JOINT TRAUMA SYSTEM CLINICAL PRACTICE GUIDELINE

Emergency Airway Management (K9 CPG: 3)

This Clinical Practice Guideline (CPG) provides guidance on emergency airway management for MWDs.

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SUMMARY OF CHANGES

1. Updated algorithm for differentiating causes of respiratory distress.
2. Added non-respiratory causes of respiratory distress, tenets of airway management and special considerations for treatment of upper airway obstructions in a military working dog (MWD).
3. Updated oxygen supplementation photos.
4. Added steps for abdominal thrust technique and external extraction technique in MWDs.
5. Added photos to tracheal insufflation table.
6. Updated terminology for orotracheal intubation to also include endotracheal intubation.
7. Added procedures for emergency cricothyrotomy.

BACKGROUND

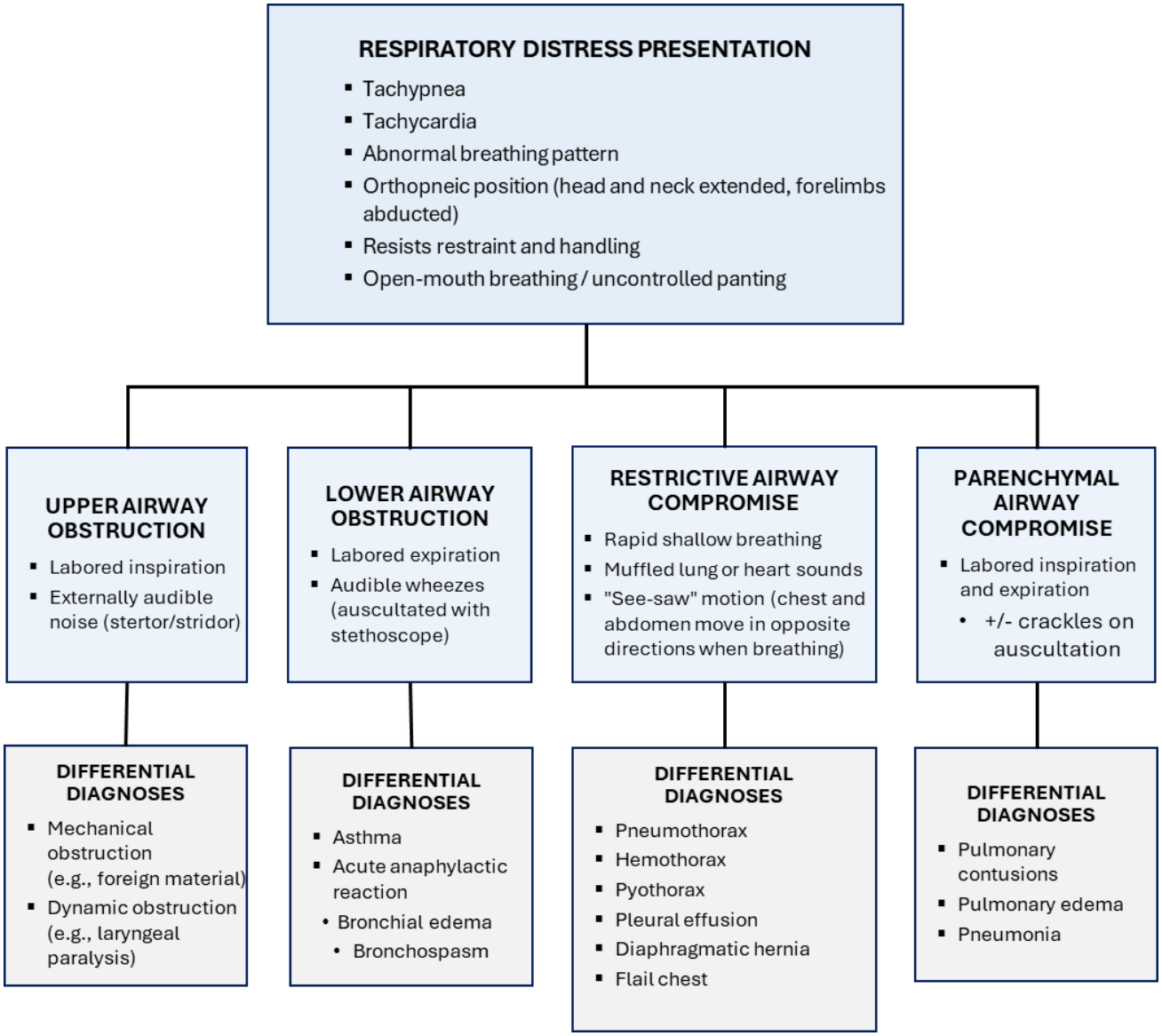
Respiratory distress in MWDs generally develops from the following anatomically based diseases and conditions:

- Upper airway obstructions (nasal cavity, oropharynx, larynx, and extra-thoracic trachea)
- Lower airway obstructions (intra-thoracic trachea and bronchi)
- Pulmonary parenchymal disease (bronchioles, alveoli, and interstitial space)
- Restrictive airway compromise (pleural space disease)

MWDs often display characteristic breathing patterns that help localize the problem to the primary anatomical area involved.

