

Committee on Surgical Combat Casualty Care (CoSCCC)



Journal Watch

3rd Quarter

FY 2022

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 Surgery
Injury	Pelvic fracture	Battlefield 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	Poly-trauma
Damage Control Resuscitation	Battlefield injury	Prolonged field care
Tension pneumothorax	Thoracotomy	Military Medicine
Blast Injury	Died of Wounds	Killed in Action
Combat casualty care	Medical treatment facility	Mortality
Surgical skills	Emergency surgery	Infection prevention
Novel Coronavirus	COVID-19	Hypocalcemia
Predictions	Vital Signs	Global Surgery
Limb Salvage	Temporary Shunts	

The Role of Whole Blood Transfusions in Civilian Trauma: A Review of Literature in Military and Civilian Trauma

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Abstract

Resuscitation techniques for the management of adult trauma patients have evolved over the 20th century. Whole blood transfusions were previously used as the standard of care, whereas blood component therapy is the current method employed across most trauma centers across the United States. Prior to the transition, no studies were conducted to show improved efficacy of hemostatic potential in trauma patients. Recent conflicts in Iraq and Afghanistan have challenged the dogma that whole blood transfusions are not the standard of care and have shown potential as the superior transfusion product for adult trauma patients. The purpose of this review is to provide a comprehensive review and elucidate if whole blood transfusions have a role in civilian trauma patients based upon recent military medical literature and civilian pilot studies using whole blood transfusions.

Keywords: acute care surgery and trauma; emergency medicine resuscitation; fluid resuscitation; fresh whole blood; hemorrhagic shock; massive blood transfusion; military trauma; surgery general; trauma patients; trauma resuscitation.

Do not forget the platelets: The independent impact of red blood cell to platelet ratio on mortality in massively transfused trauma patients

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Abstract

Background: Balanced blood component administration during massive transfusion is standard of care. Most literature focuses on the impact of red blood cell (RBC)/fresh frozen plasma (FFP) ratio, while the value of balanced RBC:platelet (PLT) administration is less established. The aim of this study was to evaluate and quantify the independent impact of RBC:PLT on 24-hour mortality in trauma patients receiving massive transfusion.

Methods: Using the 2013 to 2018 American College of Surgeons Trauma Quality Improvement Program database, adult patients who received massive transfusion (≥ 10 U of RBC/24 hours) and ≥ 1 U of RBC, FFP, and PLT within 4 hours of arrival were retrospectively included. To mitigate survival bias, only patients with consistent RBC:PLT and RBC:FFP ratios between 4 and 24 hours were analyzed. Balanced FFP or PLT transfusions were defined as having RBC:PLT and RBC:FFP of ≤ 2 , respectively. Multivariable logistic regression was used to compare the independent relationship between RBC:FFP, RBC:PLT, balanced transfusion, and 24-hour mortality.

Results: A total of 9,215 massive transfusion patients were included. The number of patients who received transfusion with RBC:PLT > 2 (1,942 [21.1%]) was significantly higher than those with RBC:FFP > 2 (1,160 [12.6%]) ($p < 0.001$). Compared with an RBC:PLT ratio of 1:1, a gradual and consistent risk increase was observed for 24-hour mortality as the RBC:PLT ratio increased ($p < 0.001$). Patients with both FFP and PLT balanced transfusion had the lowest adjusted risk for 24-hour mortality. Mortality increased as resuscitation became more unbalanced, with higher odds of death for unbalanced PLT (odds ratio, 2.48 [2.18-2.83]) than unbalanced FFP (odds ratio, 1.66 [1.37-1.98]), while patients who received both FFP and PLT unbalanced transfusion had the highest risk of 24-hour mortality (odds ratio, 3.41 [2.74-4.24]).

Conclusion: Trauma patients receiving massive transfusion significantly more often have unbalanced PLT rather than unbalanced FFP transfusion. The impact of unbalanced PLT transfusion on 24-hour mortality is independent and potentially more pronounced than unbalanced FFP transfusion, warranting serious system-level efforts for improvement.

Level of evidence: Therapeutic/Care Management; Level IV.

