Committee on Surgical Combat Casualty Care (CoSCCC)

Journal Watch

4TH Quarter

FY 2023

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
LSCO

J Trauma Acute Care Surg. 2023 Aug; 95(2): S4–S6. 2023 Jun 6. doi: 10.1097/TA.0000000000004073
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Dried plasma: An urgent priority for trauma readiness

No abstract available.

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As the US military pivots from years of low-intensity counterinsurgency operations to preparation for large-scale combat operations against a near-peer competitor, the realities of providing medical care to thousands of casualties are sobering.[1] Evidence collected during recent conflicts reinforces that damage-control resuscitation and early hemorrhage control are crucial to survival for patients with severe injuries. Numerous studies continue to demonstrate the criticality of early lifesaving interventions and the impact of timely and appropriate resuscitation with blood products.[2–12] Minutes matter when it comes to transfusion and so does the product transfused: whole blood and early plasma are lifesaving interventions that improve survival rates for patients with traumatic injuries.[8,9] Future conflicts are likely to include widespread use of artillery and rockets delivering incendiary and thermobaric munitions, resulting in increased numbers of burn casualties, further increasing requirements for plasma.[13,14]

Globally, health care systems have sized their blood collection and processing capabilities and capacity to meet peacetime requirements. To meet projected requirements for a future conflict, the United States and its allies and partners should enhance efforts to develop lifesaving blood product solutions and resuscitative adjuncts. The Department of Defense (DoD) is currently developing systems for early blood transfusion proximate to the point of injury using cold-stored low titer O whole blood, but there are numerous logistics challenges to providing standard blood products in austere locations and supplies will certainly be limited, particularly in the early and most intense phases of conflict. In addition, DoD is expanding the ability of deployed units to use “walking blood banks,” built on an emergency donor panel that would include most deployed personnel. However, walking blood banks donors are not always available when needed and in the required quantity. Also, donors can only safely donate blood about every 56 days under normal noncombat conditions. Even with these initiatives, DoD and its allies and partners should develop additional mitigation measures to increase the ability to provide blood products when and where needed. Given the benefits of early plasma resuscitation[8,9] and the current state of technology, dried plasma is the most proximate and feasible solution. We must accelerate efforts for the development and large-scale procurement of a dried plasma product for use by all deployed forces as a critical capability to ensure readiness to support future conflicts.

Dried plasma is not a new technology, nor is its use as a bridge to whole blood resuscitation a novel approach.[13] Initially developed by Max Strumia in 1938 at Bryn Mawr, millions of units of dried plasma were produced in the United States and in other countries for shipment to frontline units during World War II.[15] In the postwar years, given the decreased demand for blood products and the recognition of the risk of viral hepatitis from pooled plasma transfusion, most efforts, including in the United States, were suspended. Both France and Germany sustained their programs after incorporating changes in manufacturing to reduce the risk of transmitting infectious diseases. Advances in bloodborne pathogen testing, pathogen reducing technology, and the need for shelf-stable blood products have resulted in a reassessment of the importance of dried plasma. Currently, the French Military Medical Service, the German Red Cross, and the National Bioproducts Institute of South Africa all manufacture dried plasma products with regulatory approval. In addition, Octapharma AG of Switzerland recently received regulatory approval in Europe for its dried plasma

product. These products are used in civilian and military emergency medical systems in several countries including Canada, the Czech Republic, France, Germany, Israel, Norway, and the United Kingdom.

Since 2011, US Special Operations Forces have also used French freeze-dried plasma for resuscitation at the point of injury, initially through the Food and Drug Administration's Expanded Access program and more recently under an Emergency Use Authorization.[16,17] However, there currently is no fully approved dried plasma product for the US market, although several remain under development. In addition, dried plasma projects are underway in several European nations, Canada, and Australia. These include both centrally manufactured freeze-dried plasma products and distributed manufacturing systems usable at blood collection centers.

Four use cases for dried plasma are proposed.

