT send brain tissue for rabies testing to JPC. It is strongly recommended that specimens are shipped so they do not arrive on a weekend or holiday using private couriers (e.g. UPS, FEDEX, DHL) and that the courier's reference tracking number is retained, to locate the sample, in the event it is misdirected.

Address: Joint Pathology Center
 ATTN: Veterinary Case Accessioning
 606 Stephen Sitter Avenue
 Silver Spring, MD 20910

(6) Personnel in EUCOM, CENTCOM, and AFRICOM may submit specimens to the Public Health Command-Europe, Laboratory Sciences, Biological Analysis Division following the same protocol listed above for JPC. The only exception is that the Biological Analysis Division does accept brain tissue for rabies testing. Shipping can also be done through military transport but prior telephonic communication must be made to ensure planning for receipt, DSN 314-590-9710.

Military Address: US Army, Public Health Command-Europe
 (WK4UPX) Laboratory Sciences
 ATTN: MCHB-RE-LS Laboratory Operation Division CMR 402
 or APO AE 09180

German Address: US Army, Public Health Command-Europe
 (WK4UPX) Laboratory Sciences
 ATTN: Laboratory Operation Division
 Kirchbergh Kaserne, Gebaude 3809, Raum N202
 D-66849 Landstuhl, Germany

i. Send the MWD's complete medical record, any radiographs, the signed death certificate (DD Form 1743) and a copy of the Necropsy Report (DD Form 1626) to the DOD Military Working Dog Veterinary Service; do not wait for receipt of the finalized JPC Pathology Consult report before forwarding. The JPC Veterinary Pathology Service will send the finalized pathology consultation report to the referring VCO and to the DODMWDVS at dog.consult@us.af.mil. Records should be shipped within one week of death; however, overnight or other rush method is not required nor should be utilized except in extraordinary circumstances. The MWD's record held in ROVR should be marked "inactive" upon death (see 3-21).

Address: Central Records Repository
DOD Military Working Dog Veterinary Service
1219 Knight Street, Bldg. 7602
JBSA-Lackland, TX 78236-5631

12-3. JPC Diagnostic Services and Pathology Support. The JPC Veterinary Pathology Service offers no-cost diagnostic histopathologic and cytopathologic services for all government-owned animals, and for privately-owned animals belonging to individuals who are authorized to receive DOD veterinary services. The JPC Veterinary Pathology Service also offers second-opinion consultation services for both federal and civilian veterinary pathologists as an integral part training for Army veterinary pathology residents in the DoD Veterinary Pathology Residency Program.

a. Diagnostic materials accepted by the JPC. Accepted materials include formalin-fixed tissue specimens, paraffin-embedded tissue specimens, stained histologic sections, cytologic samples (i.e. glass slide preparations), radiographs and photographs. Do NOT send fluids (e.g.; whole blood, serum, urine), fecal, culture, uro/choleliths (stones), and/or culture samples to the JPC for processing; receipt of the aforementioned samples will be discarded immediately.

b. Surgical biopsy and cytology diagnostic material.

(1) Fix tissues and prepare for shipment as previous described.

(2) Complete one copy of JPC VET Form (Veterinary Consultation Request) and forward with case material.

A link to this form is located on the JPC website,

http://www.jpc.capmed.mil/docs/vet_consultation_request_form.pdf.

(a) Include complete signalment (animal identification, species, breed, sex and age).

(b) Include pertinent clinical information to include the anatomic location from which the specimen was collected, clinical history (including clinical signs, treatments, response to treatments, distribution of lesions, etc.) and pertinent laboratory findings.

(c) Include a telephone number, fax number and an e-mail address where the results should be directed.

Include a phone number that is answered outside of normal clinic hours.

(3) Correct packaging of specimen containers is essential to prevent breakage, environmental contamination, and tissue dehydration.

(4) Do NOT ship tissues immersed in formalin.

c. Case priority and turn-around times. Final JPC Pathology Consult reports will be sent to the contributor indicated on JPC VET Form Veterinary Consultation Request within the number of days after receipt of case materials as listed below. If special situations justify faster case processing; annotate "rush" on the request. The cases that may warrant rush include: public health issues (e.g.; zoonoses), unexplained sudden death, and/or criminal investigations.

(1) Surgical biopsy cases. Seven (7) duty days for routine cases; additional time may be required if advanced diagnostics (histochemical or immunohistochemical stains) are warranted. A resident and/or staff pathologist will contact the contributor if additional processing time is required.

