Tactical Combat Casualty Care

&

En Route Combat Casualty Care

2023 Journal Watch

Journal Article Abstracts

Oct 2023- Dec 2023

A quarterly literature review of topics related to Tactical Combat Casualty Care (TCCC) and En Route Combat Casualty Care (ERCCC) from the months of Dec 2019 through Mar 2020.

Posting of articles does not imply agreement or disagreement with the contents nor constitute a change in TCCC or ERCCC guidelines, practices, or training. Links are provided to respective publications for further reading and research. Additional log-in requirements may be required at various websites. The Joint Trauma System and Deployed Medicine do not provide downloadable articles or free access to journal sites. Access may be acquired through service medical departments/commands or medical agencies/organizations.

The CoTCCC is the branch of the JTS focused on the standard of care for prehospital battlefield medicine. The CoERCCC is the branch of the JTS focused on the standard of care for en route care medicine through the evacuation echelons of care. The JTS is the Department of Defense Center of Excellence for Trauma and division of the Defense Health Agency (DHA) providing clinical practice guidelines and performance improvement for all levels of military trauma care.

Needle Decompression Causing Pericardial and Pulmonary Artery Injuries in Patients With Blunt Trauma: Two Case Reports and Literature Review

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J Investig Med High Impact Case Rep. 2023 Jan-Dec:11:23247096231211063

Abstract

Tension pneumothorax (TPX) is a severe chest complication of blunt or penetrating trauma. Immediate decompression is the lifesaving action in patients with TPX. Needle decompression (ND) is frequently used for this purpose, particularly in limited resources setting such as the prehospital arena. Despite the safe profile, the blind nature of the procedure can result in a serious range of complications, including injury to the vital intrathoracic structures such as the lungs, great vessels, and heart. Here, we reported 2 cases of blunt chest trauma resulting in TPX demanding immediate ND; however, nonintentional pericardial and pulmonary artery injuries occurred. The first case was a 42-year-old man with a needle-related pulmonary artery injury that required surgery. The second case was a 19-year-old man in whom a needle-related pneumopericardium occurred and was treated conservatively. In both cases, trained personnel performed the ND. Although ND in the field is a lifesaving intervention, it may further complicate the patient condition. Therefore, it should be performed in adherence to the universal guidelines.

Prehospital management of earthquake crush injuries: A collective review

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Turk J Emerg Med. 2023 Oct 3;23(4):199-210

Abstract

Earthquakes are natural disasters which can destroy the rural and urban infrastructure causing a high toll of injuries and death without advanced notice. We aim to review the prehospital medical management of earthquake crush injuries in the field. PubMed was searched using general terms including rhabdomyolysis, crush injury, and earthquake in English language without time restriction. Selected articles were critically evaluated by three experts in disaster medicine, emergency medicine, and critical care. The medical response to earthquakes includes: (1) search and rescue; (2) triage and initial stabilization; (3) definitive care; and (4) evacuation. Long-term, continuous pressure on muscles causes crush injury. Ischemia-reperfusion injury following the relieving of muscle compression may cause metabolic changes and rhabdomyolysis depending on the time of extrication. Sodium and water enter the cell causing cell swelling and hypovolemia, while potassium and myoglobin are released into the circulation. This may cause sudden cardiac arrest, acute extremity compartment syndrome, and acute kidney injury. Recognizing these conditions and treating them timely and properly in the field will save many patients. Majority of emergency physicians who have worked in the field of the recent Kahramanmaraş 2023, Turkey, earthquakes, have acknowledged their lack of knowledge and experience in managing earthquake crush injuries. We hope that this collective review will cover the essential knowledge needed for properly managing seriously crushed injured patients in the earthquake field.

Prehospital tranexamic acid in trauma patients: a systematic review and meta-analysis of randomized controlled trials

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Front Med (Lausanne). 2023 Oct 20:10:1284016

Background: Prehospital tranexamic acid (TXA) may hold substantial benefits for trauma patients; however, the data underlying its efficacy and safety is scarce.

Methods: We searched PubMed, Embase, the Cochrane Library, and ClinicalTrials.gov from inception to July 2023 for all randomized controlled trials (RCTs) investigating prehospital TXA in trauma patients as compared to placebo or standard care without TXA. Data were pooled under a random-effects model using RevMan 5.4 with risk ratio (RR) and mean difference (MD) as the effect measures.

Results: A total of three RCTs were included in this review. Regarding the primary outcomes, prehospital TXA reduced the risk of 1-month mortality (RR 0.82, 95% CI 0.69-0.97) but did not increase survival with a favorable functional outcome at 6 months (RR 1.00, 95% CI 0.93-1.09). Prehospital TXA also reduced the risk of 24-h mortality but did not affect the risk of mortality due to bleeding and traumatic brain injury. There was no significant difference between the TXA and control groups in the incidence of RBC transfusion, and the number of ventilator- and ICU-free days. Prehospital TXA did not increase the risk of adverse events except for a small increase in the incidence of infections.

Conclusion: Prehospital TXA is useful in reducing mortality in trauma patients without a notable increase in the risk of adverse events. However, there was no effect on the 6-month favorable functional status. Further large-scale trials are required to validate the aforementioned findings.

Effects and side-effects of tranexamic acid: they both matter

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Anaesthesia. 2023 Nov;78(11):1320-1322

No abstract available

Testing and Evaluation of a Novel Hemostatic Matrix in a Swine Junctional Hemorrhage Model

Andrew A Angus, Lindsey N July, Patrick M McCarthy, Nola D Shepard, Jason M Rall, Jason S Radowsky

J Surg Res. 2023 Nov:291:452-458

Introduction: In an ongoing effort to improve survival and reduce blood loss from hemorrhagic injuries on the battlefield, new hemostatic dressings continue to be developed. This study aimed to determine the efficacy of a novel silicon dioxide-based hemostatic matrix (HM) and compare it with the current military standard Quikclot Combat Gauze (QCG) utilizing a lethal femoral artery injury model.

Materials and methods: The femoral arteries of 20 anesthetized swine were isolated, and an arteriotomy was performed. After a 45 s free bleed, the wound was treated with either HM or QCG (n = 10 per group). Following a 60-min observation period, ipsilateral leg manipulations and angiography were performed. Animal survival, hemostasis, blood loss, exothermic reaction, and femoral artery patency were analyzed.

Results: Despite a volumetric size discrepancy between the two products tested, the survival rate was similar between the two groups (80% HM, 90% QCG, n = 10, P = 0.588). Immediate hemostasis was obtained in 50% of HM animals and 40% of QCG animals. There was no difference in total blood loss recorded between the two groups (P = 0.472). Femoral artery patency rates following ipsilateral leg manipulations were similar between the two groups (50% HM, 33% QCG, P = 0.637), with no contrast extravasation in HM-treated wounds (0% HM, 33% QCG, P = 0.206). There was no significant difference in either pretreatment or posttreatment laboratory values, and there were no exothermic reactions in either group.

Conclusions: The SiOxMed HM demonstrated comparable hemostatic efficacy to QCG. The tested form of HM may be appropriate for surgical or topical hemostasis applications, and with further product development, it could be used for battlefield trauma implementation.

Current concepts review: Management of civilian transpelvic gunshot fractures

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Injury. 2023 Dec;54(12):111086

Introduction: Civilian gunshot fractures of the pelvic ring represent a unique challenge for orthopaedic surgeons due to a high incidence of complicating associated injuries. Internationally accepted guidelines for these injuries are not available. The aim of this review is to summarize the available literature and to provide concise management recommendations.

Methods: Literature search was performed using PubMed. The review focuses on civilian gunshot fractures of the pelvic ring and includes the acetabulum and hip joint only where it was deemed necessary for the understanding of the management of these patients.

Results: The management of civilian transpelvic gunshot fractures is complicated by potentially life-threatening associated injuries, the risk of contamination with bowel content and retained bullets in joints. The infection risk is higher compared to extremity gunshot fractures. There is no clear evidence for the use of antibiotics available. The studies focusing on civilian pelvic ring gunshot fractures reported no case of orthopaedic fracture fixation in their series. Routine wash-out and debridement of fractures is not warranted based on the literature but conflicting recommendations for surgical interventions exist.

Conclusion: There is limited evidence available for civilian transpelvic gunshot fractures. The high frequency of associated injuries requires a thorough clinical examination and multidisciplinary management. We recommend routine antibiotic prophylaxis for all transpelvic gunshots. For fractures with a high risk of infection, a minimum of 24 h broad-spectrum antibiotics is recommended. The indication for orthopaedic fixation of civilian transpelvic gunshot fractures is based on the assessment of the stability of the fracture and is rarely necessary. Although conflicting recommendations exist, routine wash-out and debridement is not recommended based on the literature. Bullets buried in bone without contact to synovial fluid do not warrant removal, unless they have traversed large bowel and are accessible without undue morbidity. Furthermore, bullets should be routinely removed if they are retained in the hip joint, if mechanical irritation of soft tissues by projectiles is expected or if the bullet traversed large bowel before entering the hip joint.

Trauma THOMPSON: Clinical Decision Support for the Frontline Medic

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Mil Med. 2023 Nov 8;188(Suppl 6):208-214

Introduction: U.S. Military healthcare providers increasingly perform prolonged casualty care because of operations in settings with prolonged evacuation times. Varied training and experience mean that this care may fall to providers unfamiliar with providing critical care. Telemedicine tools with audiovisual capabilities, artificial intelligence (AI), and augmented reality (AR) can enhance inexperienced personnel's competence and confidence when providing prolonged casualty care. Furthermore, implementing offline functionality provides assistance options in communications-limited settings. The intent of the Trauma TeleHelper for Operational Medical Procedure Support and Offline Network (THOMPSON) is to develop (1) a voice-controlled mobile application with video references for procedural guidance, (2) audio narration of each video using procedure mentoring scripts, and (3) an AI-guided intervention system using AR overlay and voice command to create immersive video modeling. These capabilities will be available offline and in downloadable format.

Materials and methods: The Trauma THOMPSON platform is in development. Focus groups of subject matter experts will identify appropriate procedures and best practices. Procedural video recordings will be collected to develop reference materials for the Trauma THOMPSON mobile application and to train a machine learning algorithm on action recognition and anticipation. Finally, an efficacy evaluation of the application will be conducted in a simulated environment.

Results: Preliminary video collection has been initiated for tube thoracostomy, needle decompression, cricothyrotomy, intraosseous access, and tourniquet application. Initial results from the machine learning algorithm show action recognition and anticipation accuracies of 20.1% and 11.4%, respectively, in unscripted datasets "in the wild," notably on a limited dataset. This system performs over 100 times better than a random prediction.

Conclusions: Developing a platform to provide real-time, offline support will deliver the benefits of synchronous expert advice within communications-limited and remote environments. Trauma THOMPSON has the potential to fill an important gap for clinical decision support tools in these settings.

Current state of technical transfusion medicine practice for out-of-hospital blood transfusion in Canada

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Vox Sang. 2023 Dec;118(12):1086-1094

Background and objectives: Canadian out-of-hospital blood transfusion programmes (OHBTPs) are emerging, to improve outcomes of trauma patients by providing pre-hospital transfusion from the scene of injury, given prolonged transport times. Literature is lacking to guide its implementation. Thus, we sought to gather technical transfusion medicine (TM)-specific practices across Canadian OHBTPs.

Materials and methods: A survey was sent to TM representatives of Canadian OHBTPs from November 2021 to March 2022. Data regarding transport, packaging, blood components and inventory management were included and reported descriptively. Only practices involving Blood on Board programme components for emergency use were included.

Results: OHBTPs focus on helicopter emergency medical service programmes, with some supplying fixed-wing aircraft and ground ambulances. All provide 1-3 coolers with 2 units of O RhD/Kell-negative red blood cells (RBCs) per cooler, with British Columbia trialling coolers with 2 units of pre-thawed group A plasma. Inventory exchanges are scheduled and blood components are returned to TM inventory using visual inspection and internal temperature data logger readings. Coolers are validated to storage durations ranging from 72 to 124 h. All programmes audit to manage wastage, though there is no consensus on appropriate benchmarks. All programmes have a process for documenting units issued, reconciliation after transfusion and for transfusion reaction reporting; however, training programmes vary. Common considerations included storage during extreme temperature environments, O-negative RBC stewardship, recipient notification, traceability, clinical practice guidelines co-reviewed by TM and a common audit framework.

