# Care of the Military Working Dog by Medical Providers

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**Objectives**

1) Differentiate normal from abnormal vital signs and laboratory values in the dog.
2) Recognize treatment for emergent conditions common to the military working dog.
3) Describe drugs, their dosages and routes, commonly used in the military working dog.

***Note:** The intent of this article is only to make healthcare providers aware that military working dogs (MWD) are part of the asymmetric battlefield. There will be occasions when healthcare providers (HCP) may be the only resource available to intervene when supporting MWDs become sick or injured. The article addresses only basic veterinary knowledge of the canine patient and is not to be considered definitive for HCPs to routinely care for MWDs. Veterinary care should be left to veterinarians and animal technicians whenever possible. However, HCPs may be called upon to provide immediate care in emergent situations. U.S. Army Special Forces Medical Sergeants (18D) receive a small amount of veterinary training through their course at the Joint Special Operations Medical Training Center, as well as some unit-level training with their Group Veterinarians. Any expansion of veterinary care by 18Ds outside the realm of emergent intervention should only be considered after consultation with the Group Veterinarian. There are few images of procedural demonstrations and canine anatomy and therefore it is recommended that HCPs become familiar with such by engaging with local Army Veterinary Corps officers (VCO). A few "hands-on" sessions will afford HCPs with an understanding of and comfort performing MWD physical exams and procedures.

## Abstract

Military Working Dogs (MWD) are important force multipliers. The U.S. Department of Defense MWD program has expanded significantly in both total numbers of dogs and scope of their missions. MWDs are utilized to enhance law enforcement and force protection capabilities usually associated with detection of explosives or illicit/illegal drugs. Currently, in support of the Global War on Terrorism, MWDs are particularly involved with explosives detection and perform duties such as vehicle and building checks, route and minefield clearing, cache sweeps, crowd control, and cordon searches. Though there currently are no MWDs organic to SOF, the concept of using MWDs within SOF is being considered.

Depending on the size and maturity of a particular theater, conventional veterinary support may or may not be readily available to any MWDs which could potentially be used in support of SOF. In situations where veterinary support is difficult to obtain, or is non-existent, the only care available for MWDs will have to come from the handler or medical providers within the supported unit. MWDs are valuable and scarce assets which cannot be replaced easily or in a timely fashion. As such, it is important for medical providers to have at least a minimal knowledge set of emergent conditions common and/or unique to the MWD so that their intervention has the best chance of success to preserve life, limb, or eyesight of the canine patient.

Though many conditions in the dog are treated in a similar fashion in the human patient, differences in anatomy, vital sign and laboratory parameters and, medications and dosages, may give the medical provider cause for hesitation to attend to canine patients. This article attempts to provide medical providers some basic knowledge of MWD patients, their conditions, and treatments.

### Dog use since 9/11 and in GWOT

Military Working Dogs (MWD) have been part of the Global War on Terrorism (GWOT) since its inception. MWDs are utilized for various law enforcement and force protection purposes, most commonly in the form of patrolling and detection of explosives or illegal drugs. As the GWOT has evolved, so has the use of MWDs, and dogs are now being used in concert with ground forces to assist in conducting cordon searches, route clearance, and ammunition/weapons cache sweeps, for example. At present, there are hundreds of MWDs deployed in support of OIF and OEF at over 30 locations.

### Veterinary assets in theater

Veterinary support within a theater of operations is usually provided by Army Table of Organization and Equipment (TOE) units, specifically the Medical Detachment, Veterinary Service (MDVS). This unit is comprised of six squads or teams that are usually dispersed throughout the operational area. Each squad has one veterinarian and one animal care specialist. It also has four or five food inspectors, but these personnel do not significantly contribute to MWD care. Of these squads, only one is usually equipped with significant equipment (i.e. anesthesia machine, surgical table, etc.) to provide up to Level II+ care to MWDs. More definitive or extensive care requires evacuation of a sick or injured MWD back to Germany, Okinawa, or San Antonio, TX, depending upon the geographic area from which the MWD will be evacuated. Depending on the freedom of movement and permissiveness within a particular area, the ability of veterinary assets to travel to the dog or vice versa, may be severely limited and even routine care may be extremely difficult to obtain.[1] Needless to say, depending on the circumstances, acquiring timely emergent care from veterinary assets may be nearly impossible.

Within SOF, one Veterinary Corps officer (VCO) is assigned to each Army Special Forces Group (Airborne) (SFGA). In cases where these units are supported by MWDs and their VCO has been deployed to the same location, care for the dogs is more easily provided. It should be noted that these officers have minimal equipment and are limited in their ability to furnish anything more than resuscitative care in emergent situations. Even so, the VCOs are not always deployed, and when they are, they have other responsibilities (e.g. conduct of civic assistance missions, working with host nation veterinary or agricultural officials, etc.). As a result, there is no assurance that MWDs will always be attended to by a veterinarian. Army Civil Affairs (CA) battalions/brigades also have assigned VCOs. However, MWD care is not usually part of the CA VCO duty description. If CA units are near your location, inquire as to whether a VCO has deployed and whether they would be willing to assist with MWD care as mission priorities and availability allow.

### Need for level I/II care

Like their human counterparts, MWDs are at risk of illness and injury throughout a deployment. Handlers are provided training in first aid procedures (e.g. cleaning and bandaging wounds, splinting fractures, etc.) and are generally very good at performing preventive and maintenance measures such as administration of parasite control products, bathing/grooming, and feeding of their dogs.

Most minor or non-emergent conditions can be managed or mitigated with solid medical knowledge of the human patient applied to a MWD, in concert with advice from a veterinarian or animal technician, until such time that veterinary personnel can attend to the MWD, or the dog can be taken to the veterinary unit. More serious conditions however, may present considerable peril to a MWD which is unable to receive swift veterinary care. For this reason, local health care providers (HCPs) such as physicians, physician assistants, nurses, and medics/corpsmen may need to intervene to preserve life, limb, and eyesight of certain sick or injured MWDs. There are also clearly humane reasons for HCPs to provide the best care they can to MWDs in pain and distress. Humaneness notwithstanding, MWDs are a "weapons systems" of relative rarity and considerable expense, and replacement of any "field loss" is a lengthy and costly process. One cannot simply walk over to the supply clerk and retrieve another MWD "off the shelf."

### MWD Medical Readiness for deployment

Like service members, MWDs have deployment medical readiness requirements.[2] MWDs will be medically processed for deployment by home station veterinary facilities. Dogs should arrive in theater with enough medications (e.g. heartworm preventive, ectoparasite control products, and any prescribed drugs) to last the duration of the deployment. Handlers are given a deployment veterinary treatment record which includes copies of the master problem list, the vaccination record, pertinent history and laboratory data (minimum two years), monthly weight charts, and most recent health certificates.

Veterinary recordkeeping will not be a priority in the event that a HCP should have to treat an emergency condition in a MWD. However, some record of events, findings, and treatment would be optimal. The dog's record may be kept with the supporting veterinary unit or with the handler. Ideally, if the dog is living in your area, the

medical section will maintain the MWD's medical file. Entry into a Standard Form 600 is generally sufficient and the SOAP format should be utilized whenever possible.

**Planning for MWD health service support**

Care for any MWDs which may be utilized by your unit should be included in deliberate health service support (HSS) planning. Once it is known that MWDs will be supporting your unit, whether prior to deployment or after arrival in theater, medical planners should engage their command veterinary staff officer. Army SOF should utilize the USASOC Command Veterinarian; all other SOF units should utilize the USSOCOM Command Veterinarian.

