

# Committee on Surgical Combat Casualty Care (CoSCCC)



## Journal Watch

3rd Quarter

FY2019

## Journal Watch Key Terminology Searched:

|                                 |                           |                               |
|---------------------------------|---------------------------|-------------------------------|
| Microcirculation                | Trauma Management         | Haemorrhage                   |
| Shock                           | Sublingual                | Ethics committees             |
| Human subject research          | IDF                       | Institutional review board    |
| Haemorrhagic shock              | Multiple trauma           | Shock index                   |
| Traumatic brain injury          | Coagulopathy              | Diagnostic accuracy           |
| Plasma                          | Pre-hospital              | Thrombelastography (TEG)      |
| Transfusion                     | Trauma                    | Imaging                       |
| RBCs                            | Resuscitation             | Severe trauma                 |
| Stability                       | Ultrasound                | Afghanistan                   |
| Blast                           | Facial trauma             | War                           |
| Amputation                      | Multiple                  | Transfusion                   |
| Traumatic Clinical outcomes     | Clinical parameters       | Damage control                |
| Injury                          | Pelvic fracture           | Trauma                        |
| Coagulopathy                    | Cryoprecipitate           | Fibrinogen                    |
| Fibrinogen concentrate          | Massive transfusion       | ABO                           |
| Viscoelastic haemostatic assays | Angiography               | External fixation             |
| Guidelines                      | Internal fixation         | Pelvic ring                   |
| fractures                       | X-ray                     | Pre-peritoneal pelvic packing |
| REBOA                           | Antibiotic prophylaxis    | Long bone fractures           |
| Orthopaedic trauma              | Perioperative antibiotics | Surgical site infection       |
| Wound ballistics                | Faecal diversion          | Primary repair                |
| Cause of injury                 | Head injuries             | Pain management               |
| Battlefield Trauma              | Austere                   | Austere Surgery               |

## **Is E-FAST possible and useful on the battlefield? A feasibility study during medical courses in hostile environment (MEDICHOS): preliminary results.**

[Renard A](#)<sup>1</sup>, [Martinet C](#)<sup>2</sup>, [Cungi PJ](#)<sup>3</sup>, [Combes E](#)<sup>2</sup>, [Gasparini G](#)<sup>2</sup>, [Cazes N](#)<sup>4</sup>, [Carfantan C](#)<sup>5</sup>, [Faivre A](#)<sup>3</sup>, [Travers S](#)<sup>6</sup>, [Kelway C](#)<sup>7</sup>, [Benner P](#)<sup>2</sup>.

### **Abstract**

**INTRODUCTION:** The extent of the French forces' territory in the Sahel band generates long medical evacuations. In case of many victims, to respect the golden hour rule, first-line sorting is essential. Through simulation situations, the aim of our study was to assess whether the use of ultrasound was useful to military doctors.

**METHODS:** In combat-like exercise conditions, we provided trainees with a pocket-size ultrasound. Every patient for whom the trainees chose to perform ultrasound in role 1 was included. An extended focused assessment with sonography for trauma (E-FAST) was performed with six basic sonographic views. We evaluated whether these reference views were obtained or not. Once obtained by the trainees, pathological views corresponding to the scenario were shown to assess whether the trainees modified their therapeutic management strategy and their priorities.

**RESULTS:** 168 patients were treated by 15 different trainee doctors. Of these 168 patients, ultrasound (E-FAST or point-of-care ultrasound) was performed on 44 (26%) of them. In 51% (n=20/39) of the situations, the practitioners considered that the realisation of ultrasound had a significant impact in terms of therapeutic and evacuation priorities. More specifically, it changed therapeutic decisions in 67% of time (n=26/39) and evacuation priorities in 72% of time (n=28/39).

**CONCLUSION:** This original work showed that ultrasound on the battlefield was possible and useful. To confirm these results, ultrasound needs to be democratised and assessed in a real operational environment.

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**KEYWORDS:** battlefield; military medicine; triage; ultrasound  
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## **Lifeline for the front lines: blood products to support the warfighter.**

[Taylor AL](#)<sup>1</sup>, [Corley JB](#)<sup>2</sup>, [Swingholm MT](#)<sup>2</sup>, [Sloan MA](#)<sup>3</sup>, [McDonald H Jr](#)<sup>4</sup>, [Quesada JF](#)<sup>5</sup>, [Evans CL](#)<sup>6</sup>, [Ceballos WA](#)<sup>7</sup>.

### **Abstract**

**BACKGROUND:** Hemorrhage is the leading cause of death on the battlefield. Damage control resuscitation guidelines in the US military recommend whole blood as the preferred resuscitation product. The Armed Services Blood Program (ASBP) has initiated low-titer group O whole blood (LTOWB) production and predeployment donor screening to make whole blood more available to military forces.