Conclusion: OHBTPs have many similarities throughout Canada, where harmonization may assist in further developing standards, leveraging best practice and national coordination.

Are Data Driving Our Ambulances? Liberal Use of Tranexamic Acid in the Prehospital Setting

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Am Surg. 2023 Oct 20: Online ahead of print

Background: Current data on tranexamic acid (TXA) supports early administration for severe hemorrhagic shock. Administration by EMS has been facilitated by developing protocols and standing orders informed by these data. In this study, patterns of TXA use by EMS agencies serving a large level 1 trauma center were examined. We hypothesized that current widespread TXA use often includes administration outside of data-driven indications.

Methods: The trauma registry at a level 1 trauma center was queried for patients who received TXA. To determine the practice patterns and appropriateness of administration of TXA, patients' physiologic state in the prehospital environment based on EMS records, physiologic state on arrival to hospital, and interventions performed in both settings were examined. Over 20 separately managed EMS systems that administer TXA transport patients to this trauma center, allowing for a broad survey of practices.

Results: From 2016 to 2021 1089 patients received TXA, 406 (37.3%) having treatment initiated by EMS services. Of these, the average prehospital systolic blood pressure (SBP) was 108.2 mmHg and initial ED SBP was 107.8 mmHg. Only 58.4% of these patients received blood transfusion after arrival to this trauma center. Compliance with standard indications was low with only 14.6% of administrations meeting any data-driven SBP indication. Similar levels of compliance were seen across high volume EMS services.

Discussion: Tranexamic acid use has become common in trauma and has been adopted by many EMS systems. These results indicate TXA in the prehospital setting is over-used as administration is not being limited to indications that have shown benefit in prior data.

Race and Ethnicity and Prehospital Use of Opioid or Ketamine Analgesia in Acute Traumatic Injury

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JAMA Netw Open. 2023 Oct 2;6(10):e2338070

Importance: Racial and ethnic disparities in pain management have been characterized in many hospital-based settings. Painful traumatic injuries are a common reason for 911 activations of the EMS (emergency medical services) system.

Objective: To evaluate whether, among patients treated by EMS with traumatic injuries, race and ethnicity are associated with either disparate recording of pain scores or disparate administration of analgesia when a high pain score is recorded.

Design, settings, and participants: This cohort study included interactions from 2019 to 2021 for US patients ages 14 to 99 years who had experienced painful acute traumatic injuries and were treated and transported by an advanced life support unit following the activation of the 911 EMS system. The data were analyzed in January 2023.

Exposures: Acute painful traumatic injuries including burns.

Main outcomes and measures: Outcomes were the recording of a pain score and the administration of a nonoral opioid or ketamine.

Results: The study cohort included 4 781 396 EMS activations for acute traumatic injury, with a median (IQR) patient age of 59 (35-78) years (2 497 053 female [52.2%]; 31 266 American Indian or Alaskan Native [0.7%]; 59 713 Asian [1.2%]; 742 931 Black [15.5%], 411 934 Hispanic or Latino [8.6%], 10 747 Native Hawaiian or other Pacific Islander [0.2%]; 2 764 499 White [57.8%]; 16 161 multiple races [0.3%]). The analysis showed that race and ethnicity was associated with the likelihood of having a pain score recorded. Compared with White patients, American Indian and Alaskan Native patients had the lowest adjusted odds ratio (AOR) of having a pain score recorded (AOR, 0.74; 95% CI, 0.71-0.76). Among patients for whom a high pain score was recorded (between 7 and 10 out of 10), Black patients were about half as likely to receive opioid or ketamine analgesia as White patients (AOR, 0.53; 95% CI, 0.52-0.54) despite having a pain score recorded almost as frequently as White patients.

Conclusions and relevance: In this nationwide study of patients treated by EMS for acute traumatic injuries, patients from racial or ethnic minority groups were less likely to have a pain score recorded, with Native American and Alaskan Natives the least likely to have a pain score recorded. Among patients with a high pain score, patients from racial and ethnic minority groups were also significantly less likely to receive opioid or ketamine analgesia treatment, with Black patients having the lowest adjusted odds of receiving these treatments.

Prehospital blood transfusion in Brazil: results of the first year of implementation in an emergency medical service

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Hematol Transfus Cell Ther. 2023 Oct 7:S2531-1379(23)02534-8

Introduction: Hemorrhagic shock is the main cause of death in the prehospital environment, which highlights the need to standardize measures aiming at bleeding control and volume replacement in this environment. In Brazil, the first prehospital packed red blood cell transfusion service started in September 2020, in Bragança Paulista, state of São Paulo.

Objectives: Describe the trends and characteristics of patients who received prehospital transfusions prior to hospital treatment during the first year of operation.

Methods: A retrospective data review was made of all patients who received transfusions from the mobile intensive care unit in Bragança Paulista over one year.

Results: In this period, 19 patients were transfused. Since activation, the average response time was 20 min. The mean shock indexes before and after blood transfusion were 2.16 and 1.1, respectively. During the course of the 1st year of prehospital transfusions, no blood was wasted and there were no adverse effects.

Conclusion: Introduction of the prehospital packed red blood cell transfusion service was successful, with significant improvement in hemodynamic parameters.

Clinical Research in Prehospital Care: Current and Future Challenges

Jonathan Cimino, Claude Braun

Clin Pract. 2023 Oct 23;13(5):1266-1285

Abstract

Prehospital care plays a critical role in improving patient outcomes, particularly in cases of time-sensitive emergencies such as trauma, cardiac failure, stroke, bleeding, breathing difficulties, systemic infections, etc. In recent years, there has been a growing interest in clinical research in prehospital care, and several challenges and opportunities have emerged. There is an urgent need to adapt clinical research methodology to a context of prehospital care. At the same time, there are many barriers in prehospital research due to the complex context, posing unique challenges for research, development, and evaluation. Among these, this review allows the highlighting of limited resources and infrastructure, ethical and regulatory considerations, time constraints, privacy, safety concerns, data collection and analysis, selection of a homogeneous study group, etc. The analysis of the literature also highlights solutions such as strong collaboration between emergency medical services (EMS) and hospital care, use of (mobile) health technologies and artificial intelligence, use of standardized protocols and guidelines, etc. Overall, the purpose of this narrative review is to examine the current state of clinical research in prehospital care and identify gaps in knowledge, including the challenges and opportunities for future research.

Use of Low-Titer O-Positive Whole Blood in Female Trauma Patients: A Literature Review, Qualitative Multidisciplinary Analysis of Risk/Benefit, and Guidelines for Its Use as a Universal Product in Hemorrhagic Shock

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J Am Coll Surg. 2023 Nov 6: Online ahead of print.

Abstract

Background: Whole blood transfusion is associated with benefits including improved survival, coagulopathy, and decreased transfusion requirements. The majority of whole blood transfusion is in the form of Low-Titer O-Positive whole blood (LTOWB). Practice at many trauma centers withholds the use of LTOWB in women of childbearing potential due to concerns of alloimmunization. The purpose of this manuscript is to review the evidence for LTOWB transfusion in female trauma patients, and generate guidelines for its application.

Methods: Literature and evidence for LTOWB transfusion in hemorrhagic shock are reviewed. The rates of alloimmunization and subsequent obstetrical outcomes are compared to the reported outcomes of LTOWB versus other resuscitation mediums. Literature regarding patient experiences and preferences in regards to the risk of alloimmunization is compared to current trauma practices.

Results: LTOWB has shown improved outcomes in both military and civilian settings. The overall risk of alloimmunization for Rh- female patients in hemorrhagic shock exposed to Rh+ blood is low (3-20%). Fetal outcomes in Rh-sensitized are excellent compared to historical standards, and treatment options continue to expand. The majority of female patients surveyed on the risk of alloimmunization favor receiving Rh+ blood products to improve trauma outcomes. Obstetrical transfusion practices have incorporated LTOWB with excellent results.

Conclusions: The use of whole blood resuscitation in trauma is associated with benefits in the resuscitation of severely injured patients. The rate at which severely injured, Rh-negative patients develop anti-D antibodies is low. Treatments for alloimmunized pregnancies have advanced, with excellent results. Fears of alloimmunization in female patients are likely overstated, and may not warrant the withholding of whole blood resuscitation. The benefits of whole blood resuscitation likely outweigh the risks of alloimmunization.

The Impact of Progressive Simulation-Based Training on Tourniquet Application

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J Spec Oper Med. 2023 Dec 29;23(4):43-46

Abstract

The Advanced Combat Medical Experience (ACME) is a progressive simulation-based training held for second-year medical students at the Uniformed Services University (USU). This study explored the impact of participating in ACME on students' tourniquet application skills. A panel of emergency medicine physician experts developed an assessment to evaluate the participants' performance. Trained raters then scored students' tourniquet application performance before and after participating in ACME. We conducted a Wilcoxon signed-rank test to detect any significant difference in the participants' pretest and posttest ratings as well as time it took them to apply the tourniquet. Our results indicated a significant difference in the pre- and posttest ratings of students as well as the time it took them to apply the tourniquet. This study confirms the effectiveness of progressive simulation-based education for teaching TCCC skills to military medical trainees.

Facial Fracture Injury Criteria from Night Vision Goggle Impact

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Aerosp Med Hum Perform. 2023 Nov 1;94(11):827-834

INTRODUCTION: Military personnel extensively use night vision goggles (NVGs) in contemporary scenarios. Since NVGs may induce or increase injuries from falls or vehicular accidents, biomechanical risk assessments would aid design goal or mitigation strategy development.METHODS: This study assesses injury risks from NVG impact on cadaver heads using impactors modeled on the PVS-14 NVG. Impacts to the zygoma and maxilla were performed at 20° or 40° angles. Risks of facial fracture, neurotrauma, and neck injury were assessed. Acoustic sensors and accelerometers assessed time of fracture and provided input variables for injury risk functions. Injuries were assessed using the Abbreviated Injury Scale (AIS); injury severity was assessed using the Rhee and Donat scales. Risk functions were developed for the input variables using censored survival analyses.RESULTS: The effects of impact angle and bone geometry on injury characteristics were determined with loading area, axial force, energy attenuation, and stress at fracture. Probabilities of facial fracture were quantified through survival analysis and injury risk functions. These risk functions determined a 50% risk of facial bone fracture at 1148 N (axial force) at a 20° maxillary impact, 588 N at a 40° maxillary impact, and 677 N at a 20° zygomatic impact. A cumulative distribution function indicates 769 N corresponds to 50% risk of fracture overall.DISCUSSION: Results found smaller impact areas on the maxilla are correlated with higher angles of impact increasing risk of facial fracture, neck injuries are unlikely to occur before fracture or neurotrauma, and a potential trade-off mechanism between fracture and brain injury.Davis MB, Pang DY, Herring IP, Bass CR. Facial fracture injury criteria from night vision goggle impact. Aerosp Med Hum Perform. 2023; 94(11):827-834.

Out-of-Hospital Arterial to End-Tidal Carbon Dioxide Gradient in Patients With Return of Spontaneous Circulation After Out-of-Hospital Cardiac Arrest: A Retrospective Study

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Ann Emerg Med. 2023 Nov;82(5):558-563 13

Study objective: End-tidal carbon dioxide (etCO2) is used to guide ventilation after achieving return of spontaneous circulation (ROSC) in certain out-of-hospital systems, despite an unknown difference between arterial and end-tidal CO2 (partial pressure of carbon dioxide [paCO2]-etCO2 difference) levels in this population. The primary aim of this study was to evaluate and quantify the paCO2-etCO2 difference in out-of-hospital patients with ROSC after nontraumatic cardiac arrest.

Methods: This retrospective single-center study included patients aged 18 years and older with sustained ROSC after nontraumatic out-of-hospital cardiac arrest. In patients with an existing out-of-hospital arterial blood gas analysis within 30 minutes after achieving ROSC, matching etCO2 values were evaluated. Linear regression and Bland-Altman plot analysis were performed to ascertain the primary endpoint of interest.

Results: We included data of 60 patients in the final analysis. The mean paCO2-etCO2 difference was 32 (±18) mmHg. Only a moderate correlation (R2=0.453) between paCO2 and etCO2 was found. Bland-Altman analysis showed a bias of 32 mmHg (95% confidence interval [CI], 27 to 36) [the upper limit of agreement of 67 mmHg (95% CI, 59 to 74) and the lower limit of agreement of -3 mmHg (95% CI, -11 to 5)].

