Committee on Surgical Combat Casualty Care (CoSCCC)

Journal Watch

4th Quarter

FY 2022

Journal Watch Key Terminology Searched:

Microcirculation
Shock
Human subject research
Haemorrhagic shock
Traumatic brain injury
Plasma
Transfusion
RBCs
Stability
Blast
Amputation
Traumatic Clinical outcomes
Injury
Coagulopathy
Fibrinogen concentrate
Viscoelastic haemostatic assays
Guidelines
Fractures
REBOA
Orthopaedic trauma
Wound ballistics
Cause of injury
Damage Control Resuscitation
Tension pneumothorax
Blast Injury
Combat casualty care
Surgical skills
Novel Coronavirus
Predictions
Limb Salvage
Trauma Management
Sublingual
IDF
Multiple trauma
Coagulopathy
Pre-hospital
Trauma
Resuscitation
Ultrasound
Facial trauma
Multiple
Clinical parameters
Pelvic fracture
Cryoprecipitate
Massive transfusion
Angiography
Internal fixation
X-ray
Antibiotic prophylaxis
Perioperative antibiotics
Faecal diversion
Head injuries
Battlefield injury
Thoracotomy
Died of Wounds
Medical treatment facility
Emergency surgery
COVID-19
Vital Signs
Temporary Shunts
Haemorrhage
Ethics committees
Institutional review board
Shock index
Diagnostic accuracy
Thrombelastography (TEG)
Imaging
Severe trauma
Afghanistan
War
Transfusion
Damage control Surgery
Battlefield Trauma
Fibrinogen
ABO
External fixation
Pelvic ring
Pre-peritoneal pelvic packing
Long bone fractures
Surgical site infection
Primary repair
Poly-trauma
Prolonged field care
Military Medicine
Killed in Action
Mortality
Infection prevention
Hypocalcemia
Global Surgery

Eur J Trauma Emerg Surg. 2022 Aug;48(4):2803-2811. doi: 10.1007/s00068-022-01885-3. Epub 2022 Feb 28.

The significance of direct transportation to a trauma center on survival for severe traumatic brain injury

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Abstract

Introduction: While timely specialized care can contribute to improved outcomes following traumatic brain injury (TBI), this condition remains the most common cause of post-injury death worldwide. The purpose of this study was to investigate the difference in mortality between regional trauma centers in Sweden (which provide neurosurgical services round the clock) and non-trauma centers, hypothesizing that 1-day and 30-day mortality will be lower at regional trauma centers.

Patients and methods: This retrospective cohort study used data extracted from the Swedish national trauma registry and included adults admitted with severe TBI between January 2014 and December 2018. The cohort was divided into two subgroups based on whether they were treated at a trauma center or non-trauma center. Severe TBI was defined as a head injury with an AIS score of 3 or higher. Poisson regression analyses with both univariate and multivariate models were performed to determine the difference in mortality risk [Incidence Rate Ratio (IRR)] between the subgroups. As a sensitivity analysis, the inverse probability of treatment weighting (IPTW) method was used to adjust for the effects of confounding.

Results: A total of 3039 patients were included. Patients admitted to a trauma center had a lower crude 30-day mortality rate (21.7 vs. 26.4% days, p = 0.006). After adjusting for confounding variables, patients treated at regional trauma center had a 28% [adj. IRR (95% CI): 0.72 (0.55-0.94), p = 0.015] decreased risk of 1-day mortality and an 18% [adj. IRR (95% CI): 0.82 (0.69-0.98)] reduction in 30-day mortality, compared to patients treated at a non-trauma center. After adjusting for covariates in the Poisson regression analysis performed after IPTW, admission and treatment at a trauma center were associated with a 27% and 17% reduction in 1-day and 30-day mortality, respectively.

Conclusion: For patients suffering a severe TBI, treatment at a regional trauma center confers a statistically significant 1-day and 30-day survival advantage over treatment at a non-trauma center.

Keywords: Mortality; Severe traumatic brain injury; Trauma center; Triage.

Prehosp Disaster Med. 2022 Aug;37(4):492-501. doi: 10.1017/S1049023X22000747. Epub 2022 May 23.

Pediatric Blast Trauma: A Systematic Review and Meta-Analysis of Factors Associated with Mortality and Description of Injury Profiles

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Abstract

Introduction: Blast polytrauma is among the most serious mechanisms of injury confronted by medical providers. There are currently no specific studies or guidelines that define risk factors for mortality in the context of pediatric blast injuries or describe pediatric blast injury profiles.

