

Committee on Surgical Combat Casualty Care (CoSCCC)



Journal Watch

1st Quarter

FY 2025

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	Ukraine
Whole Blood	Walking Blood Bank	Performance Improvement
Simulation	Coagulopathy	Machine Learning

Poor long-term outcomes and abnormal neurodegeneration biomarkers after military traumatic brain injury: the ADVANCE study

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Abstract

Background: Traumatic brain injury (TBI) is common in military campaigns and is a risk factor for dementia. Armed Services Trauma and Rehabilitation Outcome-TBI (ADVANCE-TBI) aims to ascertain neurological outcomes in UK military personnel with major battlefield trauma, leveraging advances in quantification of axonal breakdown markers like neurofilament light (NfL), and astroglial marker glial fibrillar acidic protein (GFAP) in blood. We aimed to describe the causes, prevalence and consequences of TBI, and its fluid biomarker associations.

Methods: TBI history was ascertained in 1145 servicemen and veterans, of whom 579 had been exposed to major trauma. Functional and mental health assessments were administered, and blood samples were collected approximately 8 years postinjury, with plasma biomarkers quantified (n=1125) for NfL, GFAP, total tau, phospho-tau₁₈₁, amyloid- β 42 and 40. Outcomes were related to neurotrauma exposure.

Results: TBI was present in 16.9% (n=98) of exposed participants, with 46.9% classified as mild-probable and 53.1% classified as moderate to severe. Depression ($\beta=1.65$, 95% CI (1.33 to 2.03)), anxiety ($\beta=1.65$ (1.34 to 2.03)) and post-traumatic stress disorder ($\beta=1.30$ (1.19 to 1.41)) symptoms were more common after TBI, alongside poorer 6 minute walk distance ($\beta=0.79$ (0.74 to 0.84)) and quality of life ($\beta=1.27$ (1.19 to 1.36), all $p<0.001$). Plasma GFAP was 11% (95% CI 2 to 21) higher post-TBI ($p=0.013$), with greater concentrations in moderate-to-severe injuries (47% higher than mild-probable (95% CI 20% to 82%, $p<0.001$). Unemployment was more common among those with elevated GFAP levels post-TBI, showing a 1.14-fold increase (95% CI 1.03 to 1.27, $p<0.001$) for every doubling in GFAP concentration.

Conclusions: TBI affected nearly a fifth of trauma-exposed personnel, related to worse mental health, motor and functional outcomes, as well as elevated plasma GFAP levels 8 years post-injury. This was absent after extracranial trauma, and showed a dose-response relationship with the severity of the injury.

Keywords: dementia; head injury; traumatic brain injury.

Perspectives on Half-Century of Combat Casualty Care in the Israel Defense Forces Medical Corps

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Abstract

Background: Military medicine has evolved significantly over the past 50 years, advancing from basic treatments and limited evacuations to sophisticated combat casualty care. Innovations such as hemorrhage control, early blood product administration, and telemedicine have greatly improved battlefield care. Rapid evacuation systems and skilled medical teams have reduced mortality and morbidity rates.

Objectives: To review the transformation of the Israel Defense Forces Medical Corps (IDF-MC) in combat casualty care over the past 50 years, focusing on recent applications during the Iron Swords war.

Methods: Data were collected from the personal experiences of IDF-MC doctors, IDF archives, and relevant military medical literature, with an emphasis on life-saving strategies, personnel, equipment, mental health support, and civil-military cooperation.

Results: Rapid evacuation and immediate care have improved survival rates, while increased front-line deployment of medical staff has enhanced response capabilities. Modern medical tools and techniques, such as tourniquets and blood products, have been widely adopted. Improved psychological support strategies ensure better mental health outcomes for soldiers. Enhanced coordination with civilian trauma systems optimizes care and resource allocation, leading to more efficient and effective casualty treatment.

Conclusions: The IDF-MC's advancements in rapid evacuation and front-line medical support have significantly improved combat casualty outcomes. Continued innovation and collaboration with civilian systems are essential for further progress in military medicine. Future technological advancements are anticipated to further enhance military medical care.