(2) Cytology cases. Four (4) duty days.

(3) Necropsy cases. Sixty (60) calendar days.

d. Contacting the JPC veterinary pathology service. Questions regarding any aspect of the JPC pathology services or the MWD necropsy should be addressed to JPC, Chief, Veterinary Diagnostic Services; COM (301) 295-6200; Fax (301) 295-9971; DSN 312-295-6207. E-mail: dha.ncr.ncr-medical-dir-jpc.askvetpath@mail.mil.

APPENDIX A

REFERENCES

Section I

Required Publications

Army regulations (AR) are available from the U.S. Army Publishing Directorate (APD) Web site: <http://www.armypubs.army.mil>.

AR 40-905/SECNAVINST 6401.1B/AFI 48-131

Veterinary Health Services

Section II

Related Publications

A related publication is a source of additional information. The user does not have to read it to understand this publication. Air Force publications are available at <http://www.e-publishing.af.mil>. Except as noted below, Army publications are available online from the U.S. Army Publishing Directorate Web site: <https://armypubs.army.mil/>.

AFI 31-126

DOD Military Working Dog Program

ATP 4-02.7

Multi-Service Tactics, Techniques, and Procedures for Health Service Support In A Chemical, Biological, Radiological, and Nuclear Environment

ATP 4-02.8

Force Health Protection

ATP 4-02.83

Multiservice Tactics, Techniques, and Procedures for Treatment of Nuclear and Radiological Casualties

ATP 4-02.84

Multiservice Tactics, Techniques, and Procedures for Treatment of Biological Warfare Agent Casualties

ATP 4-02.85

Multi-Service Tactics, Techniques and Procedures for Treatment of Chemical Warfare Agent Casualties and Conventional Military Chemical Injuries

Section III

Referenced Forms

Unless otherwise indicated, DD Forms are available on the Office of the Secretary of Defense (OSD) Web site <https://www.esd.whs.mil/Directives/forms>. SF Forms are available on the United States General Services Administration (GSA) Web site: <https://www.gsa.gov/reference/forms>. DA forms are available from the APD Web site: <https://www.armypubs.army.mil>.

DD Form 1741

Immunization Record

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DD Form 1829

Record of Military Dog Physical Examination

DD Form 2208

Rabies Vaccination Certificate

DD Form 2209

Veterinary Health Certificate

DD Form 2341

Report of Animal Bite

DD Form 2619

Master Problem List

SF 512

Weight Plotting Chart

SF 515

Tissue Examination

SF 516

Operation Report

SF 519

Radiographic Reports

SF 519-B

Radiological Consultation Request

SF 545

Laboratory Report Display

SF 600

Chronological Record of Medical Care.

AF Form 2110A

Health Record Outpatient

DA Form 7389

Anesthesia Record

WHMC Form 3381

Military Working Dog Procurement Physical Examination

Section III

Selected Bibliography

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APPENDIX B

SEQUENCE OF FORMS FOR MWD VETERINARY HEALTH RECORD

Record Jacket: The four part record jacket is AF Form 2110A, Health Record Outpatient (Supplied by DODMWDVS)

Front Cover:

1. Label with Dog's Name, Tattoo, Breed, and Whelp date on top right corner
2. AVID Microchip Number – sticker, hand written, and centered.
3. Label with "Procurement pelvic and elbow radiographs are on permanent file at the Department of Defense Military Working Dog Veterinary Service. Inquiries concerning them should be addressed: DODMWDVS, 1219 Knight St, Bldg 7595, JBSA-Lackland, TX 78236-5631
4. Label with "WORKING DOG" in space provided for military service and grade

Inside Back Cover:

1. Label with Dog's Name, Tattoo, Breed, and Whelp date on top right corner
2. Semiannual Identification – Red and Yellow sticker over the number corresponding to the month of the Red and Yellow Semiannual Physical Exam
3. Photo of Dog-Side view with head turned toward camera. Name & Tattoo written on photo
4. Certification – i.e. Patrol, Patrol/Drug, Patrol/Explosives

Inside record: Sections 1 – 4, left to right. Forms are listed from top to bottom. Forms are filed in proper sections, chronologically, with newest on top. All forms and documents must be clearly labeled with MWD Name and Tattoo number

Section 1:

SF 600, Chronological Record of Medical Care.