A clinical algorithm for differentiating the cause and location of an MWD's respiratory distress is Figure 1.

Figure 1. Clinical Algorithm for Differentiating Causes of Respiratory Distress Based on Breathing Pattern.



Non-respiratory causes for respiratory distress in MWDs can include:

- Abdominal distension (gastric dilatation and volvulus, hemoperitoneum, organomegaly, masses, other)
- Respiratory 'look-a-likes' (e.g., cardiac disease, circulatory shock/hypotension, clinical anemia, pain, stress/fear, metabolic acidosis, neurological disease)

A thorough history, physical assessment, and basic point-of-care testing will rule out most of the non-respiratory causes listed above. The remainder of this chapter focuses on the emergent management of MWD Upper Airway Obstruction (UAO) disorders in a theater of operations.

TENETS OF AIRWAY MANAGEMENT

Emergent canine airway management includes assuring and maintaining airway patency, preventing aspiration, and providing adequate oxygenation and ventilation.[1] Techniques to establish a patent airway include:

- Basic airway techniques (manual maneuvers such as head, neck, and body positioning).
- Advanced airway techniques [oro-/endotracheal intubation (OTI/ETI), needle and surgical cricothyrotomy (CCT) or tube tracheotomy (TT)].

OTI/ETI is the first line advanced airway management for MWDs that do not have a complete UAO. Surgical airways are considered as a last resort and should only be used when less invasive techniques are unavailable or fail to establish a patent airway and restore adequate oxygenation.

SPECIAL CONSIDERATIONS FOR UAO

Additional factors to consider when treating an UAO in an MWD include ensuring personnel safety; controlling the MWD's anxiety, stress, and discomfort; and maintaining thermoregulation.

SAFETY AND RESTRAINT

MWDs, particularly when injured or stressed, are unpredictable, potentially dangerous, and prone to bite. Personnel must take appropriate precautions to ensure safety. Use the least amount of physical restraint necessary to secure and examine the MWD. Excessive restraint can exacerbate stress and anxiety, further compromising the MWD's condition. Sedation will likely need to be administered to facilitate safe handling for conscious and fractious MWDs. (See K9 Analgesia and Anesthesia.) Providing sedation also helps eliminate the cycle of stress, anxiety and worsening respiratory distress associated with the MWD's inability to breathe. In MWDs experiencing respiratory fatigue from prolonged or strenuous increased work of breathing, even mild sedation may increase the risk of imminent respiratory failure or arrest. Have resources prepared to perform rapid OTI/ETI or CCT/TT prior to administering any sedative agent.

THERMOREGULATION

Since MWDs rely on panting to dissipate body heat, any UAO increases their risk for a potential heat-related illness.[2] Monitor body temperature and implement passive and active cooling interventions to maintain the MWD's body temperature between 99°F to 102°F (37.2°C to 38.8°C).

POSITION OF COMFORT

Allow the K9 to assume the 'position of comfort' or any position that allows the K9 to breathe with minimal restriction of air flow and that protects the airway. A K9 in respiratory distress will often sit, stand, or assume ventral or sternal recumbency.

OXYGEN SUPPLEMENTATION

Oxygen supplementation is often essential for MWDs experiencing respiratory distress. When available and until proven unnecessary, provide 100% oxygen to MWDs suffering major trauma and/or that are showing signs of respiratory distress.[3] Oxygen cages (makeshift or manufactured) and oxygen tents are impractical as an effective modality for providing supplemental oxygen to MWDs and are not available in the typical deployed environment.

CONSCIOUS MWDS

Use face mask or "blow by" technique (hold end of oxygen tubing or circuit 1-2 cm or as close to nose and mouth as possible or attach to muzzle) using high flow rates of 10-15 L/min.[4] Use caution and ensure the handler always has control of the MWD. Agitated, distressed or dyspneic MWDs may bite causing serious injury to personnel. Figures 2 and 3 show simple yet effective techniques to safely provide "blow by" oxygen supplementation to muzzled MWDs. While not the ideal method, acceptable inspired oxygen concentrations of 40-70% are achieved with this technique, which may be lifesaving.[4]

Figure 2. Administration of Supplemental Oxygen[3]

Photo courtesy of COL Lee Palmer.