If the destination is within an established area of operations (AO), it is likely that veterinary TOE units are already there and it is essential the medical planners know where those units exist and how to contact them. Communication should be made with supporting veterinary units soon after arrival of the MWDs to inform them that dogs will be, or are already in theater. These units are not fed any information regarding movement of dogs into the AO and will not be prepared to care for them if they are not aware that they exist. If OPSEC is a concern, there is no need to specify what the dogs' mission is or where they will be located. However, the veterinary unit should at least know a particular number of MWDs are "out there" and calls for their care may be made as required.

It is important you understand what veterinary capabilities exist at which locations as the assets closest may not necessarily be adequate for a particular condition. As mentioned earlier, by its TOE, only one squad of the MDVS has any significant surgical capability and that squad may not be the one overseeing routine care for the dogs in that area.

The Army Field Manual covering medical evacuation includes one paragraph about MWDs, stating only that this responsibility lies with the using unit and that dedicated ambulance assets are authorized for MWDs when mission priorities and availability exist.[3] However, this falls short of real medical evacuation doctrine for MWD casualties and such planning needs to be made ad hoc between the supported unit, the veterinary unit and potential transportation assets. True MEDEVAC of MWDs will rarely take place as that term implies that en route care is being administered. In most MWD cases, CASEVAC will be conducted to move a dog to a veterinary facility. As such, non-medical conveyances are the most probable means of transport. Medical planners should ensure that local units with possible CASEVAC platforms are contacted to determine whether they have the ability to support transport of MWD casualties.

Even if a good evacuation plan has been created, it can be rendered ineffective with poor communication. Anecdotal reports indicate communication is sometimes very difficult between units with MWDs, and also between units providing CASEVAC and the receiving veterinary unit. This is typically due to insufficient radio or telephone capacity or capability. It is important to attempt to contact the supporting veterinary unit prior to transporting a sick or injured dog in order to determine which veterinary location would be best to evacuate the patient based on its condition. VCOs have food inspection and responsibilities to other MWDs which may require them to be away from their treatment facility, so if there is no prior contact and the dog arrives at the veterinary facility when the VCO is not available, this will be putting the dog at additional risk. A handler should always travel with a MWD during evacuation. In the event that the dog's handler has been injured or killed, another handler should accompany the MWD if available.

The last task to accomplish in the MWD HSS plan is to contact supporting level II+/III medical treatment facilities (MTF) to discuss use of their facilities and personnel for emergent MWD care. Such an agreement and prior coordination is useful when veterinary personnel and facilities are not available and HCPs determine that use of the MTF would allow for the survival of a dog with a life-threatening condition. The author's experience is that MTF personnel are generally very willing to assist with MWD care when the mission allows. However, anecdotal reports indicate that some MTF commanders will not allow MWDs in their facilities under any circumstance.

If the theater is immature or the location austere, it is unlikely that veterinary units will be available to support dogs. If a VCO is assigned that will travel with the unit, then they can work with the medical planners to determine a MWD care plan. A big problem, much like for human patients in such situations, is evacuation. Getting any casualty, dog or human, out of sub-Saharan Africa, for instance, can be challenging. STRATEVAC to the regional main support area is usually the best choice, but because the Theater Patient Movement Requirements Center is unlikely to send an aircraft for a MWD, use of any MILAIR assets available to evacuate a sick or injured dog tends to be more realistic.

Depending on location, there may be host nation military or civilian veterinary personnel and facilities. Occasionally, these assets may be utilized, though many will not meet U.S. veterinary care standards. However, if the case is such that the dog is likely to die long before any evacuation to U.S. facilities may occur, use of local veterinary resources might be the only reasonable course of action available.

### Safety around MWDs

The first thing a HCP must do to provide care to a MWD is not become a casualty while caring for the animal. Many people have had a pet dog and/or are comfortable being around them. Some MWDs are very tolerant of physical examination while others are very difficult to examine, and will thrash and growl and try to hurt you if given the chance. MWDs are trained to bite and hold until commanded to release. It is a serious concern and though rare, dog bites have led to the loss/removal or functional degradation of various extremities – whether through the trauma itself or due to subsequent infection. The HCP does not want any of the cases in these journal articles which can be found in Pub Med; (e.g. "Successful Replantation of an Amputated Nose after Dog Bite Injury,"[4] "Microsurgical Replantation of the Lip: A Multi-Institutional Experience,"[5] and especially, "The Therapy of Genital Trauma by Dog Bite" to be mimiced.[6]

First, never examine a dog without a handler present. The handler should keep the dog close on a very short leash. Do not get tricked into getting close to a dog that has slack in its leash. Keep out of striking distance. Make an effort to be slow and gentle. You can try "baby talk" and words of praise ("Oh, you're such a good boy! Who's a good boy? YOU'RE a good boy, Oh yes you are!"). If the HCP is comfortable in doing so, and the dog is relatively calm, pet the dog or scratch behind its ears; they actually do seem to like that. Try to be at ease. Though they probably cannot really smell fear, they do seem to sense something from timorous individuals, which adds to a tense situation. Since the dogs are trained to work with people, most are socialized well and are not dangerous … if common-sense precautions are taken. However, there are a few "buzz saws" out there, and in aggressive dogs, it is recommended that the examiner not attempt to "show him who's boss." Avoid direct eye contact; just look at what is needed to be looked at and do not react submissively or aggressively in return. A dominant, aggressive dog will react to perceived threats to that dominance and create an even worse situation.

Only get close to the dog after the handler has demonstrated that they have positive and tight control of their dog (Figure 1). Next, make sure the dog has a muzzle secured to its head and face. This is standard operating procedure for handlers. However, the HCP needs to be aware that while they are near the dog's head for any reason (examining eyes, head/face, auscultation, etc.), they can be injured if the dog lunges at them with the muzzle. Muzzles can be made of plastic or wire as well as leather and the HCP will regret it if they are struck in the eye or face.


Figure 1. Handler in positive control of MWD for exam.

### Physical Examination of the Dog

There are parallels between caring for dogs and some pediatric human patients in that neither can effectively communicate their perceived health status with the caregiver. There may be obvious signs of distress or discomfort or other changes that are seen in each patient, but neither can provide a simple answer to "Where does it hurt?" Not only will dogs not tell the HCP what seems to be ailing them, but, many times continue to work as best they can until a problem has progressed to a point at which the illness or injury has become a serious condition. Handlers will invariably pick up even small changes in their dog's behavior and request that their MWD be seen for seemingly inconsequential reasons. This may also share some commonalities with pediatrics, but generally, if the handler is concerned, the dog should be given a cursory examination.

It is not expected that HCPs will be providing routine sick call to MWDs, but if MWDs are only looked at when they are in extremis, HCPs won't be able to determine lesser changes that are meaningful in identifying an actual problem prior to the dog having a bona fide emergency. The philosophy is similar to passing the jumpmaster personnel inspection portion of the jumpmaster course. The key to determining something is wrong with a jumper's rig is not inspecting a lot of jumpers with different gigs; rather it is inspecting huge numbers with no gigs. That way, since it is well known what normal looks like, it is much easier to pick out when something is wrong. It may not always be known exactly what is wrong, but knowing it's not right, the HCP can then pursue their finding.

