

JOINT TRAUMA SYSTEM K9 CLINICAL PRACTICE GUIDELINE



Acute Abdomen (K9 CPG: 7)

This CPG provides guidance on diagnosis and treatment of an acute abdomen in Military Working Dogs (MWDs) - including abdominal trauma and gastrointestinal emergencies.

CONTRIBUTORS

LTC Crystal Doyle, VC, USA
LTC Thomas Albrecht, VC, USAR

Previous contributors: LTC (Ret) Michael Lagutchik, VC, USA; LTC Janice Baker, VC, USAR; MAJ Jamie Brown, VC, USA; COL (Ret) Walter Burghardt, BSC, USAF; LTC(P) Matthew Enroth, VC, USA; LTC Shannon Flournoy, VC, USA; LTC (Ret) James Giles, III, VC, USA; MAJ Patrick Grimm, VC, USA; LTC Jennifer Hiniker, VC, USA; COL Jacob Johnson, VC, USAR; COL (Ret) Kelly Mann, VC, USA; MAJ (Ret) Eric Storey, VC, USAR; LTC Matt Takara, VC, USA; MAJ (Ret) Todd Thomas, VC, USA; LT Cory Frappier, MC, USN

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SUMMARY OF CHANGES

1. Revision to updated format.
2. Combination of previous “Abdominal Trauma” and “Gastrointestinal Emergencies” K9 CPGs.
3. Updated abdominal trauma and gastric dilatation-volvulus (GDV) clinical management algorithms.
4. Added specific suture recommendations for abdominal wall closure.
5. Addition of diagnosis and treatment recommendations for foreign body ingestion.
6. Added Performance Improvement (PI) Monitoring and Class VIII Medical Materiel list.

BACKGROUND

Acute abdominal trauma, pain and gastrointestinal distress require prompt evaluation and immediate intervention to determine if the MWD requires medical or surgical management. Acute abdominal pain can arise from:

- Gastrointestinal tract
- Abdominal organs
- Nerves, muscle, fascia and skin associated with the abdominal wall
- Pain referred from extra-abdominal sites

This CPG will discuss diagnosis and treatment of abdominal trauma and gastrointestinal emergencies.

The usual organs injured with blunt abdominal trauma are spleen, liver and urinary bladder (in this order). Splenic and hepatic injuries are usually fractures of the organ and are typically the cause of hemoperitoneum in MWDs that have sustained blunt abdominal trauma.¹⁻⁷ For MWDs that survive until admission, conservative medical management is often indicated. Surgical intervention may be needed for those that do not respond to resuscitation or deteriorate.

For MWDs with penetrating abdominal trauma, urgent exploratory surgery is generally recommended.

Some gastrointestinal emergencies will require emergency exploratory surgery such as GDV. Gastric dilatation-volvulus is a multifactorial, rapidly progressing, life-threatening surgical emergency common in large-breed dogs, to include MWDs.¹ In GDV, the stomach rapidly dilates (gastric dilation) with fluid, food, and air, and then rotates along the long axis (volvulus). When volvulus develops, the esophagus and duodenum become twisted, preventing passage of stomach contents. The amount of air, food, and fluid that accumulates is dramatic and progressively worsens – typically over 30 minutes to 4 hours – and causes shock by interfering with venous return from the abdomen and pelvic limbs. Death in cases of GDV in the short-term is due to shock. Death in the long-term is due to gastric wall necrosis and rupture with secondary sepsis, disseminated intravascular coagulation (DIC), or cardiac arrhythmias.⁸⁻⁹

Most MWDs have prophylactic gastropexy to create a surgical adhesion between the stomach and inner abdominal wall to prevent gastric volvulus. Gastric dilatation can still occur and must be differentiated from volvulus at presentation as initial symptoms can be identical. In rare cases, a gastropexy can fail and GDV must be considered in MWDs with typical signs.

Mesenteric volvulus is a rapidly progressive and often fatal condition in which intestinal rotation develops around the root of the mesentery. Although rare, this does occur in MWDs, and rapid recognition is necessary to afford a chance at survival.¹⁰

MWDs that ingest foreign bodies need careful consideration to determine whether medical, endoscopic or surgical intervention is required. The indiscriminate eating habits of some MWDs can lead to a variety of ingestion with possible obstruction. Linear foreign bodies are of particular concern and are typically surgical emergencies due to the risk of gastrointestinal laceration and septic peritonitis.

HISTORY AND PHYSICAL EXAM

Obtain a thorough history and annotate any trauma, access to foreign material, and gastrointestinal signs.