Section 2:

1. DD Form 2619 (or equivalent), Master Problem List
2. DD Form 1741 (or equivalent), Immunization Record
3. DD Form 1829, Record of Military Dog Physical Examination
4. WHMC Form 3381 (or equivalent), Military Working Dog Procurement Physical Examination.
5. Clinical History from previous owner (if any)

Section 3:

1. SF 512 (or equivalent), Weight Plotting Chart (each large block is equivalent to one month; with each vertical line representing 3 days and each horizontal line representing one half (½) or one (1) pound)
2. SF 545, Laboratory Report Display (or equivalent/local form) and Clinical Pathology Reports. File lab reports in order by date, not by type of test. Smaller reports should be photocopied onto a full size paper and **not** attached with staples to allow for scanning. Cytopathology is filed here. Serology and infectious disease (Serology) reports. Histopathology reports are not filed here.

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Section 4:

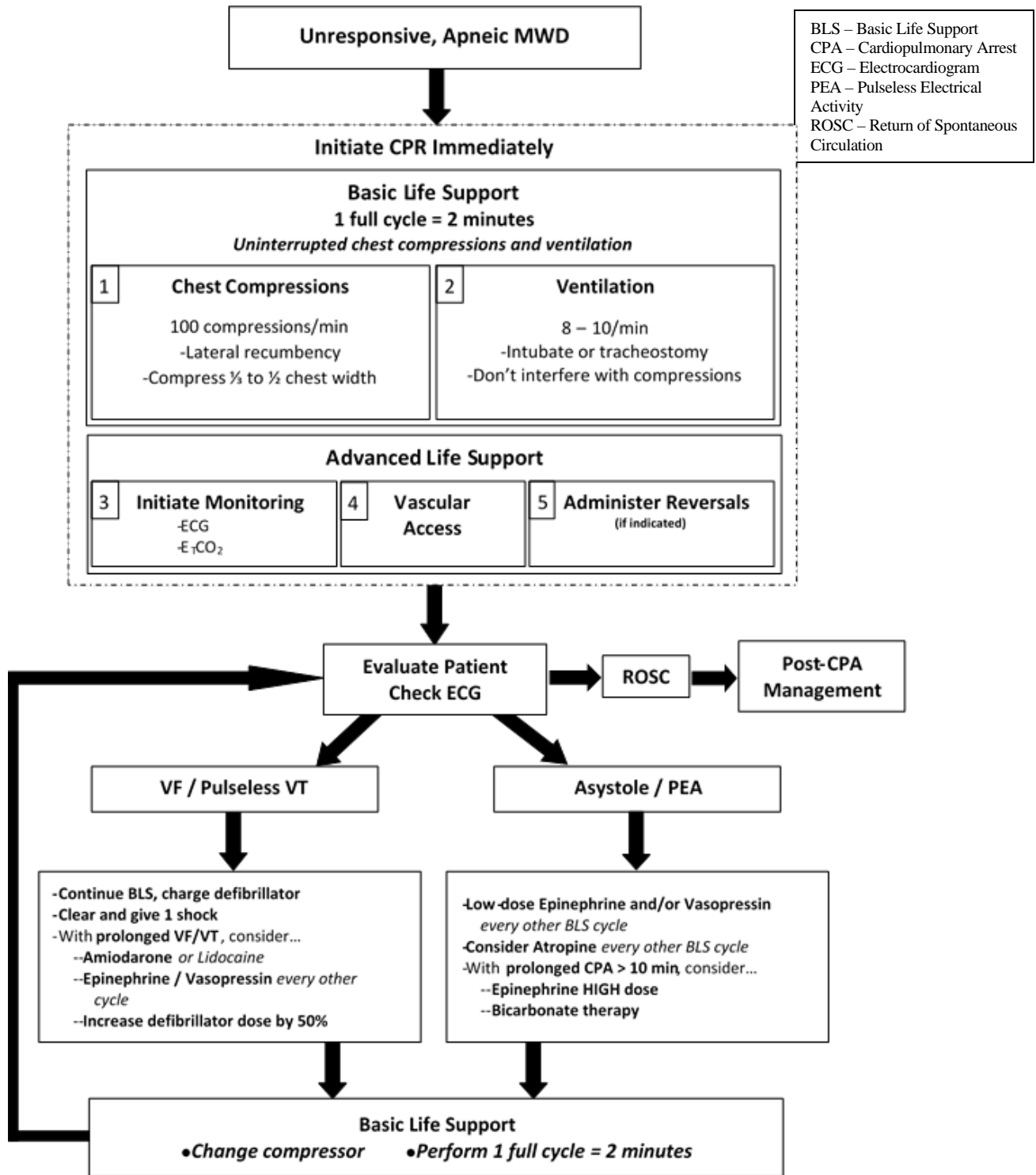
1. Deployment History Form
2. SF 519 or SF 519-B (or equivalents), Radiographic Reports and Radiological Consultation Request.
3. SF 516 (or equivalent), Operation Report. This section will also include any type of correspondence dealing with oral and dental procedures, and videoscopic procedures.
4. DA Form 7389 (or equivalent), Anesthesia Record.
5. SF 515 (or equivalent/local form), Tissue Examination. Gross and Histological Pathology reports are included here.
6. Electrodiagnostic procedures – to include: ECG, EEG, and all other neurological procedures.
7. DD Form 2209, Health Certificate. Any other import or export documents necessary for travel.
8. Miscellaneous correspondence – will include all correspondence that does not identify with any of the areas listed above (i.e., referral memorandums, rabies certificates, etc.)