### Anatomic directions on a dog

The fact that the dog is a quadruped creates potential problems between veterinary and medical personnel

when it comes to communicating where exactly on a body one is talking about. Terms applied to humans may either mean something different to a veterinarian, or mean nothing at all, when it comes to dog anatomy. In quadrupeds, toward the head is "cranial," (superior for humans) and the tail is "caudal" (inferior). Toward the spine is "dorsal" (posterior) and towards the sternum, "ventral" (anterior). See Figure 2.
http://en.wikipedia.org/wiki/Image:Anatomical-directions.svg?

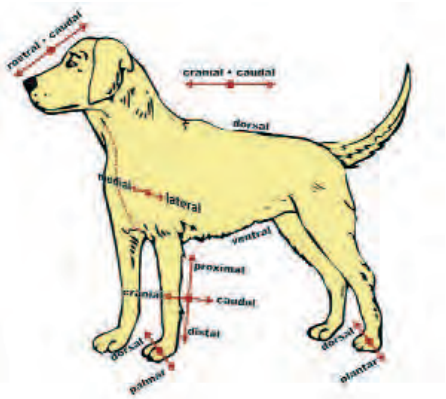


Figure 2. Anatomic directional terms for the dog

**Vital Signs**

Normal canine values are in Table 1. Methods of determining vital signs in the dog are not unlike acquiring them from pediatric patients. The HCP needs little more than a stethoscope (adult size) and digital thermometer, though a penlight may be wanted on occasion. Though infrared auricular thermometers are commercially available, it is recommended that HCPs utilize digital thermometers which can be placed rectally. Unlike the relatively straight, horizontal ear canal in humans, the canine canal has vertical and horizontal portions at approximately 100 to 120 degrees to each other. Because of this anatomy, and unfamiliarity of HCPs with it, simple placement of infrared thermometers into the vertical canal will probably not engage the beam with the tympanum, thereby giving inaccurate results. Additionally, most dogs will resist when something is placed in their ears, by either tucking or thrashing their heads, creating a moving target. Continued attempts, especially in more aggressive or fractious MWDs, will usually make things worse.

Thoracic auscultation is generally accomplished with little protestation from the MWD. However, there are some differences between auscultation of the canine and human thoraces. Anatomically, the dog thorax is flat from side to side, not front to back as it is in a human. The point of maximal intensity (PMI) to best hear the heart is the left axillary region and just caudal to it. Because MWDs are meant to be trim and fit, the HCP can many times feel the PMI with their fingers simply by placing them on the left side of the thorax caudal to the forelimb. The heartbeat should be heard easily; however, the diaphragm of the stethoscope must be held firmly against the chest wall as the movement of the diaphragm over the dog's coat will produce loud scratching sounds that may drown out the heartbeat. Another sometimes frustrating factor is that many dogs pant during the exam and the associated lung sounds make it harder to hear the heart sounds. A trick to help temporarily stop the dog from panting is to wedge an alcohol prep pad in the muzzle near the nose. This will usually stop panting for a short while, but if it is not removed relatively quickly, the dog may start to resist and struggle to get away from the odor.

Once a strong loud heartbeat is heard, the HCP will notice that it is faster than what they are used to hearing in human patients. Due to the anxiety cause by the exam, the rate may be almost twice as fast as that in a resting, physically conditioned, healthy, young male. Within the context of this article's intent, the HCP will not really have to discern arrhythmias or murmurs and will be auscultating the heart mostly to determine the heart rate. It is more difficult to hear heart sounds clearly from the right side of the thorax, and, for our purposes, there is no specific need to auscultate the heart from this side. Occasionally, sternal placement of the stethoscope can allow the examiner to hear heart sounds with less interference from panting.

Lungs are easily auscultated, but panting may make it more difficult to gain useful information. The HCP should be able to appreciate crackles and wheezes just as in human patients, but be sure to listen to all lung fields on both sides of the thorax. Conditions which cause changes to the sounds normally heard in thoracic auscultation in humans (e.g. pneumothorax, hemothorax, pneumonia, etc.) will cause the same changes in canine patients. The HCP will also realize that they cannot make the dog take a deep breath ... hold it … and exhale, so just do your best. Again, the interposition of hair between the skin of the thorax and stethoscope might cause interference which may hide abnormal sounds to those not accustomed to it – another reason to practice listening to normal MWD lung and heart sounds.

Sphygmomanometers are not particularly useful in the dog, especially an awake one. Blood pressure is assessed by looking at mucous membrane color, capillary refill time (CRT), and pulse quality. The best place to palpate for a pulse is high in the groin where the femoral artery can usually be felt. Due to most dogs' trim physiques, this is not difficult to do. Cup the right hand and set it along the cranial aspect of the dog's right thigh

(or left hand for left thigh). Then place the fingers under the fold of the flank and, as high along the medial aspect of the limb as possible, gently compress the thigh. If a pulse isn't felt right away, reposition the fingers until it is felt. Pulses should be strong and steady with one pulsation per heartbeat. The main reason to be able to find a pulse is to determine shock, in which case it will be thready like it is in the human patient.

**Table 1. Normal Vital Signs and Basic Lab Values of the Dog and Human**

| Parameter ▲ | Dog (MWD) | Human (adult male) |
|---|---|---|
| Temperature (ºF) | 99.5 to 102.5 (rectal) | 96.3 to 99.9 (oral) |
| Heart Rate (beats/minute) | 60 to 120 | 40 to 60* |
| Respiratory rate (breaths/minute) | 20 to 40 and pant** | 12 to 20 |
| Capillary refill time (seconds) | <2 | <2 |
| PCV/HCT (%) | 35 to 54 | 40 to 52 |
| Total protein (g/100 ml) | 5.7 to 7.3 | 6.3 to 8.2 |
| WBCs ($x10^3/\mu l$) | 6.4 to 16.0 | 4.1 to 10.9 |
| Urine specific gravity | 1.015 to 1.040 | 1.002 to 1.030 |
| Blood urea nitrogen | 6 to 24 | 7 to 21 |
| Blood glucose (mg/dl) | 60 to 125 | 60 to 100 |

* For conditioned athlete; otherwise normal adult male range, 60 to 100.
** Though not normal for a calm dog at rest, many normal dogs will pant during an exam if anxious or excited.

### Laboratory values

For the intent of this article, only a few canine laboratory values are given (Table 1). Packed cell volume/hematocrit, white blood count, total protein, urine specific gravity, and blood urea nitrogen provide useful information. Some information is fairly easy to obtain, but others require equipment which may not be available at every location, or in an austere environment. Utilize whatever laboratory items are available for the MWD just as for human patients. Though erythrocyte and white cell counts may not be accurate if dog blood is run through a machine calibrated for human blood, electrolyte and blood gas results are thought to be generally reflective of the actual values in the canine patient.[7] Though the HCP may not need, or have time, to interpret canine laboratory results, such values should be obtained when possible and provided to the supporting veterinary unit for advice or when transferring the patient into veterinary channels.

### Emergent conditions and management

Most emergent conditions in the dog can be managed similarly as they would be in the human patient. Canine emergencies are approached using the ABC (airway, breathing, and circulation) mnemonic. Unique conditions to the canine patient, without a commonly seen analogue in the human, will be covered separately.