Clinical signs and physical exam findings associated with acute abdominal pain may include:

- Restlessness, anxiety (often seen as pacing or unable to get comfortable with lying down).
- Guarding/splinting of the abdomen (abdominal rigidity) or sensitivity to palpation. Some gastrointestinal foreign bodies can be identified with abdominal palpation.
- An arched back or “prayer position.”
- Abdominal distension. This may be significant (such as with GDV) or mild.
- Gastrointestinal signs include vomiting, diarrhea, hypersalivation, retching or anorexia. Some conditions such as foreign bodies or colonic torsion can cause straining while defecating or only producing a small amount of feces.
 - Gastric dilatation-volvulus may cause nonproductive retching or retching a small amount of saliva.
 - Mesenteric volvulus may present with peracute to acute onset of vomiting and/or hemorrhagic diarrhea with or without tenesmus.
 - Differentiation of a foreign body from other gastrointestinal disorders (e.g., acute hemorrhagic diarrhea syndrome) normally requires imaging.
- Visible bruises or wounds on the abdominal wall.
- Poor perfusion parameters such as pale mucous membranes, prolonged capillary refill time and poor pulse quality.
 - Conditions that affect venous return (such as GDV and mesenteric volvulus) can cause rapidly progressive deterioration in clinical presentation.

- Tachypnea and/or tachycardia which may indicate compensatory shock.

When visible abdominal trauma is present, wounds involving more than the skin and superficial tissues dictate detailed examination to determine if the body wall was penetrated.

DIAGNOSIS

ABDOMINAL FOCUSED ASSESSMENT WITH SONOGRAPHY FOR TRAUMA

An Abdominal Focused Assessment with Sonography or Trauma (AFAST) exam should be considered with all MWDs presenting with clinical signs of an acute abdomen, especially in cases where blunt abdominal trauma is suspected. AFAST is extremely reliable in detecting free fluid within the abdominal cavity and can be rapidly performed during resuscitation.

Examine four quadrants (see Figure 1) – diaphragmatico-hepatic (DH) view, hepato-renal (HR) view, spleno-renal (SR) view and cysto-colic (CC) view, while moving the probe in cranial-caudal and medial-lateral planes (see [Diagnostic Imaging K9 CPG](#)).

Assign an abdominal fluid score, with one point for each quadrant with free fluid.

- No fluid = 0
- Fluid in all four quadrants = 4

Perform serial AFAST exams every 4 – 6 hours. Higher scores correlate with greater need for transfusion and/or surgery. Military Working Dogs with increasing scores should be monitored closely and prepared for urgent evacuation or surgery as exploratory surgery may be necessary for MWDs with scores of 3 or 4 or with clinical deterioration.

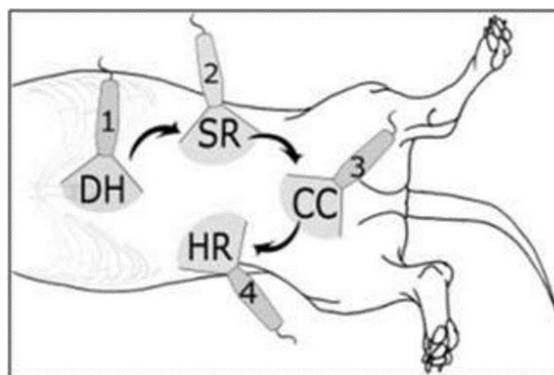


Figure 1. Four quadrants for AFAST exam.

ABDOMINOCENTESIS

If fluid is identified, perform abdominocentesis of the identified quadrant. If ultrasound is not available, perform a four-quadrant abdominocentesis.¹¹ This technique usually differentiates abdominal hemorrhage, biliary or urinary tract injury. The general rule is that a positive peritoneal tap is a reliable indicator that some hemorrhage has occurred (blood) or that free urine (clear or yellowish fluid) or bile is in the abdominal cavity, but a negative tap does not rule these out.

1. Place MWD in lateral recumbency. Clip hair and prepare for aseptic procedure.
2. Divide the abdomen into four quadrants. Tap each sequentially, unless a positive yield is obtained. Perform abdominocentesis on the “down” quadrants, rolling the MWD over for the opposite quadrants.
3. Use a large bore needle (18 or 20 gauge), insert perpendicular to the body wall approximately 2 inches off the midline in each quadrant. A large bore over-the-needle catheter can also be used. Aseptic fenestration of the catheter can increase the likelihood for higher yield as the fenestrations are less likely to occlude.

4. Collect sample by gravity drip or slight suction with a 3-cc syringe. Save in serum tube and EDTA tube.
5. Analyze fluid.

Abdominal Fluid Analysis

Assess cytology for identification of degenerate neutrophils, intracellular bacteria, or fecal/food material that would suggest gastrointestinal rupture and contamination.

Abdominal fluid glucose and lactate can be compared to serum levels to help differentiate possible septic peritonitis in the absence of cytological evidence.

- Increased abdominal fluid lactate > 2.5mmol/L or abdominal fluid to peripheral blood lactate difference of > 2mmol/L strongly suggests septic peritonitis.^{12,13}
- Abdominal fluid glucose concentration that is > 20mg/dL lower than peripheral blood glucose concentration strongly suggests septic peritonitis.^{12,13}

Hematocrit and total protein concentration are compared to peripheral blood sample (collected simultaneously). If the abdominal sample values are similar to the peripheral blood sample values, significant hemorrhage into the abdomen is probable and surgical intervention may be necessary, depending on clinical signs and MWD stability. If abdominal fluid values are significantly lower, minor hemorrhage is more likely and a more conservative approach is recommended. Presence of bilirubin suggests gall bladder injury, although it may not be present or several days after trauma.¹¹

Amylase or lipase with values higher than systemic circulation suggests pancreatic trauma.