Objective: The objectives of this study were to evaluate risk factors for pediatric mortality and to describe differences in injury profiles between explosions related to terrorism versus unrelated to terrorism within the pediatric population.

Methods: A PRISMA systematic review and meta-analysis was performed where articles published from the years 2000-2021 were extracted from PubMed. Mortality and injury profile data were extracted from articles that met inclusion criteria. A bivariant unadjusted odds ratio (OR) analysis was performed to establish protective and harmful factors associated with mortality and to describe the injury profiles of blasts related to terrorism. Statistical significance was established at $P < .05$.

Results: Thirty-eight articles were included and described a total of 222,638 unique injuries. Factors associated with increased mortality included if the explosion was related to terrorism (OR = 32.73; 95% CI, 28.80-37.21; $P < .05$) and if the explosion involved high-grade explosives utilized in the Global War on Terror ([GWOT] OR = 1.28; 95% CI, 1.04-1.44; $P < .05$). Factors associated with decreased mortality included if the patient was resuscitated in a North Atlantic Treaty Organization (NATO)-affiliated combat trauma hospital (OR = 0.48; 95% CI, 0.37-0.62; $P < .05$); if the explosive was fireworks (OR = 3.20×10-5; 95% CI, 2.00×10-6-5.16×10-4; $P < .05$); and if the explosion occurred in the United States (OR = 2.40×10-5; 95% CI, 1.51×10-6-3.87×10-4; $P < .05$). On average, victims of explosions related to terrorism were 10.30 years old (SD = 2.73) with 68.96% (SD = 17.58%) of victims reported as male. Comparison of victims of explosions related to terrorism revealed a higher incidence of thoracoabdominal trauma (30.2% versus 8.6%), similar incidence of craniocerebral trauma (39.5% versus 43.1%), and lower incidence of extremity trauma (31.8% versus 48.3%) compared to victims of explosions unrelated to terrorism.

Conclusion: Explosions related to terrorism are associated with increased mortality and unique injury profiles compared to explosions unrelated to terrorism in the pediatric population. Such findings are important for optimizing disaster medical education of pediatric providers in preparation for and management of acute sequelae of blast injuries-terror-related and otherwise.

Keywords: Disaster Medicine; blast injuries; disaster planning; mass-casualty incidents; pediatric emergency medicine.

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Prolonged casualty care: Extrapolating civilian data to the military context

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Abstract

Background: Civilian and military populations alike are increasingly faced with undesirable situations in which prehospital and definitive care times will be delayed. The Western Cape of South Africa has some similarities in capabilities, injury profiles, resource limitations, and system configuration to US military prolonged casualty care (PCC) settings. This study provides an initial description of civilians in the Western Cape who experience PCC and compares the PCC and non-PCC populations.

Methods: We conducted a 6-month analysis of an ongoing, prospective, large-scale epidemiologic study of prolonged trauma care in the Western Cape (Epidemiology and Outcomes of Prolonged Trauma Care [EpiC]). We define PCC as ≥10 hours from injury to arrival at definitive care. We describe patient characteristics, critical interventions, key times, and outcomes as they may relate to military PCC and compare these using χ 2 and Wilcoxon tests. We estimated the associations between PCC status and the primary and secondary outcomes using logistic regression models.

Results: Of 995 patients, 146 experienced PCC. The PCC group, compared with non-PCC, were more critically injured (66% vs. 51%), received more critical interventions (36% vs. 29%), and had a greater proportionate mortality (5% vs. 3%), longer hospital stays (3 vs. 1 day), and higher Sequential Organ Failure Assessment scores (5 vs. 3). The odds of 7-day mortality and a Sequential Organ Failure Assessment score of ≥5 were 1.6 (odds ratio, 1.59; 95% confidence interval, 0.68-3.74) and 3.6 (odds ratio, 3.69; 95% confidence interval, 2.11-6.42) times higher, respectively, in PCC versus non-PCC patients.

Conclusion: The EpiC study enrolled critically injured patients with PCC who received resuscitative interventions. Prolonged casualty care patients had worse outcomes than non-PCC. The EpiC study will be a useful platform to provide ongoing data for PCC relevant analyses, for future PCC-focused interventional studies, and to develop PCC protocols and algorithms. Findings will be relevant to the Western Cape, South Africa, other LMICs, and military populations experiencing prolonged care.

Level of evidence: Therapeutic/care management; Level IV.

J Trauma Acute CareSurg. 2022Aug1;93(2):256264. doi:10.1097/TA.0000000000003525. Epub 2022 Jan 21.

