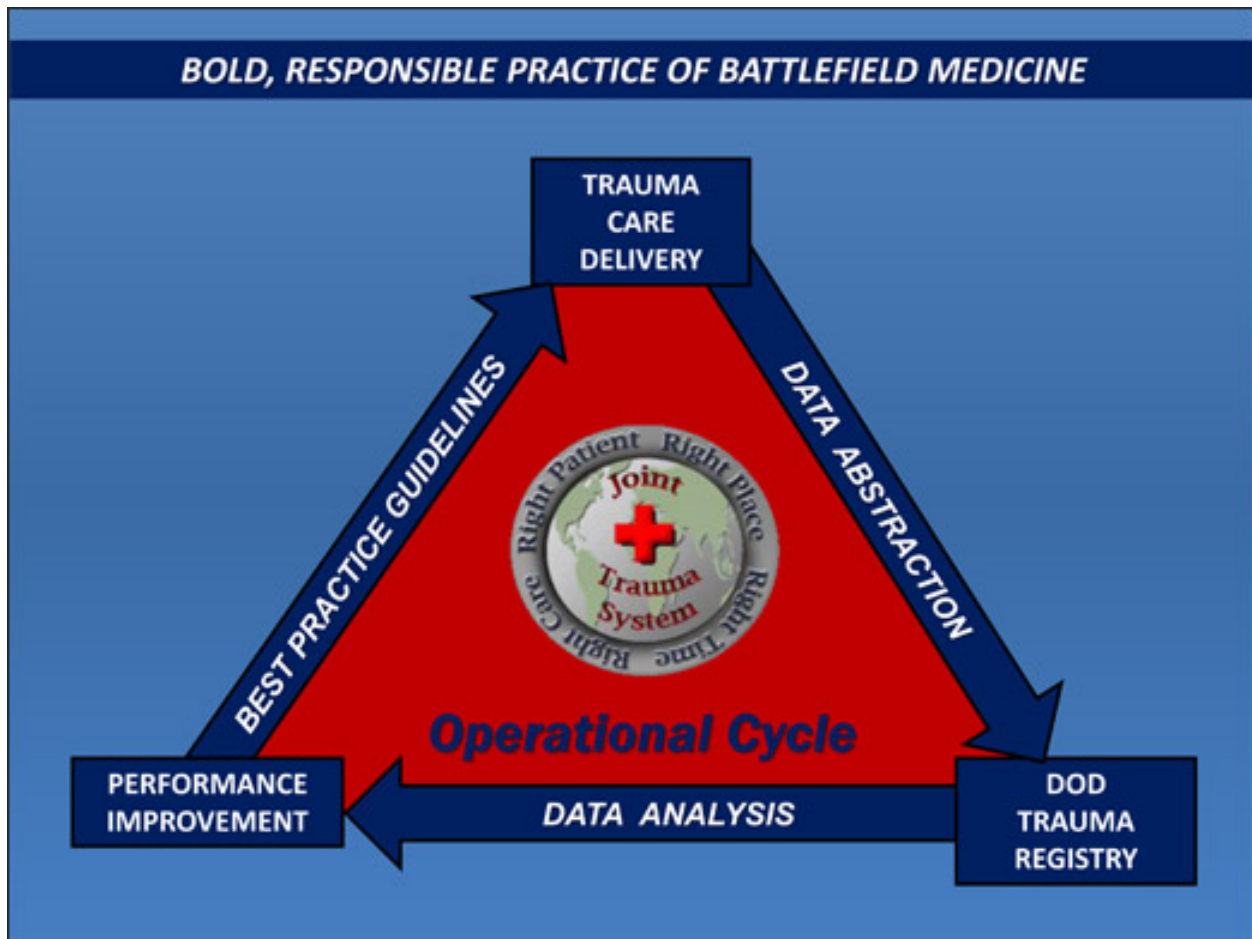


Committee on Surgical Combat Casualty Care
(CoSCCC)



Journal Watch

3rd Quarter

2018

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
Trauma management		

[J R Army Med Corps.](#) 2018 Apr 9. pii: jramc-2018-000910. doi: 10.1136/jramc-2018-000910. [Epub ahead of print]

Ketamine for military prehospital analgesia and sedation in combat casualties.