- *1. Immediate resuscitation at the point of injury, until other blood products are available;*
- *2. Initial resuscitation along with red blood cells and other components such as cold-stored platelets;*
- *3. Replacement for liquid or frozen plasma throughout the prehospital and early/acute in-hospital continuum of care;*
- *4. Initial resuscitation of burn shock.*[13,14]

As an immediate resuscitation capability for the battlefield that can be safely stored at room temperature, dried plasma should be available along the entire continuum of combat casualty care. This means that the product should be issued to all field medics and corpsmen, as well as carried on all en route care platforms, including ground ambulances. Given the challenges of resupply in a contested environment, adequate stockpiles of product must be strategically prepositioned within theater and distributed forward to operating units to facilitate “last mile” delivery.

To this end, we recommend that in-theater liquid and frozen plasma be replaced with dried plasma as pioneered by the French military,[18–21] *particularly between point of injury and forward surgical units.* Further modeling and analysis of which casualties are most likely to benefit from dried plasma, who will be trained to administer it, and related logistical considerations will help clarify how much dried plasma will be needed in future conflicts and how increased utilization of dried plasma will decrease cold chain storage requirements in the forward operating environment.

More than 10 million units of dried plasma were produced in the United States and shipped overseas during World War II. These numbers are useful in appreciating the magnitude of scale that will be required during a large-scale conflict. The Joint Trauma System, in cooperation with the Armed Service Blood Program and the Office of the Joint Staff Surgeon, recently reassessed blood planning factors. Based upon historical experience from past conflicts and DoD Trauma Registry data, casualties who require transfusion need an average of 8 U of whole blood (or whole blood equivalents from components). As additional data from the conflict in Ukraine and/or the Joint Trauma System and Armed Service Blood Program become available, these planning factors can be adjusted to reflect point of need resuscitation. *We suggest an initial planning factor of at least 2 U of dried plasma product for each of these casualties for immediate resuscitation and bridging to other blood products.*

As we prepare for potential future conflicts or large-scale natural disasters, we must accelerate development activities that will yield both centrally manufactured dried plasma products that can be rapidly procured, as well as distributed manufacturing capabilities that can be leveraged by the Armed Services Blood Program and civilian partners to provide surge capacity. Action today will better prepare our health care system to successfully resuscitate future casualties with survivable injuries.

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S180-S184. doi: 10.1097/TA.0000000000004063. Epub 2023 May 31.

Casualty care implications of large-scale combat operations

Mason H Remondelli , Kyle N Remick, Stacy A Shackelford, Jennifer M Gurney, Jeremy C Pamplin, Travis M Polk, Benjamin K Potter, Danielle B Holt

Abstract

Analysis and review of combat casualty care challenges in future large-scale and medical multi-domain operations from the perspective of past, present, and potential future conflicts.

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S13-S18. doi: 10.1097/TA.0000000000004062. Epub 2023 May 29.

The last days: The medical response of United States and allied military teams during the Afghanistan Exodus

Joseph D Bozzay, Timothy P Murphy, Michael D Baird, Marvin E Dingle, Omar A Rokayak, Chris Renninger, Shawn E Boomsma, Brian P Milam, Timothy J Horrell, Bradley A Rittenhouse, Patrick J McGlone, Harris W Kashtan, Mark Buzzelli, Remealle A How, Bruce A Lynch, Lauren Heyda, Ashley E Humphries, Elliot M Jessie, Jigarkumar A Patel, Ronald Hardin, Kenneth J Nelson, Jean-Claude G D'Alleyrand, Matthew J Bradley, Benjamin K Potter, Jennifer M Gurney

Abstract

Objectives: The objective of this study is to describe the United States and allied military medical response during the withdrawal from Afghanistan.

Background: The military withdrawal from Afghanistan concluded with severe hostilities resulting in numerous civilian and military casualties. The clinical care provided by coalition forces capitalized on decades of lessons learned and enabled unprecedented accomplishments.

Methods: In this retrospective, observational analysis, casualty numbers, and operative information was collected and reported from military medical assets in Kabul, Afghanistan. The continuum of medical care and the trauma system, from the point of injury back to the United States was captured and described.

Results: Prior to a large suicide bombing resulting in a mass casualty event, the international medical teams managed distinct 45 trauma incidents involving nearly 200 combat and non-combat civilian and military patients over the preceding 3 months. Military medical personnel treated 63 casualties from the Kabul airport suicide attack and performed 15 trauma operations. US air transport teams evacuated 37 patients within 15 hours of the attack.

