JOINT TRAUMA SYSTEM K9 CLINICAL PRACTICE GUIDELINE

Blast, Burn, and Crush Injuries (K9 CPG: 12)

This Clinical Practice Guideline (CPG) provides guidance on classification and management recommendations for blast, burn and crush injuries in Military Working Dogs (MWDs).

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SUMMARY OF CHANGES

1. Added information about primary blast lung injury.
2. Outlined specific diagnostic, stabilization and interventional therapy considerations following blast injuries.
3. Removed general approach to military working dogs (MWD) exposed to blasts algorithm.
4. Added information about inhalation injury, to include carbon monoxide (CO) toxicity.
5. Updated total body surface area burn percentage estimation reference and added visual diagram.
6. Expanded patient treatment recommendations for burns and crush injuries.
7. Removed pathophysiology information for crush injuries.

BACKGROUND

Blast injuries are not uncommon in MWDs in operational environments. However, there is little definitive clinical information available for managing blast injury in dogs, so recommendations are similar to management for human patients. Burn and crush injuries are less common but may be encountered.

BLAST INJURY

Be prepared to provide care for MWDs exposed to bomb blasts and other explosions. Blast injuries may be subtle or occult for several days and MWDs may appear stable on initial evaluation. Blast injuries can also cause wounds, ranging from mild to severe. For significant wounds that require long-term therapy, refer to the K9 Wound Management CPG.

BLAST INJURY MECHANISMS[1-4]

Blasts produce injury through:

- Primary effects of the blast overpressure wave.
- Secondary injury due to penetrating objects displaced by the explosion.
- Tertiary injury due to MWDs physically being displaced into objects.
- Quaternary injury due to complications resulting from any combination of the above or injuries unrelated to those mechanisms.

Primary blast lung injury (PBLI) caused by exposure to high-intensity pressure waves from explosions is associated with pulmonary parenchymal tissue injury and severe ventilation insufficiency in humans.[1] Research investigating the transmission mechanism of pressure on the thorax showed that the apex of the lungs received the largest stress in a blast.[3] PBLI patients are characterized by diffuse intra-alveolar destruction that has the potential to deteriorate into acute respiratory distress syndrome with high mortality.[2]

INITIAL MANAGEMENT

The approach to blast-injured MWDs is the same as for any other type of trauma. Focus on life-threatening problems first, followed by targeted support based on exam findings with emphasis on a detailed secondary evaluation and follow on care as needed once the patient is stabilized.

During initial care, focus on the life-threatening injuries caused from blasts:

- Massive hemorrhage from traumatic amputations, junctional hemorrhage, or hemoperitoneum
- Respiratory distress from an airway obstruction, pulmonary contusions, pneumothorax or hemothorax
- Shock secondary to air embolism or hypovolemia
- CNS trauma such as head trauma or spinal cord injury that could lead to spinal shock

Tympanic membrane (TM) rupture is a minor standalone injury but is typically suggestive of a more severe systemic injury. Patients with TM rupture should be observed for development of other injuries.[3,4] Based on data from humans exposed to blasts, the absence of TM rupture does not exclude potentially life-threatening internal injuries.[4]

Many injuries from blasts may not manifest for several hours, including pulmonary contusions, pneumothorax, behavioral or neurological changes due to head trauma and bowel hemorrhage with or without perforation. Perform diagnostics based on physical examination findings and clinical presentation. When available, diagnostics should include point of care ultrasound exam, laboratory analysis (i.e., blood gas [venous or arterial], electrolytes, serum lactate), blood pressure and pulse oximetry measurements, electrocardiogram, Modified Glasgow Coma Scale, and thoracic and/or abdominal radiographs. These diagnostics should be performed serially to detect early signs of impending decompensation.

Any MWD exposed to a blast should be evacuated to a veterinary facility as soon as possible for detailed evaluation and observation. Considerations for stabilization and interventional therapy include oxygen therapy, judicious use of IV fluids, analgesic medications, needle decompression and/or chest tubes, sedation, intubation, mechanical or manual ventilation, and hyperosmotic therapy. Antibiotics may be needed if there are penetrating injuries from shrapnel or if there is evidence of ruptured abdominal contents. Therapies should be chosen based on clinical assessment of the patient. If evacuation is not possible or is delayed, hospitalize the MWD for 12-24 hours for close observation or longer if new clinical signs develop or present signs worsen.