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Abstract Ketamine is an effective drug for battlefield analgesia. Recent evidence suggests that it can be safely and effectively used by Level 6 Pre-Hospital Emergency Care (PHEC) practitioners. This article presents a review of the evidence, and outlines the future use of ketamine for provision of analgesia and sedation in combat casualties.

PMID: 29632133 DOI:[10.1136/jramc-2018-000910](https://doi.org/10.1136/jramc-2018-000910)

The burden of gunshot wounding of UK military personnel in Iraq and Afghanistan from 2003-14.

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Abstract

INTRODUCTION: Gunshot wounding (GSW) is the second most common mechanism of injury in warfare after explosive injury. The aim of this study was to define the clinical burden of GSW placed on UK forces throughout the recent Iraq and Afghanistan conflicts.

METHODS: This study was a retrospective review of data from the UK Military Joint Theatre Trauma Registry (JTTR). A JTTR search identified records within the 12 year period of conflict between 19 Mar 2003 and 27 Oct 2014 of all UK military GSW casualties sustained during the complete timelines of both conflicts. Included cases had their clinical timelines and treatment further examined from time of injury up until discharge from hospital or death.

RESULTS: There were 723 casualties identified (177 fatalities, 546 survivors). Median age at the time of injury was 24 years (range 18-46 years), with 99.6% of casualties being male. Most common anatomical locations for injury were the extremities, with 52% of all casualties sustaining extremity GSW, followed by 16% GSW to the head, 15% to the thorax, and 7% to the abdomen. In survivors, the rate of extremity injury was higher at 69%, with head, thorax and abdomen injuries relatively lower at 5%, 11% and 6% respectively. All GSW casualties had a total of 2827 separate injuries catalogued. A total of 545 casualties (523 survivors, 22 fatalities) underwent 2357 recorded surgical procedures, which were carried out over 1455 surgical episodes between admission to a deployed medical facility and subsequent transfer to the Royal Centre for Defence Medicine (RCDM) in the UK. This gave a median of 3 (IQR 2-5) surgical procedures within a median of 2 (IQR 2-3) surgical episodes per casualty. Casualties had a combined length of stay (LoS) of 25 years within a medical facility, with a mean LoS in a deployed facility of 1.9 days and 14 days in RCDM.

CONCLUSION: These findings define the massive burden of injury associated with battlefield GSW and underscore the need for further research to both reduce wound incidence and severity of these complex injuries.

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Development of a portable blood salvage and autotransfusion technology to enhance survivability of personnel requiring major medical interventions in austere or military environments.

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Abstract

INTRODUCTION: Uncontrolled haemorrhage is the leading cause of death on the battlefield, and two-thirds of these deaths result from non-compressible haemorrhage. Blood salvage and autotransfusion represent an alternative to conventional blood transfusion techniques for austere environments, potentially providing blood to the casualty at point of injury. The aim of this paper is to describe the design, development and initial proof-of-concept testing of a portable blood salvage and autotransfusion technology to enhance survivability of personnel requiring major medical interventions in austere or military environments.

METHOD: A manually operable, dual-headed pump was developed that removes blood from site of injury to a collection reservoir (upper pump) and back to casualty (lower pump). Theoretical flow rate calculations determined pump configuration and a three-dimensionally printed peristaltic pump was manufactured. Flow rates were tested with fresh bovine blood under laboratory conditions representative of the predicted clinical environment.

RESULTS: Mathematical modelling suggested flow rates of 3.6 L/min and 0.57 L/min for upper and lower pumps. Using fresh bovine blood, flow rates produced were 2.67 L/min and 0.43 L/min. To mimic expected battlefield conditions, upper suction pump flow rate was calculated using a blood/air mixture.

CONCLUSION: The authors believe that this technology can potentially enhance survivability for casualties in austere and deployed military settings through autotransfusion and cell concentration. It reduces negative effects of blood donation on the conventional donor pool, and potentially negates the logistical constraints associated with allogenic transfusions.