A ratio of 1.4:1 in comparing abdominal fluid potassium with peripheral blood potassium concentrations has 100% sensitivity and specificity for uroperitoneum.¹⁴ Comparison of abdominal fluid creatinine to peripheral blood creatinine concentrations shows 86% sensitivity and 100 % specificity for ratios >2:1 for uroperitoneum.¹⁴

ADDITIONAL IMAGING MODALITIES

Radiographs

For GDV, confirmation can be obtained with a single right lateral radiograph. Marked gastric dilation will be present, with the pylorus malpositioned dorsal to the fundus (a “Popeye arm” or “double bubble” appearance because of compartmentalization). See Figure 2. If there is high suspicion for GDV and radiology is available, this should be performed prior to any AFAST exam or abdominocentesis.

Radiographs can also be helpful for diagnosis of mesenteric volvulus. Extreme gas distension of most of the small and large bowels will be noted (see Figure 3).

Gastrointestinal foreign bodies can be identified with radiographs if the material is radiopaque or if the gastrointestinal tract has typical characteristics for small intestinal mechanical obstruction. The radiographic features depend on the completeness of the obstruction, the location of the obstruction, and the duration of the obstruction.¹⁵ Distension is usually indicated by greater than 50% difference in diameter between the normal and distended bowel. If the distended small intestinal loop is greater than 1.6 times the height of the L5 vertebral body, the more reliable the diagnosis of intestinal obstruction.¹⁵⁻¹⁷ This is not 100% accurate, and the overall clinical picture of the MWD, along with response to therapy must be considered to determine if surgical intervention is required. Linear foreign bodies will typically display plication and bunching of the small intestines.

DO NOT perform a barium study to try to identify a gastrointestinal foreign body, as the risk of barium peritonitis is high if there is a partial or full perforation of the gastrointestinal tract or if surgery is indicated.

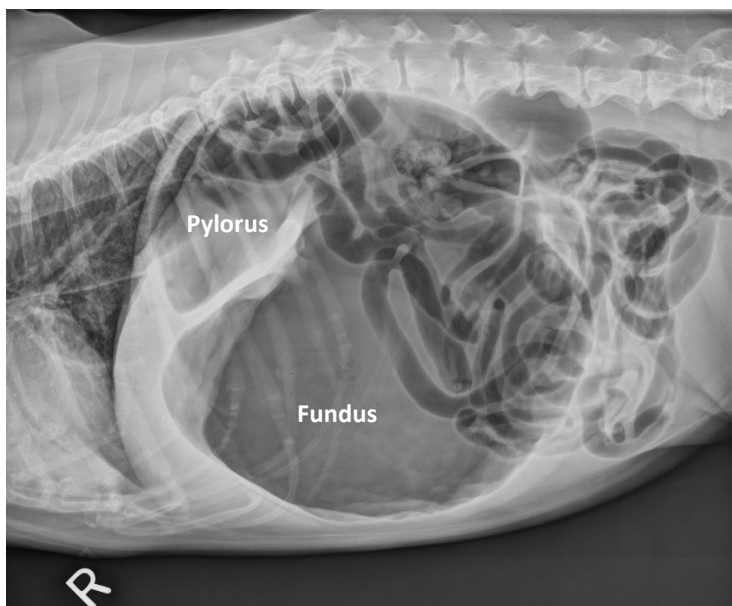


Figure 2. Right lateral radiograph of a dog with GDV.

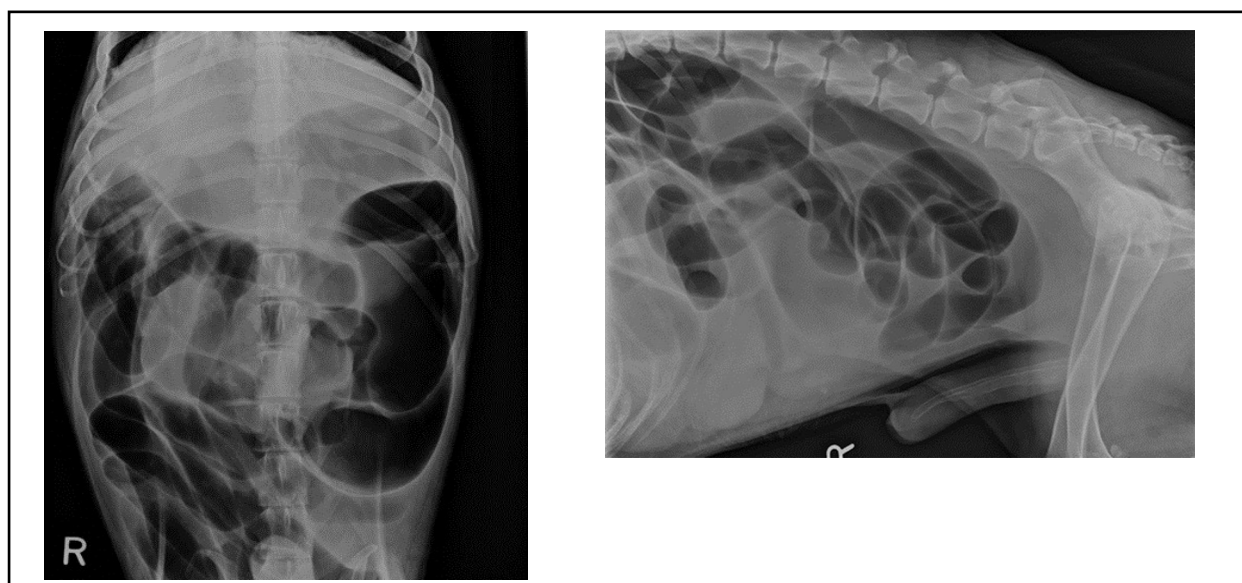


Figure 3. Lateral and ventrodorsal abdominal radiographs of a MWD with mesenteric volvulus.