Advanced bleeding control in combat casualty care: An international, expert-based Delphi consensus

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Abstract

Background: Hemorrhage from truncal and junctional injuries is responsible for the vast majority of potentially survivable deaths in combat casualties, causing most of its fatalities in the prehospital arena. Optimizing the deployment of the advanced bleeding control modalities required for the management of these injuries is essential to improve the survival of severely injured casualties. This study aimed to establish consensus on the optimal use and implementation of advanced bleeding control modalities in combat casualty care.

Methods: A Delphi method consisting of three rounds was used. An international expert panel of military physicians was selected by the researchers to complete the Delphi surveys. Consensus was reached if 70% or greater of respondents agreed and if 70% or greater responded.

Results: Thirty-two experts from 10 different nations commenced the process and reached consensus on which bleeding control modalities should be part of the standard equipment, that these modalities should be available at all levels of care, that only trained physicians should be allowed to apply invasive bleeding control modalities, but all medical and nonmedical personnel should be allowed to apply noninvasive bleeding control modalities, and on the training requirements for providers. Consensus was also reached on the necessity of international registries and guidelines, and on certain indications and contraindications for resuscitative endovascular balloon occlusion of the aorta (REBOA) in military environments. No consensus was reached on the role of a wound clamp in military settings and the indications for REBOA in patients with chest trauma, penetrating axillary injury or penetrating neck injury in combination with thoracoabdominal injuries.

Conclusion: Consensus was reached on the contents of a standard bleeding control toolbox, where it should be available, providers and training requirements, international registries and guidelines, and potential indications for REBOA in military environments.

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Rationale and Methods for Updated Guidelines for the Management of Penetrating Traumatic Brain Injury

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Abstract

Penetrating traumatic brain injury (pTBI) affects civilian and military populations resulting in significant morbidity, mortality, and healthcare costs. No up-to-date and evidence-based guidelines exist to assist modern medical and surgical management of these complex injuries. A preliminary literature search revealed a need for updated guidelines, supported by the Brain Trauma Foundation. Methodologists experienced in TBI guidelines were recruited to support project development alongside two cochairs and a diverse steering committee. An expert multi-disciplinary workgroup was established and vetted to inform key clinical questions, to perform an evidence review and the development of recommendations relevant to pTBI. The methodological approach for the project was finalized. The development of up-to-date evidence- and consensus-based clinical care guidelines and algorithms for pTBI will provide critical guidance to care providers in the pre-hospital and emergent, medical, and surgical settings.

Keywords: blast injury; guidelines; head trauma; penetrating brain injury; traumatic brain injury.

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The effect of prehospital tranexamic acid on outcome in polytrauma patients with associated severe brain injury

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Abstract

Introduction: Tranexamic acid (TXA) has shown to be beneficial in selected patients with hemorrhagic shock. Recently, TXA has gained interest in isolated traumatic brain injury (TBI) patients with variable results. There are limited data on TXA in polytrauma with associated TBI. This study investigated the role of TXA in severely injured patients with associated severe TBI.

Methods: A 7.5-year prospective cohort study was performed to investigate the relation between prehospital TXA and mortality in consecutive trauma patients with associated severe TBI (Abbreviated Injury Scale (AIS)head ≥ 3) admitted to a Level-1 Trauma Center ICU. Indication for prehospital TXA administration was (suspicion of) hemorrhagic shock, and/or systolic blood pressure (SBP) ≤ 90 mmHg. Demographics, data on physiology, resuscitation, and outcomes were prospectively collected.

Results: Two hundred thirty-four patients (67% males) with median age of 49 years and ISS 33 (98% blunt injuries) were included. Thirteen patients (6%) developed thromboembolic complications; mortality rate was 24%. Fifty-one percent of patients received prehospital TXA. TXA patients were younger, had more deranged physiology on arrival, and received more crystalloids and blood products ≤ 24 h. There was, however, no difference in overall outcome between TXA patients and no-TXA patients.

Conclusions: Despite having a more deranged physiology TXA patients had similar outcome compared to no-TXA patients who were much older. Thromboembolic complication rate was low. Prehospital tranexamic acid has no evident effect on outcome in polytrauma patients with associated critical brain injury.

Keywords: Morbidity; Mortality; Polytrauma; TBI; Tranexamic acid.

Br J Anaesth. 2022 Aug;129(2):191-199.doi: 10.1016/j.bja.2022.03.032. Epub 2022 May 18.