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PMID: 29079661 PMCID: [PMC5969372](#) DOI: [10.1136/jramc-2017-000789](#)

Early Infections Complicating the Care of Combat Casualties from Iraq and Afghanistan.

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Abstract

BACKGROUND: During the conflicts in Iraq and Afghanistan, more than 52,000 U.S. military members were wounded in action. The battlefield mortality rate was lower than in past conflicts, however, those surviving often had complex soft tissue and bone injuries requiring multiple surgeries. This report describes the rates, types, and risks of infections complicating the care of combat casualties.

PATIENTS AND METHODS: Infection and microbiology data obtained from the Trauma Infectious Disease Outcomes Study (TIDOS), a prospective observational study of infections complicating deployment-related injuries, were used to determine the proportion of infection, types, and associated organisms. Injury and surgical information were collected from the Department of Defense Trauma Registry. Multivariable Cox proportional hazards and logistic regression models were used to evaluate potential factors associated with infection.

RESULTS: From 2009-2012, 1,807 combat casualties were evacuated to U.S. TIDOS-participating hospitals. Among the 1,807 patients, the proportion of overall infections from time of injury through initial U.S. hospitalization was 34% with half being skin, soft tissue, or bone infections. Infected wounds most commonly grew *Enterococcus faecium*, *Pseudomonas aeruginosa*, *Acinetobacter* spp. or *Escherichia coli*. In the multivariable model, amputation, blood transfusions, intensive care unit admission, injury severity scores, mechanical ventilation, and mechanism of injury were associated with risk of infection.

CONCLUSIONS: One-third of combat casualties from Iraq and Afghanistan develop infections during their initial hospitalization. Amputations, blood transfusions, and overall injury severity are associated with risk of infection, whereas more easily modifiable factors such as early operative intervention or antibiotic administration are not.

PMID: 29863446 PMCID: [PMC5867509](#) [Available on 2019-04-01] DOI: [10.1089/sur.2017.240](#)

Tactical Neurocritical Care.

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Abstract Neurocritical care is usually practiced in the comfort of an intensive care unit within a tertiary care medical center. Physicians deployed to the frontline with the US military or allied military are required to use their critical care skills and their neurocritical skills in austere environments with limited resources. Due to these factors, tactical critical care and tactical neurocritical care differ significantly from traditional critical care. Operational constraints, the tactical environment, and resource availability dictate that tactical neurocritical care be practiced within a well-defined, mission-constrained framework. Although limited interventions can be performed in austere conditions, they can significantly impact patient outcome. This review focuses on the US Army approach to the patient requiring tactical neurocritical care specifically point of injury care and care during transportation to a higher level of care.

PMID: 29589329 DOI: [10.1007/s12028-018-0524-x](https://doi.org/10.1007/s12028-018-0524-x)

Outcome of open abdominal management following military trauma.

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Abstract

BACKGROUND: Temporary abdominal closure (TAC) is increasingly common after military and civilian major trauma. Primary fascial closure cannot be achieved after TAC in 30 per cent of civilian patients; subsequent abdominal wall reconstruction carries significant morbidity. This retrospective review aimed to determine this morbidity in a UK military cohort.

METHODS: A prospectively maintained database of all injured personnel from the Iraq and Afghanistan conflicts was searched from 1 January 2003 to 31 December 2014 for all patients who had undergone laparotomy in a deployed military medical treatment facility. This database, the patients' hospital notes and their primary care records were searched.

RESULTS: Laparotomy was performed in a total of 155 patients who survived to be repatriated to the UK; records were available for 150 of these patients. Seventy-seven patients (51.3 per cent) had fascial closure at first laparotomy, and 73 (48.7 per cent) had a period of TAC. Of the 73 who had TAC, two died before closure and two had significant abdominal wall loss from blast injury and were excluded from analysis. Of the 69 remaining patients, 65 (94 per cent) were able to undergo delayed primary fascial closure. The median duration of follow-up from injury was 1257 (range 1-4677) days for the whole cohort. Nine (12 per cent) of the 73 patients who underwent TAC subsequently developed an incisional hernia, compared with ten (13 per cent) of the 77 patients whose abdomen was closed at the primary laparotomy ($P = 1.000$).