Ultrasound

Comprehensive abdominal ultrasound can be used to identify individual abdominal organs for the underlying cause of an acute abdomen (e.g., ruptured gallbladder, small intestinal foreign body, liver abscess). Pathologies of the retroperitoneal space can also be determined. Interventional ultrasound techniques (such as fine needle aspiration) can provide definitive diagnosis.

Advanced Imaging

Computed tomography (CT), when available, (see [Diagnostic Imaging K9 CPG](#)) can be performed to confirm suspicion of major internal organ injury to aid in surgical planning when a penetrating abdominal injury is present.

TREATMENT

Based on physical examination and initial diagnostic results, MWDs may require treatment for shock (see [Shock Management K9 CPG](#)) and pain management (see [Analgesia and Anesthesia K9 CPG](#)).

For MWDs that have non-penetrating wounds, these should be treated (see [Wound Management K9 CPG](#)).

For MWDs that have an indication for surgery, they should be stabilized as much as possible and urgently evacuated to a veterinary facility for definitive repair.

ANTIBIOTIC THERAPY

Broad spectrum antibiotic therapy is indicated for MWDs requiring surgical intervention due to gastrointestinal compromise or penetrating abdominal injuries. Options for initial use in MWDs are shown in Table 1.

Table 1. Antibiotic selection and dosing for MWDs.

ANTIBIOTIC SELECTION AND DOSING FOR MWDs			
ANTIBIOTIC	DOSE FOR MWD	ROUTE	FREQUENCY
Amoxicillin-Clavulanic Acid	13.75mg/kg	PO	q 12h
Ampicillin Sulbactam	20 – 30mg/kg	IV	q 8h
Cefazolin	20 – 30mg/kg	IV	q 8h
Cefotaxime	22mg/kg	IV	q 8h
Ceftriaxone	25mg/kg	IV	q 8 – 12h
Cephalexin	20 – 30mg/kg	PO	q 12h

ABDOMINAL TRAUMA

Emergency exploratory laparotomy is indicated in the following MWDs with abdominal trauma:

- For MWDs with massive intra-abdominal bleeding, to identify and surgically correct the source of hemorrhage.
- Severe uroabdomen to define the extent of injury and correct the problem.
- Ruptured abdominal viscus to identify the specific injury and allow primary repair.
- Evidence of penetrating abdominal trauma.

For MWDs with evidence of hemoperitoneum, it is not advised to place an abdominal pressure bandage due to the difficulty in maintaining the bandage and the risk of respiratory compromise. Focus on resuscitation efforts.

Urinary tract trauma may not be apparent for several days after trauma. Stabilize the MWD and maintain an index of suspicion. Special imaging studies may be needed to rule out urologic trauma (see [Diagnostic Imaging K9 CPG](#)).

For MWDs with known urologic tears and urine leakage, immediately place a urinary catheter and drain the abdominal cavity via abdominocentesis. Stabilizing the MWD and maintaining with these procedures can be done for a couple of days until evacuation is available or surgery is performed. Fluid therapy to correct or prevent electrolyte and acid-base imbalances is often necessary, especially if several days have passed since traumatic injury. Surgical repair should only be performed after the MWD is stabilized. An algorithm is provided in Figure 4 that outlines clinical management of abdominal trauma in MWDs. This can be used for MWDs that present with a history of trauma and with abdominal rigidity or sensitivity to palpation, increasing abdominal size over time, visible bruising of the abdominal wall, wounds involving the abdominal wall, or failure to respond to or deterioration in face of aggressive trauma resuscitation.