Conclusion: The paCO2-etCO2 difference in patients with ROSC after out-of-hospital cardiac arrest is far from physiologic ranges, and the between-patient variability is high. Therefore, etCO2-guided adaption of ventilation might not provide adequate accuracy in this setting.

Seasonal Association With Hypothermia in Combat Trauma

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Mil Med. 2023 Nov 28: Online ahead of print

Introduction: Hypothermia increases mortality in trauma populations and frequently occurs in military casualties due to the nature of combat environments. The association between hypothermia and the time of year when injured remains unclear. We sought to determine the association between seasonal changes in temperature and hypothermia among combat casualties.

Materials and methods: This observational study was a secondary analysis of a previously described Department of Defense Trauma Registry dataset which included U.S. military and Coalition casualties who received prehospital care from January 2007 to March 2020 in Afghanistan and Iraq. We tested for associations between hypothermia (<36.2°C) and seasonal ambient temperatures by constructing multivariable logistic regression models. Summer was defined as June through August and winter as December through February. We assumed that the combat operations occurred in the area near the point of first contact with the deployed military treatment facilities. This study was determined to be exempt from Institutional Review Board oversight.

Results: There were 5,821 that met inclusion for this study. Within the multivariable logistic regression model, we adjusted for injury severity score, mechanism of injury, and imputed transport time, finding that combat casualties were 2.28 (odds ratio, 95% confidence interval 1.93-2.69) times more likely to develop hypothermia in the winter versus summer. When using temperature as a continuous outcome, casualties had a lower emergency department temperature during the winter (parameter estimate -0.133°C, $P < 0.001$) after adjusting for confounders. In casualties experiencing hypothermia, mortality was higher (4% versus 1%, $P < 0.001$), and composite median injury severity score values were higher (10 versus 5, $P < 0.001$). Among hypothermic casualties, serious injuries were significantly more common (all $P < 0.001$) to the head (15% versus 7%), thorax (15% versus 7%), abdomen (9% versus 6%), extremities (35% versus 22%), and skin (4% versus 2%).

Conclusions: We found a seasonal variation in the occurrence of hypothermia in a large cohort of trauma casualties. Despite adjustment for multiple known confounders, our findings substantiate probable ambient temperature variations to trauma-induced hypothermia. Furthermore, our findings, when taken in the context of other studies on the efficacy of current hypothermia prevention and treatment strategies, support the need for better methods to mitigate hypothermia in future cold-weather operations.

Evaluating a digital hybrid training-of-trainers (TOT) approach for lay first responder trauma education in urban Nigeria during the COVID-19 pandemic

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Injury. 2024 Feb;55(2):111174

Introduction: Road traffic injuries (RTIs) are the largest contributor to the global burden of injury, and in 2016 were among the five leading causes of global disability-adjusted life years (DALYs). In regions with limited emergency medical services (EMS), training lay first responders (LFRs) has been shown to increase availability of prehospital care for RTIs, but sustainable mechanisms to scale these programs remain unstudied.

Methods: Using a training of trainers (TOT) model, a 5.5-h LFR training program was launched in Lagos, Nigeria. The course was taught in a hybrid fashion with primary didactics using videoconferencing software and practical breakout sessions in-person concurrently. Thirty TOTs proceeded to train 350 transportation providers as LFRs over one month. A 23-question, pre- and post-assessment was administered digitally to assess knowledge acquisition. Participants responded to a five-point Likert survey assessing instruction quality and post-course confidence.

Results: TOTs scored a median of 56.5 % (IQR:43.5 %,71.7 %) and 91.3 % (IQR:88.0 %,95.7 %) on the pre- and post-assessments, respectively, with bleeding control scores increasing most (+69.4 %). LFR course trainees scored a median of 34.8 % (IQR: 26.0 %, 43.5 %) and 73.9 % (IQR: 65.2 %, 82.6 %) on the pre- and post-assessments respectively, with airway and breathing increasing the most (+48.6 %). All score increases were statistically significant with $p < 0.001$. All 30 TOT trainers instructed at least one training session after their initial session. LFR participants' rated confidence in first aid skills went from 3/5 (IQR 3, 4) pre-course to 5/5 (IQR:5,5) post-course, and in emergency transportation it went from 4/5 (IQR:3, 4) to 5/5 (IQR:5, 5), ($p < 0.001$). LFR course participants rated the quality of education content and TOT instructors to be 5/5 (IQR:5,5). 144 responders provided emergency care in the six-months following training for a total of 351 interventions. Active responders provided a median of 2 (IQR:1,3) interventions.

Conclusions: This is the first time that a digital hybrid instruction for first responder trainers in low- and middle-income countries has been investigated. Our findings demonstrate negligible attrition, high educational quality ratings, equally effective knowledge acquisition to that of prior in-person courses, and high post-training skill usage. Future work will examine the cost-effectiveness of the training of LFRs and the effect of LFRs on trauma outcomes.

Evaluation of Nonintubated Analgesia Practices in Critical Care Transport

Alyson M Esteves, Hannah E Gilchrist, Jacob M Markwood, Molly Bondurant, Matthew A Roginski

Air Med J. 2023 Jul-Aug;42(4):259-262

Objective: Current analgesia recommendations in the prehospital setting are not specific to critical care transport. Variation exists in the recommended agent and dosing strategies. Furthermore, there is a paucity of literature evaluating benzodiazepine and opiate coadministration, which may place patients at risk for respiratory decompensation.

Methods: This was a retrospective chart review of nonintubated adult critical care transport patients between July 1, 2020, and July 1, 2022, who received fentanyl or ketamine during transport. The primary outcome was the proportion of patients oversedated. The secondary outcomes were characterization of analgesic medication use during transport, the percentage of patients coadministered benzodiazepines, naloxone administration, and escalation of respiratory intervention.

Results: Three hundred seventy-six patients were administered fentanyl or ketamine during transport. Eleven patients were oversedated. Three hundred twenty-four patients received fentanyl monotherapy, and 52 received combination therapy. Patients who received benzodiazepines had higher odds of oversedation (odds ratio = 5.75; 95% confidence interval, 1.6-20.7). Two hundred thirty-six patients required an escalation in respiratory support, most commonly an increase from room air to nasal cannula. No patients had naloxone administered.

Conclusion: The rate of oversedation of nonintubated adult critical care transport patients receiving fentanyl or ketamine is low. Coadministration of benzodiazepines increases the risk of oversedation.

The Capnography Project

Faye M Evans, Rémy Turc, Maria A Echeto-Cerrato, Zipporah N Gathuya, Angela Enright

Anesth Analg. 2023 Nov 1;137(5):922-928

Abstract

Capnography is an essential tool used in the monitoring of patients during anesthesia and in critical care which, while required in most high-income countries, is unavailable in many low- and middle-income countries. Launched in 2020, the Smile Train-Lifebox Capnography Project aimed to find a "capnography solution" for resource-poor settings. The project was specifically interested in a capnography device that would meet the needs of the Smile Train partner hospitals to help monitor children requiring airway or cleft surgery. Project advisory and technical groups were formed and included representation from anesthesia practitioners from a balanced representation from all level of income countries, technical experts in capnography, and representatives from the Global Capnography Project (GCAP), the University of California at San Francisco Center for Health Equity in Surgery & Anesthesia (CHESA), and the World Federation of Societies of Anaesthesiologists (WFSA). Built upon the WFSA minimum capnometer specifications, a human centered design approach was used to develop a Target Product Profile. Seven manufacturers submitted 13 devices for consideration and 3 devices were selected for the testing phase. Each of these devices was evaluated for build quality, and clinical and usability performance. Based on the findings from the overall testing process, a combined capnography and pulse oximetry device by Zug Medical Systems was chosen. To accompany the new Smile Train-Lifebox capnograph, an international team of experienced anesthesiologists and educators came together to develop the necessary education materials. These materials were piloted in Ethiopia, subsequently modified, and endorsed by the education team. The device is now ready for distribution, with the accompanying education package, to the Smile Train network and beyond. In addition, a study is being planned to measure the impact of capnography introduction into operating rooms in resource-constrained settings.

Tranexamic Acid for Traumatic Injury in the Emergency Setting: A Systematic Review and Bias-Adjusted Meta-Analysis of Randomized Controlled Trials

Pieter Francsois Fouche, Christopher Stein, Martin Nichols, Benjamin Meadley, Jason C Bendall, Karen Smith, David Anderson, Suhail A Doi

Ann Emerg Med. 2023 Nov 22:S0196-0644(23)01281-7

Study objective: Traumatic injury causes a significant number of deaths due to bleeding. Tranexamic acid (TXA), an antifibrinolytic agent, can reduce bleeding in traumatic injuries and potentially enhance outcomes. Previous reviews suggested potential TXA benefits but did not consider the latest trials.

Methods: A systematic review and bias-adjusted meta-analysis were performed to assess TXA's effectiveness in emergency traumatic injury settings by pooling estimates from randomized controlled trials. Researchers searched Medline, Embase, and Cochrane Central for randomized controlled trials comparing TXA's effects to a placebo in emergency trauma cases. The primary endpoint was 1-month mortality. The methodological quality of the trials underwent assessment using the MASTER scale, and the meta-analysis applied the quality-effects method to adjust for methodological quality.

Results: Seven randomized controlled trials met the set criteria. This meta-analysis indicated an 11% decrease in the death risk at 1 month after TXA use (odds ratio [OR] 0.89, 95% confidence interval [CI] 0.84 to 0.95) with a number needed to treat of 61 to avoid 1 additional death. The meta-analysis also revealed reduced 24-hour mortality (OR 0.76, 95% CI 0.65 to 0.88) for TXA. No compelling evidence of increased vascular occlusive events emerged (OR 0.96, 95% CI 0.73 to 1.27). Subgroup analyses highlighted TXA's effectiveness in general trauma versus traumatic brain injury and survival advantages when administered out-of-hospital versus inhospital.

Conclusions: This synthesis demonstrates that TXA use for trauma in emergencies leads to a reduction in 1-month mortality, with no significant evidence of problematic vascular occlusive events. Administering TXA in the out-of-hospital setting is associated with reduced mortality compared to inhospital administration, and less mortality with TXA in systemic trauma is noted compared with traumatic brain injury specifically.

Intramuscular Administration of Tranexamic Acid in a Large Swine Model of Hemorrhage with Hyperfibrinolysis

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J Trauma Acute Care Surg. 2023 Nov 13: Online ahead of print

Background: Traumatic injury with subsequent hemorrhage is one of the leading causes of mortality among military personnel and civilians alike. Post traumatic hemorrhage accounts for 40-50% of deaths in severe trauma patients occurring secondary to direct vessel injury or the development of trauma induced coagulopathy (TIC). Hyperfibrinolysis plays a major role in TIC and its presence increases a patient's risk of mortality. Early therapeutic intervention with intravenous (IV) tranexamic acid (TXA) prevents development of hyperfibrinolysis and subsequent TIC leading to decreased mortality. However, obtaining IV access in an austere environment can be challenging. In this study, we evaluated the efficacy of intramuscular (IM) versus IV TXA at preventing hyperfibrinolysis in a hemorrhaged swine.

Methods: Yorkshire cross swine were randomized on the day of study to receive IM or IV TXA or no treatment. Swine were sedated, intubated, and determined to be hemodynamically stable prior to experimentation. Controlled hemorrhaged was induced by the removal of 30% total blood volume. After hemorrhage, swine were treated with 1000 mg of IM or IV TXA. Control animals received no treatment. Thirty minutes post TXA treatment, fibrinolysis was induced with a 50 mg bolus of tissue plasminogen activator (tPA). Blood samples were collected to evaluate blood TXA concentrations, blood gases, blood chemistry, and fibrinolysis.

Results: Blood TXA concentrations were significantly different between administration routes at the early timepoints, but were equivalent by 20 minutes after injection, remaining consistently elevated for up to three hours post administration. Induction of fibrinolysis resulted in 87.18 ± 4.63% lysis in control animals, compared to swine treated with IM TXA 1.96 ± 2.66 % and 1.5 ± 0.42% lysis in the IV TXA group.

Conclusion: In the large swine model of hemorrhage with hyperfibrinolysis, IM TXA is bioequivalent and equally efficacious in preventing hyperfibrinolysis as IV TXA administration.