Figure 3. Administration of Supplemental Oxygen[3]

UNCONSCIOUS MWDS

Use tracheal insufflation, OTI/ETI, or surgical airways (CCT/TT). See Tables 1 through 4 for techniques. Bag-valve-mask (BVM) ventilation is a viable non-invasive airway management technique in MWDs for providing effective oxygenation and ventilation. Considering many UAOs are not completely occlusive, BVM ventilation may provide a stopgap until a more definitive airway can be obtained.

UAO – DIAGNOSIS AND INTERVENTIONS

The structures of the upper airway consist of the nasal passageways, nasopharynx, oropharynx, larynx, and extra-thoracic trachea (cranial to the thoracic inlet). An MWD with a UAO breathing pattern typically displays respiratory distress characterized by a labored inspiratory effort with a normal or passive expiratory effort and abnormal, audible upper airway noise such a stridor or stertor (see Figure 1).

CAUSES

Common causes of UAO common to MWDs include:

- Oromaxillofacial trauma (jaw fractures).[5]
- Tracheal compression due to trauma-induced hemorrhage and muscle edema in the cervical area.
- Direct tracheal injury caused by penetrating cervical trauma from stab wounds, gunshot wounds, bite wounds, or secondary blast injuries (blast-energized fragments, shrapnel, explosive debris components, and environmental debris).
- Mechanical obstructions, intraluminal (foreign objects, blood clots).
- Dynamic or functional obstructions (laryngeal paralysis).
- Tracheal swelling and edema from miscellaneous non-trauma causes (smoke inhalation, anaphylaxis).

DIAGNOSIS

Primarily based on the history of trauma, mechanism of injury, and presenting signs to include the primary anatomical areas of injury (head and cervical region).

Observe the MWD for clinical signs of an UAO. If the MWD is unconscious, observe closely for signs of spontaneous breathing and listen for any obvious audible abnormal airway noises (stridor, stertor). Consider that any MWD that can bark, growl or whine most likely has a patent airway.

Common signs of UAO:

- Pawing at mouth
- Gagging, excessive drooling
- Frequent swallowing motions
- Audible, abnormal airway noises (stridor, stertor)
- Extended head and neck
- Elbows and upper legs held out from the chest (e.g., “tripod position”)
- Reluctance to lie down

Palpate and examine the face, muzzle, nose, mouth, external laryngeal area, and trachea for deformities, traumatic wounds, or other abnormalities.

Safely assess the airway for patency by opening the mouth and directly examining the oropharyngeal cavity.

IF UNCONSCIOUS:

- Place the MWD in the recovery position (sternal recumbency or prone position). Tilt the head slightly back and extend the neck.
- Physically open the mouth and pull the tongue forward to help open the airway and allow optimal visualization of the mouth and oropharyngeal cavities.

Note: *When present, have the handler securely hold the MWD's mouth in an open position. This allows medical personnel the ability to visualize and assess the entirety of the mouth and oropharyngeal cavities thoroughly and safely. If no additional people are available, use a roll of gauze, rope, or leash looped behind the upper and lower canine teeth to pry and securely hold the MWD's mouth open. Consider using a roll of medical tape or syringe tube casing without a plunger (Figure 4) as a mouth gag to keep the mouth open.*

Figure 4. Syringe tube casing is used as a modified mouth gag by placing over upper and lower canine teeth.

INTERVENTION

Provide interventions and supportive care to alleviate any potential confounding factors:

- Fear and anxiety: tranquilize, sedate, or anesthetize if necessary. (See K9 Analgesia and Anesthesia.)
- Hyperthermia: active and/or passive cooling to maintain appropriate body temperature. (See K9 Heat Injury CPG.)

Provide oxygen supplementation while preparing to access and extract the obstruction. Consider that most UAOs are not complete obstructions. Most often, some air can still flow around the obstruction and reach the lungs.

Ensure personnel safety to avoid bite injuries. Do not stick one's hand into the mouth of a conscious MWD.

Quickly and safely establish a patent airway by removing any obstructive material from the upper airway.

- Suction or wipe the mouth and oropharyngeal area of any excessive secretions or blood that may be contributing to the UAO and to allow for greater visualization. BE CAREFUL to not push the object deeper into the airway.
- Consider providing abdominal thrust maneuver in MWDs with a moveable object located within or rostral to the supraglottic area. Only attempt if the object is known to be lodged in the trachea or larynx and is confirmed to be smooth. DO NOT attempt in MWDs with sharp object obstructions or with known or suspected abdominal trauma.