BURN INJURY

Burns in MWDs are typically caused by structure fires, motor vehicle mufflers, scalding liquids (i.e., boiling water, frying oil, etc.), caustic chemicals or explosions. While uncommon, these injuries can cause not only severe pain and complicated local wounds but also result in serious metabolic abnormalities and systemic infection that can lead to life-threatening compromise.

BURN CLASSIFICATION IN MWDS[5-7]

Burns affecting dogs are physically similar to those in humans. Carefully clip over burned areas for adequate assessment. Be sure to evaluate the paw pads for burns, evident by depigmentation of pads, pads appearing grossly hyperemic and swollen, loss of hair adjacent to pads, exudation, lameness, and reluctance to walk.

- **Superficial** (equivalent to first-degree) burns are red and painful, similar to a sunburn, and involve the outer layer of the epidermis.
- **Partial thickness** (equivalent to second-degree)
  - Superficial partial thickness burns are red or mottled, with epidermal sloughing, fluid leakage, swelling, extreme hypersensitivity (pain), and involve the epidermis and variable amounts of the dermis. Hair should not easily pull out.
  - Deep partial-thickness burns are black or yellow-white and hair follicles are destroyed. The skin surface is dry. These burns are usually less painful as nerve endings are destroyed. If any hair remains, it will pull out easily.
- **Full-thickness** (equivalent to third-degree) burns are black, dry, and leathery. These burns have destroyed the epidermis and dermis and expose underlying connective tissue, muscle, and bone. Any eschar that forms is painless.

INHALATION INJURY

Burn patients may have significant inhalation injury that occurs primarily in the pharynx and upper trachea. Perform an oral exam to look for evidence of thermal injuries in the mouth that could indicate thermal injuries lower in the airway. Clinical signs of inhalation and pulmonary injuries may not manifest for several hours, and the full extent may not be observed for 24 to 36 hours. Clinical signs of inhalation injury include stertor or stridor, harsh upper airway sounds, coughing, production of dark sputum, tachypnea, and respiratory distress.

Diagnostics include thoracic radiographs, pulse oximetry, and venous or arterial blood gas analysis. Treatment involves oxygen supplementation in addition to nebulization with sterile saline, chest coupage, and analgesic medications. Observe MWDs with inhalation injuries closely for respiratory distress to assess if orotracheal intubation or (uncommonly) tracheostomy or cricothyrotomy is needed.[5]

Carbon monoxide (CO) is the most frequent cause of immediate death following smoke inhalation in humans. CO displaces oxygen on red blood cells which can lead to significant tissue hypoxia that is most prevalent in high oxygen demand tissues such as the brain and heart. Hemoglobin bound to oxygen and CO appear the same when measured with pulse oximetry, therefore oxygen saturation measurements (SpO_2) will be falsely elevated and as such arterial blood gas CO-oximetry (measuring carboxyhemoglobin) should be utilized to confirm CO toxicity. Additionally, the mucous membranes may appear normal, or may appear bright cherry red, masking tissue hypoxia. Early oxygen therapy is the mainstay treatment for CO toxicity.[5]

THERMAL OCULAR INJURY

If burns have affected the face and/or eyes of the MWD, reference the K9 Ocular Injuries CPG for additional information regarding examination, diagnosis and treatment of ocular injuries.

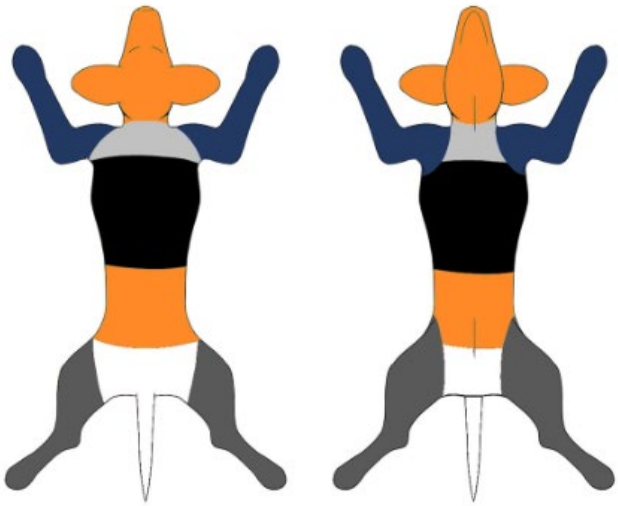
ESTIMATION OF TOTAL BODY SURFACE AREA BURNED

Determine the severity of the burn once the MWD has been resuscitated and stabilized. General characteristics of the wound that are important to examine include color, texture, presence or absence of pain, moistness, and extent of swelling, if present.