**STUDY DESIGN AND METHODS:** ASBP donor centers updated procedures and labeling for LTOWB production. Donors are screened according to US Food and Drug Administration regulations and standard operating procedures. Group O donors are tested for anti-A and anti-B titer levels. Additionally, military personnel notified for pending deployment coordinate with their local ASBP donor center to complete whole blood donor prescreening. The process consists of completing a donor history questionnaire, processing of blood samples for blood group and infectious disease testing, and titer determination for group O personnel.

**RESULTS:** Since March 2016, 7940 LTOWB units have been manufactured at ASBP donor centers and shipped in support of combat operations. Additionally, ASBP donor centers have screened several thousand service members before deployment. From these screenings, the donor low titer rate was 68% and infectious disease reactive test rate was extremely low ( $\leq 0.004$ ).

**CONCLUSION:** Whole blood is now the preferred blood product for resuscitation of combat trauma patients. The ASBP partnered with combat forces to screen personnel before deployment. Additionally, LTOWB is manufactured and shipped in support of combat operations. These efforts are expanding the availability of LTOWB for the warfighter.

PMID: 30980750 DOI: [10.1111/trf.15165](#)

## Missed injuries in combat casualties: Lessons from Iraq and Afghanistan.

[Undurraga Perl VJ](#)<sup>1</sup>, [Johnson C](#)<sup>2</sup>, [Kelley S](#)<sup>2</sup>, [Woods P](#)<sup>2</sup>, [Martin K](#)<sup>2</sup>, [Zonies D](#)<sup>3</sup>.

### Abstract

**INTRODUCTION:** Once injured in the battlefield in Iraq and Afghanistan, U.S. and NATO troops receive medical treatment through tiered echelons of care with varying resources, from austere to state-of-the-art. Similar to civilian trauma systems, the aim is to provide rapid and safe patient movement toward definitive management. A consequence of the rapid transfer of patients is the possibility of missed or delayed diagnosis of injuries. With the new injury patterns seen during these conflicts, we aimed to identify and characterize which injuries are missed and what consequences do they have on our troops' road to recovery.

**PATIENTS AND METHODS:** A retrospective review of a PI database (established 2007) for consecutively admitted combat casualties was performed between 2007-2013. Baseline patient characteristics, injury year, admitting service, injury type, and subsequent management decisions were categorized and analyzed.

**RESULTS:** There were 301 missed injuries (MI) identified in 248 patients. The annual missed injury rate was 25 per 1000 admissions. Missed injuries were associated with a penetrating mechanism (82.7% vs 58.5%,  $p < 0.001$ ), ICU admission (58.5% vs 27.4%,  $p < 0.001$ ), higher ISS (median 14 vs 8,  $p < 0.001$ ), and a longer length of stay (median 3 versus 2 days,  $p < 0.001$ ). 194 (64.5%) missed injuries led to a change in management, with 68 (22.6%) requiring a surgical procedure. 1.3% of missed injuries were life threatening, 28.2% major and 65.4% minor. The most common injuries were distal extremity fractures (23.9%), followed by spine fractures (13.3%) and traumatic tympanic membrane rupture (12.6%). There were no deaths attributed to a missed injury.

**DISCUSSION:** Missed injuries during combat operations occur on a low but consistent basis. Most injuries are orthopedic in nature and typically occur in critically ill patients admitted to the ICU. It is rare that a missed injury results in a life-threatening condition.

**CONCLUSION:** As healthcare practitioners prepare for future deployments, this analysis may serve as a resource to focus on frequently missed injuries and possibly improve their detection.

**KEYWORDS:** Combat casualties; Missed injuries; Performance improvement

PMID:30661669 DOI:[10.1016/j.injury.2019.01.005](#)

## A descriptive study of US Special Operations Command fatalities, 2001-2018.

[Kotwal RS<sup>1</sup>](#), [Mazuchowski EL](#), [Stern CA](#), [Montgomery HR](#), [Janak JC](#), [Howard JT](#), [Butler FK](#), [Holcomb JB](#), [Eastridge BJ](#), [Gurney JM](#), [Shackelford SA](#).

### Abstract

**BACKGROUND:** Studies of fatalities from injury and disease guide prevention and treatment efforts for populations at risk. Findings can inform leadership and direct clinical practice guidelines, research, and personnel, training, and equipment requirements.

**METHODS:** A retrospective review and descriptive analysis was conducted of United States Special Operations Command (USSOCOM) fatalities who died while performing duties from September 11, 2001 to September 10, 2018. Characteristics analyzed included subcommand, military activity, operational posture, and manner of death.

**RESULTS:** Of 614 USSOCOM fatalities (median age, 30; male 98.5%) the leading cause of death was injury (97.7%); specifically, multiple/blunt force injury (34.5%), blast injury (30.7%), gunshot wound (GSW; 30.3%), and other (4.5%). Most died outside the US (87.1%); during combat operations (85.3%); in the prehospital environment (91.5%); the same day of insult (90.4%). Most fatalities were with the US Army Special Operations Command (67.6%), followed by the Naval Special Warfare Command (16.0%), Air Force Special Operations Command (9.3%), and Marine Corps Forces Special Operations Command (7.2%). Of 54.6% who died of injuries incurred during mounted operations, most were on ground vehicles (53.7%), followed by rotary-wing (37.3%) and fixed-wing (9.0%) aircraft. The manner of death was primarily homicide (66.0%) and accident (30.5%), followed by natural (2.1%), suicide (0.8%), and undetermined (0.7%). Specific homicide causes of death were GSW (43.7%), blast injury (42.2%), multiple/blunt force injury (13.8%), and other (0.2%). Specific accident causes of death were multiple/blunt force injury (80.7%), blast injury (6.4%), GSW (0.5%), and other (12.3%). Of accident fatalities with multiple/blunt force injury, the mechanism was mostly aircraft mishaps (62.9%), particularly rotary-wing (68.4%).