Airway: Establishment of a patent airway in the obtunded/unconscious MWD is made with an endotracheal tube (ETT). Dogs tend to have larger tracheal lumen diameters than humans per body weight. An adult male human and MWD would require about the same size ETT; the MWD being able to accommodate a slightly larger tube (8.0 to 9.0mm ETT, human; 9.0 to 11.0mm ETT, canine). Intubation of the canine patient should generally be easier than in a human as the dog's jaws can be widely opened to allow direct visualization of the vocal folds. A stylet is generally not required and dogs should be intubated in sternal recumbency (pronate).

The HCP can use dry gauze to grasp the dog's tongue to pull it forward and down while an assistant/handler grasps the maxilla behind the upper canine teeth. This allows the jaws to be opened wide with good visualization of the glottis. The tube can then be inserted between the vocal cords. To preclude intubation of only one lung, the end of the tube should not extend past the thoracic inlet. Determination of the how far to insert the tube can be made by approximating the course of the tube and trachea next to the dog prior to the tube's insertion. The HCP should make a mental note of how much of the tube should remain extending out of the muzzle when determining proper placement of the ETT. Because it is likely that the ETT will extend relatively far from the muzzle when placed properly, it must be secured to prevent its accidental removal. This is obtained by using a three-foot long piece of roll gauze or a large rubber band placed around the tube at the point where the tube passes the commissure of the mouth, and then secured behind the head near the occiput, or on the dorsal surface of the muzzle. Cuff inflation should be done slowly as the Ambu bag is squeezed. When air no longer escapes from around the tube, cuff inflation is sufficient. The patient should be bagged eight to twelve times per minute ensuring good chest excursions.

Catheter placement in the canine patient is usually made in the cephalic vein on the dorsal/dorsomedial aspect of the forelimbs. Occasionally, it is placed in the

lateral saphenous vein, (runs craniodistal to caudoproximal on the lateral surface of the hind limb above the hock, or "ankle"), or the jugular vein. One item of equipment that really makes catheter placement easier, but is generally lacking in medical sets, is a pair of hair clippers such as those used in a barber shop. If the hair is not clipped, especially in dogs with long hair, it can be very difficult to place a catheter at all, much less aseptically. Hair can be cut with scissors, but results are mixed. Safety razors with chlorhexidine/povidone iodine scrub (not solution) as a "lather" can be tried in short-coated dogs, or after long hair is trimmed with scissors, but it takes time and can cut the skin. Catheter size is important and, if possible, 18G x 2″ should be used. However, if the vein is small, something as small as 22G may be necessary, but larger is preferred for fluid resuscitation.

A tourniquet or assistant's hand is used to occlude the vein proximal to the insertion site. Initially the HCP should attempt to place the catheter at the most distal location where they can clearly see the vein. If they are unsuccessful, they will want to be able to try again closer to the elbow/stifle (knee). Do not try to insert the catheter directly through skin and into vein in one thrust. First, place the catheter through the skin alongside the vein and, once through, direct it into the vein. Catheters must be firmly secured with tape to help preclude dislodgement.

Single-lumen central venous/jugular catheters are not difficult to place in an otherwise fit and well-conditioned MWD. If available, and the situation permits, placement of a jugular catheter is recommended, especially if the dog will be transported to a veterinary unit later. Peripheral catheters can be easily dislodged due to movement of the patient. With the dog in lateral recumbency, shave the neck from thoracic inlet to angle of the mandible just lateral to the trachea. Extend the head, wet the shaved area, and occlude the jugular where it enters the thorax. The vessel should be easily seen so standard catheter placement can be accomplished. Be sure to secure the catheter by suturing to the skin.

### Shock

Shock in the canine patient will present as it does in the human patient. A shocky dog will have tachycardia and a weak/thready pulse, may have changes in mentation, and can exhibit pallor and increased CRT. Potential confounding factors for the HCP in assessing mucous membrane color and CRT are that the oral mucosa in some dogs may be highly pigmented. Try to find a portion of the gingiva or mucosal surface of the lip that is pink when checking CRT and color. In dogs with completely black (due to pigmentation) oral mucosa, which is rare, assess color by looking at the conjunctiva of the eyes. Cool, clammy skin is not as well appreciated in the dog due to its hair coat, though the feet may subjectively feel cooler than normal.

Shock in the dog can be caused by the same things that cause shock in humans and symptomatic treatment is also generally the same, primarily treatment of the underlying cause. Type of fluid(s) used will depend on severity of shock. Compensated shock can be addressed with crystalloids only, but if decompensation is occurring or has occurred, use of colloids and/or hypertonic saline can be used. Fluid rates can be found in the section on gastric dilatation-volvulus.

### Gastric Dilatation-Volvulus (GDV)

GDV is a life-threatening condition seen with some frequency in the common MWD breeds (German/Dutch Shepherds, Belgian Malinois). One study found that almost 10% of MWD deaths are due to GDV.[8] As the term implies, the stomach can fill with gas and fluid (dilatation) and in many cases will subsequently twist upon itself (volvulus). The condition is commonly called "bloat," due to the abdominal distention which GDV causes. GDV leads to gastric wall ischemia/necrosis and circulatory shock due to occlusion/impingement of the distended stomach on the caudal vena cava and portal vein (see Figures 3 and 4). Aggravating factors can include myocardial ischemia/arrhythmias, disseminated intravascular coagulopathy, renal failure, and splenic torsion, so it is very important that GDV is quickly diagnosed and treated

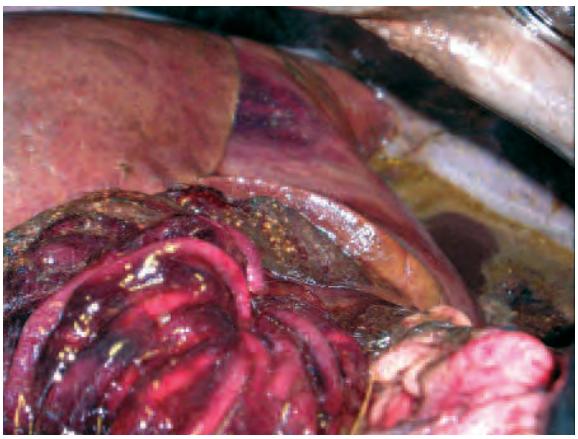

Figure 3. Intra-operative view of MWD with gastric wall necrosis and perforation secondary to GDV. Note dark purple rugal folds of exposed gastric lumen, flocculent particles of food, and brown fluid accumulation in the abdomen. This patient died during surgery. Liver is at upper left, with intestines at lower right.

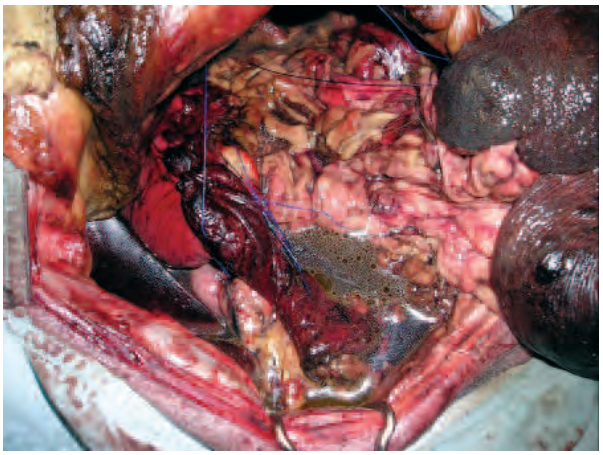

Figure 4. Post-mortem image of open abdomen in same patient as in Figure 3. Partial gastrectomy was being performed to remove necrotic stomach wall. Cranial to left, caudal to right.

to help preclude these other complications.