Estimate the percent of total body surface area (TBSA) burned using a modification of the "Rule of Nines" used for humans.[6]

Add the estimated percent of burn from each of the following body areas to determine TBSA burned (Figure 1).

Figure 1. Body surface area chart, showing surface areas of individual body parts presented as percentage of TBSA.[6]



Head	14%
Neck	9%
Thorax	18%
Abdomen	14%
Thoracic limb	9%
Pelvic limb	11%
Tail and pelvis	5%

The percent TBSA is important in calculating initial fluid requirements, assessing severity, anticipating problems and determining prognosis. Patients with TBSA >20% often have severe metabolic problems (e.g., hypovolemic shock, albumin and electrolyte losses, metabolic acidosis, renal failure) and patients with TBSA >50% have a poor prognosis.[7]

Prognosis must also consider not only TBSA but also burn severity. Initial evaluation of burn severity may be inaccurate, as wounds progress over a period of 3 to 7 days before completely manifesting ultimate severity.[7, 8]

GENERAL PATIENT MANAGEMENT RECOMMENDATIONS[7-10]

Monitor and treat for complications related to burn injury, to include shock, fluid losses, respiratory problems, and electrolyte abnormalities. Manage pain using appropriate analgesics. (See K9 Analgesia and Anesthesia CPG.) Frequent monitoring of vital parameters is essential in severely burned patients. Additional monitoring may include urine output, pain scores, bloodwork (i.e., complete blood count, biochemistry profiles, venous blood gases), pulse oximetry, and blood pressure.

Shock Resuscitation

If burns are greater than 20% TBSA, fluid resuscitation should be initiated as soon as IV (or intraosseous) access is established. Initiate resuscitation with (order of preference) Lactated Ringer's, Plasma-Lyte A/Normosol-R, or normal saline. Initial fluid rate is calculated as % TBSA burned x 10 mL/hour. If hemorrhagic shock is also present, resuscitation for hemorrhagic shock takes precedence over resuscitation for burn shock. If the wounds are partial or full thickness, hypovolemic shock can also occur from fluid sequestration in the burn area in the first 12 hours

Because the fluid loss can be profound, plasma products should be considered as a part of the continued fluid plan as indicated on an individual patient basis.[7]

Oxygen Therapy

Humidified oxygen therapy is important to initiate early in resuscitation for every patient with suspected smoke inhalation. CO toxicity can be masked by normal mucous membrane color and a falsely elevated pulse oximetry. The goal of oxygen therapy should be to administer as high of a fraction of inspired oxygen as possible and should be continued for a minimum of five hours if possible.[5]

Skin Cooling

If the patient presents within two hours of the burns occurring, cool the burned skin using cool water (45-65° F) by immersion, application of compresses, or gentle spray for at least 30 minutes. Cooling is analgesic and improves long-term wound healing with benefits seen if performed within two hours of injury.[7,9] Do not apply ice to any burned skin as the vasoconstriction it causes may impede wound healing and may worsen the extent of tissue damage. Measure the patient's rectal or esophageal temperature frequently to monitor for and prevent hypothermia due to systemic extravasation of fluid and evaporative fluid loss.

Minimize Contamination

- Minimize potential contamination of burned skin and resulting wounds.
- Wash hands thoroughly before handling patients.
- Wear clean exam gloves (superficial burns, superficial partial-thickness burns) or sterile surgical gloves (deep partial-thickness burns, full-thickness burns) for each wound.
- Follow strict aseptic technique when placing invasive devices and use clean examination gloves whenever handling catheters, adapters, fluid lines, etc. Unless necessary, do not place invasive devices through burned skin.

Nursing Care

- Provide excellent nursing care.
- Turn or rotate the MWD every 4 hours if recumbent and perform passive range of motion exercises of all limbs except burned limbs every 4 hours.
- Provide soft, padded bedding.
- Prevent urine scalding and fecal soiling.
- Allow MWDs to eat and drink if able. Major burns cause a hypermetabolic state characterized by hyperglycemia and catabolism of body protein stores. A high-energy critical care diet is recommended.
- Maintain thermoregulation, particularly for burns >20% TBSA, since severe burns lose heat rapidly through denuded skin, making it harder to maintain core body temperature. Recommend keeping denuded areas covered and keeping MWD in a warm relatively humid environment with routine monitoring of rectal temperatures.

