

## **OPTIMIZING TREATMENT PROTOCOLS FOR TRAUMATIC PATIENTS IN CRITICAL CARE**

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### **INTRODUCTION**

Traumatic injuries represent a significant portion of veterinary emergency cases, presenting unique challenges in terms of assessment, stabilization, and definitive management. Successful treatment depends on coordinated teamwork, thorough preparedness, systematic patient assessment, and effective stress management protocols. This lecture discusses the optimization of trauma management by emphasizing multidisciplinary collaboration, systematic triage algorithms (MARCH-PAWS), cognitive offloading strategies, and practical stress management approaches.

### **TEAMWORK AND COMMUNICATION IN TRAUMA MANAGEMENT**

Effective trauma care requires well-coordinated teamwork among emergency personnel. In larger practices, trauma teams typically comprise emergency-trained veterinarians, veterinary technicians, critical care specialists, radiologists, anesthesiologists, neurologists, and surgeons. However, many practices operate with smaller teams or single-team models, where clear role designation, rapid and precise communication, and streamlined workflows become even more critical.

Structured communication methods, such as closed-loop communication and standardized hand-offs, significantly reduce misunderstandings during high-stress trauma scenarios. Pre-emptive simulations and regular drills foster a cohesive team dynamic, ensuring rapid mobilization and efficient resource allocation during real emergencies.

Team preparation should include:

- Defined team leader roles (usually emergency clinician)
- Clear delegation of procedural tasks (e.g., catheter placement, monitoring, imaging)
- Standardized communication methods, such as closed-loop communication (repeat-back system)

### **PREPAREDNESS FOR SEVERE TRAUMA CASES**

Preparedness significantly impacts outcomes. Practices should maintain readily accessible trauma carts stocked with essential emergency supplies (IV fluids, catheters, thoracocentesis and abdominocentesis kits, airway management tools). Regular staff training ensures proficiency in performing life-saving procedures, such as rapid IV access, thoracocentesis, chest tube placement, and emergency ultrasonography.

Recognizing cases requiring advanced vascular access techniques, such as ultrasound-guided or intraosseous catheter placement, is crucial to optimizing resuscitative efforts in profoundly hypovolemic patients.

### **MARCH-PAWS: A TRAUMA-SPECIFIC ALGORITHM FOR RAPID ASSESSMENT**

While traditional ABC assessment (Airway, Breathing, Circulation) remains foundational, trauma cases benefit significantly from a structured, trauma-specific approach: the MARCH-PAWS protocol. Initially developed in military trauma care, MARCH-PAWS systematically prioritizes immediate life-threatening conditions:

- **Massive hemorrhage control**
- **Airway stabilization**
- **Respiratory support**
- **Circulatory stabilization**
- **Head injury and Hypothermia management**
- **Pain relief**
- **Antibiotic prophylaxis**
- **Wound care**

- **Splinting and spinal stabilization**

Early hemorrhage control reduces progression to hemorrhagic shock (**HS**) and significantly improves outcomes. Using this algorithm streamlines initial interventions, reducing decision-making fatigue and cognitive overload.

### **STRESS MANAGEMENT AND TEAM PERFORMANCE: "BEAT THE STRESS FOOL"**

During high-stakes trauma or resuscitation, maintaining cognitive clarity is a critical skill for any clinician. The **Beat the Stress Fool** (BTSF) technique is a performance-enhancing psychological tool designed to help individuals regulate acute stress responses in real time. It supports decision-making, prevents cognitive freeze, and is most effective when practiced in advance, allowing it to become automatic under pressure.

**Breathe:** Utilize tactical breathing to shift your physiological state rapidly. A recommended pattern is a slow inhale over 4 seconds, followed by a controlled exhale over 8–10 seconds. This calms the sympathetic nervous system, reduces anxiety, and improves mental clarity.

**Talk:** Engage in short, affirmative self-talk. Use simple, present-tense phrases like "I've got this" or "Stay focused" to block intrusive thoughts and anchor your mindset.