Barriers and facilitators to burn first aid practice in the prehospital setting: A qualitative investigation amongst emergency medical service clinicians

Maleea D Holbert, Roy M Kimble, Kerrianne Watt, Bronwyn R Griffin

Burns. 2023 Dec 5: Online ahead of print

Abstract

First aid cooling for burn injuries improves re-epithelialisation rates and reduces scarring. The objective of this research was to explore and describe barriers and facilitators to the provision of optimal first aid for acute burn patients in the prehospital setting. Emergency medical service (EMS) clinicians in Queensland were invited via email to participate in a survey designed to assess experience, knowledge, and attitudes regarding provision of optimal burn first aid in the prehospital setting (N = 4500). Barriers and facilitators to administering optimal first aid in the prehospital environment were assessed via two open-ended questions with free-text response boxes. An inductive approach to qualitative content analysis was used to analyze free-text data. In total, we included 326 respondents (7.2% response rate). Responses (n = 231) regarding barriers to first aid were classified into 12 categories, within five overarching dimensions. The most common of these was identified as pain. Similarly, free text responses (n = 276) regarding facilitators of burn first aid formed eight dimensions with 21 subcategories - most commonly fast and effective pain relief. Factors influencing burn first aid provision in the prehospital setting were wide-ranging and varied, with pain identified as the most prominent.

Rethinking limb tourniquet conversion in the prehospital environment

John B Holcomb, Warren C Dorlac, Brendon G Drew, Frank K Butler, Jennifer M Gurney, Harold R Montgomery, Stacy A Shackelford, Eric A Bank, Jeff D Kerby, John F Kragh, Michael A Person, Jessica L Patterson, Olha Levchuk, Mykola Andriievskyi, Glib Bitiukov, Oleksandr Danyljuk, Oleksandr Linchevskyy

J Trauma Acute Care Surg. 2023 Dec 1;95(6):e54-e60

Abstract

We have highlighted the issue of overuse of tourniquets and described why tourniquet conversion and replacement should be taught and done in the prehospital setting.

The Bloody Transfusion Problem

John B Holcomb, William K Hoots, Travis M Polk

JAMA. 2023 Nov 21;330(19):1839-1840

No abstract available

The management of severe traumatic brain injury in the initial postinjury hours - current evidence and controversies

Iftakher Hossain, Elham Rostami, Niklas Marklund

Curr Opin Crit Care. 2023 Dec 1;29(6):650-658

Purpose of review: To provide an overview of recent studies discussing novel strategies, controversies, and challenges in the management of severe traumatic brain injury (sTBI) in the initial postinjury hours.

Recent findings: Prehospital management of sTBI should adhere to Advanced Trauma Life Support (ATLS) principles. Maintaining oxygen saturation and blood pressure within target ranges on-scene by anesthetist, emergency physician or trained paramedics has resulted in improved outcomes. Emergency department (ED) management prioritizes airway control, stable blood pressure, spinal immobilization, and correction of impaired coagulation. Noninvasive techniques such as optic nerve sheath diameter measurement, pupillometry, and transcranial Doppler may aid in detecting intracranial hypertension. Osmotherapy and hyperventilation are effective as temporary measures to reduce intracranial pressure (ICP). Emergent computed tomography (CT) findings guide surgical interventions such as decompressive craniectomy, or evacuation of mass lesions. There are no neuroprotective drugs with proven clinical benefit, and steroids and hypothermia cannot be recommended due to adverse effects in randomized controlled trials.

Summary: Advancement of the prehospital and ED care that include stabilization of physiological parameters, rapid correction of impaired coagulation, noninvasive techniques to identify raised ICP, emergent surgical evacuation of mass lesions and/or decompressive craniectomy, and temporary measures to counteract increased ICP play pivotal roles in the initial management of sTBI. Individualized approaches considering the underlying pathology are crucial for accurate outcome prediction.

Identifying Trauma Patients in Need for Emergency Surgery in the Prehospital Setting: The Prehospital Prediction of In-Hospital Emergency Treatment (PROPHET) Study

Stefano Isgrò, Marco Giani, Laura Antolini, Riccardo Giudici, Maria Grazia Valsecchi, Giacomo Bellani, Osvaldo Chiara, Gabriele Bassi, Nicola Latronico, Luca Cabrini, Roberto Fumagalli, Arturo Chieregato, Fabrizio Sammartano, Giuseppe Sechi, Alberto Zoli, Andrea Pagliosa, Alessandra Palo, Oliviero Valoti, Michele Carlucci, Annalisa Benini, Giuseppe Foti

J Clin Med. 2023 Oct 20;12(20):6660. doi: 10.3390/jcm12206660

Abstract

Prehospital field triage often fails to accurately identify the need for emergent surgical or non-surgical procedures, resulting in inefficient resource utilization and increased costs. This study aimed to analyze prehospital factors associated with the need for emergent procedures (such as surgery or interventional angiography) within 6 h of hospital admission. Additionally, our goal was to develop a prehospital triage tool capable of estimating the likelihood of requiring an emergent procedure following hospital admission. We conducted a retrospective observational study, analyzing both prehospital and in-hospital data obtained from the Lombardy Trauma Registry. We conducted a multivariable logistic regression analysis to identify independent predictors of emergency procedures within the first 6 h from admission. Subsequently, we developed and internally validated a triage score composed of factors associated with the probability of requiring an emergency procedure. The study included a total of 3985 patients, among whom 295 (7.4%) required an emergent procedure within 6 h. Age, penetrating injury, downfall, cardiac arrest, poor neurological status, endotracheal intubation, systolic pressure, diastolic pressure, shock index, respiratory rate and tachycardia were identified as predictors of requiring an emergency procedure. A triage score generated from these predictors showed a good predictive power (AUC of the ROC curve: 0.81) to identify patients requiring an emergent surgical or non-surgical procedure within 6 h from hospital admission. The proposed triage score might contribute to predicting the need for immediate resource availability in trauma patients.

Do Experienced Nurses Benefit From Training on Bleeding Control in the Community Setting?

Allison R Jones, Melanie Hallman, Penni Watts, Karen Heaton

J Emerg Nurs. 2023 Nov 24: Online ahead of print

Introduction: Nurses' preparedness to provide hemorrhage control aid outside of the patient care setting has not been thoroughly evaluated. We evaluated nurses' preparedness to provide hemorrhage control in the prehospital setting after a proof-of-concept training event.

Methods: We performed a secondary analysis of evaluations from a voluntary hemorrhage control training offered to a group of experienced nurses. Education was provided by a nurse certified in Stop the Bleed training and using the Basic Bleeding Control 2.0 materials. The training lasted approximately 1 hour and included a didactic portion followed by hands-on practice with task trainer legs. Participants were surveyed after training to assess their preparedness to provide hemorrhage control aid using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree); comments and feedback were also requested. Mean (SD) was used to analyze Likert scale data. Content analysis was performed to identify common themes in qualitative data.

Results: Forty-five experienced nurses participated in the voluntary training. Nursing experience included obstetrics, pediatrics, critical care, acute care, community health, and psychiatric/mental health. Only 39% of participants reported having previously completed a similar course. After training completion, participants reported an increase in their preparedness to provide hemorrhage control aid (mean 3.47 [SD = 1.40] vs mean 4.8 SD [.04], $P < .01$). Major themes identified included wanting to feel prepared to help others, refreshing skills, and knowing how to respond in an emergency.

Discussion: Regardless of background and experience, nurses may benefit from more advanced hemorrhage control education to prepare them to provide aid in prehospital emergency settings.

Finding the bleeding edge: 24-hour mortality by unit of blood product transfused in combat casualties from 2002-2020

Jennifer M Gurney, Amanda M Staudt, John B Holcomb, Matthew Martin, Phil Spinella, Jason B Corley, Andrew J Rohrer, Jennifer D Trevino, Deborah J Del Junco, Andrew Cap, Martin Schreiber

J Trauma Acute Care Surg. 2023 Nov 1;95(5):635-641.

Background: Transfusion studies in civilian trauma patients have tried to identify a general futility threshold. We hypothesized that in combat settings there is no general threshold where blood product transfusion becomes unbeneficial to survival in hemorrhaging patients. We sought to assess the relationship between the number of units of blood products transfused and 24-hour mortality in combat casualties.

Methods: A retrospective analysis of the Department of Defense Trauma Registry supplemented with data from the Armed Forces Medical Examiner. Combat casualties who received at least one unit of blood product at US military medical treatment facilities (MTFs) in combat settings (2002-2020) were included. The main intervention was the total units of any blood product transfused, which was measured from the point of injury until 24 hours after admission from the first deployed MTF. The primary outcome was discharge status (alive, dead) at 24 hours from time of injury.

Results: Of 11,746 patients included, the median age was 24 years, and most patients were male (94.2%) with penetrating injury (84.7%). The median injury severity score was 17 and 783 (6.7%) patients died by 24 hours. Median units of blood products transfused was 8. Most blood products transfused were red blood cells (50.2%), followed by plasma (41.1%), platelets (5.5%), and whole blood (3.2%). Among the 10 patients who received the most units of blood product (164 units to 290 units), 7 survived to 24 hours. The maximum amount of total blood products transfused to a patient who survived was 276 units. Of the 58 patients who received over 100 units of blood product, 20.7% died by 24 hours.

Conclusion: While civilian trauma studies suggest the possibility of futility with ultra-massive transfusion, we report that the majority (79.3%) of combat casualties who received transfusions greater than 100 units survived to 24 hours. These results do not support a threshold for futility of blood product transfusion. Further analysis as to predictors for mortality will help in situations of blood product and resource constraints.

Considering human cognitive architecture in stressful medical prehospital interventions might benefit care providers

Andrew W Kirkpatrick, Jessica L McKee, Robert Barrett, Kyle Couperus, Juan Wachs

Can J Surg. 2023 Nov 1;66(6):E522-E534

Abstract

People suffering from critical injuries/illness face marked challenges before transportation to definitive care. Solutions to diagnose and intervene in the prehospital setting are required to improve outcomes. Despite advances in artificial intelligence and robotics, near-term practical interventions for catastrophic injuries/illness will require humans to perform unfamiliar, uncomfortable and risky interventions. Development of posttraumatic stress disorder is already disproportionately high among first responders and correlates with uncertainty and doubts concerning decisions, actions and inactions. Technologies such as remote telementoring (RTM) may enable such interventions and will hopefully decrease potential stress for first responders. How thought processes may be remotely assisted using RTM and other technologies should be studied urgently. We need to understand if the use of cognitively offloading technologies such as RTM will alleviate, or at least not exacerbate, the psychological stresses currently disabling first responders.

Does tranexamic acid increase venous thromboembolism risk among trauma patients? A prospective multicenter analysis across 17 level I trauma centers

Lisa Marie Knowlton, Katherine Arnow, Amber W Trickey, Angela Sauaia, M Margaret Knudson

Injury. 2023 Nov;54(11):111008

Importance: The early use of tranexamic acid (TXA) has demonstrated benefit among some trauma patients in hemorrhagic shock. The association between TXA administration and thromboembolic events (including deep vein thrombosis (DVT), pulmonary embolism (PE) and pulmonary thrombosis (PT)) remains unclear. We aimed to characterize the risk of venous thromboembolism (VTE) subtypes among trauma patients receiving TXA and to determine whether TXA is associated with VTE risk and mortality.

Methods: We analyzed a prospective, observational, multicenter cohort data from the Consortium of Leaders in the Study of Traumatic Thromboembolism (CLOTT) study group. The study was conducted across 17 US level I trauma centers between January 1, 2018, and December 31,2020. We studied trauma patients ages 18-40 years, admitted for at least 48 h with a minimum of 1 VTE risk factor and followed until hospital discharge or 30 days. We compared TXA recipients to non-recipients for VTE and mortality using inverse probability weighted Cox models. The primary outcome was the presence of documented venous thromboembolism (VTE). The secondary outcome was mortality. VTE was defined as DVT, PE, or PT.

Results: Among the 7,331 trauma patients analyzed, 466 (6.4%) received TXA. Patients in the TXA group were more severely injured than patients in the non-TXA group (ISS 16+: 69.1% vs. 48.5%, $p < 0.001$) and a higher percentage underwent a major surgical procedure (85.8% vs. 73.6%, $p < 0.001$). Among TXA recipients, 12.5% developed VTE (1.3% PT, 2.4% PE, 8.8% DVT) with 5.6% mortality. In the non-TXA group, 4.6% developed VTE (1.1% PT, 0.5% PE, 3.0% DVT) with 1.7% mortality. In analyses adjusting for patient demographic and clinical characteristics, TXA administration was not significantly associated with VTE (aHR 1.00, 95%CI: 0.69-1.46, $p = 0.99$) but was significantly associated with increased mortality (aHR 2.01, 95%CI: 1.46-2.77, $p < 0.001$).