SPECIFIC BURN WOUND MANAGEMENT RECOMMENDATIONS[4-5,7]

- Depending on severity and extent of burn, the patient may require daily heavy sedation or general anesthesia to allow debridement and management. (See K9 Analgesia and Anesthesia CPG.)
- Superficial or superficial partial-thickness burns are generally managed with daily cool water lavage, followed by topical silver sulfadiazine cream application until healed or the wound worsens.
- Deep partial-thickness and full-thickness burns need varying degrees of daily wound debridement (non-surgical or surgical).

- Non-surgical debridement of deep partial-thickness and full-thickness burns involves hydrotherapy using sterile saline lavage and application of a hyperosmotic moisture retentive dressing (e.g., honey, hypertonic saline) under a bandage.
- Surgical debridement is removal of obvious necrotic or dead tissue using aseptic technique and sharp dissection. This may be necessary in very deep or widespread wounds to more aggressively remove necrotic tissue. Following surgical debridement, a moisture retentive dressing (see K9 Wound Management CPG) and bandage is also applied.
- Prophylactic systemic antimicrobials are not routinely administered for managing burns. Provide systemic antibiotic coverage only for MWDs presumed to be immunocompromised, with pneumonia, acute lung injury, or with suspected or confirmed sepsis. Topical antimicrobials such as silver sulfadiazine are preferable to systemic treatment unless other indications justify their use.[10]
- Bandage burn wounds if the burn area is amenable to application (i.e., the bandage will not increase the potential for wound injury). For large areas that are not able to be bandaged, silver sulfadiazine should be used to cover the burn area and the patient kept in a low-fomite environment (i.e., a clean kennel). Change bandages daily or more often if wound exudate is excessive and/or the bandage becomes soiled.
- Extremity compartment syndrome secondary to burns is rare in dogs; this seems to be a much more common and severe problem in humans. Measures to control intracompartmental pressures like fasciotomy would be rarely needed.

CRUSH INJURY & CRUSH SYNDROME

Crush injury is defined as injury due to compression of extremities or other parts of the body that causes muscle swelling or trauma, with or without neurological or orthopedic problems in those body parts. The body areas most commonly involved are the limbs and torso.

Crush syndrome develops when crush injury is both extensive and prolonged, causing systemic manifestations. These systemic effects are due to traumatic rhabdomyolysis (muscle breakdown) and reperfusion injury (release of myoglobin, reactive oxygen species, and electrolytes into the circulatory system) after sudden release of pressure of the crushed limb or torso. Acute hypovolemia and metabolic abnormalities are common and can be both sudden and severe (even fatal) after release of pressure. Myoglobinuria from trauma to muscles may cause or exacerbate acute kidney injury if untreated. Cardiac arrhythmias can occur with reperfusion due to the shift in both calcium and potassium.

Crush injuries and crush syndrome in MWDs are expected after building collapses, most frequently following natural disasters or explosions, but also after motor vehicle accidents or roll-overs. Crush syndrome is rarely reported in animals; however, the incidence of acute kidney injury is high and should be closely observed for development.[11]

Other consequences of reperfusion include massive third spacing of fluids in crushed tissues leading to compartment syndrome as well as hypovolemia and shock and exacerbation of acute kidney injury.

CLINICAL PRESENTATION

Clinical signs of crush injury/syndrome include some or all of the following:

- Skin injury of the affected body part (may be subtle and less impressive than other signs)
- Limb swelling (may be delayed)
- Paresis or paralysis (may be mistaken as spinal cord injury)
- Loss of sensation (may mask the severity of underlying injury)
- Pain (typically becomes severe with reperfusion)
- Absent or weak extremity pulses
- Discolored urine due to myoglobinuria, hematuria or both
- Hypotension due to hypovolemia (dehydration, hemorrhage, third spacing of fluids) – may be severe

- Massive third spacing (often causes or exacerbates compartment syndrome and acute kidney injury)
- Metabolic abnormalities (hypocalcemia, hyperkalemia, and lactic acidosis)
- Clinical signs of compartment syndrome (severe pain in the involved extremity, pain on passive stretching of the involved muscles, decreased sensation to the affected limb)
- Acute kidney injury (due to rhabdomyolysis and secondary myoglobinuric acute tubular necrosis)
- Cardiac arrhythmias (due to the shift in electrolytes from the damaged tissue)[12]

CRUSH INJURY MANAGEMENT

Treat MWDs before and during extrication if possible.