NOTE: When an MWD is transferred to the DODMWDVS, the referral memorandum should be temporarily placed on the top of the SF 600s in Section 1.

9. Sequence of Forms Memorandum

APPENDIX C

CARDIOPULMONARY RESUSCIATION (CPR) ALGORITHM FOR MWDS



BLS – Basic Life Support
 CPA – Cardiopulmonary Arrest
 ECG – Electrocardiogram
 PEA – Pulseless Electrical Activity
 ROSC – Return of Spontaneous Circulation

APPENDIX D

STEP-BY-STEP MRI GUIDELINES

a. MRI studies must be directly supervised by a 64F. When considering whether or not an MRI is indicated, consult directly with the supporting 64F. The actual performance of the study must be performed under the direct supervision of a 64F in order to ensure:

(1) That an MRI is absolutely indicated. Radiologists from DODMWDVS indicate that subjectively over 90% of advanced imaging required for MWD work-ups may be performed satisfactorily with CT alone.

(2) Safety of the MWD is preserved. Historically we have lost an unacceptable number of MWDs to anesthesia-related deaths during MRI studies. Involvement of a 64F helps ensure that safe performance of anesthesia is accomplished as well as mentoring the 64A in the fundamentals of TIVA.

b. Perform a site visit to the MRI suite PRIOR to the scheduled procedure date. This allows the VCO to consult with the technician(s) and/or radiologist to discuss the technical requirements for a diagnostic scan (see Section 6-12 for specifics) as well as to ensure that requirements for a safe anesthetic event can be met.

c. Assemble required equipment prior to performing the scan:

(1) Syringe pump; ideally a syringe pump will be utilized to precisely deliver propofol at the recommended dosage rate. Ensure the machine is MRI compatible IAW manufacturer guidance and compliance with the facility's safety guidelines. Ensure that the pump is secured outside the 150 Gauss line in the magnet room. Alternately, a non-MRI compatible syringe pump can be used from the control room and several extension sets daisy chained through the port to the patient.

(2) Endotracheal tube, ties/gauze, and laryngoscope; it is of paramount importance that the MWD be intubated in order to preserve a patent airway, implement ventilation, and to provide supplemental oxygen during the procedure.

(3) Oxygen line; if oxygen is unavailable in the magnet room, coordinate with the staff to take an E-tank and regulator yoke. The tank may be maintained in the control room and the oxygen line can be pushed through the control port to the patient. If supplemental oxygen cannot be provided for the patient, the procedure should not be performed.

(4) BVM

(5) Esophageal stethoscope (MRI compatible); a technician should be present during the procedure to monitor heart rate and respiratory rate during the procedure

(6) IV fluids and drip sets; a crystalloid such as lactated ringer's solution (LRS) should be delivered during the procedure at a rate of 5-10 ml/kg/hr

(7) Syringes of various sizes, needles of various sizes

(8) IV catheters, flush, tape, vet wrap, scrub/alcohol, clippers, etc. for placing IV catheter

(9) Eye lubrication

(10) Thermometer

(11) Pulse oximeter (only for use outside MRI suite, unless MRI compatible)

(12) Emergency drugs. Resuscitation and reversal medications is primarily indicated.