The Safety and Efficacy of Hypertonic Saline in Achieving Primary Fascial Closure Following Damage Control Laparotomy: A Systematic Review and Meta-Analysis

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Abstract

Effective fluid management is critical in patients undergoing damage control laparotomy (DCL) for trauma and sepsis. Hypertonic saline (HTS) has been proposed as an alternative to isotonic fluids to enhance primary fascial closure rates and optimize fluid balance. This systematic review and meta-analysis aims to evaluate the efficacy and safety of HTS compared to isotonic fluids in patients undergoing DCL. A comprehensive literature search was conducted across multiple databases up to the 14th of June 2024, identifying studies that compared HTS to isotonic fluids in adult patients undergoing DCL for trauma or sepsis. Eligible studies included randomized controlled trials and observational studies reporting outcomes such as early primary fascial closure (EPFC) rates, time to fascial closure, fluid requirements, electrolyte imbalances, renal function, and mortality. Data extraction and quality assessment were performed independently by two reviewers, and pooled analyses were conducted using fixed-effect models where appropriate. Four studies encompassing 375 patients met the inclusion criteria, with 100 patients receiving HTS and 275 receiving isotonic fluids. HTS administration was associated with a significantly higher EPFC rate compared to isotonic fluids (odds ratio (OR): 0.314; 95% confidence interval (CI): 0.142-0.696; $p=0.004$). The mean time to fascial closure was also significantly reduced in the HTS group by approximately eight hours (mean difference (MD): 8.007 hours; 95% CI: 5.558-10.596; $p<0.001$). Patients receiving HTS required significantly less total fluid over 48 hours (MD: 1.055 liters; 95% CI: 0.713-1.398; $p<0.001$). While HTS use led to higher peak sodium levels (MD: -4.318 mEq/L; 95% CI: -4.702 to -3.934; $p<0.001$), there were no significant differences in peak creatinine levels, need for inpatient renal replacement therapy, or 28-day mortality between the groups. HTS appears to be effective in improving EPFC rates and reducing both time to closure and overall fluid requirements in patients undergoing DCL for trauma and sepsis. Although associated with higher serum sodium levels, HTS did not increase the risk of renal dysfunction or mortality. These findings suggest that HTS is a safe and efficacious alternative to isotonic fluids in the management of critically ill patients requiring DCL. Further large-scale, randomized controlled trials are warranted to confirm these results and inform clinical guidelines.

Keywords: 3% sodium chloride hypertonic saline (hts); acute hypernatremia; damage control laparotomy; elevated creatinine; impaired renal function; laparotomy; primary fascial closure.

The impact of an open-label design on human amniotic membranes vs. silver sulfadiazine dressings for second-degree burns: a randomized controlled clinical trial

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Abstract

Background: Burn wounds require optimal medical management due to associated psycho-emotional and socioeconomic impacts and severe pain. The use of synthetic and biological dressings improves healing and reduces burn wound complications. The present study aimed to compare the outcomes of using human amniotic membrane (hAM) dressings and conventional silver sulfadiazine (SSDZ) ointment dressings in the management of second-degree burn wounds.

Methods: Fifty patients who participated in this clinical trial were divided into two groups via simple randomization. All the enrolled patients, who had burnt in the last 24 h, had thermal damage mechanisms and were suffering from less than 20% second-degree heat-burn wounds on the skin surface. The target group (n = 25) was treated with hAM, and the control group (n = 25) was treated with SSDZ ointment. The researcher-designed checklist was used to determine the clinical performance in the follow-up assessments on days 7, 14, and 30.

Results: No significant differences were detected in terms of sex, age, or percentage of burn wounds ($p > 0.05$). Wound epithelialization at days 7, 14, and 30, scar formation, wound pigmentation, pain severity, analgesia requirements, and hospital stay length (on day 30) were significantly lower in the target group (treated with hAM) than in the control group (treated with SSDZ ointment) ($p < 0.05$). However, treatment costs in the target group (\$170) were significantly higher than those in the control group (\$71) ($p < 0.001$).