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Building trauma capability: using geospatial analysis to consider military treatment facilities for trauma center development

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Abstract

Background: The Military Health System must develop and sustain experienced surgical trauma teams while facing decreased surgical volumes both during and between deployments. Military trauma resources may enhance local trauma systems by accepting civilian patients for care at military treatment facilities (MTFs). Some MTFs may be able to augment their regional trauma systems by developing trauma center (TC) capabilities. The aim of this study was to evaluate the geographical proximity of MTFs to the continental US (CONUS) population and relative to existing civilian adult TCs, and then to determine which MTFs might benefit most from TC development.

Methods: Publicly available data were used to develop a list of CONUS adult civilian level 1 and level 2 TCs and also to generate a list of CONUS MTFs. Census data were used to estimate adult population densities across zip codes. Distances were calculated between zip codes and civilian TCs and MTFs. The affected population sizes and reductions in distance were tabulated for every zip code that was found to be closer to an MTF than an existing TC.

Results: 562 civilian adult level 1 and level 2 TCs and 33 military medical centers and hospitals were identified. Compared with their closest civilian TCs, MTFs showed mean reductions in distance ranging from 0 to 30 miles, affecting populations ranging from 12 000 to over 900 000 adults. Seven MTFs were identified that would offer clinically significant reductions in distance to relatively large population centers.

Discussion: Some MTFs may offer decreased transit times and improved care to large adult populations within their regional trauma systems by developing level 1 or level 2 TC capabilities. The results of this study provide recommendations to focus further study on seven MTFs to identify those that merit further development and integration with their local trauma systems.

Level of evidence: IV.

Keywords: geography; health care quality, access, and evaluation; multiple trauma.

Department of Defense Trauma Registry Infectious Disease Module Impact on Clinical Practice

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Abstract

Background: The Joint Trauma System (JTS) is a DoD Center of Excellence for Military Health System trauma care delivery and the DoD's reference body for trauma care in accordance with National Defense Authorization Act for Fiscal Year 2017. Through the JTS, evidence-based clinical practice guidelines (CPGs) have been developed and subsequently refined to standardize and improve combat casualty care. Data are amassed through a single, centralized DoD Trauma Registry to support process improvement measures with specialty modules established as the registry evolved. Herein, we review the implementation of the JTS DoD Trauma Registry specialty Infectious Disease Module and the development of infection-related CPGs and summarize published findings on the subsequent impact of the Infectious Disease Module on combat casualty care clinical practice and guidelines.

Methods: The DoD Trauma Registry Infectious Disease Module was developed in collaboration with the Infectious Disease Clinical Research Program (IDCRP) Trauma Infectious Disease Outcomes Study (TIDOS). Infection-related information (e.g., syndromes, antibiotic management, and microbiology) were collected from military personnel wounded during deployment June 1, 2009 through December 31, 2014 and medevac'd to Landstuhl Regional Medical Center in Germany before transitioning to participating military hospitals in the USA.

Results: To support process improvements and reduce variation in practice patterns, data collected through the Infectious Disease Module have been utilized in TIDOS analyses focused on assessing compliance with post-trauma antibiotic prophylaxis recommendations detailed in JTS CPGs. Analyses examined compliance over three time periods: 6 months, one-year, and 5 years. The five-year analysis demonstrated significantly improved adherence to recommendations following the dissemination of the 2011 JTS CPG, particularly with open fractures (34% compliance compared to 73% in 2013-2014). Due to conflicting recommendations regarding use of expanded Gram-negative coverage with open fractures, infectious outcomes among patients with open fractures who received cefazolin or expanded Gram-negative coverage (cefazolin plus fluoroquinolones and/or aminoglycosides) were also examined in a TIDOS analysis. The lack of a difference in the proportion of osteomyelitis (8% in both groups) and the significantly greater recovery of Gram-negative organisms resistant to aminoglycosides or fluoroquinolones among patients who received expanded Gram-negative coverage supported JTS recommendations regarding the use of cefazolin with open fractures. Following recognition of the outbreak of invasive fungal wound infections (IFIs) among blast casualties injured in Afghanistan, the ID Module was refined to capture data (e.g., fungal culture and histopathology findings, wound necrosis, and antifungal management) needed for the TIDOS team to lead the DoD outbreak investigation. These data captured through the Infectious Disease Module provided support for the development of a JTS CPG for the prevention and management of IFIs, which was later refined based on subsequent TIDOS IFI analyses.