**CONCLUSIONS:** Most USSOCOM fatalities died abroad from injury in the prehospital setting. To improve survival from military activities worldwide, leaders must continue to optimize prehospital capability and develop strategies that rapidly connect patients to advanced resuscitative and surgical care. Performance Improvement and Epidemiological, level IV.

PMID:31045733 DOI:[10.1097/TA.0000000000002354](#)

## **Give the trauma patient what they bleed, when and where they need it: establishing a comprehensive regional system of resuscitation based on patient need utilizing cold-stored, low-titer O+ whole blood.**

[Zhu CS](#)<sup>1</sup>, [Pokorny DM](#)<sup>1</sup>, [Eastridge BJ](#)<sup>1,2</sup>, [Nicholson SE](#)<sup>1</sup>, [Epley E](#)<sup>2</sup>, [Forcum J](#)<sup>3</sup>, [Long T](#)<sup>2</sup>, [Miramontes D](#)<sup>1,2</sup>, [Schaefer R](#)<sup>2</sup>, [Shiels M](#)<sup>1</sup>, [Stewart RM](#)<sup>1,2</sup>, [Stringfellow M](#)<sup>4</sup>, [Summers R](#)<sup>2</sup>, [Winckler CJ](#)<sup>1,2,5</sup>, [Jenkins DH](#)<sup>1,2,5</sup>.

### **Abstract**

**BACKGROUND:** Despite countless advancements in trauma care a survivability gap still exists in the prehospital setting. Military studies clearly identify hemorrhage as the leading cause of potentially survivable prehospital death. Shifting resuscitation from the hospital to the point of injury has shown great promise in decreasing mortality among the severely injured.

**MATERIALS AND METHODS:** Our regional trauma network (Southwest Texas Regional Advisory Council) developed and implemented a multiphased approach toward facilitating remote damage control resuscitation. This approach required placing low-titer O+ whole blood (LTO+ WB) at helicopter emergency medical service bases, transitioning hospital-based trauma resuscitation from component therapy to the use of whole blood, modifying select ground-based units to carry and administer whole blood at the scene of an accident, and altering the practices of our blood bank to support our new initiative. In addition, we had to provide information and training to an entire large urban emergency medical system regarding changes in policy.

**RESULTS:** Through a thorough, structured program we were able to successfully implement point-of-injury resuscitation with LTO+ WB. Preliminary evaluation of our first 25 patients has shown a marked decrease in mortality compared to our historic rate using component therapy or crystalloid solutions. Additionally, we have had zero transfusion reactions or seroconversions.

**CONCLUSION:** Transfusion at the scene within minutes of injury has the potential to save lives. As our utilization expands to our outlying network we expect to see a continued decrease in mortality among significantly injured trauma patients.

# An Analysis of Orthopedic Surgical Procedures Performed During U.S. Combat Operations from 2002 to 2016.

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## Author information

### Abstract

**INTRODUCTION:** Orthopedic surgery constitutes 27% of procedures performed for combat injuries. General surgeons may deploy far forward without orthopedic surgeon support. This study examines the type and volume of orthopedic procedures during 15 years of combat operations in Iraq and Afghanistan.

**MATERIALS AND METHODS:** Retrospective analysis of the US Department of Defense Trauma Registry (DoDTR) was performed for all Role 2 and Role 3 facilities, from January 2002 to May 2016. The 342 ICD-9-CM orthopedic surgical procedure codes identified were stratified into fifteen categories, with upper and lower extremity subgroups. Data analysis used Stata Version 14 (College Station, TX).

**RESULTS:** A total of 51,159 orthopedic procedures were identified. Most (43,611, 85.2%) were reported at Role 3 s. More procedures were reported on lower extremities (21,688, 57.9%). Orthopedic caseload was extremely variable throughout the 15-year study period.

**CONCLUSIONS:** Orthopedic surgical procedures are common on the battlefield. Current dispersed military operations can occur without orthopedic surgeon support; general surgeons therefore become responsible for initial management of all injuries. Debridement of open fracture, fasciotomy, amputation and external fixation account for 2/3 of combat orthopedic volume; these procedures are no longer a significant part of general surgery training, and uncommonly performed by general/trauma surgeons at US hospitals. Given their frequency in war, expertise in orthopedic procedures by military general surgeons is imperative.

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**KEYWORDS:** orthopedic surgery; training; trauma

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