CONCLUSION: Rates of delayed primary closure of abdominal fascia after temporary abdominal closure appear high. Subsequent rates of incisional hernia formation were similar in patients undergoing delayed primary closure and those who had closure at the primary laparotomy.

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PMID: 29601081 DOI: [10.1002/bjs.10813](https://doi.org/10.1002/bjs.10813)

[JAMA Surg.](#) 2018 Jan 1;153(1):84-86. doi: 10.1001/jamasurg.2017.3142.

Humanitarian Surgical Care in the US Military Treatment Facilities in Afghanistan From 2002 to 2013.

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Abstract: Medical units of the US military have operated for more than 15 years in Afghanistan, a country with among the lowest estimates of access to safe, timely surgical and anesthesia care.¹ Surgeons from the US military have delivered humanitarian surgical care (HSC) to local national civilians throughout the conflict, although previous large reports about this care focused on children.^{2,3} To provide a more comprehensive accounting, we conducted a retrospective study on HSC provided by deployed US military medical units to local national civilians during the Afghanistan conflict.

PMID: 28903140 PMCID: [PMC5833623](#) [Available on 2018-09-13] DOI: [10.1001/jamasurg.2017.3142](#)

Analysis of incidence of traumatic brain injury in blunt trauma patients with Glasgow Coma Scale of 12 or less.

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Collaborators (16) [Bahouth H](#), [Becker A](#), [Hadary A](#), [Jeroukhimov M](#), [Karawani I](#), [Klein Y](#), [Lin G](#), [Merin O](#), [Miklosh B](#), [Mnouskin Y](#), [Rivkind A](#), [Shaked G](#), [Sivak G](#), [Soffer D](#), [Stein M](#), [Weiss M](#).

Abstract

PURPOSE: Early diagnosis of traumatic brain injury (TBI) is important for improving survival and neurologic outcome in trauma victims. The purpose of this study was to assess whether Glasgow Coma Scale (GCS) of 12 or less can predict the presence of TBI and the severity of associated injuries in blunt trauma patients.

METHODS: A retrospective cohort study including 303,435 blunt trauma patients who were transferred from the scene to hospital from 1998 to 2013. The data was obtained from the records of the National Trauma Registry maintained by Israel's National Center for Trauma and Emergency Medicine Research, in the Gertner Institute for Epidemiology and Health Policy Research. All blunt trauma patients with GCS 12 or less were included in this study. Data collected in the registry include age, gender, mechanism of injury, GCS, initial blood pressure, presence of TBI and incidence of associated injuries. Patients younger than 14 years old and trauma victims with GCS 13-15 were excluded from the study. Statistical analysis was performed by using Statistical Analysis Software Version 9.2. Statistical tests performed included Chi-square tests. A p-value less than 0.05 was considered statistically significant.

RESULTS: There were 303,435 blunt trauma patients, 8731 (2.9%) of them with GCS of 3-12 that including 6351 (72%) patients with GCS of 3-8 and 2380 (28%) patient with GCS of 9-12. In these 8731 patients with GCS of 3-12, 5372 (61.5%) patients had TBI. There were total 1404 unstable patients in all the blunt trauma patients with GCS of 3-12, 1256 (89%) patients with GCS 3-8, 148 (11%) patients with GCS 9-12. In the 5095 stable blunt trauma patients with GCS 3-8, 32.4% of them had no TBI. The rate in the 2232 stable blunt trauma patients with GCS 9-12 was 50.1%. In the unstable patients with GCS 3-8, 60.5% of them had TBI, and in subgroup of patients with GCS 9-12, only 37.2% suffered from TBI.

CONCLUSION: The utility of a GCS 12 and less is limited in prediction of brain injury in multiple trauma patients. Significant proportion of trauma victims with low GCS had no TBI and their impaired neurological status is related to severe extra-cranial injuries. The findings of this study showed that using of GCS in initial triage and decision making processes in blunt trauma patients needs to be re-evaluated.

