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Interventions Performed on Multipurpose Military Working Dogs in the Prehospital Combat Setting

A Comprehensive Case Series Report

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ABSTRACT

Introduction: The military working dog (MWD) has been essential in military operations such as Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). MWDs sustain traumatic injuries that require point of injury and en route clinical interventions. The objective of this study was to describe the injuries and treatment military working dogs received on the battlefield and report their final disposition. **Methods:** This was a convenience sample of 11 injury and treatment reports of US MWDs from February 2008 to December 2014. We obtained clinical data regarding battlefield treatment from the 160th Special Operations Aviation Regiment (SOAR) database and supplemental operational sources. A single individual collected the data and maintained the dataset. The data collected included mechanism of injury, clinical interventions, and outcomes. We reported findings as frequencies. **Results:** Of the 11 MWD casualties identified in this dataset, 10 reports had documented injuries secondary to trauma. Eighty percent of the cases sustained gunshot wounds. The hindlegs were the most common site of injury (50%); however, 80% sustained injuries at more than one anatomical location. Seventy percent of cases received at least one clinical intervention before arrival at their first treatment facility. The most common interventions included trauma dressing (30%), gauze (30%), chest seal (30%), and pain medication (30%). The survival rate was 50%. **Conclusion:** The majority of the MWD cases in this dataset sustained traumatic injuries, with gunshot being the most common mechanism of injury. Most MWDs received at least one clinical intervention. Fifty percent did not survive their traumatic injuries.

KEYWORDS: *military working dog; Operation Iraqi Freedom; Operation Enduring Freedom; combat training; combat veterinary care*

Introduction

The military working dog (MWD) has proved to be essential to military operations throughout history.[1-4] Historical evidence of the use of dogs during conflict dates back to the Persians, Greeks, Assyrians, Babylonians, Peloponnesian, and Corinthians.[4] There were an estimated 75,000 MWDs in World War I, with European countries running MWD training schools leading up to that conflict. Moving forward, the MWD was also deployed for the Korean and Vietnam conflicts and Gulf wars.[4] War is not the only time the MWD is used; they are also deployed for peacekeeping missions, used in the US Secret Service, the Central Intelligence Agency, and the US Department of Agriculture.[4] In the United States, the MWD has been used most recently in OIF and OEF.[5] At one point, there were an estimated 15,000 MWDs in the US Department of Defense inventory.[4]

These canines are trained to detect hidden enemies and explosives, and their presence on the battlefield can convince enemies to surrender.[3,4] The MWDs are a force multiplier in the military[3] and are equipped with better senses than their human counterparts. This is beneficial to Special Operations Forces (SOF) because they seek low-tech alternatives to improve their operational capabilities.[4] These animals are responsible for saving lives as they selflessly risk their own, loyally serving alongside their handler and unit. Miller et al.[5] reported that based on personal observations by one of their retired authors, the total number of deployed dogs may have been as high as 2,000 to 2,600 during OIF and OEF.

The MWDs encounter the same dangers on the battlefield as their human counterparts,[1,5,6] and as a result, they sustain traumatic injuries that require medical care—at point of injury, en route, and at a treatment facility. Baker et al.[6] evaluated gunshot wounds (GSWs) in MWDs and reported that five of seven MWDs in their study were critical and required lifesaving interventions. In this study, the survival rate from gunshot wounds was 33%. In addition, Giles et al.[1] mentioned that the injuries sustained by MWDs merited blood product administration similar to that in humans. To our knowledge, there are no studies simultaneously reporting multiple injury patterns, prehospital treatment, and outcomes to date. Also, there have been no reports on the treatment MWDs received secondary to explosion-related injuries or analgesia received. Miller et al.[5] reported that explosion or blast was the cause of death for 26.1% of the 92 MWDs included in their study. We seek to provide the first comprehensive case series reporting the multiple injury types sustained and the interventions rendered to MWDs in the prehospital combat setting. The objective of this study was to describe the injuries, prehospital clinical interventions, and outcomes of traumatically injured MWDs in the prehospital combat setting.

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Methods

This was a convenience sample of 11 injury and treatment reports of US- and ally-owned MWDs from February 2008 to December 2014. The canines in this dataset were specifically multipurpose canines (MPCs) and were typically used on raids with SOF. This was evaluated as a performance improvement project, and the University of Texas Institutional Review Board determined this to be nonregulated research. Clinical data from battlefield treatment were obtained through the 160th SOAR database and supplemental operational sources. A single individual collected the data and maintained the dataset. One animal was wounded in two separate scenarios and, thus, had two entries into the database.