Use of tranexamic acid in major trauma: a sex-disaggregated analysis of the Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage (CRASH-2 and CRASH-3) trials and UK trauma registry (Trauma and Audit Research Network) data

Tim Nutbeam [1], Ian Roberts [2], Lauren Weekes [3], Haleema Shakur-Still [2], Amy Brenner [2], Francois-Xavier Ageron [4]

Abstract

Background: Women are less likely than men to receive some emergency treatments. This study examines whether the effect of tranexamic acid (TXA) on mortality in trauma patients varies by sex and whether the receipt of TXA by trauma patients varies by sex.

Methods: First, we conducted a sex-disaggregated analysis of data from the Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage (CRASH)-2 and CRASH-3 trials. We used interaction tests to determine whether the treatment effect varied by sex. Second, we examined data from the Trauma and Audit Research Network (TARN) to explore sex differences in the receipt of TXA. We used logistic regression models to estimate the odds ratio for receipt of TXA in females compared with males. Results are reported as n (%), risk ratios (RR), and odds ratios (OR) with 95% confidence intervals.

Results: Overall, 20 211 polytrauma patients (CRASH-2) and 12 737 patients with traumatic brain injuries (CRASH-3) were included in our analysis. TXA reduced the risk of death in females (RR=0.69 [0.52-0.91]) and in males (RR=0.80 [0.71-0.90]) with no significant heterogeneity by sex (P=0.34). We examined TARN data for 216 364 patients aged ≥16 yr with an Injury Severity Score ≥9 with 98 879 (46%) females and 117 485 (54%) males. TXA was received by 7198 (7.3% [7.1-7.4%]) of the females and 19 697 (16.8% [16.6-17.0%]) of the males (OR=0.39 [0.38-0.40]). The sex difference in the receipt of TXA increased with increasing age.

Conclusions: Administration of TXA to patients with bleeding trauma reduces mortality to a similar extent in women and men, but women are substantially less likely to be treated with TXA.

Keywords: haemorrhage; injuries; multiple trauma; tranexamic acid; transfusion; trauma.

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Predictive factors of mortality in damage control surgery for abdominal trauma

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Abstract

Introduction: damage control surgery (DCS) is well recognized as a surgical strategy for patients sustaining severe abdominal trauma. Literature suggests the indications, operative times, therapeutic procedures, laboratory parameters and intraoperative findings have a direct bearing on the outcomes.

Objective: to analyze the clinical profile of patients undergoing DCS and determine predictors of morbidity and mortality.

Methods: a retrospective cohort study was conducted on all patients undergoing DCS following abdominal trauma from November 2015 and December 2021. Data on subjects' demographics, baseline presentation, mechanism of injury, associated injuries, injury severity scores, laboratory parameters, operative details, postoperative complications, length of stay and mortality were assessed. A binary logistic regression analysis was performed to determine potential risk factors for mortality.

Results: During the study period, 696 patients underwent trauma laparotomy. Of these, 8.9% (n=62) were DCS, with more than 80% due to penetrating mechanisms. Overall mortality was 59.6%. In the logistic regression stratified by survival, several variables were significantly associated with mortality, including hypotension, and altered mental status at admission, intraoperative cardiorespiratory arrest, need for resuscitative thoracotomy, metabolic acidosis, hyperlactatemia, coagulopathy, fibrinolysis, and severity of the trauma injury scores.

Conclusion: DCS may be appropriate in critically injured patients; however, it remains associated with significant morbidity and high mortality, even at specialized trauma care centers. From pre and postoperative clinical and laboratory parameters, it was possible to predict the risk of death in the studied sample.

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The National Disaster Medical System and military combat readiness: A scoping review

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Abstract

A scoping review was conducted to describe the history of the National Disaster Medical System (NDMS) in the context of US military medical preparedness for a large-scale overseas military conflict. National Disaster Medical System civilian hospitals would serve as backups to military treatment facilities if both US Department of Defense and US Department of Veterans Affairs hospitals reached capacity during such a conflict. Systematic searches were used to identify published works discussing the NDMS in the scientific and gray literature. Results were limited to publicly available unclassified English language works from 1978 to January 2022; no other restrictions were placed on the types of published works. Full-text reviews were conducted on identified works (except student papers and dissertations) to determine the extent to which they addressed NDMS definitive care. Data charting was performed on a final set of papers to assess how these works addressed NDMS definitive care. The search identified 54 works published between 1984 and 2022. More than half of the publications were simple descriptions of the NDMS (n = 30 [56%]), and most were published in academic or professional journals (n = 38 [70%]). Only nine constituted original research. There were recurrent criticisms of and recommendations for improving the definitive care component of the NDMS. The lack of published literature on NDMS definitive care supports the assertion that the present-day NDMS may lack the capacity and military-civilian interoperability necessary to manage the casualties resulting from a large-scale overseas military conflict.