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PMID: 29776836 DOI: [10.1016/j.cjtee.2018.01.004](https://doi.org/10.1016/j.cjtee.2018.01.004)

[West J Emerg Med](#). 2018 May;19(3):542-547. doi: 10.5811/westjem.2018.1.36233. Epub 2018 Mar 8.

Emergency Physicians at War.

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Abstract Operation Enduring Freedom (OEF-A) in Afghanistan and Operation Iraqi Freedom (OIF) represent the first major, sustained wars in which emergency physicians (EPs) fully participated as an integrated part of the military's health system. EPs proved invaluable in the deployments, and they frequently used the full spectrum of trauma and medical care skills. The roles EPs served expanded over the years of the conflicts and demonstrated the unique skill set of emergency medicine (EM) training. EPs supported elite special operations units, served in medical command positions, and developed and staffed flying intensive care units. EPs have brought their combat experience home to civilian practice. This narrative review summarizes the history, contributions, and lessons learned by EPs during OEF-A/OIF and describes changes to daily clinical practice of EM derived from the combat environment.

PMID: 29760853 PMCID: [PMC5942022](#) DOI: [10.5811/westjem.2018.1.36233](#)

The complications associated with Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA).

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Abstract Non-compressible torso hemorrhage (NCTH) remains a significant cause of morbidity and mortality in the field of trauma and emergency medicine. In recent times, there has been a resurgence in the adoption of Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for patients who present with NCTH. Like all medical procedures, there are benefits and risks associated with the REBOA technique. However, in the case of REBOA, these complications are not unanimously agreed upon with varying viewpoints and studies. This article aims to review the current knowledge surrounding the complications of the REBOA technique at each step of its application.

PMID: 29774048 PMCID: [PMC5948672](#) DOI: [10.1186/s13017-018-0181-6](#)

A US Military Role 2 Forward Surgical Team Database Study of Combat Mortality in Afghanistan.

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Abstract

BACKGROUND: Timely and optimal care can reduce mortality among critically injured combat casualties. US military Role 2 surgical teams were deployed to forward positions in Afghanistan on behalf of the battlefield trauma system. They received prehospital casualties, provided early damage control resuscitation and surgery, and rapidly transferred casualties to Role 3 hospitals for definitive care. A database was developed to capture Role 2 data.

METHODS: A retrospective review and descriptive analysis was conducted of battle-injured casualties transported to US Role 2 surgical facilities in Afghanistan from February 2008 to September 2014. Casualties were analyzed by mortality status and location of death (pre, intra, or post transport), military affiliation, transport time, injury type and mechanism, combat mortality index-prehospital (CMI-PH), and documented prehospital treatment.

RESULTS: Of 9,557 casualties (median age, 25.0; male 97.4%), most (95.1%) survived to transfer from Role 2 facility care. Military affiliation included US coalition forces (37.4%), Afghanistan National security forces (23.8%), civilian/other forces (21.3%), Afghanistan National police (13.5%), and non-US coalition forces (4.0%). Mortality differed by military affiliation ($p < 0.001$). Among fatalities, most were Afghanistan National security forces (30.5%) civilian/other forces (26.0%), or US coalition forces (25.2%). Of those categorized by CMI-PH, 40.0% of critical, 11.2% of severe, 0.8% of moderate, and $< 0.1\%$ of mild casualties died. Most fatalities with CMI-PH were categorized as critical (66.3%) or severe (25.9%); whereas, most who lived were mild (56.9%) or moderate (25.4%). Of all fatalities, 14.0% died prehospital (pre-transport 5.8%; intra-transport 8.2%) and 86.0% died at a Role 2 facility (post-transport). Of fatalities with documented transport times (median, 53.0 minutes), most (61.7%) were evacuated within 60 minutes.

CONCLUSIONS: Role 2 surgical team care has been an important early component of the battlefield trauma system in Afghanistan. Combat casualty care must be documented, collected, and analyzed for outcomes and trends to improve performance.

LEVEL OF EVIDENCE: Performance Improvement and Epidemiological, level IV.

PMID: 29851907 DOI: [10.1097/TA.0000000000001997](https://doi.org/10.1097/TA.0000000000001997)