Conclusion: TXA was not clearly identified as an independent risk factor for VTE in adjusted analyses, but the risk of VTE among trauma patients receiving TXA remains high (12.5%). This supports the judicious use of TXA in resuscitation, with consideration of early initiation of DVT prophylaxis in this high-risk group.

Determination of the Cricothyroid Membrane Height by Age and Sex and Optimal Tracheal Tube Size

Kamil Kokulu, Ender Alkan, Ekrem T Sert, Hüseyin Mutlu, Cagri Turkucu, Emin H Akar

Laryngoscope. 2023 Oct 10: Online ahead of print

Objectives: The primary aim of this study was to determine the average cricothyroid membrane (CTM) height in healthy volunteers, and the secondary aim was to determine the hypothetical success rate for emergency cricothyrotomy with a tracheal tube with an 8.0 mm outer diameter.

Methods: This study included healthy volunteers aged 18 years and older. The participants' clinical characteristics were recorded, and their CTM height was measured using ultrasound, with their necks placed sequentially in the neutral and extension positions. The relationship between the CTM height and sex, age, height, weight, body mass index, and sternomental distance was evaluated using linear regression analysis. An equation that could estimate the height of the CTM was obtained with the parameters found significant in this analysis.

Results: Of the 340 participants, 208 (61.2%) were male. The mean (SD) height of the CTM in the extension position was 9.60 (1.54) mm, and it was significantly shorter in the women than in the men (8.72 [1.19] mm vs. 10.16 [1.48] mm, $p < 0.001$). Among the participants of short stature, the CTM was significantly shorter, regardless of sex. The hypothetical success rate for emergency cricothyrotomy was 93.3% for the males and 73.5% for the females. The equation for estimating the height of the CTM in the extension position was determined as $-4.36 + 5.27 \times \text{height (m)} + 0.32 \times \text{sternomental distance (cm)}$.

Conclusions: Since the CTM height may differ according to age, sex, and height, cricothyrotomy sets should be available in various outer diameters.

Retention of military combat lifesaving skills during six months following classroom-style and individualized-style initial training

Annemarie Landman, Daný de Vries, Olaf Binsch

Mil Psychol. 2023 Nov-Dec;35(6):590-602

Abstract

The current study was performed to obtain insight into the retention of combat lifesaving (CLS) skills after initial training and to compare a more individualized-style training with a more classroom-style training. We measured performance at 0 month, 2 months, and 6 months after initial training in 40 CLSers (17 individualized, 23 classroom). Each test consisted of two 20-minute scenarios with a medical mannequin to simulate combat injuries. An instructor scored the actions, which were divided into critical and non-critical by medical experts. We also measured the speed of performing the protocol and perceived mental effort and anxiety. There were no differences between the groups in critical actions. The full sample made on average almost six critical errors per scenario at 6 months. However, on non-critical actions, the individualized group scored better at 0 month. The individualized group also performed the protocol faster at each test. The classroom group reported an increase in mental effort and anxiety at subsequent tests, while the individualized group did not. Based on the high number of critical errors at 6 months, and on the drop-off in performance at 2 months, we advise that extra refresher training is organized within 2 months after initial training to improve retention further down the line.

The Perfect Med Bag is One that Doesn't Fall Off a Cliff: A Combat Mass Casualty Case

David Lenn, Daniel T Le, Christopher J Scheiber, Alan M Smeltz

Mil Med. 2023 Nov 10: Online ahead of print

Abstract

Military trauma provides a unique pattern of injuries due to the high velocity, high kinetic energy ammunition utilized, and the high prevalence of blast injury. To further complicate this, military trauma often occurs in austere environments with limited logistical support. Therefore, military medical providers are forced to learn nonstandard techniques and when necessary, practice a level of improvisation not commonly seen in other medical fields. The case presented in this manuscript is a prime example of these challenges. At the onset of fighting both the medic's rucksack, carrying with it the primary source of medical gear and the precious supply of cold-stored blood products are lost. The scenario was further complicated by rough mountainous terrain and a prolonged evacuation time. The medical provider was forced to utilize nonstandard devices such as an improvised junctional tourniquet which used a rock to focus the devices pressure. They also adapted their basic understanding of surgical procedures to conduct a vascular cutdown procedure for wound exposure and effectively pack an otherwise non-compressible wound to a major artery. Despite a significant loss of equipment, the medic and their team were able to successfully care for a number of patients in this mass casualty scenario.

Artificial intelligence evaluation of focused assessment with sonography in trauma

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J Trauma Acute Care Surg. 2023 Nov 1;95(5):706-712

Background: The focused assessment with sonography in trauma (FAST) is a widely used imaging modality to identify the location of life-threatening hemorrhage in a hemodynamically unstable trauma patient. This study evaluates the role of artificial intelligence in interpretation of the FAST examination abdominal views, as it pertains to adequacy of the view and accuracy of fluid survey positivity.

Methods: Focused assessment with sonography for trauma examination images from 2015 to 2022, from trauma activations, were acquired from a quaternary care level 1 trauma center with more than 3,500 adult trauma evaluations, annually. Images pertaining to the right upper quadrant and left upper quadrant views were obtained and read by a surgeon or radiologist. Positivity was defined as fluid present in the hepatorenal or splenorenal fossa, while adequacy was defined by the presence of both the liver and kidney or the spleen and kidney for the right upper quadrant or left upper quadrant views, respectively. Four convolutional neural network architecture models (DenseNet121, InceptionV3, ResNet50, Vgg11bn) were evaluated.

Results: A total of 6,608 images, representing 109 cases were included for analysis within the "adequate" and "positive" data sets. The models relayed 88.7% accuracy, 83.3% sensitivity, and 93.6% specificity for the adequate test cohort, while the positive cohort conferred 98.0% accuracy, 89.6% sensitivity, and 100.0% specificity against similar models. Augmentation improved the accuracy and sensitivity of the positive models to 95.1% accurate and 94.0% sensitive. DenseNet121 demonstrated the best accuracy across tasks.

Conclusion: Artificial intelligence can detect positivity and adequacy of FAST examinations with 94% and 97% accuracy, aiding in the standardization of care delivery with minimal expert clinician input. Artificial intelligence is a feasible modality to improve patient care imaging interpretation accuracy and should be pursued as a point-of-care clinical decision-making tool.

Development of a novel scoring tool to predict the need for early cricothyroidotomy in trauma patients

Mary Londoño, Jeffry Nahmias, Matthew Dolich, Michael Lekawa, Allen Kong, Sebastian Schubl, Kenji Inaba, Areg Grigorian

Surg Open Sci. 2023 Sep 20:16:58-63

Background: The lack of a widely-used tool for predicting early cricothyroidotomy in trauma patients prompted us to develop the Cricothyroidotomy After Trauma (CAT) score. We aimed to predict the need for cricothyroidotomy within one hour of trauma patient arrival.

Methods: Derivation and validation datasets were obtained from the Trauma Quality Improvement Program (TQIP) database. Logistic modeling identified predictors, and weighted averages were used to create the CAT score. The score's performance was assessed using AUROC.

Results: Among 1,373,823 derivation patients, <1 % (n = 339) underwent cricothyroidotomy within one hour. The CAT score, comprising nine predictors, achieved an AUROC of 0.88. Severe neck injury and gunshot wound were the strongest predictors. Cricothyroidotomy rates increased from 0.4 % to 9.3 % at scores of 5 and 8, respectively. In the validation set, the CAT tool yielded an AUROC of 0.9.

Conclusion: The CAT score is a validated tool for predicting the need for early cricothyroidotomy in trauma patients. Further research is necessary to enhance its utility and assess its value in trauma care.

What Is the Utility of Antibiotic Prophylaxis in Adult Trauma Patients With Hemothorax or Pneumothorax Who Undergo Tube Thoracostomy?

Austin G MacDonald, Brit Long

Ann Emerg Med. 2023 Nov;82(5):624-626

No abstract available

Management of Combat Casualties during Aeromedical Evacuation from a Role 2 to a Role 3 Medical Facility

Joseph K Maddry, Allyson A Araña, Alejandra G Mora, Steven G Schauer, Lauren K Reeves, Julie E Cutright, Joni A Paciocco, Crystal A Perez, William T Davis, Patrick C Ng

Mil Med. 2023 Nov 7: Online ahead of print

Introduction: Emergent clinical care and patient movements through the military evacuation system improves survival. Patient management differs when transporting from the point-of-injury (POI) to the first medical treatment facility (MTF) versus transporting from the Role 2 to the Role 3 MTF secondary to care rendered within the MTF, including surgery and advanced resuscitation. The objective of this study was to describe care provided to patients during theater inter-facility transports and compare with pre-hospital transports (POI to first MTF).

Materials and methods: We performed a retrospective chart review of patients with the Role 2 to the Role 3 transports in Afghanistan and Iraq from 2007 to 2016. Data collected included procedures and events at the MTF and during transport. We compared the intra-theater transport data (Role 2 to Role 3) to data from a previous study evaluating pre-hospiital transports (POI to first MTF).

Results: We reviewed the records of 869 Role 2 to Role 3 transport patients. Role 2 to Role 3 transports were longer in duration compared to POI transports (39 minutes vs. 23 minutes) and were more likely to be staffed by advanced personnel (nurses, physician assistants, and physicians) (57% vs. 3%). The sample primarily consisted of military-aged males (mean age 27 years) who suffered from explosive or blunt force injuries. Procedures performed during each phase of care reflected the capabilities of the teams and locations. Pain and cardiac events were more common in POI evacuations compared to the Role 2 to Role 3 transports, but documentation of respiratory events, hemodynamic events, neurologic events, and equipment failure was more common during the Role 2 to Role 3 transports. Survival rates were slightly higher among the Role 2 to Role 3 cohort (98% vs. 95%, difference 3% [95% confidence interval of the difference 1-5%]).

Conclusions: Inter-facility transports (Role 2 to Role 3) are longer in duration, transport more complex patients, and are staffed by more advanced level provider types compared to transports from POI.

Validation of a Smartphone Pupillometry Application in Diagnosing Severe Traumatic Brain Injury

Anthony J Maxin, Bernice G Gulek, Chungeun Lee, Do Lim, Alex Mariakakis, Michael R Levitt, Lynn B McGrath

J Neurotrauma. 2023 Oct;40(19-20):2118-2125

Abstract

The pupillary light reflex (PLR) is an important biomarker for the detection and management of traumatic brain injury (TBI). We investigated the performance of PupilScreen, a smartphone-based pupillometry app, in classifying healthy control subjects and subjects with severe TBI in comparison to the current gold standard NeurOptics pupillometer (NPi-200 model with proprietary Neurological Pupil Index [NPi] TBI severity score). A total of 230 PLR video recordings taken using both the PupilScreen smartphone pupillometer and NeurOptics handheld device (NPi-200) pupillometer were collected from 33 subjects with severe TBI (sTBI) and 132 subjects who were healthy without self-reported neurological disease. Severe TBI status was determined by Glasgow Coma Scale (GCS) at the time of recording. The proprietary NPi score was collected from the NPi-200 pupillometer for each subject. Seven PLR curve morphological parameters were collected from the PupilScreen app for each subject. A comparison via t-test and via binary classification algorithm performance using NPi scores from the NPi-200 and PLR parameter data from the PupilScreen app was completed. This was used to determine how the frequently used NPi-200 proprietary NPi TBI severity score compares to the PupilScreen app in ability to distinguish between healthy and sTBI subjects. Binary classification models for this task were trained for the diagnosis of healthy or severe TBI using logistic regression, k-nearest neighbors, support vector machine, and random forest machine learning classification models. Overall classification accuracy, sensitivity, specificity, area under the curve, and F1 score values were calculated. Median GCS was 15 for the healthy cohort and 6 (interquartile range 2) for the severe TBI cohort. Smartphone app PLR parameters as well as NPi from the digital infrared pupillometer were significantly different between healthy and severe TBI cohorts; 33% of the study cohort had dark eye colors defined as brown eyes of varying shades. Across all classification models, the top performing PLR parameter combination for classifying subjects as healthy or sTBI for PupilScreen was maximum diameter, constriction velocity, maximum constriction velocity, and dilation velocity with accuracy, sensitivity, specificity, area under the curve (AUC), and F1 score of 87%, 85.9%, 88%, 0.869, and 0.85, respectively, in a random forest model. The proprietary NPi TBI severity score demonstrated greatest AUC value, F1 score, and sensitivity of 0.648, 0.567, and 50.9% respectively using a random forest classifier and greatest overall accuracy and specificity of 67.4% and 92.4% using a logistic regression model in the same classification task on the same dataset. The PupilScreen smartphone pupillometry app demonstrated binary healthy versus severe TBI classification ability greater than that of the NPi-200 proprietary NPi TBI severity score. These results may indicate the potential benefit of future study of this PupilScreen smartphone pupillometry application in comparison to the NPi-200 digital infrared pupillometer across the broader TBI spectrum, as well as in other neurological diseases.