(13) Anesthesia chart with emergency drug dosages pre-calculated

(14) Positioning equipment such as V-trough

(15) Litter/stretchers

(16) Additional drugs such as propofol, IV fluids, etc.

d. It is extremely important that all personnel involved with the scan understand that no metallic objects should be brought into the MRI suite. MRI staff may assume that veterinary personnel are also medical and understand this concept. Reiterating with all personnel that metallic objects (pens, needles, laryngoscope, implants such as bone plates, etc.) can become dangerous projectiles causing severe injury or even death to the patient or attending personnel.

APPENDIX E

INFORMATION FOR UPLOADING FILES FOR TRANSFER TO VIA AMRDEC SAFE

- a. Save the files in one folder and create a .zip file to upload.
 - (1) Find the folder on the computer hard drive.
 - (2) Right click on the folder name.
 - (3) Scroll down to “send to” and select “compressed (zip) folder.”
 - (4) Save the file as a .zip folder on the desktop.
- b. Upload the file for delivery.
 - (1) Go to the following website: <https://safe.amrdec.army.mil/SAFE/default.asp>
 - (2) The following screen will come up:

- (3) Type in **your** name and email address.
- (4) Type in a short description of the file.
 - (a) Make the description something that will alert the person to what the files are that are waiting for download. This description will show up in the email the receiver gets in their inbox.
 - (b) For imaging consults, be sure that the description includes the patient’s name, tattoo number, type of images, and a list of who the consult is being sent to.
- (5) Select the number of separate files to upload (25 max).
- (6) Click on Browse next to “File1.”
 - (a) Find the .zip file saved on the desktop and select it.

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- (b) Click Open at the bottom of the window.
- (c) The file with the complete path (i.e. C:\users....) will now be in the File1 box.
- (7) Select a deletion date (up to 14 days max) or leave as the default date.
- (8) Type an email address to *send to* and click Add.
- (a) The email address will show up in the “grant access to these people:” box.
- (b) Military and civilian addresses can be used.
- (c) For referrals/consults through DODMWDVS, send files to the main DODMWDVS consult email address (dog.consult@us.af.mil). Also include the email of the individual VCO expecting the case; however, all DODMWDVS consults are tracked through the dog.consult email inbox.
- (d) Use this site to consult with the supporting 64F by entering their email address(es) here instead.
- (e) If an email address is entered incorrectly, delete it by highlighting/selecting the email address and clicking remove.
- (9) Click **Upload** under File Submission.
- c. The files are in route to the recipients selected. Each email address entered will receive an email with a link to the pick-up website, the file description, and a unique password.
- d. To retrieve a file once an email is received:
 - (1) Click on the website link.
 - (2) Paste the password into the password box on the website.
 - (3) Click Submit.
 - (4) Select the first file in the download list.
 - (5) Select Save and choose a location.
 - (6) When the download is complete, click Close.
 - (7) For .zip file, right click on the file and Extract all to open files.

APPENDIX F

EXAMPLE OF ATTENDING VCO DISPOSITION MEMORANDUM



DEPARTMENT OF THE ARMY
 MOODY AIR FORCE BASE VETERINARY TREATMENT FACILITY
 4997 BURRELL STREET
 MOODY AIR FORCE BASE, GEORGIA 316995

MCHB-RS-GSY

13 May 2019

MEMORANDUM FOR Commander, Commander, 23d Security Forces Squadron

SUBJECT: Veterinary Corps Officer Disposition Request for Military Working Dog (MWD)
 Benga V160

1. **History:** Military Working Dog (MWD) Benga V160 is an 8 year-old male neutered German Shepherd Dog certified in patrol and explosives detection. He is currently in deployment Category IV status due to lumbosacral stenosis (LSSD) and elbow dysplasia. Benga was evaluated on 13 March 2019 for lameness of all four limbs. Radiographs, computed tomography (CT) and magnetic resonance imaging (MRI) were performed revealing degeneration and stenosis of the lumbosacral junction leading to compression of the spinal cord and spinal nerves. Benga also has a history of otitis externa that is managed with routine ear cleaning.
2. **Diagnosis:** Benga has been diagnosed with LSSD and elbow dysplasia. Due to these medical conditions he is unable to perform his required duties as an MWD.
3. **Prognosis:** Benga's prognosis for utility as an MWD is poor. He is unable to perform both patrol and detection duties due to pain and neuro logic deficits of his hind end as a result of LSSD and pain in his forelimbs from elbow dysplasia. Benga's prognosis for retirement is good with medical pain control.
4. **Fitness for Duty:** I recommend that Benga V160 be declared excess to the needs of the DoD and considered for adoption at the discretion of the unit commander and IAW Public Law 106-446. Review of his records describe Benga's personality as friendly making him an excellent candidate for adoption.
5. I have consulted with MAJ Iam A. Specialist (64F), and they concur with the clinical assessment, prognosis, and fitness for duty recommendation for Benga. It must be noted that the replacement of any MWD is also a logistics and supply function that must be completed through the kennel master's chain-of-command and in conjunction with their MWD Program Manager.
6. POC is the undersigned at (229) 000-0000 or starr.veterinarian.mil@mail.mil.