Clinical signs are fairly characteristic. The abdomen is usually distended and the dog will appear uncomfortable and seem to have some difficulty breathing due to the restriction of diaphragmatic movement. The handler may have noted that the dog has retched with no vomitus expelled. Early in the course of GDV, dogs may not seem to be particularly compromised, but the condition can proceed very quickly, leading to death within minutes to an hour, depending on severity. In more advanced cases, the dog will be shocky. In garrison environments where dogs may be monitored infrequently during the night, reports of a dog appearing normal one hour and dead the next (due to GDV) are not unheard of.

Diagnosis is fairly straightforward based on history, clinical signs, and physical exam. Imaging studies are generally not required, but if unsure and there is the ability, take a right lateral abdominal x-ray; GDV has a very recognizable radiographic presentation (Figure 5).

A recent study indicated the two most important prehospital predictors of unsuccessful outcome in GDV were hypotension and clinical signs for more than six hours prior to examination.[9] As such, the immediate treatment goal is to quickly provide hemodynamic support and decompress the stomach. Place an 18G x 2″ cephalic catheter for fluid administration and IV access for other drugs. Ideally, a jugular catheter is subsequently placed for ensuing transport to a veterinary facility. Do not place a catheter in the lateral saphenous vein (or any vein in the hind limbs) of a GDV patient. Because the dilated stomach impedes venous return from the caudal vena cava, fluids administered through the saphenous cannot easily be delivered to the heart.

If 5 to 7.5% hypertonic saline in 6% dextran 70 is available, administer a 5ml/kg bolus then follow-up with crystalloid at 20ml/kg/hr.[10] If hypertonic saline is not available, an initial bolus of 6% hetastarch can be given at 20ml/kg followed by crystalloid administration. If no other fluids are readily at hand, start with a crystalloid at 90ml/kg (generally, running fluids "wide open") and reassess heart rate and pulse quality every 10 to 15 minutes.[11] If using straight crystalloids, in most cases it will be reasonable to give at least two liters (in a 60 to 80 pound dog) at this rate prior to considering the need to adjust it downwards.

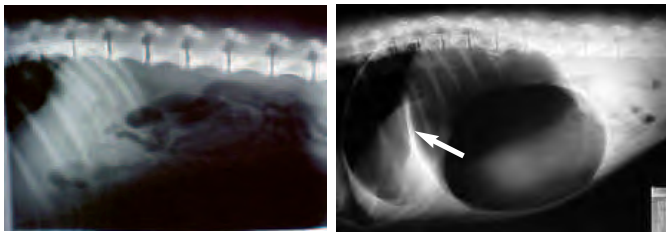

Figure 5. Abdominal radiographs of dogs taken in right lateral recumbency.
Picture on the left is of a normal stomach. Picture on right is GDV. The stomach is severely distended and filled with gas. Soft-tissue "shelf" (arrow) indicates volvulus and not simple gastric dilatation.

If an assistant is available, proceed with antibiotic administration after fluids are started. A first generation cephalosporin (e.g. Cefazolin) or Ampicillin can be given at 22mg/kg IV.[11] Ceftriaxone, a broad-spectrum third-generation cephalosporin can be used instead, if available (see Table 2 for dosing information). If things are too chaotic however, give antibiotics after the dog is decompressed and stabilized. Corticosteroids have been widely used in GDV patients, though its effectiveness is not proven. They might help, but probably only if given prior to decompression of the stomach (after which it is thought endotoxins are released); methylprednisolone sodium succinate can be given IV at 30mg/kg.[11]

Immediate decompression of the stomach is most easily accomplished by trocharization. Percutaneous placement of a large bore IV catheter (12 to 16G, 2″ or longer) is not only useful for quick removal of some gas, but also may ease subsequent passage of an orogastric tube. Though gas may be vented through a trochar, it is not effective for removing fluid. For more effective function, additional fenestrations (one or two) can be made into the sides of the catheter with a scalpel blade while it is still on the stylet; this allows gas to be relieved if the end becomes clogged with fluid/ingesta.

With a distended abdomen, it is not difficult to hit the intended target. However, the area just caudal to the ribs must first be "pinged" to insure the trochar is placed in the gas cap of the stomach and not into fluid or some other organ such as the spleen. To ping, place a stethoscope over the uppermost (toward the ceiling) portion of the abdomen (assuming the dog is in lateral recumbency) and then percuss the area immediately adjacent to the stethoscope diaphragm. If placement is over the gas cap, a resonant "ping" will be heard; if not, a dull thud will be heard. If unable to successfully ping the stomach, place the dog on its opposite side and try again.

When satisfied the gas cap has been identified, shave a small area and simply place the catheter perpendicular to the body wall in one swift motion. Local anesthesia is generally not required, though lidocaine infiltration beforehand would surely be appreciated by the patient. Do this only if the MWD's physiologic status permits. If the trochar is properly placed, foul-smelling gas should immediately be detected when the stylet is removed, perhaps along with a sputtering of fluid. Do not let go of the trochar during decompression and follow the body wall downward as decompression occurs. This would prevent the stomach from falling away from the body wall and off the catheter as gas escapes.

Handlers whose dogs have not received a prophylactic gastropexy should be deployed with an orogastric tube (Figure 6) which is the best way to more effectively decompress the stomach after trocharization. Orogastric tubes used in dogs generally are intended for use in the equine patient, so they are sometimes referred to as "foal tubes" as the size which works in the neonate horse is appropriate for the MWD. Such tubes are 1/4 to 3/8" (approximately 20 to 32 French) internal diameter.

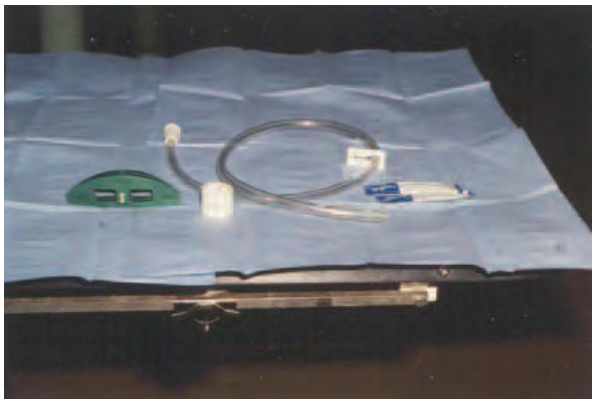

Figure 6. Orogastric tube

Nasogastric tubes used in human patients are not likely to be useful in a dog with GDV as they are too small in diameter. Though NG tubes could possibly be passed through a twisted gastroesophageal junction, the fluid and ingesta usually found in the stomach would not likely be evacuated. The large-bore orogastric tube better allows for removal of such material.

Placement is not difficult though there are a few points to remember. Prior to inserting into the mouth, hold the tube with the tip midway between the last rib and xiphoid process and stretch the tube to the tip of the nose, placing a piece of tape at that point. This landmark will help prevent forcing the tube too far and potentially puncturing the stomach wall. Because the tubes usually are packaged in a coil, the tip of the tube will have curve to it. After liberally lubricating the last four to six inches of the tube, insert the end into the mouth with the curve pointing toward the top of the head as this will help prevent placement into the trachea. The tube should slide easily, at least until it reaches the gastroesophageal junction. If there is any question as to whether the tube is in the esophagus or not, palpate the neck, if two tubes (trachea and orogastric tube) are felt, it is OK. More likely, if the tube is in the trachea, the dog will cough violently. For those inclined, another means to check placement is to suck on the free end of the tube and if able to withdraw air, the tube is probably in the trachea. If the tube is in the esophagus, the suction will pull the mucosa into the end of the tube and obstruct the ability to withdraw air. (A field-expedient Toomey syringe!)