Getting Capnography to the Front Lines

Robert J McDougall, Wayne W Morriss, Priya K Desai, Natsagdorj Batgombo

Anesth Analg. 2023 Nov 1;137(5):929-933

No abstract available

The relationship between acute pain and other types of suffering in pre-hospital trauma victims: An observational study

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Int Emerg Nurs. 2023 Nov:71:101375

Background: Acute pain is an important complaint reported by trauma victims, however, the relationship between it and other types of discomfort, such as discomfort caused by cold, discomfort caused by immobilization, and psychological distress such as fear, anxiety, and sadness is limitedly studied and documented.

Aim: To assess the relationship between acute trauma pain and other types of suffering in pre-hospital trauma victims.

Methods: This is a prospective multicentre cohort study conducted in Immediate Life Support Ambulances in Portugal. All adult trauma victims with a mechanism of blunt and penetrating injuries, falls, road accidents and explosions, were included.

Results: 605 trauma victims were included, mainly male, with a mean age of 53.4 years. Before the intervention of the rescue teams, 90.5 % of the victims reported some level of pain, 39.0 % reported discomfort caused by cold, while 15.7 % felt fear, 8.4 % sadness, 49.8 % anxiety and 4.5 % apathy. Victims with high discomfort caused by cold tend to have higher pain levels. Significantly higher pain intensity were observed in victims with fear and anxiety. Univariate and multivariate analysis indicates that immobilization is associated with increased pain levels.

Conclusions: There is a statistically significant relationship between acute trauma pain, anxiety, fear, cold and immobilization.

TCCC Decision Support With Machine Learning Prediction of Hemorrhage Risk, Shock Probability

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Mil Med. 2023 Nov 8;188(Suppl 6):659-665

Introduction: Expected future delays in evacuation during near-peer conflicts in remote locales are expected to require extended care including prolonged field care over hours to days. Such delays can increase potential complications, such as insufficient blood flow (shock), bloodstream infection (sepsis), internal bleeding (hemorrhage), and require more complex treatment beyond stabilization. The Trauma Triage Treatment and Training Decision Support (4TDS) system is a real-time decision support system to monitor casualty health and identify such complications. The 4TDS software prototype operates on an Android smart phone or tablet configured for use in the DoD Nett Warrior program. It includes machine learning models to evaluate trends in six vital signs streamed from a sensor placed on a casualty to identify shock probability, internal hemorrhage risk, and need for a massive transfusion.

Materials and methods: The project team used a mixed methods approach to create and evaluate the system including literature review, rapid prototyping, design requirements review, agile development, an algorithm "silent test," and usability assessments with novice to expert medics from all three services.

Results: Both models, shock (showing an accuracy of 0.83) and hemorrhage/massive transfusion protocol, were successfully validated using externally collected data. All usability assessment participants completed refresher training scenarios and were able to accurately assess a simulated casualty's condition using the phone prototype. Mean responses to statements on evaluation criteria [e.g., fit with Tactical Combat Casualty Care (TCCC), ease of use, and decision confidence] fell at five or above on a 7-point scale, indicating strong support.

Conclusions: Participatory design ensured 4TDS and machine learning models reflect medic and clinician mental models and work processes and built support among potential users should the system transition to operational use. Validation results can support 4TDS readiness for FDA 510k clearance as a Class II medical device.

Prehospital transfusion in paediatric trauma can improve patient outcomes: further research and collaboration is needed to increase availability and appropriate application

Kelly Nwankiti

Evid Based Nurs. 2023 Nov 8: Online ahead of print

No abstract available

Global Capnography to Improve Safety for All Patients: Time for Urgent Action

Ellen P O'Sullivan, Mary T Nabukenya, Mark Newton

Anesth Analg. 2023 Nov 1;137(5):917-920

No abstract available

Evaluation of hemostatic devices in a randomized porcine model of junctional hemorrhage and 72-hour prolonged field care

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J Trauma Acute Care Surg. 2024 Feb 1;96(2):256-264

Background: Hemorrhage control in prolonged field care (PFC) presents unique challenges that drive the need for enhanced point of injury treatment capabilities to maintain patient stability beyond the Golden Hour. To address this, two hemostatic agents, Combat Gauze (CG) and XSTAT, were evaluated in a porcine model of uncontrolled junctional hemorrhage for speed of deployment and hemostatic efficacy over 72 hours.

Methods: The left subclavian artery and subscapular vein were isolated in anesthetized male Yorkshire swine (70-85 kg) and injured via 50% transection, followed by 30 seconds of hemorrhage. Combat Gauze (n = 6) or XSTAT (n = 6) was administered until bleeding stopped and remained within subjects for observation over 72 hours. Physiologic monitoring, hemostatic efficacy, and hematological parameters were measured throughout the protocol. Gross necropsy and histology were performed following humane euthanasia.

Results: Both CG and XSTAT maintained hemostasis throughout the full duration of the protocol. There were no significant differences between groups in hemorrhage volume (CG: 1021.0 ± 183.7 mL vs. XSTAT: 968.2 ± 243.3 mL), total blood loss (CG: 20.8 ± 2.7% vs. XSTAT: 20.1 ± 5.1%), or devices used (CG: 3.8 ± 1.2 vs. XSTAT: 5.3 ± 1.4). XSTAT absorbed significantly more blood than CG (CG: 199.5 ± 50.3 mL vs. XSTAT: 327.6 ± 71.4 mL) and was significantly faster to administer (CG: 3.4 ± 1.6 minutes vs. XSTAT: 1.4 ± 0.5 minutes). There were no significant changes in activated clot time, prothrombin time, or international normalized ratio between groups or compared with baseline throughout the 72-hour protocol. Histopathology revealed no evidence of microthromboemboli or disseminated coagulopathies across evaluated tissues in either group.

Conclusion: Combat Gauze and XSTAT demonstrated equivalent hemostatic ability through 72 hours, with no overt evidence of coagulopathies from prolonged indwelling. In addition, XSTAT offered significantly faster administration and the ability to absorb more blood. Taken together, XSTAT offers logistical and efficiency advantages over CG for immediate control of junctional noncompressible hemorrhage, particularly in a tactical environment. In addition, extension of indicated timelines to 72 hours allows translation to PFC.

Can we use normal saline stored under stress conditions? A simulated prehospital emergency medical setting

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Heliyon. 2023 Sep 25;9(10):e20377

Background: Data on stability and suitability to use normal saline stored under stress conditions in ambulances is lacking.

Objective: We aimed to study the impact of exposure to extreme temperature variations on normal saline stability and compatibility with its packaging.

Methods: Normal saline in 96 polyolefin bags were exposed to continuous temperature of 22, 50, and 70 °C or to a cyclic temperature of 70 °C per 8 h and 22 °C per 16 h. The bags were sampled at 12, 24, 48 and 72 h and at 1, 2, 3, and 4 weeks in the short- and long-term experiments, respectively. Solution inside the bags was evaluated for any evidence of crystallization, discoloration, turbidity, or pH changes. A sample of normal saline was withdrawn from each bag to analyze sodium and chloride levels.

Results: Precipitation, discoloration, or turbidity were not observed in the solution inside normal saline bags. The average pH was 5.59 at 22 °C, 5.73 at 50 °C, 5.86 at 70 °C and 5.79 at cyclic exposure. In the short- and long-term experiments, sodium and chloride concentrations were within 100.2-111.27% and 99.04-110.95%, respectively. Leaching of the plastic components in the polyolefin bag into the normal saline solution was not detected.

Conclusions: Sodium and chloride levels of normal saline were stable and compatible with polyolefin bags stored in simulated continuous and cyclic extreme temperatures for around one month. The effect of storage in the cabinet of operational ambulance vehicles during different seasons in arid countries is yet to be evaluated in real-world conditions, to further confirm our results.

Ketamine in Trauma: A Literature Review and Administration Guidelines

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Cureus. 2023 Nov 1;15(11):e48099

Abstract

Ketamine is a phencyclidine (PCP) derivative, which primarily acts as a noncompetitive N-methyl-D-aspartate (NMDA) receptor antagonist. Ketamine serves as an analgesic and a dissociative sedative that produces potent analgesia, sedation, and amnesia while preserving spontaneous respiratory drive. It is rapidly gaining acceptance in the management of pain as multiple studies have demonstrated its reliable efficacy and a wide margin of safety. This article reviews some of these studies, the history of ketamine, and its pharmacological and pharmacokinetic properties. The article also discusses the use of ketamine in the trauma setting, including joint reductions, procedures, sedation, and pain control, as well as dosing recommendations.

Intraosseous administration of freeze-dried plasma in the prehospital setting

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Isr Med Assoc J. 2022 Sep;24(9):591-595.

Background: Freeze dried plasma (FDP) is a commonly used replacement fluid in the prehospital setting when blood products are unavailable. It is normally administered via a peripheral intravenous (PIV) line. However, in severe casualties, when establishing a PIV is difficult, administration via intraosseous vascular access is a practical alternative, particularly under field conditions.

Objectives: To evaluate the indications and success rate of intraosseous administration of FDP in casualties treated by the Israel Defense Forces (IDF).

Methods: A retrospective analysis of data from the IDF-Trauma Registry was conducted. It included all casualties treated with FDP via intraosseous from 2013 to 2019 with additional data on the technical aspects of deployment collected from the caregivers of each case.

Results: Of 7223 casualties treated during the study period, intravascular access was attempted in 1744; intraosseous in 87 of those. FDP via intraosseous was attempted in 15 (0.86% of all casualties requiring intravascular access). The complication rate was 73% (11/15 of casualties). Complications were more frequent when the event included multiple casualties or when the injury included multiple organs. Of the 11 failed attempts, 5 were reported as due to slow flow of the FDP through the intraosseous apparatus. Complications in the remaining six were associated with deployment of the intraosseous device.

Ensuring the affordable becomes accessible-lessons from ketamine, a new treatment for severe depression

Anthony Rodgers, Dilara Bahceci, Christopher G Davey, Mary Lou Chatterton, Nick Glozier, Malcolm Hopwood, Colleen Loo

Aust N Z J Psychiatry. 2024 Feb;58(2):109-116

Abstract

In this paper, the case study of ketamine as a new treatment for severe depression is used to outline the challenges of repurposing established medicines and we suggest potential solutions. The antidepressant effects of generic racemic ketamine were identified over 20 years ago, but there were insufficient incentives for commercial entities to pursue its registration, or support for non-commercial entities to fill this gap. As a result, the evaluation of generic ketamine was delayed, piecemeal, uncoordinated, and insufficient to gain approval. Meanwhile, substantial commercial investment enabled the widespread registration of a patented, intranasal s-enantiomeric ketamine formulation (Spravato®) for depression. However, Spravato is priced at $600-$900/dose compared to ~$5/dose for generic ketamine, and the ~AUD$100 million annual government investment requested in Australia (to cover drug costs alone) has been rejected twice, leaving this treatment largely inaccessible for Australian patients 2 years after Therapeutic Goods Administration approval. Moreover, emerging evidence indicates that generic racemic ketamine is at least as effective as Spravato, but no comparative trials were required for regulatory approval and have not been conducted. Without action, this story will repeat regularly in the next decade with a new wave of psychedelic-assisted psychotherapy treatments, for which the original off-patent molecules could be available at low-cost and reduce the overall cost of treatment. Several systemic reforms are required to ensure that affordable, effective options become accessible; these include commercial incentives, public and public-private funding schemes, reduced regulatory barriers and more coordinated international public funding schemes to support translational research.