STARR VETERINARIAN
 CPT, VC
 OIC, Moody AFB Section

APPENDIX G

EXAMPLE OF 64F DISPOSITION MEMORANDUM



DEPARTMENT OF THE ARMY
PUBLIC HEALTH COMMAND-ATLANTIC
4411 LLEWELLYN AVENUE, BLDG 4550, STE 204A
FORT GEORGE G. MEADE, MD 20755-5225

MCHB-RN-VSD

3 June 2019

MEMORANDUM FOR Commander, 341st Training Squadron, ATTN: Disposition Board Members, 1239 Knight Street, Lackland Air Force Base, Texas 78236-5631

SUBJECT: Disposition Board Request for Military Working Dog (MWD) Benga V160

1. Benga V160 is an 8 year old, male, neutered, German shepherd, military working dog that has been trained as a patrol and explosives detection dog (P/EDD). I have reviewed his medical records, physical exam findings, imaging reports, and other pertinent records pertaining to the disposition. Benga V160 has a history of lameness in multiple limbs. During his medical work-up, Benga V160 was diagnosed with degenerative lumbosacral stenosis (DLSS) with nerve root compression at L7-S1 and bilateral elbow degenerative joint disease. He is on multimodal pain management but continued work will only exacerbate his clinical signs. Medical disposition is warranted.
2. I recommend Benga V160 be declared excess to the needs of the DoD. There are no indicators of aggression in his medical record or adoption suitability checklist. He has one bite that occurred during patrol training. Both the Veterinary Corps Officer (VCO) and accountable unit commander recommend adoption. Based on medical record, adoption suitability checklist, and bite muzzle video review, I have assessed Benga V160 as a fair candidate for adoption.
3. If adopted, his owners should be counseled on his current medical conditions. He will need routine veterinary check-ups and daily medications to maintain his current quality of life. He may need further medical care, including surgery, if his condition declines. Strenuous physical activity should be avoided, and he would benefit from regular, controlled exercise, physical therapy, and other pain management modalities. In addition, Benga V160 requires a special diet to manage his allergic dermatitis.
4. Point of contact is the undersigned at (301) 000-0000 or iam.a.specialist.mil@mail.mil.

IAM A. SPECIALIST
MAJ, VC
Clinical Consultant, PHC-A

APPENDIX H

EXAMPLE OF MWD MEDICAL DEPLOYMENT CATEGORY MEMORANDUM

01 November 2017

MEMORANDUM FOR RECORD

SUBJECT: Deployment Status for 802nd SF MWD Kennels

1. Listed below are the Medical Deployment Categories for the MWDs:

Name	Tattoo	Age	Deployment Status	Cat III ERD	WDMS Registry Comment	Meal 1a	Meal 2a
ARES	P669	8 Y	Cat I		Conus	2c SDA	2c SDA
BONO	P589	8 Y	Cat II		Mild OA	2c SDA	2c SDA
FANDO	R364	7 Y	Cat I		Deployed	2c SDA	2c SDA
JANY	N544	10 Y	Cat IV		Pending Dispo	3c Z/D	2.5c Z/D
LUIGI	T260	8 Y	Cat I			2c SDA	2c SDA
SONJA	P307	9 Y	Cat I			2c SDA	2c SDA
VVENICE	N772	9 Y	Cat III	01-Dec-17	RR Lameness	2c SDA	2c SDA
VVIPER	N714	9 Y	Cat I			2c SDA	2c SDA
ZUSA	N098	10 Y	Cat I			2c SDA	2c SDA

Note: Chart generated utilizing ROVR Registry Report

2. Deployment category definitions are as follows

a. CAT 1 - Unrestricted Deployment: MWD is medically fit for any contingency or exercise, can handle extreme stresses and environments (very hot weather, prolonged physical activity, etc.) and has no limiting or compromising factors (lack of stamina, etc.). MWD will have no existing or recurring medical problems that limit performance or will worsen by stress or increased demands. Note: Medical problems may exist or be under treatment but do not limit performance.