Conclusion: Despite its higher cost, hAM, as a technology-based therapy dressing, demonstrates superiority over SSDZ ointment in terms of wound healing and pain management.

Keywords: Amniotic membrane; Burns; Clinical trial; Silver sulfadiazine.

Fresh whole blood: A feasible alternative in disasters and mass casualty incidents? a systematic review and meta-analysis

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Abstract

Introduction: While balanced blood component therapy (BCT) is pivotal in trauma patient damage control resuscitation in well-resourced settings, disasters, and mass casualty incidents (MCIs) pose significant challenges, especially in securing sufficient access to blood products. This systematic review and meta-analysis aim to explore the utilization of fresh whole blood (FWB) transfusion as a potential alternative to BCT, informing future research and clinical strategies.

Methods: We searched Pubmed, MEDLINE, Embase, CINAHL, the Cochrane Library and grey literature for articles identifying FWB transfusions, limited to those published in English or French. We evaluated the outcomes of post-FWB transfusion and conducted a meta-analysis comparing overall mortality in patients receiving FWB in addition to BCT during damage control resuscitation with those receiving BCT or single blood components alone.

Results: Of the 4830 studies identified, only 74 articles met all the eligibility criteria; the majority of them were conducted in military contexts. Mortality was lower among the FWB group compared to the BCT alone group, with a pooled OR of 0.61 (95% CI: 0.38-0.98) overall, and a pooled OR of 0.47 (95% CI: 0.25-0.87) among studies adjusting for confounders. FWB transfusion related complications rarely occurred.

Conclusions: While FWB shows potential as an alternative to BCT for managing severe haemorrhagic shock in disasters and MCIs, additional research is essential to validate FWB's efficacy before considering it as a standard approach in civilian scenarios. Further studies focusing on the feasibility of implementing FWB in civilian contexts are also warranted.

Keywords: Damage control resuscitation; Disasters; Fresh whole blood; Mass casualty incidents; Walking blood banks.

Preparing the future combat surgeon: a survey of the military general surgery trainee GME experience

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Abstract

Introduction: Graduate medical education (GME) lacks a standardized military training program for general surgery residents, and concern exists that they may not be prepared to serve as combat surgeons on training completion. The purpose of this study was to assess military surgery trainee satisfaction with their programs. Our hypothesis was that military residents were not completely confident to care for combat casualties on completion of current GME training.

Methods: We surveyed US Army, Navy, and Air Force general surgery residents and fellows between November 2023 and March 2024 to assess their confidence in managing combat injuries. Queried residents further rate their overall satisfaction with surgical training, perceived level of deployment preparedness and curriculum elements which they thought would be most beneficial to their training.

Results: The survey yielded an overall 43% response rate (132/305) with a response rate of 42% (61/147) from the Army, 56% (44/79) from the Navy, and 34% (27/79) from the Air Force. Most trainees were trained in military medical treatment facility residency programs (n=91, 68.9%) and nearly half of respondents (n=64, 49%) were senior trainees (postgraduate year (PGY)4, PGY5, and fellows). Among all trainees, only two-thirds (n=88, 67%,) thought they were adequately prepared to deploy and operate on military combat casualties by the end of residency but 114 (86%) were satisfied with the training they received during general surgery residency in adult trauma, 103 (78%) in critical care, and 112 (85%) in acute care surgery. However, more than half were unsatisfied with the training they received in obstetric/gynecologic and urologic emergencies (n=72, 55%; and n=67, 51%, respectively).

Conclusion: Although the majority of military surgical residents surveyed are satisfied with their training in adult trauma, critical care, and emergency general surgery, a large number of trainees thought they would not be ready to deploy and manage combat casualties.

Level of evidence: Prognostic and epidemiological, Level IV.