Integrating Battlefield Documentation into Virtual Reality Medical Simulation Training: Virtual Battlefield Assisted Trauma Distributed Observation Kit (BATDOK)

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Mil Med. 2023 Nov 8;188(Suppl 6):110-115

Introduction: Clinical documentation is an essential component of the provision of medical care, enabling continuity of information across provider and site handoffs. This is particularly important in the combat casualty care setting when a single casualty may be treated by four or more or five completely disparate teams across the roles of care. The Battlefield Assisted Trauma Distributed Observation Kit (BATDOK) is a digital battlefield clinical documentation system developed by the Air Force Research Laboratory to address this need. To support the deployment of this tool, we integrated BATDOK into a commercially available virtual reality (VR) medical simulation platform used by the U.S. Air Force and Defense Health Agency personnel in order to provide an immersive simulation training experience which included battlefield documentation.

Methods: A multidisciplinary team consisting of medical educators, VR simulation engineers, emergency physicians and pararescuemen, and BATDOK developers first developed a specification for a virtual BATDOK capability, including a detailed listing of learning objectives, critical interfaces and task plans, and sensor integrations. These specifications were then implemented into the commercially available Virtual Advancement of Learning for Operational Readiness VR Medical Simulation System and underwent developmental testing and evaluation during pararescueman training exercises at the Air Force Special Operations Command Special Operations Center for Medical Integration and Development.

Results and conclusions: The BATDOK capability was successfully implemented within the VR Medical Simulation System. The capability consisted of a virtual tablet with replicated interfaces and capabilities based on the developed specifications. These capabilities included integrated point-of-care ultrasound capability, multi-patient management, vitals sign monitoring with sensor pairing and continuous monitoring, mechanism of injury documentation (including injury pattern documentation), intervention logging (including tourniquets, dressing, airways, lines, tubes and drains, splints, fluids, and medications), and event logging. The capability was found to be operational and in alignment with learning objectives and user acceptance goals.

Effects of Airway Localization Device Use During Surgical Cricothyrotomy on Procedural Times and Confidence Levels of Pre-Hospital Personnel

Caroline Schlocker, Steve Grosser, Carmen Spaulding, Bryan Beltrech, Rebecca Brady

J Spec Oper Med. 2023 Dec 29;23(4):57-61

Abstract

This study evaluated the effect of an airway localization device (ALD) on surgical cricothyrotomy (SC) success rates and prehospital provider confidence. SC is indicated in 0.62% to 1.8% of all patients with military trauma, especially those presenting with traumatic airway obstruction. The effect of ALD was evaluated in an airway mannequin model during SC with the Committee on Tactical Combat Casualty Care (CoTCCC)-recommended Control-Cric Cricothyrotomy System. Outcomes included procedural time, Likert measures of operator confidence, and qualitative data/feedback for suggested future improvements in device design and training. The average procedural times of the hospital corpsmen (HM) including 20 men and 8 women were 67 seconds (without ALD) and 87 seconds (with ALD) respectively, which were statistically significant. Provider confidence for all SC procedural steps increased significantly after SC with and without ALD. The average procedural times of the Navy Special Operations Forces (SOF) group comprising 8 males were 56 seconds (without ALD) and 64 seconds (with ALD), which was not statistically significant. Provider confidence for two SC procedural steps (adequate hook retraction and first-attempt SC tube insertion) increased significantly after SC with and without ALD. First-attempt SC success rates were 90% in each group. Both groups provided feedback on the Control-Cric and ALD, with qualitative feedback analyzed for further SC training recommendations. Procedural times were increased with ALD when compared to those without ALD, although the increase may not be clinically significant in this classroom setting.

Examining the safety profile of a standard dose tranexamic acid regimen in spine surgery

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Neurosurg Focus. 2023 Oct;55(4):E16

Objective: Perioperative blood loss during spinal surgery is associated with complications and in-hospital mortality. Weight-based administration of tranexamic acid (TXA) has the potential to reduce blood loss and related complications in spinal surgery; however, evidence for standardized dosing is lacking. The purpose of this study was to evaluate the impact of a standardized preoperative 2 g bolus TXA dosing regimen on perioperative transfusion, blood loss, thromboembolic events, and postoperative outcomes in spine surgery patients.

Methods: An institutional review board approved this retrospective review of prospectively enrolled adult spine patients (> 18 years of age). Patients were included who underwent elective and emergency spine surgery between September 2018 and July 2021. Patients who received a standardized 2 g dose of TXA were compared to patients who did not receive TXA. The primary outcome measure was perioperative transfusion. Secondary outcomes included estimated blood loss and thromboembolic or other perioperative complications. Descriptive statistics were calculated, and continuous variables were analyzed with the two-tailed independent t-test, while categorical variables were analyzed with the Fisher's exact test or chi-square test. Stepwise multivariate regression analysis was performed to examine independent risk factors for perioperative outcomes.

Results: TXA was administered to 353 of 453 (78%) patients, and there were no demographic differences between groups. Although the TXA group had more operative levels and a longer operative time, the transfusion rate was not different between the TXA and no-TXA groups (7.4% vs 8%, p = 0.83). Stepwise multivariate regression found that the number of operative levels was an independent predictor of perioperative transfusion and that both operative levels and operative time were correlated with estimated blood loss. TXA was not identified as an independent predictor of any postoperative complication.

Conclusions: A standardized preoperative 2 g bolus TXA dosing regimen was associated with an excellent safety profile, and despite increased case complexity in terms of number of operative levels and operative time, patients treated with TXA did not require more blood transfusions than patients not treated with TXA.

The Effect of Ketamine Versus Etomidate for Rapid Sequence Intubation on Maximum Sequential Organ Failure Assessment Score: A Randomized Clinical Trial; Some Concerns

Muhammed Shaji, Amiya Kumar Barik, Rakesh Vadakkethil Radhakrishnan, Chitta Ranjan Mohanty

J Emerg Med. 2023 Dec;65(6):e619-e621

No abstract available

Doing more with less: low-titer group O whole blood resulted in less total transfusions and an independent association with survival in adults with severe traumatic hemorrhage

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J Thromb Haemost. 2024 Jan;22(1):140-151

Background: Low-titer group O whole blood (LTOWB) or component therapy (CT) may be used to resuscitate hemorrhaging trauma patients. LTOWB may have clinical and logistical benefits and may improve survival.

Objectives: We hypothesized LTOWB would improve 24-hour survival in hemorrhaging patients and would be safe and equally efficacious in non-group O compared with group O patients.

Methods: Adult trauma patients with massive transfusion protocol activations were enrolled in this observational study. The primary outcome was 24-hour mortality. Secondary outcomes included 72-hour total blood product use. A Cox regression determined the independent associations with 24-hour mortality.

Results: In total, 348 patients were included (CT, n = 180; LTOWB, n = 168). Demographics were similar between cohorts. Unadjusted 24-hour mortality was reduced in LTOWB vs CT: 8% vs 19% (P = .003), but 6-hour and 28-day mortality were similar. In an adjusted analysis with multivariable Cox regression, LTOWB was independently associated with reduced 24-hour mortality (hazard ratio, 0.21; 95% CI, 0.07-0.67; P = .004). LTOWB patients received significantly less 72-hour total blood products (80.9 [41.6-139.3] mL/kg vs 48.9 [25.9-106.9] mL/kg; P < .001). In stratified 24-hour survival analyses, LTOWB was associated with improved survival for patients in shock or with coagulopathy. LTOWB use in non-group O patients was not associated with increased mortality, organ injury, or adverse events.

Conclusion: In this hypothesis-generating study, LTOWB use was independently associated with improved 24-hour survival, predominantly in patients with shock or coagulopathy. LTOWB also resulted in a 40% reduction in blood product use which equates to a median 2.4 L reduction in transfused products.

Abdominal Aortic Junctional Tourniquet - Stabilized (AAJTS) can be applied both successfully and rapidly by Combat Medical Technicians (CMTs)

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BMJ Mil Health. 2023 Nov 22;169(6):493-498

Background: 'Non-compressible' haemorrhage is the leading cause of preventable battlefield death, often requiring surgical or radiological intervention, which is precluded in the pre-hospital environment. One-fifth of such bleeds are junctional and therefore potentially survivable. We examine the use of the Abdominal Aortic Junctional Tourniquet - Stabilized (AAJTS) among UK Combat Medical Technicians (CMTs) as a device to control junctional haemorrhage with external compression of the abdominal aorta-compression of junctional haemorrhage previously considered 'non-compressible.' This follows animal studies showing that the AAJTS achieves control of haemorrhage and improves physiological parameters.

Methods: CMTs were selected and applied the AAJTS to each other following a 1-hour training package. A consultant radiologist-operated hand-held ultrasound monitored flow changes in the subjects' common femoral artery. CMTs were then surveyed for their opinions as to utility and function.

Results: 21 CMTs were screened and 17 CMTs participated with 34 total applications (16 day and 18 low-light). 27/34 (79%) achieved a successful application. The median application time was 75 s in daylight and 57 s in low-light conditions. There was no significant difference in Body Mass Index (p=0.23), median systolic blood pressure (p=0.19), nor class of CMT (p=0.10) between successful and unsuccessful applications. Higher systolic blood pressure was associated with longer application times (p=0.03). Users deemed the device easy to use (median score 4.4 on a 5-point Likert scale).

Conclusion: CMTs can use AAJTS successfully after a 1-hour training session in the majority of applications. Application was successful in both daylight and low-light conditions. Self-reported usability ratings were high.

Capnography: Video in Clinical Anesthesia

Austin Snyder, Dhanesh Binda, Jean-Luc Germany, Victoria Rosales, Faisal Tan, Ala Nozari, Rafael Ortega

Anesth Analg. 2023 Nov 1;137(5):943-946

No abstract available

Is a Positive Prehospital FAST Associated with Severe Bleeding? A Multicenter Retrospective Study

Grace Stralec, Camille Fontaine, Sarah Arras, Keryann Omnes, Hamza Ghomrani, Pablo Lecaros, Philippe Le Conte, Frederic Balen, Xavier Bobbia

Prehosp Emerg Care. 2023 Oct 24:1-8

Introduction: Severe hemorrhage is the leading cause of early preventable death in severe trauma patients. Delayed diagnosis is a poor prognostic factor, and severe hemorrhage prediction is essential. The aim of our study was to investigate if there was an association between the detection of peritoneal or pleural fluid on prehospital sonography for trauma and posttraumatic severe hemorrhage.

Methods: We retrospectively studied data from records of thoracic or abdominal trauma patients managed in mobile intensive care units from January 2017 to December 2021 in four centers in France. Severe hemorrhage was defined as a condition necessitating transfusion of at least four packed red blood cells or surgical intervention/radioembolization for hemostasis within the first 24 h. Using a multivariate analysis, we investigated the predictive performance of focused assessment with sonography for trauma (FAST) alone or in combination with the five Red Flags criteria validated by Hamada et al.

Results: Among the 527 patients analyzed, 371 (71%) were men, the mean age was 41 ± 19 years, and the Injury Severity Score was 11 (Interquartile range = [5; 22]). Seventy-three (14%) patients had severe hemorrhage - of whom 28 (38%) had a positive FAST, compared to 61 (13%) without severe hemorrhage ($p < 0.01$). For severe hemorrhage prediction, FAST had a sensitivity of 38% (95%CI = [27%; 50%]) and a specificity of 87% (95%CI = [83%; 90%]) (AUC = 0.62, 95%CI = [0.57; 0.68]). The comparison of the other outcomes between positive and negative FAST was: hemostatic procedure, 22 (25%) vs 28 (6%), $p < 0.01$; intensive care unit admission 71 (80%) vs 190 (43%), $p < 0.01$; mean length of hospital stay 11 [4; 27] vs 4 [0; 14] days, $p = 0.02$; 30-day mortality 13 (15%) vs 22 (5%), $p < 0.01$.

Conclusion: A positive FAST performed in the prehospital setting is associated with severe hemorrhage and all prognostic criteria we studied.