b. CAT 2 - Restricted Deployment: MWD is medically fit for regions/missions with minimal requirement for acclimation to heat or physical stress, no significant limiting or compromising factors. MWD may have medical problems which exist that slightly limit performance but are controlled. The reason for restriction must be reported in the Veterinary Health Record (VHR).

c. CAT 3 - Temporarily Nondeployable: MWD has a medical condition exists that impedes daily duty performance and is under diagnosis, observation, or treatment. The reason for nondeployability must be reported in the VHR. The Estimated Release Date (ERD) from CAT 3 must be reported in the VHR and be no longer than 90 days.

d. CAT 4 - Nondeployable: MWD has unresolved medical or physical problems exist that frequently or regularly impede daily duty performance and ERD cannot be given. Medical or physical conditions warrant submission to the

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MWD Disposition Process with subsequent replacement. The reason for nondeployability must be reported in the VHR.

4. Point of contact is the undersigned at _____.

JOHN SMITH
CPT, VC
Camp Swampy VTF

DISTRIBUTION
Kennel Master (Squad Leader, 1st Line Supervisor)
Local File

Date _____

Receipt of Notice of Medical Deployment Status for Military Working Dogs (MWD).

Receipt acknowledged. I understand that the medical deployment category as defined above.

(Signature)

(Printed Name)

APPENDIX I

CANINE – TACTICAL COMBAT CASUALTY CARD (cTCCC)

Can be found on the Joint Trauma System (JTS) Web site,
https://jts.amedd.army.mil/index.cfm/documents/forms_after_action

CANINE-TACTICAL COMBAT CASUALTY CARE CARD (cTCCC)

EVAC CAT: Urgent Priority Routine

EVAC TYPE: Fixed Rotary Ground MEDEVAC CASEVAC

UNIT: **NAME:** **TATTOO:**

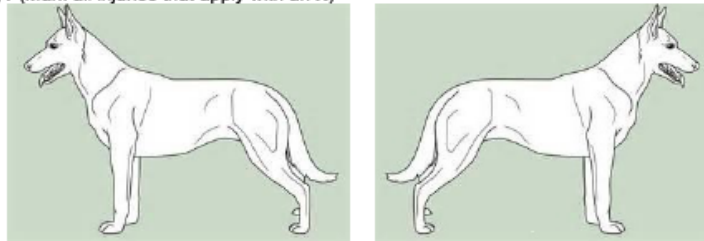
DATE: (DD-MM-YY) **TIME:** **GENDER:** M F

Mechanism of Injury: (Mark X all that apply)

IED GSW MINE BURN GRENADE ARTILLERY FALL

OTHER:

Injury: (Mark all injuries that apply with an X)



Signs and Symptoms: (fill in the blank)

Time					
Pain Score (0-10)					
Temperature (99-102.5)					
Pulse Rate/Location (60-80)					
Respirations (16-30)					
Blood Pressure (120/80)					
Pulse Ox% (> 95%)					
Capillary Refill (< 2 sec)					

NOTES:

CANINE-TACTICAL COMBAT CASUALTY CARE CARD (cTCCC)

Treatments: (Mark X all that apply) and fill in the blank

Location:

M: Dressing - Hemostatic Pressure TQ Other:

A: Intact ET-Tube Tracheostomy

R: O² Needle-D Chest-Tube Chest-Seal

C: Total Crystalloid Shock Volume of fluids is 90 mls/kg:
Administer 20ml/kg over 10-20 min. Reassess (as with human casualty):
If lack of response after 2-3 boluses consider adjunct therapy (HES/HTS.)

CRYSTALLOID	Volume	Route	Time
HYDROXYETHYL STARCH (HES): 5mls/kg over 5 - 10 min. After ½ shock crystalloid not effective.			
HYPERTONIC SALINE (HTS): 4mls/kg (If two or three ¼ shock boluses and 1-2 boluses of HES not effective)			
TXA: 10 mg/kg IV in 100ml NaCl or LRS given in first 3hrs. Followed by a 10-15 mg/kg CRI over 8 hours.			

C: Splint Other Bandage

H: Hypothermia-Prevention Hyperthermia-External Cooling

H: Head Injury

Pain Meds and Antibiotics (Circle if given and write the time in the notes.)