Conclusion: Lessons learned from the last 20 years of combat casualty care were successfully implemented during the culmination of the Afghanistan conflict. Ultimately, the effort, teamwork, and system adaptability exemplify not only the attitudes and character of service members who provide modern combat casualty care but also the paramount importance of the battlefield learning health care system. A continued posture to maintain military surgical preparedness in unique environments remain crucial as the US military prepares for the future. Retrospective observational analysis.

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

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S7-S12. doi:10.1097/TA.0000000000004058.Epub 2023 May 31.

Committee on Surgical Combat Casualty Care position statement: Neurosurgical capability for the optimal management of traumatic brain injury during deployed operations

Jennifer M Gurney , Matthew D Tadlock, Bradley A Dengler, Brian J Gavitt, Michael S Dirks, John B Holcomb, Russ S Kotwal, Linda C Benavides, Jeremy W Cannon, Theodore Edson, John C Graybill, Brian J Sonka, Donald W Marion, Matthew J Eckert, Martin A Schreiber, Travis M Polk, Shane D Jensen; Commentaries Provided by: Matthew J. Martin, MD, FACS, DABA, Bellal A. Joseph, MD, FACS, Alex Valadka, MD, FAANS, FACS, and Jeffrey D. Kerby, MD, PhD, FACS

Abstract

Background: Experiences over the last three decades of war have demonstrated a high incidence of traumatic brain injury (TBI) resulting in a persistent need for a neurosurgical capability within the deployed theater of operations. Despite this, no doctrinal requirement for a deployed neurosurgical capability exists. Through an iterative process, the Joint Trauma System Committee on Surgical Combat Casualty Care (CoSCCC) developed a position statement to inform medical and nonmedical military leaders about the risks of the lack of a specialized neurosurgical capability.

Methods: The need for deployed neurosurgical capability position statement was identified during the spring 2021 CoSCCC meeting. A triservice working group of experienced forward-deployed caregivers developed a preliminary statement. An extensive iterative review process was then conducted to ensure that the intended messaging was clear to senior medical leaders and operational commanders. To provide additional context and a civilian perspective, statement commentaries were solicited from civilian clinical experts including a recently retired military trauma surgeon boarded in neurocritical care, a trauma surgeon instrumental in developing the Brain Injury Guidelines, a practicing neurosurgeon with world-renowned expertise in TBI, and the chair of the Committee on Trauma.

Results: After multiple revisions, the position statement was finalized, and approved by the CoSCCC membership in February 2023. Challenges identified include (1) military neurosurgeon attrition, (2) the lack of a doctrinal neurosurgical capabilities requirement during deployed combat operations, and (3) the need for neurosurgical telemedicine capability and in-theater computed tomography scans to triage TBI casualties requiring neurosurgical care.

Conclusion: Challenges identified regarding neurosurgical capabilities within the deployed trauma system include military neurosurgeon attrition and the lack of a doctrinal requirement for neurosurgical capability during deployed combat operations. To mitigate risk to the force in a future peer-peer conflict, several evidence-based recommendations are made. The solicited civilian commentaries strengthen these recommendations by putting them into the context of civilian TBI management. This neurosurgical capabilities position statement is intended to be a forcing function and a communication tool to inform operational commanders and military medical leaders on the use of these teams on current and future battlefields.

Level of evidence: Prognostic and Epidemiological; Level V.

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S19-S25. doi: 10.1097/TA.0000000000004051. Epub 2023 May 15.

The 16-year evolution of a military-civilian partnership: The University of Alabama at Birmingham experience

Omar A Rokayak, Daniel T Lammers, Emily W Baird, John B Holcomb, Jan O Jansen, Daniel B Cox, Jon P Winkler, Richard D Betzold, Nathan R Manley, David Marc Northern, James K Wright, John Dorsch, Jeffrey D Kerby

Abstract

Background: At the University of Alabama at Birmingham (UAB), a multi-tiered military-civilian partnership (MCP) has evolved since 2006. We aimed to outline this model to facilitate potential replication nationally.

Methods: We performed a comprehensive review of the partnership between UAB, the United States Air Force Special Operations Command, and the Department of Defense (DoD) reviewing key documents and conducting interviews with providers. As a purely descriptive study, this project did not involve any patient data acquisition or analysis and therefore was exempt from institutional review board approval per institutional policy.