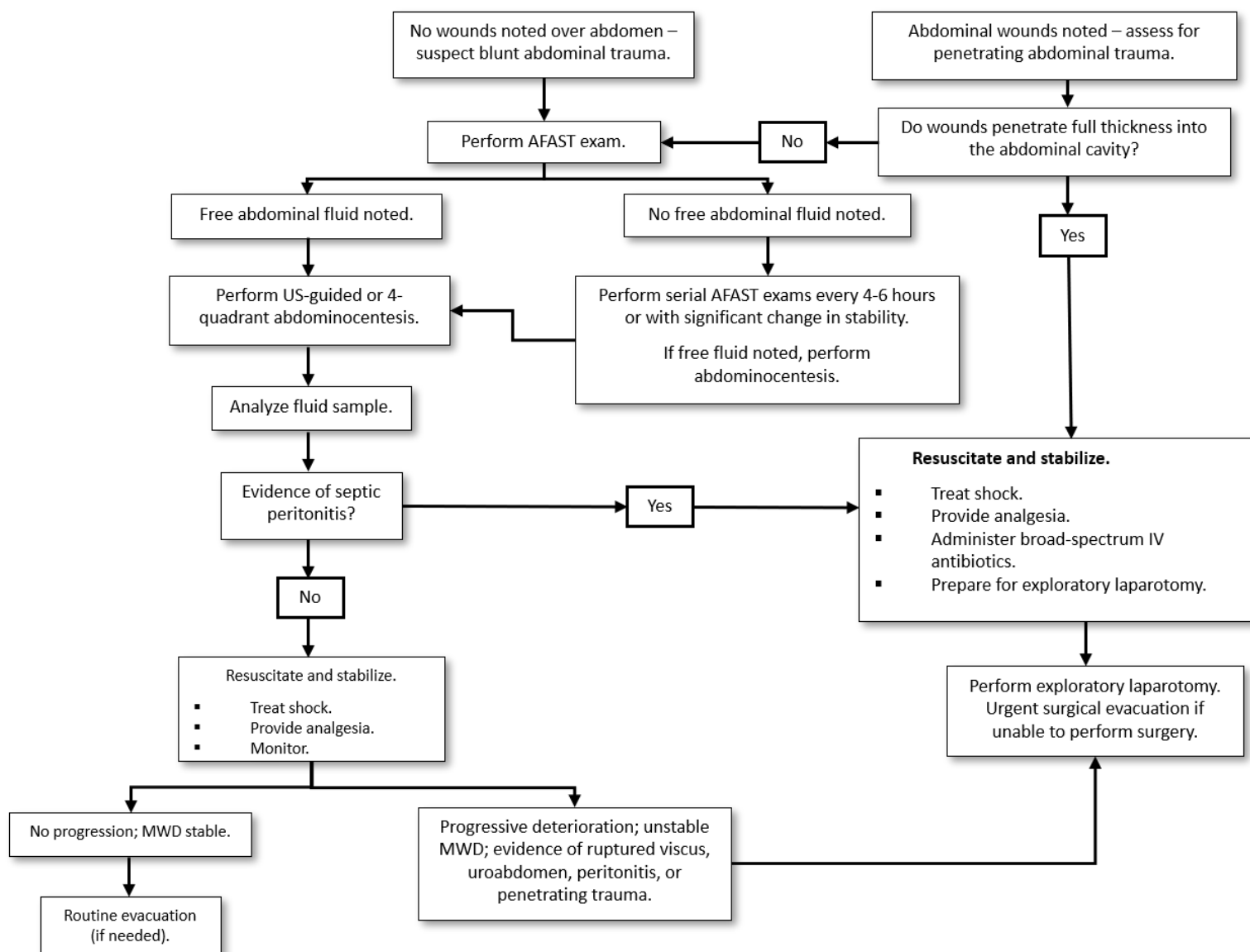


Figure 4. Clinical management algorithm for MWDs with abdominal trauma.

GASTROINTESTINAL FOREIGN BODIES

When a foreign body is highly suspected, a veterinarian must be consulted if not already providing primary care to the MWD. They will provide guidance to determine if induction of vomiting is appropriate or if medical or surgical management will be required.

Consider evacuating the MWD to a facility that can monitor progress and provide surgery if it becomes indicated. Monitoring and returning to duty (RTD) with medical treatment from higher roles of care is a preferred option instead of monitoring at a facility that cannot address emergent surgical needs if the MWDs status declines.

If the ingested item is small, smooth and non-toxic/non-corrosive, the MWD may be able to receive medical management (gastrointestinal support, IV fluids and pain control) to allow the material to pass. Medical management has been shown to be successful in approximately 50% of cases.¹⁸ Induction of vomiting may be considered for non-digestible gastric foreign bodies that are not caustic, acidic, or sharp.^{19, 20} Consider the MWDs' mentation, co-morbidities, amount of material ingested and time since ingestion.^{19, 20} Inducing emesis could result in aspiration of the foreign body, lodging of the foreign body in the esophagus, vasovagal events, aspiration pneumonia, esophagitis with associated stricture and plication of the small intestines in MWDs that have ingested linear foreign bodies.²¹ See [Training Aid Toxicoses K9 CPG](#) for specific instructions and medication doses used for induction of emesis.

Some ingested items are appropriate to consider retrieval via endoscopy if they remain within the stomach and induction of emesis was not indicated or was not successful. If endoscopy is not available, or the item is unable to be retrieved via endoscopy, surgical intervention via a gastrotomy is indicated.

Linear foreign bodies are very unlikely to resolve with medical management and will almost always require an emergent exploratory laparotomy.

GASTRIC DILATATION-VOLVULUS

A management algorithm is provided in Figure 5.

After initiating resuscitation for shock, attempts must be made to decompress the stomach by percutaneous trocarisation.