Abdominal Thrust Technique

- Approach the MWD from the rear.
- Reach over top and bear hug the MWD by placing your fist(s) immediately caudal to their xiphoid process.
- Compress the abdomen with five quick upward (craniodorsal) thrusts. When performing the abdominal thrusts, slightly elevate the hind end, while ensuring the MWD's front feet remain on the ground. Avoid picking up and holding the MWD completely off the ground or holding them upright like a person.
- Check to see if the object was dislodged.
- Repeat 1-2 times. If unsuccessful, immediately move to an alternate airway clearance technique.

Non-Invasive Extraction Technique

An alternative to performing abdominal thrusts, with the mouth held open, use large forceps (e.g., Magill) or similar instrument to extract any movable objects or obstructions.

Attempt extraction only under direct visualization of the obstructive material. AVOID performing a blind 2-finger sweep of the oral cavity if the object is not readily visible. This can push the object further down into the airway.

External Extraction Technique

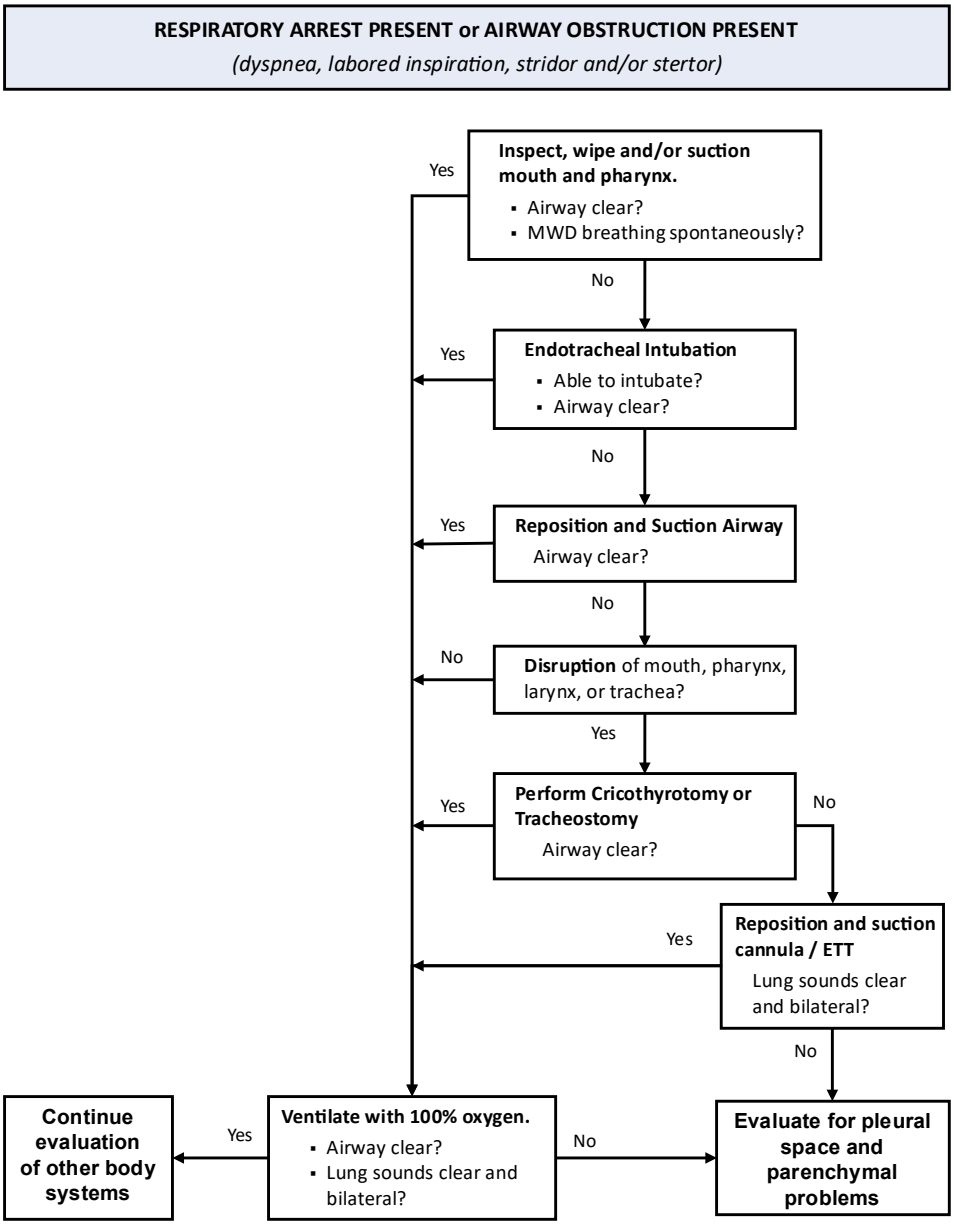
Ball-like objects that are causing an UAO can be removed by placing the dog on their back with their head and airway parallel to the floor. Feeling the ball lodged in the throat, place thumbs on each side of the trachea below the ball (toward the body), using the middle fingers to help open the jaw. Push down and out against the ball, ejecting it from the mouth.