Maintain a high index of suspicion, as MWDs with crush injury may present initially with few signs or symptoms. Delayed treatment leads to poor outcomes.

Most crush syndrome patients have an extensive area of involvement such as lower extremity and/or the pelvis. It requires more involvement than just one paw. Also, the crushing force must be present for some time before crush injury syndrome can occur.

The syndrome may develop in < 1 hour in a severe crush situation but usually takes 4-6 hours of compression for the processes that cause crush injury syndrome to take place.

Hallmark initial treatment for crush syndrome is IV fluid therapy before the release of pressure and continuing during extrication and evacuation. Place multiple IV lines because the MWD will require large fluid volumes and there is a risk of catheter dislodgement during extrication. Isotonic crystalloid fluids should be used for initial treatment and resuscitation.

Once compression is removed, maintain aggressive fluid therapy. Specific guidelines for fluid volumes are difficult to provide. As a starting point, use a rate of 3-5 mL/kg/hr to improve pulse quality, blood pressure (if available), capillary refill time, mucous membrane color and mentation. Try to estimate urine output – the goal is to maintain urine output > 1-2 mL/kg/hr.

> *If urine output decreases to below 0.5 mL/kg/hr and the patient is euvolemic, the patient has likely developed an acute kidney injury. Care should be taken to avoid fluid overload and the MWD should be evacuated.*[11]

The electrocardiogram (ECG) should be monitored for cardiac arrhythmias. ECG waveform tracings consistent with hyperkalemia should be treated as described in the paragraph below. For arrhythmias associated with cardiopulmonary arrest, treat in accordance with current RECOVER cardiopulmonary resuscitation guidelines.[13]

Monitor venous potassium levels with serial blood gas measurements if possible.

- If severe hyperkalemia (> 7.5 mEq/L) is present, the patient is at high risk for cardiac arrhythmias and should be emergently treated with 10% calcium gluconate (1 mL/kg IV over 2-3 minutes), insulin (0.5 U/kg IV) and dextrose (2 grams per kg of dextrose, or 4 mL/kg dextrose 50% IV), and terbutaline (0.01 mg/kg IM or slow IV).
    - Simultaneous ECG monitoring is recommended during administration of calcium gluconate to ensure the infusion does not worsen or create new arrhythmias.
    - Monitor blood glucose prior to and during insulin and dextrose therapy as well as in MWDs with concomitant hypoglycemia to delay insulin therapy until normoglycemia has been established.
- Moderate hyperkalemia (> 6.0 mEq/L) should be treated with insulin and 50% dextrose to prevent continued increased to cardiotoxic levels. Administering albuterol (inhalation or nebulization) or terbutaline (0.01 mg/kg IV slowly at 0.03 mg/min) concurrently with insulin dextrose therapy can further reduce serum potassium levels.[14,15]

Alkalinization of blood with bicarbonate (as is done for humans) will likely not be feasible. Providers should focus on aggressive IV fluid therapy to correct dehydration and promote diuresis pending extrication and evacuation.

Anticipate secondary complications. MWDs with crush injury should be treated initially as any other multiple trauma victim by triaging and treating all life-threatening injuries first.

While compartment syndrome seems to be a much more common and severe problem in humans, it is rare in dogs and as such, extreme measures to control intracompartmental pressures such as fasciotomy are unwarranted.

Wounds should be cleaned and covered with sterile dressings in the usual fashion. Splint fractures if possible.

Provide analgesia (see K9 Analgesia and Anesthesia CPG) to any MWD with crush injury or crush syndrome.

If available, administering N-acetylcysteine at 150-250 mg/kg IV at 0 and 6 hours after reperfusion should be considered as it may decrease reactive oxygen species, increase recovery of muscle function and decrease fibrosis.[16]

PERFORMANCE IMPROVEMENT (PI) MONITORING

POPULATION OF INTEREST

All MWDs that sustained blast, burn or crush injuries.