Data collected included the mechanism of injury (GSWs, blast-related injuries, or nontraumatic [heat illness]); clinical interventions performed on the MWD, when these interventions were performed (point of injury [POI] or en route); and the clinical outcome. As with human combat casualties, animals were considered wounded in action (WIA) if they survived their wounds, killed in action (KIA) if they died before reaching a treatment facility, and died of wounds (DOW) if they arrived at a treatment facility but died before discharge. Interventions were grouped as airway interventions, chest interventions, hemorrhage control, vascular access, and analgesics (Table 1). In this study, resuscitation efforts and trauma dressings were grouped under "hemorrhage control."

TABLE 1 *Interventions Collected*

Intervention Category	Interventions
Airway management	Nasopharyngeal airway Cricothyroidotomy
Chest procedures	Chest needle decompression Chest seal application
Hemorrhage control	Oxyglobin Hextend Trauma dressing
Vascular access	Intravenous access Intraosseous access Intravenous fluids

Results

Eleven MWD reports were identified in this dataset, with 10 sustaining an injury secondary to trauma. One MWD was treated for dehydration/heat stress. Eighty percent of the MWDs sustained GSWs, 30% sustained blast-related injuries, and one MWD sustained both a single GSW and fragment wounds from an explosion. The hindlegs were the most common site of injury (50%) (Figure 1). One MWD was catastrophically wounded due to an explosion. Eight MWDs (80%) sustained injuries at more than one anatomical location. Additionally, one handler was injured along with his MWD and experienced two small fragment wounds to his right lower back from an explosion.

POI Care

Seventy percent of MWDs received at least one clinical intervention at the POI. Three dogs died within seconds to minutes of their injury from catastrophic, nonsurvivable wounds; therefore, no treatment could be administered. Of all POI interventions, hemorrhage control was the most common (47%), specifically trauma dressings (41%) (Table 2). Of the

FIGURE 1 *Anatomical Location of Injury*

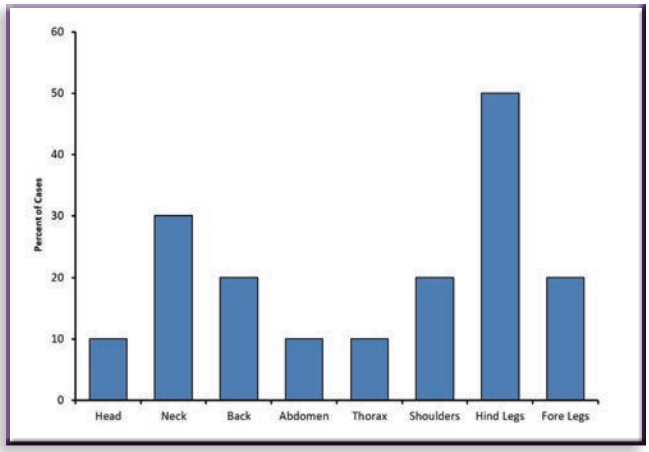

TABLE 2 *Prehospital Interventions*

	Point of Injury, % (n/N*)	En Route Care, % (n/N*)	Prehospital Setting, % (n/N*)
Airway interventions			
Nasopharyngeal airway	6 (1/17)	0 (0)	4 (1/24)
Cricothyroidotomy	6 (1/17)	14 (1/7)	8 (2/24)
Chest interventions			
Needle decompression	6 (1/17)	0 (0)	4 (1/24)
Chest seal	12 (2/17)	14 (1/7)	13 (3/24)
Hemorrhage control			
Oxyglobin	6 (1/17)	0 (0)	4 (1/24)
Hextend	0 (0)	29 (2/7)	8 (2/24)
Trauma dressing	41 (7/17)	14 (1/7)	33 (8/24)
Vascular access			
Intravenous access	6 (1/17)	0 (0)	4 (1/24)
Intraosseous access	0 (0)	14 (1/17)	4 (1/24)
Intravenous fluids	6(1/17)	0 (0)	4 (1/24)
Analgesics†	12 (2/17)	14 (1/7)	13 (3/24)

*Total number of interventions performed at a particular stage of care
†Analgesics included morphine and hydromorphone.

MWDs that received trauma dressings, 50% received multiple applications. Two MWDs were administered analgesic agents, to include morphine and hydromorphone. Additionally, one MWD received CPR at the point of injury.

En Route Care

Fifty percent of MWDs received at least one clinical intervention en route. Hemorrhage control was the most common en route lifesaving intervention performed (43%), with the administration of Hextend® given to 29% of MWDs (Table 2). Additional interventions included the completion of a Tactical Combat Casualty Care (TCCC) card, administration of analgesic agents, hypothermia prevention, and the administration of CPR, which was a continuation of CPR received at POI in the single MWD.

Provider Type

Ground medics provided the majority of medical care (71%). Of the MWDs that received point of injury care, 71% received care from the ground medic, 29% received care from the ground force surgeon or physician assistant, and 14% received care from the handler. Of the MWDs that received en route care, 80% received care from the flight medic, and 20%

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received care from the handler. Fifty-percent of MWDs did not receive care en route, of which two did not receive interventions en route, and three were KIA.