The tube may be difficult to pass into the stomach due to torsion/volvulus of the organ. Do <u>not</u> force the tube in such cases. First, attempt to rotate the tube clockwise and counterclockwise as it is attempted to gently advance it. If this does not work, the dog can be suspended by its front limbs, nose pointed upward, so the dog is in a vertical orientation, and then gently jostled. The weight of the stomach may allow some unwinding of the stomach. This may facilitate enough relief to pass the tube into the gastric lumen. If this maneuver is required, ensure the dog is placed back in lateral/sternal recumbency after the tube is in the stomach. The dog's head should hang off the edge of the table so that if contents are vomited, the HCP can mitigate against aspiration.

Successful gastric intubation generally results in food/fluid filling the tube, depending on the viscosity of the contents. Many times it is required that the HCP suck on the free end of the tube, as in siphoning, to get fluid contents out of the stomach. Most veterinarians who have treated more than a few GDVs have received at least one mouthful of partially-digested kibble in the process. When contents are thick, water can be poured down the tube into the stomach, the tube gently agitated (remem-

bering your tape mark limit) and siphoning continued. The stomach need not be completely evacuated of fluid and food, it just needs to be decompressed enough to allow for cardiovascular stabilization. This stage is reached when heart rate decreases, pulse gets stronger, and the breathing pattern becomes easier. Mucous membrane color and CRT time should also get better or normalize when decompression is sufficient.

Dogs which are not severely depressed will need to be sedated in order to pass an orogastric tube. Diazepam/midazolam can be given alone (0.1 to 0.125mg/kg slow IV) or in conjunction with ketamine.[11] In veterinary medicine, diazepam (5mg/ml) is often mixed with ketamine in equal volumes and given IV to effect. However, veterinary formulations of ketamine are 100mg/ml. If using a benzodiazepine-ketamine cocktail, use a twice the volume of ketamine if using the 50mg/ml form.

If trocharization and orogastric tube placement do not work, the last resort for decompression is a temporary gastrostomy. Such a procedure is not difficult, though it may be daunting depending on the experience and skill level of the HCP. Heavy sedation, and local infiltration of lidocaine at the proposed incision site, or light general anesthesia (ketamine-benzodiazepine to effect as described previously) is required. With the dog in left lateral recumbency, the HCP will ping the right side of the abdomen to insure the gas cap is immediately under the body wall. After shaving and prepping the skin, the HCP will make a 4 to 6cm incision parallel to the costal arch ensuring they are caudal to the last rib (precluding potential pneumothorax). Separate the underlying muscles parallel to the long axis of the muscle fibers using a gridiron technique until through the peritoneum. It is best to use blunt dissection to avoid unintentional puncture of the gastric wall (or possibly spleen), as it should be firmly pressed against the peritoneum. Once through, the HCP will tack the gastric wall to the skin edges using 3.0 suture in a simple continuous pattern. They will then incise into the gastric lumen, being careful not to stand in the way of gastric contents being expelled.

When transporting GDV patients to veterinary facilities via aircraft, it must be remembered that gas-filled viscus will fill with more gas at altitude due to lower atmospheric pressures. Pilots should be alerted to this risk when coordinating evacuation with the unit and should fly as low as the tactical/security situation allows. In such cases, the (sedated) patient should have an orogastric tube placed during transport to avoid further accumulation of gas which can lead to shock, gastric wall necrosis, and death in an otherwise favorable case. If a temporary gastrostomy was performed, then no orogastric tube is needed for transport.

The ECG will oftentimes show ventricular arrhythmias, usually premature contractions and tachycardia. However, most of these arrhythmias seem to occur after definitive surgical treatment.[12] Administration of lidocaine at 1mg/kg slow IV bolus should only be given if the patient is clinically affected by the condition, when ventricular tachycardia is sustained, or if R-on-T phenomenon is recognized.[11]

### Heat Injury [11]

Heat stress is not uncommon in the MWD. Dogs do not sweat like humans and particularly when the dogs are working in environments which are very hot/humid, they are at greater risk to become a heat casualty. Even if the dog is not engaged in physical activity, it can sustain heat injury such as being confined in a vehicle without sufficient ventilation/air-conditioning. Dogs new to such environments must have a period of acclimatization, perhaps one to two weeks prior to working full days. As in humans, dogs can have gradations of heat injury which, in its severest form, is deadly. A dog with exertional hyperthermia will pant heavily, but is not dyspneic and can stop panting if an alcohol swab is placed by, or when someone blows into, the dog's nose. The dog will generally be responsive and ambulate normally. Rectal temperatures in these dogs may be up to 106ºF. The dog may also be tachycardic. However, the pulse is strong and steady. In such cases the dog should be given rest in a cool/shaded area, offered water, and reassessed every five minutes. If signs abate, then nothing more need be done.

A diagnosis of heat exhaustion is made when the panting is uncontrolled and rectal temperature is 106 to 108ºF. Dyspnea in the form of noise from the upper airway may be present. Most dogs in this category will be tachycardic with only fair or poor pulse quality. The dog may seem weak. Heat stroke in a MWD will generally show a rectal temperature of over 108ºF, which may be in excess of what the thermometer may be able to register. However, make the diagnosis based on clinical signs, and not temperature alone, as heat exhaustion/stroke can occur at lower body temperatures in some unacclimated dogs. Signs of heat stroke are those of exhaustion with the addition of weakness or collapse, obtunded mental status, muddy (dark) mucous membranes, vomiting, and shock.

The immediate treatment for these conditions is external cooling. Try to decrease stress on the dog with minimal restraint during examination and treatment. The goal is to bring the rectal temperature down to less than 103.5ºF and support hemodynamic stability. External cooling should be accomplished with circulation of air (fans, air-conditioned area), application of isopropyl alcohol to the foot pads/outer (concave) surface of the ears; and place-

ment of ice/cold packs in the axilla and groin. If such means are not immediately available, the dog can be soaked in flowing, cool (not cold) water, though this method is not as effective as those previously mentioned. Cooling should be continued until the temperature is ≤103ºF. Continuation of cooling below 103ºF may lead to hypothermia, so the temperature must be closely monitored. Pulse rate/quality and body temperature should be rechecked every five minutes until the dog maintains a temperature below 103ºF for 20 minutes. Ensure the collar and muzzle do not impede the dogs ability to pant. For the safety of the medical team and handler, the muzzle should generally be left on, though it should be loosened.

Fluid therapy should be added to the treatment regimen whenever heat exhaustion/stroke is diagnosed. Once cooling is started, place an IV catheter (18G, 2" in the cephalic or saphenous vein) and begin rapid administration of a crystalloid at room temperature. Rate of administration should be 20 to 30ml/kg (10 to 15ml/lb) over 10 to 15 minutes. The pulse must be monitored for rate/quality. If the pulse quality is not improved after this bolus, a second may be given.

Due to possibilities of gastrointestinal damage and cerebral edema in heat stroke cases, it is not unreasonable to administer 1gm of cefazolin and 30mg/kg methylprednisolone sodium succinate IV.