1. Determine the location of the most distended portion of the stomach within the right or left abdominal flank region (i.e., area immediately caudal to the last rib). If no area appears grossly distended, or both sides appear equally distended, then percuss each side to identify the area with the greatest tympany (loudest "ping"). This identifies where the gas-filled stomach is closest to the body wall. Then place the MWD in lateral recumbency with the side with the greatest tympany facing up.
2. Clip the hair over the area with greatest tympany (6 x 6 inches) and aseptically prepare the area with surgical scrub. If clippers are not available, clean the area with 70% isopropyl alcohol or other medical-grade skin antiseptic agent.

3. Insert a 10–14-gauge trocar or a 14–18 gauge IV over-the-needle catheter through the skin, abdominal wall and stomach wall, ensuring that length of the trocar or catheter is approximately 3". Seat the catheter fully into the gastric lumen by sliding the catheter off the stylet into the stomach until the catheter hub is flush with the body wall. Removal of the stylet mitigates causing trauma to the stomach and other internal organs. While maintaining positive control of the catheter hub against the body wall, compress both sides of the abdomen together; this facilitates keeping the catheter inside the gastric lumen as the stomach deflates, and it forces gas to escape.

NOTE: If no air or gas is coming from the catheter or trocar, attempt the procedure one more time. If still unsuccessful, do not attempt again. Emergent surgery is indicated if trocarisation is not possible.

4. Once the majority of the air is evacuated, remove the trocar/catheter.
5. If the procedure was successful, but clinical signs return prior to surgical correction, repeat the procedure.

Monitor for the most common complications seen in MWDs with GDV, to include ventricular arrhythmia, persistent shock, recurrent gastric dilation, nausea and vomiting, ileus, electrolyte abnormalities (especially potassium), and metabolic acidosis. Multi-organ failure may develop, depending on the degree and duration of shock.

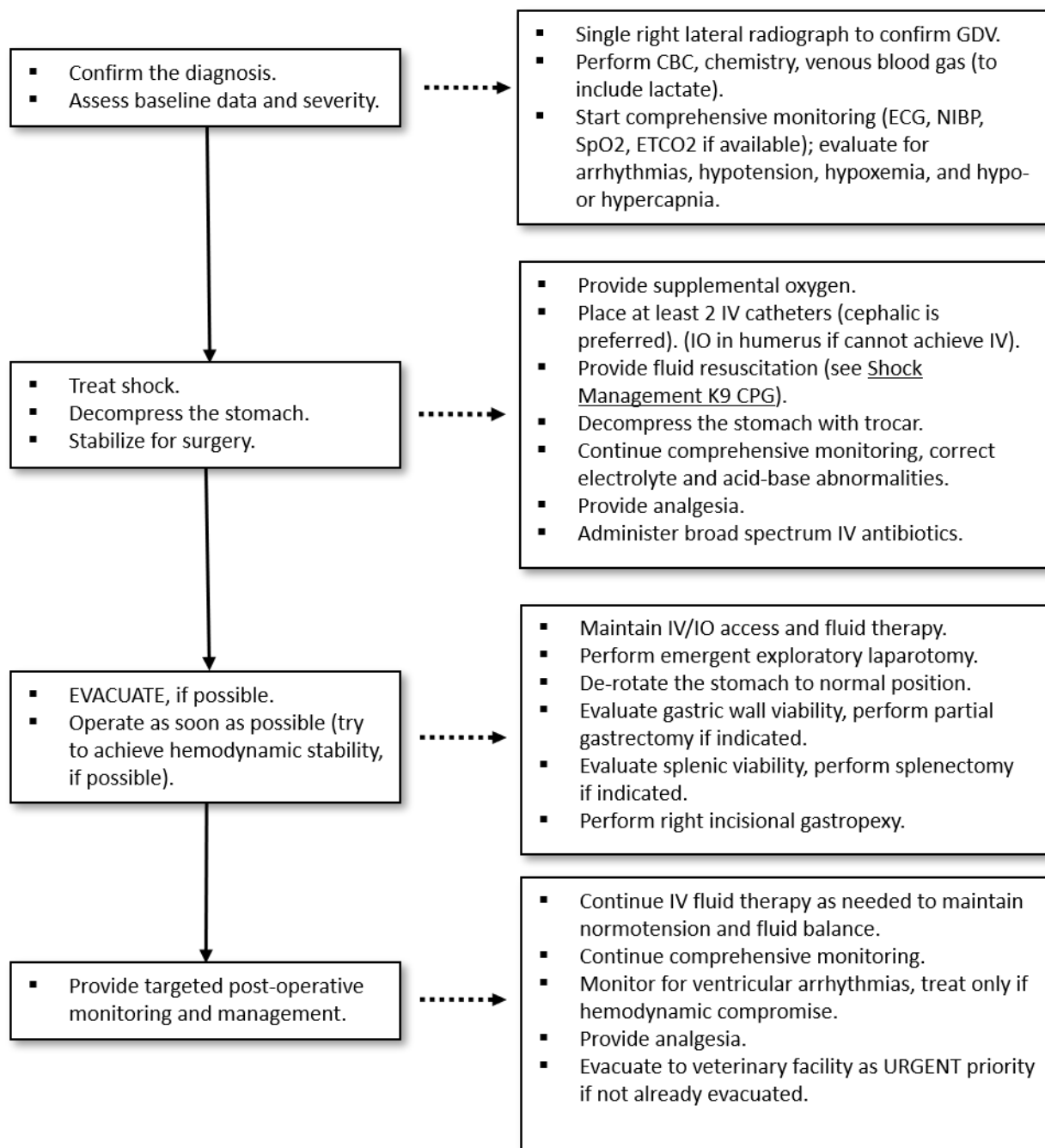


Figure 5. Clinical management algorithm for GDV in MWDs.