**See:** Visualize the subsequent critical actions before taking them. This mental rehearsal primes your neural pathways, increasing the likelihood of a smooth and confident performance. Picture yourself acting deliberately and effectively.

**Focus:** Choose a personal trigger word or cue (e.g., "steady," "clear," "breathe") to anchor your attention. Repeating this word internally helps suppress noise and refocus attention on the immediate task.

Use BTSF **before** initiating high-stakes actions to establish focus and calm. If overwhelmed during a case, mentally cycle through: *Breathe, Talk, See, Focus*, even for just 10–15 seconds. Practice BTSF during low-stress situations so it becomes instinctive during crises. Under acute stress, working memory and cognitive flexibility decline. BTSF provides a rapid and structured method to restore control and maintain performance. Unlike mindfulness or team-based strategies, BTSF is designed for the **individual** clinician, giving you a personal mental toolkit to remain steady when it matters most.

### **ADVANCED DIAGNOSTICS IN TRAUMA CARE**

Timely diagnostic imaging significantly impacts decision-making. Point-of-care ultrasound (POCUS), radiography, and computed tomography (CT) are crucial for identifying thoracic injuries (pneumothorax, hemothorax), abdominal injuries (hemoperitoneum, uroabdomen, gastrointestinal perforations), and associated complications, such as diaphragmatic hernias or fractures.

Rapid and serial evaluations using POCUS have become the standard of care, providing real-time bedside insights and guiding further interventions.

### **KEY THERAPEUTIC INTERVENTIONS**

#### **Difficult Vascular Access**

In critically unstable trauma patients, rapid vascular access is essential. When traditional peripheral catheter placement fails, clinicians should be familiar with advanced methods such as ultrasound-guided catheterization, vascular cut-down, or intraosseous access techniques.

#### **Fluid and Massive Transfusion (Please see notes for Cutting-edge treatments for hemorrhagic shock in veterinary medicine)**

Initial fluid resuscitation may involve isotonic crystalloids; however, severe hemorrhage often demands early blood product transfusion. Massive transfusion protocols in veterinary medicine advocate balanced blood product administration (1:1 ratio of packed RBCs and plasma) when feasible.

Complications of massive transfusion, such as citrate toxicity (hypocalcemia), hypothermia, and coagulopathy, should be proactively managed.

**Tranexamic acid (TXA) can be beneficial in cases of severe hemorrhage.** The initial dose is 10–15 mg/kg IV slowly over 10 minutes, followed by a continuous infusion of 1–2 mg/kg/hr for 5–8 hours.

#### **Vasopressor and Supportive Therapies**

Persistent hypotension post-fluid therapy may require vasopressor support, typically with norepinephrine (0.05–0.5 µg/kg/min IV CRI). Vasopressin (0.5–4 mU/kg/min IV CRI) is another viable option for refractory cases.

### DECISION-MAKING FOR SURGICAL INTERVENTION

Rapid identification of patients requiring surgical intervention is vital. Indications for urgent surgery typically include:

- Uncontrollable hemorrhage
- Organ rupture (bladder, gastrointestinal tract, diaphragm)
- Penetrating trauma with evisceration
- Severe ongoing peritonitis

Delaying necessary interventions substantially increases morbidity and mortality; thus, timely surgical consultation is paramount.

### PRIORITIZATION AND DECISION-MAKING IN COMPLEX POLYTRAUMA PATIENTS

In complex polytrauma patients presenting with multiple system injuries, such as fractures, ocular trauma, and urinary tract rupture, clinical teams frequently face challenging decisions regarding the timing and prioritization of interventions. Effective management depends upon collaborative assessment and clear communication across specialty services, recognizing that initial stabilization of life-threatening or organ-threatening injuries takes precedence. For example, priority typically focuses on addressing conditions posing imminent systemic risks, such as a ruptured bladder leading to severe metabolic derangements or massive hemorrhage threatening hemodynamic stability. Once the patient is systemically stable, surgical interventions for injuries like open fractures or a ruptured ocular globe can follow in order of urgency and prognosis for functional recovery. Establishing clear interdisciplinary dialogue, guided by principles of rapid triage, hemodynamic stabilization, and sequential organ preservation, ensures the best possible outcomes in these challenging clinical scenarios.