### Hemangiosarcoma rupture

Splenic hemangiosarcoma (HSA) is a relatively common neoplasia in German Shepherds.[13] This condition also occurs in other MWD breeds. Splenic HSA most often occurs in older dogs (eight to thirteen years of age).[13] Elderly dogs make up a smaller percentage of the MWD population, but they can still deploy if they are clinically healthy and can perform their job to standard. Dogs with splenic HSA can appear totally normal one minute, and hours later be near death due to rupture and hemorrhage of the tumor. The handler may indicate whether the dog has had episodes of weakness followed by normalcy which could be attributed to acute bleeding from the tumor followed by recovery. However, many times there is no previous abnormal history and the dog presents with varying severity of clinical signs ranging from weakness to shock to sudden death in rarer cases. Along with weakness or shock, tachycardia, panting, and abdominal distention are often seen in a dog with ruptured splenic HSA. If the abdomen is distended, ping it to rule out GDV. Hemoabdomen will not produce a resonant ping as gas does in a distended stomach.

Diagnosis is made through history, clinical signs, and physical exam, as well as imaging (see imaging section). If imaging modalities are not available, abdominocentesis with large-bore (16 to 18G, 2") IV catheter can be utilized. In lateral recumbency, infiltrate an area on the abdominal midline at the umbilicus (which is not particularly distinct in dogs) and is about midway between the xiphoid and groin (an inch or two cranial to the prepuce in male dogs), from skin to abdominal wall with a local anesthetic. Use a scalpel blade to make a shallow stab incision, being sure to guard the blade to the estimated distance to the abdominal cavity. Create extra fenestrations in the catheter as described for GDV trocharization and insert it through the body wall in one swift thrust. As with the scalpel blade, guard down on the catheter and stylet so it will just go through the body wall; being careful to prevent a puncture/laceration of the spleen or other viscera with the stylet. Once through, slide the catheter into the abdominal cavity.

Next, place an extension set on the catheter and attach a 35 to 60cc syringe. If able to withdraw blood or bloody fluid easily, the diagnosis of tumor rupture is almost certain, or the catheter has been inserted into either the spleen or major vessel. If no fluid can be withdrawn, the fenestrations may be occluded by omentum, or the amount of fluid in the abdomen is small. In such cases, place a drip set into a bag of crystalloid fluids, attach to the extension set, then run 500 to 1000ml into the abdomen. A minute or so after the fluid is in, attempt to aspirate it out with the syringe, or leave the bag attached and place it on the floor. Be sure to keep a good grasp of the catheter during this procedure to prevent it from slipping out of the abdomen. If blood-tinged fluid is recovered, it is likely rupture of a splenic tumor. Applying a "belly band" around the abdomen theoretically may prevent more blood from a ruptured tumor from accumulating. However, this could also increase resistance to excursion of the diaphragm leading to decreased ventilation. Other than supportive therapy, there is little the HCP can do, short of performing a splenectomy, which is the definitive treatment for this condition. Though dogs surviving splenectomy do very well after surgery, eventual decline and death due to metastatic disease tends to occur within months.[13] Though dogs with a diagnosis of splenic HSA have no future as a working dog, the determination of whether to euthanize the patient or perform splenectomy should lie with, and be performed by the supporting veterinarian.

### Envenomation

Through prior medical planning, the HCP will likely already know of potential venomous reptiles and/or arthropods which may be encountered. Antivenin on hand for human patients can be utilized in canine patients, but it may cause anaphylactic reactions and is

many times not required for successful treatment. Antivenin should be used with caution, but should be used when the species of snake is positively known, the specific antivenin for that species is available, and the dog's condition dictates.

A handler may or may not witness their dog being bitten or stung. If they did, they will likely bring this to the HCPs attention quickly. If not witnessed, the dog may present with clinical signs such as swelling, pain, bleeding, tissue necrosis and heat at the envenomation site, shock, vomiting and/or diarrhea, or neurologic abnormalities. In known or suspected bites/stings, be ready to place a catheter to provide cardiovascular support. Fluids can be given as described elsewhere, depending on the dog's physiologic status and fluid availability. If indicated, diphenhydramine (Benedryl®) can be given at a dose of 50mg IV. Broad-spectrum antibiotic such as cefazolin or amoxicillin-clavulanic acid should be given and routine wound care administered.

If antivenin is given, it is imperative the dog be observed for an anaphylactic reaction. Diphenhydramine administration prior to antivenin is suggested. If erythema of the ear edges is noted or the dog starts to rub its face, the MWD is probably reacting to the antivenin and administration should be stopped.[11]

Arthropod bites/stings are many times going to be unnoticed by the handler, unlike a snake bite. Acute swelling of an area without history of trauma could be due to an arthropod bite/sting and should be treated symptomatically. For both snake bites and complicated arthropod bites/stings, transfer the patient to a veterinary facility as soon as practicable.

### Ingestion of training aids and finds

To maintain detection proficiency, MWDs must be continuously trained on odor. This training is accomplished using training aids. These aids can be smaller amounts of the actual substance, and though extremely uncommon, MWDs may ingest these aids. Similarly, MWDs could also ingest substances they find on missions. In this article, we are only concerned about explosives, and not drugs, as support of SOF units by drug detection dogs will be very unlikely. However, if such occurs, treat the dog as you would a human patient who has ingested the particular drug.

There is little experience or scientific knowledge regarding explosives ingestion in dogs. Cyclonite, also known as RDX and used as the base in C-4, Semtex and other "plastic" explosives, was identified as causing the illness of at least two police dogs.[14,15]

General treatment for incidences of explosives ingestion is to cause emesis and provide supportive therapy while contacting the supporting veterinary unit for instructions. Cyclonite causes similar signs as strychnine poisoning and may require the use of anticonvulsants such as the benzodiazepines.[15] The handler should know when such ingestion occurs and present the MWD to the HCP quickly after it has happened.

### Analgesia, Anesthesia, and Chemical Restraint

All drugs of these categories commonly used by military medical personnel are also used in dogs to greater or lesser degrees. For moderate to severe pain from traumatic injury or other painful incident/condition, morphine and fentanyl can be used. The HCP should rarely face a situation where general anesthesia is required; however, ketamine/benzodiazepine cocktails or propofol can be used in the dog when needed. Such instances may be for emergency temporary gastrostomy (do not use propofol for this procedure due to its hypotensive properties) or when attempted sedation does not allow for procedures needed to save life, limb, or eyesight (never use ketamine in eye cases). Chemical restraint may be needed to perform catheter placement, required examinations in fractious patients, or orogastric tube placement.

Table 2 shows these drugs with dosage and routes. However, as in the human patient, clinical judgment must be made as to which drugs and amounts should be given under the circumstances encountered. If a particular drug would not be given in a certain human patient senario, do not give it to a canine patient in an analogous situation. Drugs should be given "to effect" ensuring any patient and their vital signs are monitored during administration.

### Monitoring methods

MWDs should be monitored during any period of heavy sedation/anesthesia and during treatment for emergent conditions. Vital signs can be assessed by standard, low-tech methods such as chest auscultation, manual assessment of the pulse of the femoral artery, mucous membrane color and CRT, skin tenting, rectal temperature, observation of mental state, character of respirations, response to painful stimuli, etc. If available, use of a pulse oximeter, especially one that can show an ECG, is recommended. Problems with using an oximeter/electrocardiograph made for human patients is that it is sometimes difficult to get reliable $SPO_2$ readings when the standard finger clip is used on anything other than the tongue of a dog, or when ECG pads are placed on shaved skin. However, adhesive ECG leads for human patients can be placed on the dog's footpads to obtain a tracing.[16]

### Diagnostic imaging

Some emergent conditions lend themselves to diagnosis with imaging methods that may be available in some units. Though GD/GDV can usually be determined without imaging, radiography will confirm the diagnosis in most cases when the HCP is unsure. If x-ray equipment is available, lay the dog on its right side and make an exposure on the biggest screen available. Center the beam just in front of the last rib. The HCP can use whatever technique with which they are comfortable. Almost any image made on the film will probably give the answer, so a perfect image is not needed. Get the picture and then get back to treating the patient.