INTENT (EXPECTED OUTCOMES)

- Recovery from blast, burn or crush injury.
- 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 blast injury.
- Number and percentage of patients in the population of interest (deployed MWDs) that sustained burn injury.
- Number and percentage of patients in the population of interest (deployed MWDs) that sustained crush injury.
- For the injury type listed above that was sustained:
    - Specify cause of injury (if known) and location of injury.
    - Specify type of intervention and treatment performed.
    - Determine the number and percentage of patients in the population of interest (deployed MWDs) that recovered from the original injury.
    - Determine the number and percentage of MWDs that returned to duty versus those that were medically retired following the event or that died as result of injury.

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

Based on the CPG below is an extensive list of medical supplies, fluid requirements, monitoring equipment, pain medications, and antibiotics for managing blast, burn, and crush injuries.

Airway & Respiratory

- Oxygen concentrator, (if available) cylinders, and regulators
- Bag-valve mask with PEEP valve
- Suction unit (portable)
- Suction catheters (various sizes)
- Endotracheal tubes (7.0 – 12.0 mm)
- Laryngoscope handles (Miller/Mac blades)
- Stylets
- Surgical cricothyrotomy or tracheostomy kit
- Capnography adapter for K9 ET tube
- Portable/transport ventilator with disposable circuits

Hemorrhage Control & Chest Injury

- SWAT-T tourniquets
- Hemostatic gauze (combat gauze, Celox, etc.)
- Pressure dressings
- Large sterile trauma dressings
- Chest tube trays (20 - 32Fr)
- Chest drainage systems
- Portable ultrasound

IV / IO Access & Fluid Resuscitation

- IV catheters (18 - 22G assortment)
- IV start kits
- IO needles and driver/drill (15-18G)
- IV tubing and administration sets
- Pressure infuser bags
- Crystalloids (Normal Saline, Lactated Ringer's, PlasmaLyte)
- Blood product administration sets
- Urinary catheter (Foley) kits (6-10Fr)
- Urine drainage bags / urine meters

Burn Wound Care

- Sterile normal saline (large volume)
- Irrigation tubing
- Irrigation syringes (35 mL with blunt tip)
- Silver sulfadiazine (Silvadene) cream
- Silver-impregnated dressings
- Hydrogel dressings
- Non-adherent dressings (Adaptic, Telfa)
- Sterile gauze pads
- Rolled gauze / conforming bandages
- ABD pads
- Burn sheet(s)
- Sterile drapes
- Debridement tools (scissors, forceps, scalpel blades)

Escharotomy / Fasciotomy / Surgical Supplies

- Surgical instrument set (scalpels, scissors, hemostats, retractors)
- Electrocautery unit, tips, and grounding pads
- Sterile gowns, gloves (surgical sizes), towels, and drapes
- Sutures (various sizes)
- Skin staples and staple remover
- Packing materials
- Surgical suction tubing

Crush Syndrome Management

- Sodium bicarbonate (IV)
- Mannitol (IV)
- Urine output measurement devices (urine meters, graduated cylinders)
- Lab draw kits
- Point-of-care testing cartridges (electrolytes/chem if available)

Continued on next page

Wound Debridement & Infection Control

- Sterile saline (1 L / 3 L bags)
- 30-60 mL irrigation syringes
- Chlorhexidine (CHG) solution
- CHG wipes
- Broad-spectrum antibiotics (stock, per CPG)
- Biohazard bags
- Sharps containers

Analgesia / Sedation / Med Adjunct Supplies

- IV administration sets
- Infusion pump tubing
- Syringes (1 mL - 60 mL)
- Needles (18 - 25G range)
- Alcohol preps
- Elizabethan collar

Monitoring & Diagnostics

- Vital signs monitor (BP, SpO2, temp, ECG)
- Capnography device ($ETCO_2$)
- Thermometers
- Glucometer + test strips
- Point-of-care analyzer (if available)
- Urine dipstick

Imaging

- Portable X-ray unit (if available)
- X-ray cassettes / digital plates

Splinting & Immobilization

- SAM splints
- Vacuum splints (if available)
- Vet wrap
- Cast padding
- Bandage tape
- Backboard or K9 compatible litter
- Towels and blankets

PPE & Sterile Supplies

- Surgical masks
- N95 respirators
- Eye protection
- Impermeable gowns
- Non-sterile gloves
- Hand sanitizer
- Soap
- Sterile surgical sets

Documentation/Field Tools

- K9TCCC card (DD 3073)
- Burn assessment chart
- Waterproof patient documentation
- Clippers
- Markers pens

For additional information including National Stock Number (NSN), refer to Logistics Plans & Readiness (sharepoint-mil.us)

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