If attempts to clear or remove object or obstruction from the airway using the above non-invasive techniques have failed and/or the MWD collapses, immediately proceed to performing a surgical airway (CCT/TT).

Continue to provide oxygen supplementation and/or assisted ventilations, while preparing to perform the surgical airway.

- Partial UAO: Provide artificial ventilation via BVM technique or mouth to snout.
- Complete UAO: Consider needle CCT or tracheal oxygen insufflation to provide oxygen delivery (see Table 1).

Figure 5. Airway Obstruction Management Algorithm for MWDs.



TRACHEAL INSUFFLATION WITH OXYGEN[6,7]

Performed by inserting a large bore catheter through the cricothyroid membrane (CTM) or annular ring at the mid-cervical trachea.

Use tracheal insufflations as a bridge to more definitive methods (e.g., OTI, CCT, TT).

Do not use this method for more than 30-45 minutes, as hypercapnia may develop, and lung barotrauma may occur due to high airway pressures.

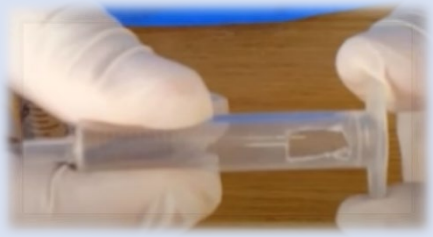
Table 1. Tracheal Insufflation with Oxygen for MWD Technique[6,7]

TRACHEAL INSUFFLATION WITH OXYGEN TECHNIQUE FOR MWD
1. Clip the hair and aseptically prepare a 6-inch-wide area of the ventral neck area extending just cranial to the larynx down to the mid-cervical region.
2. For conscious MWDs, sedate and use 20 mg lidocaine as local anesthetic over the anticipated insertion site.
3. Attach a 10 mL syringe to the hub of a large gauge (10- to 16-gauge), 6-inch, over-the-needle catheter.
4. Position the MWD in dorsal recumbency. Stabilize the larynx (for passing through the CTM) or the trachea (for passing through the annular ring) with one hand. 
5. While holding the syringe-catheter apparatus at a 45-degree angle, and directed in a caudal or aboral direction, insert the catheter through the skin and either the CTM or annular ring between the 3rd and 4th or 4th and 5th tracheal cartilages.
6. Slowly aspirate with the syringe as you pass the catheter through skin. Aspiration of air signifies successful entry into the tracheal lumen. If blood returns, and/or resistance is felt, re-evaluate needle positioning.
7. After confirming successful placement of the catheter/needle unit within the tracheal lumen, stabilize the needle to prevent any further advancement of the needle into the airway.
8. Advance the catheter off the needle, directed down the tracheal lumen, until the hub of the catheter is in contact with the skin. *Note: Consider decreasing the angle of insertion to less than 30° to ensure the catheter smoothly travels down the tracheal lumen without becoming lodged on the dorsal tracheal lumen wall (the lumen surface contralateral to the point of insertion).* 9. Remove the needle from the catheter. 

10. Attach oxygen tubing directly to the hub of the catheter (or syringe) and provide high-flow oxygen (10-15 L/min). Secure the hub as needed to prevent dislodging the catheter from the tracheal lumen.