Results: At the time of this review, six core programs existed targeting training, clinical proficiency, and research. Training: (1) The Special Operations Center for Medical Integration and Development trains up to 144 combat medics yearly. (2) UAB trains one integrated military Surgery resident yearly with two additional civilian-sponsored military residents in Emergency Medicine. (3) UAB's Surgical Critical Care Fellowship had one National Guard member with two incoming Active-Duty, one Reservist and one prior service member in August 2022. Clinical Proficiency: (4) UAB hosts four permanently assigned United States Air Force Special Operations Command Special Operations Surgical Teams composed of general surgeons, anesthesiologists, certified registered nurse anesthetists, surgical technologists, emergency physicians, critical care registered nurses, and respiratory therapists totaling 24 permanently assigned active-duty health care professionals. (5) In addition, two fellowship-trained Air Force Trauma Critical Care Surgeons, one Active-Duty and one Reservist, are permanently assigned to UAB. These clinicians participate fully and independently in the routine care of patients alongside their civilian counterparts. Research: (6) UAB's Division of Trauma and Acute Care Surgery is currently conducting nine DoD-funded research projects totaling $6,482,790, and four research projects with military relevance funded by other agencies totaling $15,357,191.

Conclusion: The collaboration between UAB and various elements within the DoD illustrates a comprehensive approach to MCP. Replicating appropriate components of this model nationally may aid in the development of a truly integrated trauma system best prepared for the challenges of the future.

Level of evidence: Economic and Value-based Evaluations; Level IV.

J Am Coll Surg. 2023 Aug 1;237(2):206-219. doi: 10.1097/XCS.0000000000000708. Epub 2023 Apr 11.

Whole Blood Resuscitation and Association with Survival in Injured Patients with an Elevated Probability of Mortality

Jason L Sperry, Bryan A Cotton, James F Luther, Jeremy W Cannon, Martin A Schreiber, Ernest E Moore, Nicholas Namias, Joseph P Minei, Stephen R Wisniewski, Frank X Guyette; Shock, Whole Blood, and Assessment of Traumatic Brain Injury (SWAT) Study Group

Abstract

Background: Low-titer group O whole blood (LTOWB) resuscitation is becoming common in both military and civilian settings and may represent the ideal resuscitation intervention. We sought to characterize the safety and efficacy of LTOWB resuscitation relative to blood component resuscitation.

Study design: A prospective, multicenter, observational cohort study was performed using 7 trauma centers. Injured patients at risk of massive transfusion who required both blood transfusion and hemorrhage control procedures were enrolled. The primary outcome was 4-hour mortality. Secondary outcomes included 24-hour and 28-day mortality, achievement of hemostasis, death from exsanguination, and the incidence of unexpected survivors.

Results: A total of 1,051 patients in hemorrhagic shock met all enrollment criteria. The cohort was severely injured with >70% of patients requiring massive transfusion. After propensity adjustment, no significant 4-hour mortality difference across LTOWB and component patients was found (relative risk [RR] 0.90, 95% CI 0.59 to 1.39, p = 0.64). Similarly, no adjusted mortality differences were demonstrated at 24 hours or 28 days for the enrolled cohort. When patients with an elevated prehospital probability of mortality were analyzed, LTOWB resuscitation was independently associated with a 48% lower risk of 4-hour mortality (relative risk [RR] 0.52, 95% CI 0.32 to 0.87, p = 0.01) and a 30% lower risk of 28-day mortality (RR 0.70, 95% CI 0.51 to 0.96, p = 0.03).

Conclusions: Early LTOWB resuscitation is safe but not independently associated with survival for the overall enrolled population. When patients were selected with an elevated probability of mortality based on prehospital injury characteristics, LTOWB was independently associated with a lower risk of mortality starting at 4 hours after arrival through 28 days after injury.

J Am Coll Surg. 2023 Aug 1;237(2):364-373. doi: 10.1097/XCS.0000000000000707. Epub 2023 Apr 24.