Definitive Surgical Management

Any MWD with a GDV should be considered an urgent casualty. Definitive surgical management requires trained personnel intimate with anatomy and physiology of the dog. Upon entering the abdominal cavity, GDV is confirmed by identifying a dilated stomach typically covered by omentum.

A markedly tympanic stomach should be further decompressed by intraoperative needle decompression with suction to allow manipulation. An orogastric tube can also be placed to achieve decompression (the tube may not be able to be passed all the way into the stomach until after de-rotation).

De-rotate the stomach to the normal position by grasping the stomach on both extreme lateral aspects simultaneously and rotating the stomach counterclockwise (when viewed from the dog's right side in dorsal recumbency).

Evaluate the gastric wall for any evidence of partial or full-thickness necrosis. If bruising persists or worsens intraoperatively, or if gastric wall necrosis is suspected, perform a partial gastrectomy of suspect gastric wall. Gastrectomy is ideally performed using Thoracoabdominal (TA) or Gastrointestinal Anastomosis (GIA) surgical stapling equipment. Note that postoperative mortality in dogs that require gastrectomy is approximately 25-35%, compared to mortality <10% in dogs that do not require gastrectomy.

Typically, intra-abdominal bleeding is encountered due to rupture of the short gastric arteries and/or splenic injury. Assess the viability of the spleen and perform splenectomy if splenic thrombosis, marked splenic vessel injury and bleeding, or splenic lacerations are noted. Arcade ligation, with special attention to the major splenic vessels, is optimal, and can be done with Ligating and Dividing Stapler (LDS) stapling equipment (for vessels <4mm diameter) and suture ligation (for vessels >4mm diameter) using transfixation sutures or with an electrosurgical vessel sealing device (vessels < 7mm).

Perform an incisional gastropexy (to prevent future GDV). Create a 3-4cm incision in the seromuscular layer of the right pyloric area of the stomach wall. Create a similar sized incision in the right ventrolateral abdominal wall musculature. Oppose the margins of the gastric wall incision against the margins of the incision in the abdominal wall musculature and create a gastropexy by suturing each margin using 2-0 monofilament slowly absorbable suture (e.g., polydioxanone).

MESENTERIC VOLVULUS

This is a true surgical emergency. Hallmark immediate treatment includes rapid assessment and determination for the need for emergency abdominal surgery and aggressive shock therapy. Time for evacuation to veterinary facilities is not possible, so be prepared for operation in a Medical Treatment Facility (MTF). Extended monitoring for common life-threatening sequelae is required in the post-operative period.

Follow the procedures for an emergent exploratory laparotomy. Management with intestinal resection and anastomosis should only be considered if the following conditions are met:

- The duodenum is intact.
- At least 2cm of healthy ileum is present.
- At least 50% of the jejunum is assessed to be viable.
- No large bowel is affected.

If surgery was successfully completed, monitor for the most common complications seen in MWDs with mesenteric volvulus, to include ventricular arrhythmias, persistent shock, septic peritonitis, nausea and vomiting, ileus, and metabolic acidosis. Multi-organ failure may develop, depending on the degree and duration of shock.

Euthanasia should be considered (see [Euthanasia K9 CPG](#)) for an MWD presenting in extremis, in dogs that fail to respond to therapy, that deteriorate despite care, or in which operative management is not feasible.

EMERGENT EXPLORATORY LAPAROTOMY

When indicated, this should be performed by a veterinarian whenever feasible. In RARE circumstances, an emergent laparotomy may be necessary by human healthcare providers to afford a chance at MWD survival. This may include MWDs with GDV that cannot be evacuated to a higher echelon veterinary facility in 4 to 6 hours. This should ONLY be done following consultation with a veterinarian unless circumstances exist that make it impossible to make contact.

- Surgical management includes an approach through the ventral midline under general anesthesia with the MWD in dorsal recumbency to expose the abdominal cavity.
- A complete abdominal exploration is necessary to define all injuries. Routine exploratory techniques used for humans are appropriate for MWDs.
- Surgical management will depend on the injuries noted. Look for sources of hemorrhage to include the liver, spleen and major abdominal vessels, bowel perforation, urinary tract injuries, and abdominal wall injuries. Repair of injuries in MWDs is similar to these types of repairs in human casualties.
- Abdominal wall closure is in 3 layers:
 - Linea alba – 0 monofilament slowly absorbable suture (e.g., polydioxanone).
 - Subcutaneous tissues – 2-0 or 3-0 monofilament rapidly absorbable suture (e.g., poliglecaprone 25).
 - Skin – 3-0 monofilament rapidly absorbable suture (e.g., poliglecaprone 25) if performing an intradermal pattern. For removable, external skin suture, 3-0 monofilament non-absorbable suture (e.g., nylon, polybutester).