Blast-Related Injuries

Thirty percent of the MWDs sustained a blast-related injury. One of the MWDs experienced a catastrophic injury and therefore no interventions could be performed. The two subsequent MWDs sustained fragment wounds secondary to the blast and were treated similarly to those that sustained other traumatic mechanism of injury (MOI) types. The two MWDs treated for blast-related MOI received placement of combat gauze and a chest seal at POI and pain medications as well as hypothermia prevention en route. The survival rate for the blast-related MOI was 66%.

Prehospital Care

Overall, 70% of MWDs received at least one clinical intervention in the field, with 60% receiving more than one intervention and 30% receiving more than three interventions. Of those casualties who received more than three interventions, only one survived. Hemorrhage control was the most commonly performed intervention in the prehospital setting, accounting for 46% of the total number of interventions given. Of all prehospital hemorrhage interventions, trauma dressing placement was the most common, accounting for 73% of the total hemorrhage interventions.

Of the 10 MWD trauma casualties, one dog returned to duty and was KIA in a subsequent deployment. Five MWDs survived their injuries and five died (50% survival rate). Those with an MOI of GSW had a 37.5% survival rate. One MWD survived to a Role 3 treatment facility but was humanely euthanized after evaluation, due to the severity of the animal's wounds.

Discussion

This is the first case series report to provide comprehensive documentation regarding the multiple injury types, associated prehospital medical care, and provider types performing the care while differentiating the time of care—POI or en route—for MWD injuries. This case series demonstrated the role human providers play in veterinary care in the combat environment. Combat injuries to MWDs are associated with a high lethality rate, and GSWs were the most common wounding agent. Our case series is the first to discuss prehospital interventions performed on MWDs sustaining blast- or explosion-related MOI. The most frequent anatomical location of injury was the lower extremities. This may be due to the location of improvised explosive devices (IEDs) because they are often on or near the ground. The prehospital interventions performed on MWDs with blast-related injuries were similar to those performed on MWDs with a GSW. This could be due to the limited resources available and similarity of injury. Baker et al.[6] demonstrated a 38% survival rate for MWDs that sustained a GSW. Additionally, Miller et al.[5] demonstrated a 31.5% fatality rate for MWDs that sustained a GSW. Our mortality rate of 37.5% for MWDs sustaining a GSW is congruent with what has been previously reported. The increased mortality rate for GSWs reported in our study compared with Miller et al.[5] is most likely due to the short ranges and high-velocity military weapons involved in this dataset. These findings are likely because of the weapons used in the combat setting and the fact that MWDs are not outfitted with protective armor because of issues regulating their body temperature in the desert environments. As technology develops, a lightweight flexible armor may prove useful.

Our case series study is the first to discuss the provider type performing interventions on injured MWDs at POI and while en route to the first medical treatment facility. Our cases demonstrate that the handler is not always the provider administering care to the canine and that veterinary staff were not present at POI or en route for any of our cases. Although it is likely that the handler would assist with medical care for the canine as well, it may not have been documented in the after-action reports. Additionally, in the en route care phase, casualties are often evacuated via CASEVAC by themselves and, in this situation, the handler may have been required to stay on the mission. The MWDs in our study received care by nonveterinary providers of varying skill levels, who train mainly for human casualties and place less emphasis on canine injuries. This may result in less than optimal care when treating a canine casualty.

There is currently no information available on what kind of pain management is provided to MWDs at POI or en route to a higher level of care in the combat setting. Lagutchik et al.[7] discusses the sedation protocols for a MWD for different scenarios in a controlled environment but does not offer any suggestions for the traumatically injured MWD at the POI in a combat setting, where the presence of veterinary staff is also highly unlikely. Only 30% of the MWDs in our data received some kind of pain management at POI or en route to definitive care. This raises concerns as to the type of efforts conducted in addressing pain immediately on injury or en route. A combat medic is trained in the doses of morphine or ketamine to give a human casualty but may be more hesitant to treat a MWD in fear of providing the incorrect dosage. Additionally, canines show different signs and symptoms when in pain,[7] making it more likely for someone who is unfamiliar with their behavior to miss the need to treat pain. This raises another important point—to support the need to train those deployed with units with assigned MWDs on how to treat MWDs should the situation arise.

One unique concern that has arisen in regard to MWDs is the topic of euthanasia and where that fits into the well-defined categories of KIA or DOW. KIA means that the patient has died before reaching surgical care, and DOW means that the patient has died after reaching surgical care. At times when injuries are so severe, euthanasia is deemed necessary after reaching surgical care. It may be best to come up with the separate, distinctive MWD category of "euthanized" to maintain accuracy in the records.