11. Alternatively, attach an endotracheal tube adapter (typically from a 7 to 8 mm inner diameter tube pending the manufacturer) to a 3 mL syringe and connect the adapter to an oxygen line.
12. You may also attach a BVM/Ambu-bag to the adapter and provide positive pressure ventilation

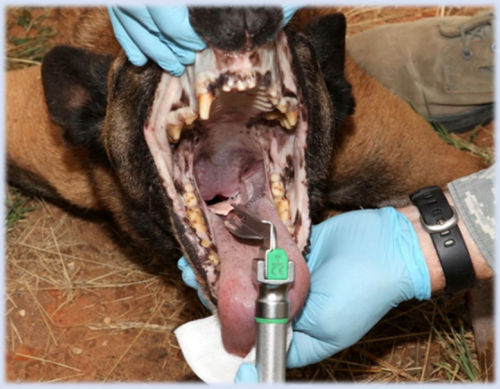
13. To facilitate removal of expired CO2 cut a small hole in the side of the 3 mL syringe to serve as a vent during exhalation phase (e.g., place your finger over the hole to close the hole and squeeze the bag for 1 second inspiratory period, and then remove your finger to open the hole during the expiratory phase).



ENDOTRACHEAL/OROTRACHEAL INTUBATION (ETI/OTI)[7]

Table 2. Endotracheal/Orotracheal Intubation Technique for MWD[7]

	ENDOTRACHEAL / OROTRACHEAL INTUBATION FOR MWD TECHNIQUE
1	Typical MWD needs an 8-11 mm internal diameter (ID) cuffed endotracheal tube (ETT).
2	Premeasure intended insertion length by placing the tube alongside the extended head and neck of the MWD. Locate the larynx and ensure the cuff is positioned below (caudal) to the larynx. ▪ The distal end of the ETT should not extend past the thoracic inlet (point of the shoulder) to prevent the risk of endobronchial intubation. ▪ The proximal end of the ETT should not extend too far out of the mouth. Ideally, the ETT adaptor should rest against the incisor teeth. Excessive tube length extending past the incisor teeth will contribute to excessive mechanical dead space.
3	Ensure the ETT adaptor is fully seated onto the tube.
4	Cut and tie an 18-to-24-inch length of roll gauze to the end of the tube.
5	Lightly lubricate the cuffed end of the ETT with sterile lubricant.
6	Place the MWD in sternal recumbency (if possible).
7	Have the handler lift the head and extend the MWD's neck, pulling the head toward the person intubating, by using one hand to grasp and hold the upper jaw. Rolling the upper lips away improves visibility. DO NOT allow the assisting person to wrap their fingers inside the mouth to avoid the risk of bite injury if the MWD snaps their mouth shut. Alternatively, the assisting person can hold the mouth open by looping roll gauze behind the upper canine teeth.
8	Have the handler use their free hand to grasp the MWD's tongue with a dry 4x4 gauze sponge and gently pull the tongue out and down between the lower canine teeth.

ENDOTRACHEAL / OROTRACHEAL INTUBATION FOR MWD TECHNIQUE	
9	Place the tip of the laryngoscope blade on the base of the MWD's tongue near the epiglottis and apply gentle downward pressure on the tip of the laryngoscope blade to visualize the opening to the trachea. 
10	Using a slight rotating motion, guide the ETT over the epiglottis, between the vocal cords, through the laryngeal opening, into the trachea. 
11	Advance the ETT into the trachea ensuring the cuff fully passes through the larynx. The ETT adaptor should sit against the incisor teeth to minimize mechanical dead space.
12	Using a 10 mL syringe, inflate the cuff with the appropriate volume of air as indicated on the ETT. Avoid inflating the cuff until back pressure is noted in the syringe as this may result in excessive cuff pressure leading to subsequent tracheal tissue damage and necrosis.
13	Using a BVM/AMBU bag or anesthetic machine check for leaks and normal lung sounds during assisted ventilation.
14	Verify ETT placement: ▪ Palpate the MWD'S neck and feel for ONE tube. If TWO tubes are felt, the ETT is in the esophagus (ONE tube is the trachea and the other is the ETT in the esophagus). Remove the ETT and attempt intubation again if TWO tubes are palpated. ▪ Observe for fogging within the ETT. Fogging occurs if the MWD is exhaling air through the ETT which indicates that the ETT is in the correct location. ▪ Attach a capnometer (if available) to the ETT and measure $ETCO_2$. If $ETCO_2$ is measured >10 mmHg, the tube is correctly positioned. ▪ Using a BVM/AMBU bag or anesthetic machine provide assisted ventilation and: ・ Observe for bilateral chest rise and fall. ・ Auscultate for presence of bilateral breath sounds with absence of epigastric sounds.
15	Secure the ETT into place by securing the attached roll gauze behind the canine teeth. Tie the gauze using a bow knot around the upper or lower jaw.
16	IMPORTANT: An intubated MWD that regains consciousness may bite the endotracheal tube and can cause further self-injury or injury to providers attempting to remove the tube. PROMPT AND ATTENTIVE monitoring of consciousness and maintaining an appropriate anesthetic depth (if applicable) is required.