Putting Medical Boots on the Ground: Lessons from the War in Ukraine and Applications for Future Conflict with Near-Peer Adversaries

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Abstract

In the past 20 years of the Global War on Terror, the US has seen substantial improvements in its system of medical delivery in combat. However, throughout that conflict, enemy forces did not have parity with the weaponry, capability, or personnel of the US and allied forces. War against countries like China and Russia, who are considered near-peer adversaries in terms of capabilities, will challenge battlefield medical care in many different ways. This article reviews the experience of a medical team, Global Surgical and Medical Support Group, that has been providing assistance, training, medical support, and surgical support to Ukraine since the Russian invasion began in February 2022. The team has extensive experience in medicine, surgery, austere environments, conflict zones, and building partner nation capacities. This article compares and contrasts the healthcare systems of this war against the systems used during the Global War on Terror. The lessons learned here could help the US anticipate challenges and successfully plan for the provision of medical care in a future conflict against an adversary with capabilities close to its own.

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S72-S78. doi: 10.1097/TA.0000000000004018. Epub 2023 May 29.

Epidemiology of cranial infections in battlefield-related penetrating and open cranial injuries

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Abstract

Background: Penetrating brain injuries are a potentially lethal injury associated with substantial morbidity and mortality. We examined characteristics and outcomes among military personnel who sustained battlefield-related open and penetrating cranial injuries during military conflicts in Iraq and Afghanistan.

Methods: Military personnel wounded during deployment (2009-2014) were included if they sustained an open or penetrating cranial injury and were admitted to participating hospitals in the United States. Injury characteristics, treatment course, neurosurgical interventions, antibiotic use, and infection profiles were examined.

Results: The study population included 106 wounded personnel, of whom 12 (11.3%) had an intracranial infection. Posttrauma prophylactic antibiotics were prescribed in more than 98% of patients. Patients who developed central nervous system (CNS) infections were more likely to have undergone a ventriculostomy ($p = 0.003$), had a ventriculostomy in place for a longer period (17 vs. 11 days; $p = 0.007$), had more neurosurgical procedures ($p < 0.001$), and have lower presenting Glasgow Coma Scale ($p = 0.01$) and higher Sequential Organ Failure Assessment scores ($p = 0.018$). Time to diagnosis of CNS infection was a median of 12 days postinjury (interquartile range, 7-22 days) with differences in timing by injury severity (critical head injury had median of 6 days, while maximal [currently untreatable] head injury had a median of 13.5 days), presence of other injury profiles in addition to head/face/neck (median, 22 days), and the presence of other infections in addition to CNS infections (median, 13.5 days). The overall length of hospitalization was a median of 50 days, and two patients died.

Conclusion: Approximately 11% of wounded military personnel with open and penetrating cranial injuries developed CNS infections. These patients were more critically injured (e.g., lower Glasgow Coma Scale and higher Sequential Organ Failure Assessment scores) and required more invasive neurosurgical procedures.

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S170-S179. doi: 0.1097/TA.0000000000004005. Epub 2023 May 12.

A scoping review of two decades of pediatric humanitarian care during wartime

Veronica I Kocik, Matthew A Borgman, Michael D April, Steven G Schauer

Abstract

Abstract: Humanitarian care is a vital component of the wartime mission. Children comprise a significant proportion of casualties injured by explosives and penetrating weapons. Children face a variety of unique injury patterns in the combat setting as high-powered firearms and explosives are rarely seen in the civilian setting. We sought to perform a scoping review of pediatric research from the recent US-led wars in Afghanistan, and Iraq conflicts beginning in 2001. We used Google Scholar and PubMed to identify pediatric combat literature published between 2001 and 2022. We utilized the PRISMA-ScR Checklist to conduct this review. We identified 52 studies that met inclusion for this analysis-1 prospective observational study, 50 retrospective studies, and 1 case report. All the original research studies were retrospective in nature except for one. We identified one prospective study that was a post hoc subanalysis from an overall study assessing the success of prehospital lifesaving interventions. Most of the articles came from varying registries created by the United States and British militaries for the purposes of trauma performance improvement. The deployed health service support mission often includes treatment of pediatric trauma patients. The deployed health service support mission often includes treatment of pediatric trauma patients. We found that available literature from this setting is limited to retrospective studies except for one prospective study. Our findings suggest that pediatric humanitarian care was a significant source of medical resource consumption within both of the major wars. Further, many of the lessons learned have directly translated into changes in civilian pediatric trauma care practices highlighting the need for collaborative scientific developments between the military and civilian trauma programs.

Emerg Med J. 2023 Sep 13:emermed-2023-213086. doi: 10.1136/emermed-2023-213086. Online ahead of print.