Conclusions: To improve combat casualty care outcomes and mitigate high-consequence infections in future conflicts, particularly in the event of prolonged field care, expansion, refinement, and a mechanism for sustainability of the DoD Trauma Registry Infectious Disease Module is needed to include real-time surveillance of infectious disease trends and outcomes.

Combat injury profiles among U.S. military personnel who survived serious wounds in Iraq and Afghanistan: A latent class analysis

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Abstract

Background: The U.S. military conflicts in Iraq and Afghanistan had the most casualties since Vietnam with more than 53,000 wounded in action. Novel injury mechanisms, such as improvised explosive devices, and higher rates of survivability compared with previous wars led to a new pattern of combat injuries. The purpose of the present study was to use latent class analysis (LCA) to identify combat injury profiles among U.S. military personnel who survived serious wounds.

Methods: A total of 5,227 combat casualty events with an Injury Severity Score (ISS) of 9 or greater that occurred in Iraq and Afghanistan from December 2002 to July 2019 were identified from the Expeditionary Medical Encounter Database for analysis. The Barell Injury Diagnosis Matrix was used to classify injuries into binary variables by site and type of injury. LCA was employed to identify injury profiles that accounted for co-occurring injuries. Injury profiles were described and compared by demographic, operational, and injury-specific variables.

Results: Seven injury profiles were identified and defined as: (1) open wounds (18.8%), (2) Type 1 traumatic brain injury (TBI)/facial injuries (14.2%), (3) disseminated injuries (6.8%), (4) Type 2 TBI (15.4%), (5) lower extremity injuries (19.8%), (6) burns (7.4%), and (7) chest and/or abdominal injuries (17.7%). Profiles differed by service branch, combat location, year of injury, injury mechanism, combat posture at the time of injury, and ISS.

Conclusion: LCA identified seven distinct and interpretable injury profiles among U.S. military personnel who survived serious combat injuries in Iraq or Afghanistan. These findings may be of interest to military medical planners as resource needs are evaluated and projected for future conflicts, and medical professionals involved in the rehabilitation of wounded service members.

US Navy Ship-Based Disaster Response: Lessons Learned

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Abstract

Purpose of review: The US Navy has a long history of responding to disasters around the globe. US Navy ships have unique characteristics and capabilities that determine their capacity for a disaster response. This paper discusses common considerations and lessons learned from three distinct disaster missions.

Recent findings: The 2010 earthquake in Haiti had a robust response with multiple US Navy ship platforms. It was best assessed in three phases: an initial mass casualty response, a subacute response, and a humanitarian response. The 2017 response to Hurricane Maria had a significant focus on treating patients with acute needs secondary to chronic illnesses to decrease the burden on the local healthcare system. The COVID-19 response brought distinctive challenges as it was the first mission where hospital ships were utilized in an infectious disease deployment.

Summary: The first ships to respond to a disaster will need to focus on triage and acute traumatic injury. After this first phase, the ship's medical assets will need to focus on providing care in a disrupted health care system which most often includes acute exacerbations of chronic disease. Surgeons must be ready to be flexible in their responsibilities, be competent with end-of-life care, and negotiate technical and cultural communication challenges.

Keywords: Disaster medicine; Hospital ships; Humanitarian surgery; Military medicine; Military ships; Military surgery.

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How Should Access to Military Health Care Facilities Be Controlled in Conflict?

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Abstract

This commentary on a case analysis examines the principles that govern decisions about which patients might be admitted to an international military hospital during humanitarian or combat operations. It explores the balance between duties under the Geneva Conventions and other international humanitarian laws, the requirement to be able to provide medical support to the military mission, and the obligation of clinicians to coordinate with other health care practitioners (local civilian, local military, and nongovernment organizations). Finally, this commentary considers the practical aspects of implementing these arrangements.