SURGICAL AIRWAY TECHNIQUES

Table 3. Emergency Cricothyrotomy Technique for MWD[1,8-11]

	EMERGENCY CRICOTHYROTOMY TECHNIQUE FOR MWD
1	Position the unconscious, sedated or anesthetized MWD in dorsal recumbency.
2	Place a rolled towel, 1-liter bag of fluid, or small sandbag under the dorsal aspect of the neck to mildly hyperextend the head and neck. This displaces the larynx and trachea to a more superficial position facilitating palpation of external landmarks. *Note: Maintain a neutral position if cervical spine injury is suspected.*
3	Clip/shave the ventral aspect of the neck extending caudally from the ramus of the mandible to the thoracic inlet and at least 3 – 4 inches on each side of midline. *Note: Clipping is not a required step but can facilitate visualization and palpation of external landmarks.*
4	Perform aseptic preparation of surgical field.
5	Stabilize the larynx with the thumb and middle finger of your non-dominant hand. Use your index finger to palpate and identify the location of the cricothyroid membrane (CTM).
6	Administer local anesthetic (0.5% bupivacaine or 2% lidocaine) at the intended incision site. Note: If feasible, allow time for the local anesthetic (bupivacaine: 5 – 10 minutes; lidocaine: 2 – 3 minutes) to take effect prior to making the initial skin incision.[12,13]
7	With your dominant hand, make a full-thickness midline vertical (parallel to the long axis of the neck) incision, approximately 3 cm long directly over the CTM. *Note: Do NOT make a transverse skin incision (perpendicular to the long axis of the trachea), as this increases the risk of injury to adjacent vascular structures*.
8	Palpate the CTM through the incision using the index finger of your non-dominant hand.
9	Make a horizontal stab incision through the caudal aspect (cranial border of the cricoid cartilage) of the CTM. *Note: Incising at the caudal aspect of the CTM avoids the risk of incising through the cranially located cricothyroid arteries*.
10	A distinct pop is felt as the scalpel blade penetrates through the CTM and enters the trachea; the scalpel blade may be gently rotated (twisted) 90° to enlarge the opening into the cricothyroid space; do not remove the scalpel blade from the incision.
11	Insert endotracheal tube introducer (bougie), directed caudal or aboral, into the trachea using the side of scalpel blade as guide into trachea.
12	Remove the scalpel blade while holding the bougie firmly in place.
13	Insert the commercial CCT or preferably a modified endotracheal tube (ETT) over the bougie and using a slight rotating motion guide into the trachea; avoid inserting the tip of the ETT beyond the thoracic inlet to prevent the risk of endobronchial intubation. If using a modified ETT, an 8.0 mm ID cuffed ETT will fit most MWDs. *Note: Gently twisting the cuffed tube back and forth while inserting at a 90°angle through the cricothyroid space facilitates placement into the trachea.*
14	Inflate the cuff and confirm placement through observation of chest rise, auscultation, and assessment of end-tidal CO_2 (35 – 45 mm Hg).
15	Place a dressing (optional) between tube and skin (e.g. cut a stack of two-three 4 x 4 gauze sponges partway like a 'pair of pants' and fashion around the tube).
16	Secure the tube in place with umbilical tape, roll gauze, or intravenous tubing (used as tracheal ties) secured around the CCT or ETT and then secured behind the neck in a bow for quick release.
17	Continually reassess and monitor.

PERFORMANCE IMPROVEMENT (PI) MONITORING

POPULATION OF INTEREST

All MWDs that sustained airway trauma or obstruction.

INTENT (EXPECTED OUTCOMES)

- Recovery from airway trauma or obstruction.
- No need for long-term airway modification (such as permanent tracheostomy).
- No long-term morbidity from trauma or subsequent interventions.

PERFORMANCE/ADHERENCE MEASURES

- Number and percentage of patients in the population of interest (deployed MWDs) that sustained airway trauma or obstruction.
  Specify what type of injury and location of injury/obstruction.
- Specify type of intervention performed (non-invasive or surgical) and specific the specific intervention.
- Number and percentage of patients in the population of interest (deployed MWDs) that recovered from the original injury.
  Number and percentage of MWDs that returned to duty versus those that were medically retired following the event or that died as result of the airway trauma/obstruction.

DATA SOURCE

- Patient Record
- Department of Defense Military Working Dog Trauma Registry

SYSTEM REPORTING & FREQUENCY

The above constitutes the minimum criteria for 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 K9C4 Chair.