| Body System            | High Priority (Immediate)                                                                 | Moderate Priority (Early, post-stabilization)    | Lower Priority (Delayed, once stable)           |
|------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------|
| <b>Cardiovascular</b>  | Massive hemorrhage, cardiac tamponade                                                     | Moderate bleeding                                | Minor bleeding, small pericardial effusions     |
| <b>Respiratory</b>     | Airway obstruction, tension pneumothorax, severe hypoxemia                                | Moderate pneumothorax, moderate pleural effusion | Mild pneumothorax, mild pleural effusion        |
| <b>Neurological</b>    | Severe traumatic brain injury, spinal cord trauma with instability                        | Moderate spinal injury without instability       | Peripheral nerve injuries                       |
| <b>Abdominal</b>       | Ruptured urinary bladder, gastrointestinal perforation, active intra-abdominal hemorrhage | Stable hemoabdomen, mild urinary tract injuries  | Minor hepatic or splenic contusions             |
| <b>Musculoskeletal</b> | Open fractures with ongoing hemorrhage                                                    | Closed long-bone fractures, pelvic fractures     | Stable, minor fractures or soft tissue injuries |
| <b>Ocular</b>          | Chemical injury, ocular foreign body with risk of intracranial involvement                | Ruptured globe, significant corneal laceration   | Minor corneal abrasions or contusions           |
| <b>Integumentary</b>   | Severe burns, open wounds with major hemorrhage                                           | Moderate lacerations, contaminated wounds        | Minor superficial wounds, abrasions             |

The priorities outlined above serve as general clinical guidance. Actual clinical decisions must rely on individual patient assessments, clinician judgment, resource availability, and situational context. Complex polytrauma management frequently requires flexibility and adaptation beyond standardized protocols.

### COGNITIVE OFFLOADING CHECKLIST FOR TRAUMA CARE

To manage the complexity of trauma scenarios effectively, teams benefit from cognitive offloading strategies such as clear checklists:

- Rapid initial triage (MARCH-PAWS)
- Immediate massive hemorrhage control
- Secure airway, ensure adequate ventilation
- Initiate IV access (consider advanced techniques)
- Evaluate rapidly with bedside ultrasound
- Administer balanced fluid resuscitation, early blood products

- Consider a surgical consultation promptly
- Systematic reassessment of response to therapy
- Communicate clearly, document thoroughly
- Monitor for evolving complications (coagulopathy, organ dysfunction, vasodilation)

**TABLE: Common Trauma Complications and Early Signs**

| Complication       | Early Clinical Signs                    | Diagnostic Confirmation                     |
|--------------------|-----------------------------------------|---------------------------------------------|
| Hemorrhagic shock  | Tachycardia, pale mm, prolonged CRT     | Lactate, PCV, ultrasound                    |
| Pneumothorax       | Dyspnea, decreased lung sounds          | POCUS, radiographs                          |
| Uroabdomen         | Abdominal distension, lack of urination | Ultrasound, creatinine ratios               |
| Septic peritonitis | Fever, abdominal pain, free fluid       | Fluid cytology, glucose, and lactate levels |
| Coagulopathy       | Persistent bleeding, bruising           | Coagulation profile (PT, aPTT, TEG/ROTEM)   |

### SUMMARY AND CLINICAL PEARLS

Optimizing trauma management involves structured teamwork, preparedness, systematic triage (MARCH-PAWS), effective stress management ("Beat the Stress Fool"), rapid diagnostic assessments, and targeted resuscitation approaches. These principles, supported by clear checklists and cognitive offloading strategies, significantly enhance clinical outcomes, reduce errors, and improve team resilience in challenging emergencies.

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