Understanding pre-hospital blood transfusion decision-making for injured patients: an interview study

Max E R Marsden, Suzie Kellett, Rahul Bagga, Jared M Wohlgemut, Richard L Lyon, Zane B Perkins, Katie Gillies, Nigel Rm Tai

Abstract

Background: Blood transfusion for bleeding trauma patients is a promising pre-hospital intervention with potential to improve outcomes. However, it is not yet clear which patients may benefit from pre-hospital transfusions. The aim of this study was to enhance our understanding of how experienced pre-hospital clinicians make decisions regarding patient blood loss and the need for transfusion, and explore the factors that influence clinical decision-making.

Methods: Pre-hospital physicians, from two air ambulance sites in the south of England, were interviewed between December 2018 and January 2019. Participants were involved in teaching or publishing on the management of bleeding trauma patients and had at least 5 years of continuous and contemporary practice at consultant level. Interviews were semi-structured and explored how decisions were made and what made decisions difficult. A qualitative description approach was used with inductive thematic analysis to identify themes and subthemes related to blood transfusion decision-making in trauma.

Results: Ten pre-hospital physicians were interviewed, and three themes were identified: *recognition-primed analysis*, *uncertainty* and *imperfect decision analysis*. The first theme describes how participants make decisions using selected cues, incorporating their experience and are influenced by external rules and group expectations. What made decisions difficult for the participants was encapsulated in the uncertainty theme. Uncertainty emerged regarding the patient's true underlying physiological state and the treatment effect of blood transfusion. The last theme focuses on the issues with decision-making itself. Participants demonstrated lapses in decision awareness, often incomplete decision evaluation and described challenges to effective learning due to incomplete patient outcome information.

Conclusion: Pre-hospital clinicians make decisions about bleeding and transfusion which are recognition-primed and incorporate significant uncertainty. Decisions are influenced by experience and are subject to bias. Improved understanding of the decision-making processes provides a theoretical perspective of how decisions might be supported in the future.

Keywords: diagnosis; major trauma management; pre-hospital; resuscitation.

J Trauma Acute Care Surg. 2023 Aug 1;95(2S Suppl 1):S66-S71. doi: 10.1097/TA.0000000000004048. Epub 2023 May 23.

Pediatric trauma surgery in Iraq and Afghanistan: Mortality, indicators, and most common operating room interventions from 2007 to 2016

Andrew S Oh, Steven G Schauer, Kathleen Adelgais, John L Fletcher, Frederick M Karrer

Abstract

Background: The wars in Afghanistan and Iraq produced thousands of pediatric casualties, using substantial military medical resources. We sought to describe characteristics of pediatric casualties who underwent operative intervention in Iraq and Afghanistan.

Methods: This is a retrospective analysis of pediatric casualties treated by US Forces in the Department of Defense Trauma Registry with at least one operative intervention during their course. We report descriptive, inferential statistics, and multivariable modeling to assess associations for receiving an operative intervention and survival. We excluded casualties who died on arrival to the emergency department.

Results: During the study period, there were a total of 3,439 children in the Department of Defense Trauma Registry, of which 3,388 met inclusion criteria. Of those, 2,538 (75%) required at least 1 operative intervention totaling 13,824 (median, 4; interquartile range, 2-7; range, 1-57). Compared with nonoperative casualties, operative casualties were older and male and had a higher proportion of explosive and firearm injuries, higher median composite injury severity scores, higher overall blood product administration, and longer intensive care hospitalizations. The most common operative procedures were related to abdominal, musculoskeletal, and neurosurgical trauma; burn management; and head and neck. When adjusting for confounders, older age (unit odds ratio, 1.04; 1.02-1.06), receiving a massive transfusion during their initial 24 hours (6.86, 4.43-10.62), explosive injuries (1.43, 1.17-1.81), firearm injuries (1.94, 1.47-2.55), and age-adjusted tachycardia (1.45, 1.20-1.75) were all associated with going to the operating room. Survival to discharge on initial hospitalization was higher in the operative cohort (95% vs. 82%, $p < 0.001$). When adjusting for confounders, operative intervention was associated with improved mortality (odds ratio, 7.43; 5.15-10.72).

Conclusion: Most children treated in US military/coalition treatment facilities required at least one operative intervention. Several preoperative descriptors were associated with casualties' likelihood of operative interventions. Operative management was associated with improved mortality.