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APPENDIX A: CLASS VIII MEDICAL MATERIEL

Itemized list of recommended medical materiel based on the JTS Emergency Airway Management of the Military Working Dog CPG. (K9 CPG:3)

Oxygen Supply & Delivery

- Portable oxygen cylinder(s) (E or D size for field; with regulator capable of 0 -15 L/min).
- Oxygen tubing (standard 15 mm / 22 mm connectors and 2-3 m flexible tubing).
- Mask adapters/animal face masks (canine-specific masks if available).
- BVM (bag-valve-mask) resuscitator — pediatric/infant and small adult sizes suitable for dogs (one or two sizes that match typical MWD tidal volumes).
- High-flow oxygen supply tubing and fittings for “blow-by” technique (10–15 L/min capability).

Airway Adjuncts for Basic and Temporary Oxygenation

- Large suction catheters (Yankauer) and soft suction catheters; suction tubing and portable suction device with collection canister and vacuum capable of veterinary suction pressures. Suction unit with additional tubing/catheters.
- Large forceps (Magill forceps or equivalent) for foreign-body removal.

Orotracheal Intubation Kit (Table 6 Guidance)

- Cuffed endotracheal tubes (ETT), internal diameters 9 mm, 10 mm, 11 mm (guideline: typical MWD needs 9-11 mm ID cuffed ETT).
- Stylets (malleable) compatible with ETTs.
- Laryngoscope handle with various size blades: Miller and Macintosh blades in sizes appropriate for canines.
- Endotracheal tube ties (18-24 inch roll gauze as recommended in guideline to secure tube).
- Cuff syringe (10 mL) and cuff pressure manometer (if available)
- Stethoscope to confirm breath sounds

Tracheal Insufflation & Emergency Tracheostomy/Cricothyrotomy Kit

- Over-the-needle catheters: 14-gauge and 16-gauge, 6-inch (for tracheal insufflation) with Luer hub
- 10 mL syringes
- Tracheostomy tubes-size -10 mm and 11 mm internal diameter
- Emergency tracheostomy/cricothyrotomy kit components: scalpel (no. 10), scalpel handle, hemostats, scissors, curved forceps, dilators, suture material (silk or nylon) for stay sutures, sterile gloves, antiseptic prep (povidone/chlorhexidine), sterile drapes, gauze sponges. Assemble as a dedicated surgical airway tray.
- Suction tubing and ability to suction tracheal/lung secretions after tracheostomy.

Ventilation & Monitoring Equipment

- Portable capnography ($ETCO_2$) monitor or colorimetric CO_2 detector
- Pulse oximeter with veterinary probe options (tongue probe for anesthetized dogs; ear pinna / lip for awake).
- Portable mechanical ventilator or transport ventilator capable of low tidal volumes (if prolonged ventilation anticipated) - settings guidance is in the CPG

Securing, Maintenance, And Post-Procedure Supplies

- Sterile suture kit (needles, suture materials)
- Adhesive tape (medical), conforming bandage roll, roll gauze
- Sterile saline (500–1000 mL) for irrigation and wound care.
- Sterile dressings, occlusive dressings, transparent dressings for trach site care.
- Disposable gloves (sterile and non-sterile), face shields, gowns

Dog-specific Items (Emphasized by the CPG)

- Clippers and blade for rapid clipping of ventral neck and around wounds.
- Muzzles (loose-fit short-term muzzle) or improvised muzzle materials and leash
- Collars/rolled towels/ sandbags to position and stabilize head/neck for tracheostomy.
- Bite-blocks/mouth gag

Tools For Removal Of Airway Obstruction

Large forceps/hemostats, Magill forceps, suction (Yankauer), gauze, oral spatula.

Pharmaceuticals Required During Airway/Emergency Procedures

NOTE: The CPG notes sedation/anesthesia may be necessary - local veterinary guidance/consultation required before drug use by HCPs.

- Local anesthetic (Lidocaine 1% or 2%) (e.g., 20 mg recommended for local infiltrative anesthesia during tracheal procedures). Supply vials and syringes.
- Rapid-acting sedative/analgesic agents (e.g., ketamine, midazolam, opioids - only per local veterinary/medical policy).
- Emergency resuscitation drugs: epinephrine (1:10,000 dilution for IV/IO), atropine, etc. (follow local canine dosing under veterinary direction).

Documentation, Training, and Sterilization Supplies

- K9 Tactical Combat Casualty Card (DD 3073), Canine Treatment and Resuscitation Record (DD 3074) (CPG references completing records).
- Sharps container, biohazard waste bags, disinfectants for reusable durable equipment.

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.*