DRUG (conc)	DOSE	RTE	60lb/ 27.3kg	70lb/32kg	80lb/36.4kg
Ketamine (100mg/ml)	2-5mg/kg	IV/IM	1 ml	1.5 mls	2 mls
Midazolam (5mg/ml)	0.1-0.3mg/kg	IV/IM	3 mls	4 mls	5 mls
Morphine (10mg auto inj.)	0.2-0.5 mg/kg	IM	1 <i>auto</i>	1 <i>auto</i>	2 <i>auto</i>
Meloxicam	0.1-0.2mg/kg	IV/SQ/PO	5 <i>mg</i>	6 <i>mg</i>	7 <i>mg</i>
Cefazolin/Ceftriaxone	25 mg/kg	IV/IM	600 <i>mg</i>	800 <i>mg</i>	900 <i>mg</i>
Cefotaxime	25 mg/kg	IV/IM/SQ	600 <i>mg</i>	800 <i>mg</i>	900 <i>mg</i>
Ertapenem (100mg/ml)	15mg/kg	IV/SQ	4 mls	5 mls	6 mls

NOTES:

FIRST RESPONDER:

Name (Last, First): **AOC/MOS:**

GLOSSARY

Section I Acronyms

341 TRS

341st Training Squadron

64B

US Army Veterinary Corps Officer, Veterinary Preventive Medicine Specialist Area of Concentration

64F

US Army Veterinary Corps Officer, Veterinary Clinical Specialist Area of Concentration

AAHA

American Animal Hospital Association

AFAST

Abdominal Focused Assessment with Sonography for Trauma

AFI

Air Force Instruction

AR

Army Regulation

ATP

Army Techniques and Procedures

AVS

US Army Veterinary Service

BVM

Bag Valve Mask (Ambu® bag)

CBP

Customs and Border Protection

CBRN

Chemical, Biological, Radiological and Nuclear

ccSOAP

Chief Complaint, Subjective, Objective, Assessment, Plan

CDC

Centers for Disease Control

COHAT

Comprehensive Oral Health Assessment and Treatment

TB MED 298

CPG

Clinical Practice Guidelines

CPR

Cardiopulmonary Resuscitation

c-PTSD

canine – Post Traumatic Stress Disorder

CWDs

Contract Working Dogs

DHAVS

Defense Health Agency, Veterinary Services

DHS

Department of Homeland Security

DLA

Defense Logistics Agency

DOD

Department of Defense

DODMWDVS

Department of Defense Military Working Dog Veterinary Service

DV

Dorsoventral

EA

Executive Agent

ECG

Electrocardiogram

ERD

Estimated Release Date

FADL

DOD Food and Animal Diagnostic Laboratory

FDA

U.S. Food and Drug Administration

FYGVE

First Year Graduate Veterinary Education

GDV

Gastric Dilatation Volvulus

GOA

Government Owned Animal

Glossary

GVMP

Global Veterinary Medical Practice

IAG

Interagency Agreements

IAW

In Accordance With

IWR

Ideal Weight Range

JPC

Joint Pathology Center

JSMWDC

Joint Services Military Working Dog Committee

KM

Kennel Master

MEDCOM

US Army Medical Command

MPL

Master Problem List

MOA

Memoranda of Agreement

MOS 68T

US Army Animal Care Specialist

MOU

Memoranda of Understanding

MTF

Medical Treatment Facility

MWD

Military Working Dog

NAF

Non-Appropriated Fund

NATO

North Atlantic Treaty Organization

NCMI

National Center for Medical Intelligence

PHA

Public Health Activity

TB MED 298

PM

Program Manager

POA

Privately Owned Animal

SAPE

Semi-Annual Physical Examination

TFAST

Thoracic Focused Assessment with Sonography for Trauma

TSA

Transportation Security Agency

USAF

United States Air Force

USDA

United States Department of Agriculture

USMC

United States Marine Corps

USSS

United States Secret Service

VCO

Veterinary Corps Officer

VETAC

Veterinary Activity

VETCEN

Veterinary Center

VD

Ventrodorsal

VHR

Veterinary Health Record

VMO

Veterinary Medical Officer (GS Civilian)

VMSB

Veterinary Medical Standardization Board

VTF

Veterinary Treatment Facility

WDMS

Working Dog Management System

Glossary

TB MED 298

09 MAY 2019

By Order of the Secretary of the Army:

MARK A. MILLEY
General, United States Army
Chief of Staff

Official:



KATHLEEN S. MILLER
Administrative Assistant
to the Secretary of the Army

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