PERFORMANCE IMPROVEMENT MONITORING

POPULATION OF INTEREST

All MWDs diagnosed with an acute abdomen.

INTENT (EXPECTED OUTCOMES)

- Return to duty (RTD).

PERFORMANCE / ADHERENCE MEASURES

- Number and percentage of patients in the population of interest (deployed MWDs) that sustained treatment for an acute abdomen.
 - Specify what category of underlying condition caused the acute abdomen.
 - Abdominal trauma (blunt or penetrating).
 - Gastrointestinal emergency (e.g., GDV mesenteric volvulus).
 - Gastrointestinal foreign body.
 - Other (describe the condition).
- Number and percentage of MWDs in the population of interest (deployed MWDs) that required surgical intervention for an acute abdomen (of any underlying cause).
- Number and percentage of MWDs that were definitively diagnosed with septic peritonitis.
- For MWDs with a gastrointestinal foreign body, the number and percentage that received the following interventions:
 - Medical management (specify if induction of emesis occurred and if it was successful).
 - Endoscopic retrieval.
 - Surgical retrieval (annotate the type of procedure performed).

DATA SOURCE

- Patient Record
- Department of Defense (DoD) MWD Trauma Registry

SYSTEM REPORTING AND FREQUENCY

The above constitutes the minimum criteria for Performance Improvement (PI) monitoring of this K9 CPG. System reporting will be performed annually; additional PI monitoring and system reporting may be performed as needed.

The system review and data analysis will be performed by direction of the Committee on K9 Combat Casualty Care Chair.

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APPENDIX A: CLASS VIII MEDICAL MATERIEL

DIAGNOSTIC / IMAGING

- Portable ultrasound system with abdominal/microconvex or curvilinear transducer
- Ultrasound gel
- Ultrasound probe covers
- Portable radiography capability

ABDOMINOCENTESIS / DIAGNOSTIC PERITONEAL LAVAGE

- 18G and 20G needles
- Large-bore over-the-needle catheters
- Diagnostic peritoneal lavage catheter
- Syringes, assorted sizes
- Extension tubing
- Three-way stopcocks
- Sterile specimen containers
- Blood collection tubes (EDTA and serum)
- Sterile gloves, drapes, gauze, and skin-preparation supplies
- Sterile isotonic fluid for peritoneal lavage

POINT-OF-CARE / LABORATORY

- iStat machine and cartilages
- Glucose testing capability
- Centrifuge/microhematocrit capability
- Refractometer
- Microscope/cytology supplies
- Chemistry/lactate/glucose test cartridges and consumables

IV ACCESS / FLUID RESUSCITATION

- Large-bore IV catheters, assorted sizes
- IV administration sets and extension sets
- Three-way stopcocks
- IV infusion pumps
- Isotonic crystalloid fluids

SURGICAL CONSUMABLES / ABDOMINAL CLOSURE

- Absorbable suture, assorted sizes (0 to 3-0)
- Skin staples/stapler
- Hemostatic agents
- Sterile irrigation solution

ABDOMINAL DRAINAGE

- Closed-suction abdominal drains
- Drain collection reservoirs
- Drain securement materials
- Sterile dressings

ANESTHESIA / AIRWAY

- Canine endotracheal tubes, assorted sizes
- Laryngoscope
- Oxygen delivery capability
- Anesthesia machine/breathing circuits
- Ambu/resuscitation bag
- Capnography
- Pulse oximetry
- ECG
- Non-invasive blood pressure monitoring

PATIENT MONITORING / SUPPORT

- Multiparameter patient monitor
- Temperature monitoring
- Active patient warming system
- IV/syringe infusion pumps
- Urinary catheterization and closed drainage capability

IV ACCESS / FLUID RESUSCITATION (CONT'D)

- Fluid warming capability
- Pressure infusion bags

BLOOD PRODUCT SUPPORT

- Canine whole-blood collection/storage capability
- Blood administration sets with filters
- Blood typing/crossmatch supplies
- Blood warming capability

SURGICAL / EXPLORATORY LAPAROTOMY

- General/major surgical instrument set
- Abdominal retractor system
- Scalpel handles/blades
- Surgical scissors
- Tissue and hemostatic forceps
- Needle holders
- Suction equipment and tubing
- Electrosurgical unit/cautery
- Laparotomy sponges
- Sterile surgical drapes/gowns/gloves

PHARMACEUTICALS

- Broad-spectrum injectable antibiotics
- Anaerobic antimicrobial coverage
- Injectable analgesics
- IV access / fluid resuscitation
- Sedation/anesthesia medications
- Local anesthetic (lidocaine)
- Emergency/resuscitation medications

WOUND / ASEPTIC SUPPLIES

- Sterile gauze
- Non-adherent dressings
- Abdominal dressings
- Medical tape
- Antiseptic/skin-preparation solutions
- Sterile saline for irrigation
- Clippers

For additional information including National Stock Number (NSN), please contact dha.ncr.med-log.list.lpr-cps@health.mil

DISCLAIMER: *This is not an exhaustive list. These are items identified to be important for the care of combat casualties.*