The Joint Trauma System has an MWD Clinical Practice Guideline[7] to provide guidance and assistance for providers caring for MWDs. The MWD dataset described here was part of the SOF units, and during their training events, these units are expected to practice treating wounded MWDs. At the very least, training on the basic medical treatment of traumatically injured canines should be required of human providers who may be assigned (or in close proximity) to units with an MWD while deployed. For the cases in our study, veterinary care was available at the combat support hospitals overseas, and the wounded animals were evacuated to those hospitals as appropriate.

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Last, there are not many publications on the treatment and injury patterns of MWDs. There is no centralized database to keep track of canine casualties, like the Joint Theater Trauma Registry used for human casualties. A need exists to create an MWD trauma registry, which would provide a more comprehensive picture of the treatment rendered to the MWD, as well as enable the development of prudent training and treatment programs to improve injury prevention and outcomes of MWDs . Time to treatment was not available in our dataset and will offer value in a future registry. The September 2018 published MWD clinical practice guideline now recommends completion and submission of a Canine Tactical Combat Casualty Card.[8] This new recommendation will provide the necessary documentation to establish an MWD registry. As our prehospital casualty databases grow and mature, the true number of canine casualties, and their treatment, will be evident. The authors estimate that the mortality rates of MWDs will continue to be greater than those of human Soldiers; therefore, more resources should be used to provide a complete picture of their care, similar to the information available for human casualties.

Study Limitations

The limitations for this case series include that data were collected through nonconventional methods in the form of after-action reviews. In addition, the first-hand account of one of the authors was included in the data collection process. Personal experience and recollection are subject to recall and information bias, although documentation was completed to the best abilities of the clinician. Only 10 trauma cases provide a limited amount of data to evaluate for trends and to inform of future injury prevention or care. Also, the data in this case series are data from Special Operations units and may not be generalizable to other forces.

Conclusion

The MOI for the cases in our study included GSWs, blast injury, and heat illness. Our study found that the majority of the cases sustained GSWs and received at least one intervention in the prehospital setting. There was a 50% overall survival rate. The most commonly performed interventions involved those done for hemorrhage control. The least frequently performed interventions were airway interventions, the administration of analgesics, and the completion of the TCCC Card.

Further, MWDs should be included in prehospital combat injury datasets because they represent a valuable asset to our forces, and the development of lightweight, flexible armor for MWDs should be considered. In addition, human medical providers tasked to units with MWDs should have mandatory basic training on trauma care for canines.

Disclosure

The authors have no conflict of interest and have indicated they have no financial relationships relevant to this article to disclose.

Author Contributions

TTR conceived the study concept and collected data. LKR and AGM analyzed the data. All authors interpreted the data. AF provided subject matter expertise, feedback, and recommendations for reporting data. LKR wrote the first draft, and all authors read, edited, and approved the final manuscript.

References

1. Giles JT. Role of human health care providers and medical treatment facilities in military working dog care and accessibility difficulties with military working dog blood products. *Veterinary Care* 2016; April-September:157–160.
2. Baker JL, Truesdale CA, Schlanser JR. Overview of combat trauma in military working dogs in Iraq and Afghanistan. *Journal of Special Operations Medicine* 2009;9(2):105-108.
3. The K-9-Tactical Emergency Casualty Care Working Group. Operational K9 Tactical Emergency Casualty Care (K9-TECC) Training and K9 Individual First Aid Kits (K9-IFAK) White Paper 2015. http://www.specialoperationsmedicine.org/Documents/K9%20Documents/Operational%20K9%20TECC%20%20IFAK%20White%20Paper-Final%20dated%2029%20Sep%202015.pdf Accessed 02/01/2019
4. Whelan JF. Countering enemy special purpose forces. an evolving mission for United States Special Operations Forces; monograph 2001. Defense Technical Information Center. https://apps.dtic.mil/dtic/tr/fulltext/u2/a390475.pdf Accessed 02/01/2019.
5. Miller L, Pacheco GJ, Janak J, et al. Causes of death in military working dogs during Operation Iraqi Freedom and Operation Enduring Freedom, 2001-2013 [published online ahead of print Mar 14, 2018]. *Mil Med*. doi: 10.1093/milmed/usx235..
6. Baker J, Havas K, Miller L, et al. Gunshot wounds in military working dogs in Operation Enduring Freedom and Operation Iraqi Freedom: 29 cases (2003-2009). *J Vet Emerg Crit Care* 2013; 23(1): 47–52.
7. Lagutchik M, Baker J, Balser J, et al. Trauma management of military working dogs. *Mil Med*. 2018;183(2):180-189.
8. Joint Trauma System: JTS Clinical Practice Guidelines. Military working dog clinical practice guideline. http://www.usaisr.amedd.army.mil/cpgs.html. Accessed September 27, 2018.

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