Diagnosis of a splenic hemangiosarcoma rupture can be confirmed with application of an ultrasound probe. Though a large spleen with a nodule may actually be seen, it is recommended that if rupture of a splenic hemangiosarcoma is high on the rule out list, simply perform a focused assessment with sonography for trauma (FAST) scan and evaluate for free fluid in the abdomen. If suspicion is high and the scan is positive, the fluid is likely blood and indicates a tumor nodule has probably ruptured.

Radiography and sonography can be applied to the MWD for penetrating or blast trauma as they would be for the human patient.

Images courtesy of http://thehousehound.net/_wsn/page4.html

### Dog-Handler bond

It is reasonable to assume that a handler will develop a very strong bond with his dog. Though many officers and enlisted personnel bear responsibility for those that serve under them, the handler's role in the care and preservation of his/her dog is more personal, intimate and demanding. The handler has to do everything for the dog. He has to feed and water the dog, he takes it out to urinate and defecate, he cleans the dog's kennel, and he grooms and bathes the dog. He gives the dog its medications, he takes it to sick call, he provides recreation and exercise for the dog, and in deployed environments, sometimes keeps the dog in his quarters during rest. The dog's ability to perform its role is based almost solely on the training provided by that particular handler. The handler's requirement to do all these things for the dog places the handler in a role similar to that of a parent. Most handlers seem to enjoy being handlers and genuinely love their dogs. Dogs are the non-judgmental confidants of their handlers and they even tell their dogs things they would never tell another person. Dogs usually don't have mood swings and are generally upbeat regardless of what transpires throughout the day.

Though little scientific data exists, it is believable that illness, injury, or death of a MWD would bring considerable stress and sadness to the handler. As such, it would be prudent for medical providers to ensure handlers who have lost their dog, or whose dog is seriously ill or injured, be provided some type of mental health care or grief counseling.

Image courtesy of http://www.uswardogs.org/index.html

### Remote veterinary reachback and telemedicine

Anecdotal reports indicate that when local veterinary care or advice is unobtainable when needed, generally when theater communication methods fail, handlers have called their home station veterinary staff for guidance. If this is true, it is hopefully rare. However, the HCP may

wish to have the MWD handlers obtain good contact numbers of home station, or other veterinary offices as appropriate just in case.

### Veterinary use of drugs intended for humans

Almost all drugs used in the human patient can be used for similar indications in dogs, though dosages may be very different. An example is the common antibiotic cephalexin. A typical human dose is 500mg twice daily which, assuming the patient was 180 lb (82 kg), equals about 6mg/kg. A typical cephalexin dose in the dog is 20mg/kg two to three times daily. If you guessed that a 90 lb dog would need half that an adult male would, you would be underdosing the dog. Table 2 shows some drugs commonly used in the dog and the human. Doses and routes are based on use described in this article for the canine patient, with comparison for similar use in the human patient.

**Table 2. Drugs commonly used in the canine patient**

| Drug | Dog (MWD)[11,17] | Human (adult male)[18] |
|---|---|---|
| Epinephrine | 0.02mg/kg IV | 0.1mg IV, 0.3 to 0.5mg IM/SC |
| Diphenhydramine | 2mg/kg IM | 10 to 50mg IM/IV |
| Cefazolin | 20 to 30mg/kg IV Q8h | 250 to 2000mg IM/IV Q8h |
| Ceftriaxone | 25mg/kg IV Q8-12h | 1 to 2g IV Q12 to 24h |
| Cephalexin | 20 to 30mg/kg PO Q8 to 12h | 250 to 1000mg PO Q6h |
| Amoxicillin-clavulanic acid* | 13.75mg/kg PO Q12h | 875mg PO Q12h |
| Methylprednisolone sodium succinate | 30mg/kg IV | up to 30mg/kg IV |
| Morphine | 0.5 to 2.0mg/kg IM/SC Q3 to 4h | 5 to 20mg IM/SC Q3 to 4h |
| Diazapam (IV) / Midazolam (IM or IV) | 0.2 to 0.3mg/kg | 2 to 10mg / 5mg |
| Ketamine | 5 to 10mg/kg IV/IM | 1 to 2mg/kg IV, 3 to 8mg/kg IM |
| Fentanyl | 4 to 10µg/kg IV | 50 to 100µg IM |
| Propofol | 3 to 6mg/kg slow IV to effect, then 0.1 to 0.6mg/kg/min | 2 to 2.5mg/kg slow IV to effect, then 0.125 to 0.3mg/kg/min IV |

*Veterinary formulation of this compound is in a 2:1 ratio of amoxicillin to clavulanic acid regardless of strength; dosage is based on combined quantities of both drugs. Human use formulations have variable ratios of amoxicillin to clavulanic acid and are dosed on the amoxicillin component only.

### SOF medical staff training in garrison - Linking with local Army vets at home station

SOF medical personnel in units with organic MWDs, or working with attached MWDs, are urged to contact their unit VCO for training opportunities. Units without VCOs should contact the nearest Army veterinary facility to coordinate MWD care training. SFGA VCOs will come to Battalion/Group Surgeons and PAs for help. Be willing to assist your VCOs with caring for the MWDs.

### Retirement and adoption of MWDs

Until November 2000 when Public Law 106-446 (also known as the "Robby Law" for the MWD which spurred its passing) was signed by President Clinton, MWDs could not be adopted after it had been determined that they were no longer able to perform their mission. Since then, however, many MWDs have been able to live out the remainder of their natural lives as pets, usually adopted by dog handlers.

Due to the possibility of adoption, it is reasonable that veterinary and medical personnel attempt to save wounded/injured MWDs which would not be able to perform their mission subsequent to recovery (e.g. amputation, loss of eyesight, etc.).

### Veterinary emergency medical library

There are many available texts on the subject of veterinary emergency medicine. The below list is in no particular order, nor are any texts endorsed by the Department of Defense and U.S. Special Operations Command.

- Kirk and Bistner's (2006). *Handbook of Veterinary Procedures and Emergency Treatment*. Ford and Mazzaferro, 8th ed.
- MacIntire et al. (2004). *Manual of Small Animal Emergency and Critical Care Medicine*.
- Battaglia. *Small Animal Emergency and Critical Care*; new edition expected May 2007.
- Hackett and Mazzaferro (2006). *Veterinary Emergency Critical Care Procedures*.
- Mathews. (2006). *Veterinary Emergency and Critical Care Manual*, 2nd ed.
- Wingfield. (2000). *Veterinary Emergency Medicine Secrets*, 2nd ed.

### Summary

Military working dogs are valuable partners in the Global War on Terrorism. Veterinary care for these dogs may at times be difficult to obtain, or untimely in its procurement. SOF healthcare providers should have basic knowledge of emergency care principles and treatment in the canine patient so that they may intervene to preserve life, limb, and eyesight.

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