Keywords: Surveys And Questionnaires; education; wounds and injuries.

invasive Fungal Diseases of Combat Wounds: Burden, Epidemiology, and Mycology

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Abstract

During the last two decades, wound invasive fungal diseases (WIFDs) have reemerged as important causes of mortality and morbidity in military personnel and civilian casualties in war areas. Historically, mycotic infections acquired in combat operations during Vietnam War and were associated with burn wounds. Modern combat related WIFDs are almost exclusively associated with severe traumatic events which encompass blast exposure as the primary mechanism of injury and subsequent extremity amputation and extensive blood loss. Such infections often lead to deep tissue necrosis, long hospitalizations, extensive surgeries, and more severe amputation. Studies of combat related WIFDs among U.S. military personnel in Operation Enduring Freedom (Afghanistan) demonstrated incidence rates of approximately 7% and crude mortality of 8.5%. WIFDs were also seen in U.K. military personnel returning from Afghanistan and are common in the current Ukraine and Gaza conflicts. Mucorales, *Aspergillus* and *Fusarium* species are the predominant causes of WIFDs. These molds are opportunistic pathogens which thrive in patients with immune system imbalances following traumatic injury. They are ubiquitous environmental fungi found in a variety of soils but there are significant regional differences depending on the local soil type, vegetation, and climate. The management of WIFDs is complicated by the limited efficacy of current antifungals on many of these environmental species and by emerging antifungal resistance globally. This review provides an overview of the global burden, epidemiology, and clinical features of combat-related fungal infections with the aim to provide a better understanding of the threat posed for wounded Service Members and civilians.

Keywords: Combat wounds; Invasive fungal infections; Military medicine; Mucorales; Wound infections.

Characteristics and survival of hospitalized combat casualties during two major conflicts between Israel and Hamas: 2023 versus 2014

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Abstract

Background: In the complex landscape of modern warfare, understanding combat-related injuries leading to hospitalization is crucial for optimizing injury treatment. This study aims to compare combat casualty characteristics and outcomes during the major conflicts between Israel and Hamas in 2023 and 2014 as a basis for understanding the effectiveness of trauma care practices for wounded soldiers.

Methods: A cohort study of soldiers hospitalized due to combat injuries during two major wars between Israel and Hamas in 2023 and 2014, using data from the Israeli National Trauma Registry. This study did not include deaths before hospital arrival or casualties who were discharged from the Emergency Department.

Results: Of the 1,198 study subjects, 67.8% belonged to the 2023 cohort and 32.2% to the 2014 cohort. The percentage of casualties with severe and critical injuries (Injury Severity Score [ISS] 16-75) was higher among the 2023 cohort (18.6% vs. 13.7%, $p = 0.036$), as was the percentage of casualties with multiple severe injuries (≥ 2 regions with Abbreviated Injury Score ≥ 3 : 11.5% vs. 7.5%, $p = 0.035$) and firearm injuries (19.6% vs. 14.5%, $p = 0.081$). Injuries to the torso and extremities were more frequent among the 2023 cohort. Among the critically injured casualties (ISS 25-75), the mortality rates were 17.3% vs. 28.6%, respectively, for the 2023 and 2014 cohorts ($p = 0.351$); adjusted HR (95% CI): 0.56 (0.21-1.49). The 2023 cohort had higher rates for treatment in the trauma bay (61.5% vs. 47.9%, $p < 0.001$), ICU utilization (admission: 16.3% vs 11.7%, $p = 0.036$), surgical intervention (51.5% vs. 42.7%, $p = 0.005$), longer duration from arrival to surgery (median [interquartile range]: 4.6 (1.2-18.5) vs. 2.6 (1.1-10.1) hours, $p = 0.037$), and longer hospital stays (> 14 days: 15.5% vs. 8.8%, $p < 0.001$).

Conclusions: Our data demonstrated that more casualties who survived to hospital arrival were severely and multiply injured in the 2023 Israel-Hamas war as compared to the 2014 war. Despite the increased severity, in-hospital survival did not worsen though there was an increase in hospital resource utilization.

Keywords: Combat; Injuries; Interventions; Resource utilization; Soldier; Survival.