Possible effect of the early administration of tranexamic acid on myocardial injury in patients with severe trauma

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J Thromb Thrombolysis. 2023 Oct 15: Online ahead of print

Abstract

Hemodynamic stabilization plays a crucial role in the treatment of patients suffering from severe trauma. Current guidelines recommend the early administration of tranexamic acid (TXA) for bleeding control. While less blood loss can result in less end-organ damage, including myocardial injury, TXA also exhibits prothrombotic effects with potentially adverse myocardial effects. The aim of this study was to investigate the association between the administration of TXA and myocardial injury in patients with severe trauma. We conducted a monocentric cohort study including severely injured patients ≥ 18 years [defined by Injury severity score (ISS) ≥ 16], who were admitted to a tertiary care hospital between 2016 and 2019. Primary outcome measure was myocardial injury according to the fourth Universal Definition (= high sensitive troponin T ≥ 14 ng/l). Secondary endpoints were in-hospital major adverse cardiovascular events (MACE) and mortality. Main exposure was defined as administration of TXA during prehospital period. We conducted multivariate logistic regression models including predefined covariables. A total of 368 patients were screened. Among the 297 included patients (72% male, age. 55?21 years), 119 (40%) presented myocardial injury at hospital arrival. TXA was administered to 20/297 (7%) patients in the prehospital setting, and in 96/297 (32%) patients during pre-or in-hospital period. MACE incidence was 9% (26/297) and in-hospital mortality was 26% (76/297). The adjusted odds ratios (OR) for prehospital TXA and myocardial injury, MACE and mortality were 0.75 [95% confidence interval (CI): 0.25-2.23], 0.51 [95%CI: 0.06-4.30] and 0.84 [0.21-3.33], respectively. In the present cohort of patients suffering from severe trauma, prehospital TXA did not affect the incidence of myocardial injury.

Tick-tock: Prehospital intubation is associated with longer field time without any survival benefit

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Surgery. 2023 Oct;174(4):1034-1040

Background: Prehospital endotracheal intubation is a debated topic, and few studies have found it beneficial after trauma. A growing body of evidence suggests that prehospital endotracheal intubation is associated with increased morbidity and mortality. Our study was designed to compare patients with attempted prehospital endotracheal intubation to those intubated promptly upon emergency department arrival.

Methods: A retrospective review of a single-center trauma research data repository was utilized. Inclusion criteria included age ≥15 years, transport from the scene by ground ambulance, and undergoing prehospital endotracheal intubation attempts or intubation within 10 minutes of emergency department arrival without prior prehospital endotracheal intubation attempt. Propensity score matching was used to minimize differences in baseline characteristics between groups. Standard mean differences are also presented for pre- and post-matching datasets to evaluate for covariate balance.

Results: In total, 208 patients met the inclusion criteria. Of these, 95 patients (46%) underwent prehospital endotracheal intubation, which was successful in 47% of cases. A control group of 113 patients (54%) were intubated within 10 minutes of emergency department arrival. We performed propensity score matching between cohorts based on observed differences after univariate analysis and used standard mean differences to estimate covariate balance. After propensity score matching, patients who underwent prehospital endotracheal intubation experienced a longer time on scene as compared with those intubated in the emergency department (9 minutes [interquartile range 6-12] vs 6 minutes [interquartile range 5-9], P < .01) without difference in overall mortality (67% vs 65%, P = 1.00). Rapid sequence intubation was not used in the field; however, it was used for 58% of patients intubated within 10 minutes of emergency department arrival. After matched analysis, patients with a failed prehospital intubation attempt were equally likely to receive rapid sequence intubation during re-intubation in the emergency department as compared with those undergoing a first attempt (n = 13/28, 46% vs n = 28/63, 44%, P = 1.00, standard mean differences 0.04). Among patients with prehospital arrest (n = 98), prehospital endotracheal intubation was associated with shorter time to death (8 minutes [interquartile range 3-17] vs 14 minutes [interquartile range 8-45], P = .008) and longer total transport time (23 minutes [interquartile range 19-31] vs 19 minutes [interquartile range 16-24], P = .006), but there was no difference in observed mortality (n = 29/31, 94% vs n = 30/31, 97%, P = 1.00, standard mean differences = 0.15) after propensity score matching.

Conclusion: Prehospital providers should prioritize expeditious transport over attempting prehospital endotracheal intubation, as prehospital endotracheal intubation is inconsistently successful, may delay definitive care, and appears to have no survival benefit.

An investigation into emergency medicine resident cricothyrotomy competency: Is three the magic number?

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Objectives: Cricothyrotomy is a high-stakes emergency procedure. Because the procedure is rare, simulation is often used to train residents. The Accreditation Council for Graduate Medical Education (ACGME) requires performance of three cricothyrotomies during residency, but the optimal number of training repetitions is unknown. Additional repetitions beyond three could increase proficiency, though it is unknown whether there is a threshold beyond which there is no benefit to additional repetition. The objective of this study was to establish a minimum number of simulated cricothyrotomy attempts beyond which additional attempts did not increase proficiency.

Methods: This was a prospective, observational study conducted over 3 years at the simulation center of an academic emergency medicine residency program. Participants were residents participating in a cricothyrotomy training as part of a longitudinal airway curriculum course. The primary outcome was time to successful completion of the procedure as first-year residents. Secondary outcomes included time to completion as second- and third-year residents. Procedure times were plotted as a function of attempt number. Data were analyzed using descriptive statistics, repeated-measures analysis of variance, and correlation analysis. Preprocedure surveys collected further data regarding procedure experience, confidence, and comfort.

Results: Sixty-nine first-year residents participated in the study. Steady improvement in time to completion was seen through the first six attempts (from a mean of 75 to 41 sec), after which no further significant improvement was found. Second- and third-year residents initially demonstrated slower performance than first-year residents but rapidly improved to surpass their first-year performance. Resident mean times at five attempts were faster with each year of residency (first-year 48 sec, second-year 30 sec, third-year 24 sec). There was no statistically significant correlation between confidence and time to complete the procedure.

Conclusions: Additional repetition beyond the ACGME-endorsed three cricothyrotomy attempts may help increase proficiency. Periodic retraining may be important to maintain skills.

Parenteral medications at Role 1: do doctors in the British Army require improved training and experience?

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Abstract

Role 1 doctors in the British Army work predominantly in primary healthcare, but also provide prehospital emergency care and administer potent parenteral medications in the field. Role 1 doctors have theoretical training in the use of these medications on short courses but then have little refresher training and use them infrequently in their routine practice, introducing the risk of skill fade. This may lead to higher rates of medication errors in an environment where the consequences may be significant. This article explores the current training of Role 1 doctors, the threat of skill fade and how the safety of drug administration can be improved. This includes recommendations for the development of training competencies, bespoke courses and clinical placements, e-learning and the use of new technology. Application of these recommendations has the potential to improve patient safety and the confidence of doctors in the use of parenteral analgesia.

Ertapenem Versus Meropenem for the Treatment of Extended Spectrum Beta-Lactamase-Producing Enterobacterales Bacteremia in Critically Ill Patients

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Background: The preferred carbapenem for treatment of infections caused by extended spectrum beta-lactamase-producing Enterobacterales (ESBL-E) in critically ill patients is debated.

Objective: The purpose of this study was to evaluate the difference in clinical failure between ertapenem and meropenem for treatment of ESBL-E bacteremia in critically ill patients. Of concern is ertapenem use in hypoalbuminemia given the potential for higher drug clearance.

Methods: This retrospective, matched cohort study compared critically ill patients treated with ertapenem or meropenem for ESBL-E bacteremia between October 2016 and August 2022. Patients were matched on age, sex, lowest albumin, and in a 1:2 ratio of ertapenem to meropenem. The primary outcome, clinical failure, was a composite of 30-day mortality, antibiotic escalation, and microbiological failure. Secondary outcomes included all-cause readmission and development of superinfection.

Results: Of 54 patients, 18 received ertapenem and 36 meropenem. Most had a urinary infection source (55.6% vs 41.7%, P = 0.393). There was no difference in clinical failure (50.0% vs 38.9%, P = 0.436). Ertapenem patients had antibiotic escalation more often (33.3% vs 2.8%, P = 0.002). There was no difference in 30-day mortality (11.1% vs 27.8%, P = 0.298), microbiological failure (27.8% vs 11.1%, P = 0.142), all-cause readmission (22.2% vs 13.9%, P = 0.461), or development of superinfection (11.1% vs 13.9%, P = 1.000).

Conclusion and relevance: There was no difference in clinical failure in a small, retrospective cohort of critically ill patients receiving ertapenem or meropenem for ESBL-E bacteremia. Ertapenem may be appropriate in some critically ill and hypoalbuminemic patients, though additional data are needed.

Non-compressible truncal and junctional hemorrhage: A retrospective analysis quantifying potential indications for advanced bleeding control in Dutch trauma centers

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Background: Truncal and junctional hemorrhage is the leading cause of potentially preventable deaths in trauma patients. To reduce this mortality, the application of advanced bleeding control techniques, such as resuscitative endovascular balloon occlusion of the aorta (REBOA), junctional tourniquets, Foley catheters, or hemostatic agents should be optimized. This study aimed to identify trauma patients with non-compressible truncal and junctional hemorrhage (NCTJH) who might benefit from advanced bleeding control techniques during initial trauma care. We hypothesized that there is a substantial cohort of Dutch trauma patients that can possibly benefit from advanced bleeding control techniques.

Methods: Adult trauma patients with an Abbreviated Injury Scale ≥3 in the torso, neck, axilla, or groin region, who were presented between January 1st, 2014 and December 31st, 2018 to two Dutch level-1 trauma centers, were identified from the Dutch Trauma Registry. Potential indications for advanced bleeding control in patients with NCTJH were assessed by an expert panel of three trauma surgeons based on injury characteristics, vital signs, response to resuscitation, and received treatment.

Results: In total, 1719 patients were identified of whom 249 (14.5 %) suffered from NCTJH. In 153 patients (60.6 %), hemorrhagic shock could have been mitigated or prevented with advanced bleeding control techniques. This group was younger and more heavily injured: median age of 40 versus 48 years and median ISS 33 versus 22 as compared to the entire cohort. The mortality rate in these patients was 31.8 %. On average, each of the included level-1 trauma centers treated an NCTJH patient every 24 days in whom a form of advanced bleeding control could have been beneficial.

Conclusions: More than half of included Dutch trauma patients with NCTJH may benefit from in-hospital application of advanced bleeding control techniques, such as REBOA, during initial trauma care. Widespread implementation of these techniques in the Dutch trauma system may contribute to reduction of mortality and morbidity from non-compressible truncal and junctional hemorrhage.

PATCHing Traumatic Hemorrhage With Out-of-Hospital Tranexamic Acid Administration

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No abstract available

Capnography-An Essential Monitor, Everywhere: A Narrative Review

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Abstract

Capnography is now recognized as an indispensable patient safety monitor. Evidence suggests that its use improves outcomes in operating rooms, intensive care units, and emergency departments, as well as in sedation suites, in postanesthesia recovery units, and on general postsurgical wards. Capnography can accurately and rapidly detect respiratory, circulatory, and metabolic derangements. In addition to being useful for diagnosing and managing esophageal intubation, capnography provides crucial information when used for monitoring airway patency and hypoventilation in patients without instrumented airways. Despite its ubiquitous use in high-income-country operating rooms, deaths from esophageal intubations continue to occur in these contexts due to incorrect use or interpretation of capnography. National and international society guidelines on airway management mandate capnography's use during intubations across all hospital areas, and recommend it when ventilation may be impaired, such as during procedural sedation. Nevertheless, capnography's use across high-income-country intensive care units, emergency departments, and postanesthesia recovery units remains inconsistent. While capnography is universally used in high-income-country operating rooms, it remains largely unavailable to anesthesia providers in low- and middle-income countries. This lack of access to capnography likely contributes to more frequent and serious airway events and higher rates of perioperative mortality in low- and middle-income countries. New capnography equipment, which overcomes cost and context barriers, has recently been developed. Increasing access to capnography in low- and middle-income countries must occur to improve patient outcomes and expand universal health care. It is time to extend capnography's safety benefits to all patients, everywhere.

A modified chain-based sponge dressing controls junctional hemorrhage in the tactical combat casualty care simulation of pigs

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Background: Hemorrhage has always been the focus of battlefield and pre-hospitalization treatment. With the increasing fatality rates associated with junctional bleeding, treatment of bleeding at junctional sites has gradually gained attention in battlefield trauma emergency care. We designed a modified chain-based sponge dressing with a medical polyvinyl alcohol sponge that can be used to treat junctional hemorrhage and tested its hemostatic efficacy and biocompatibility.

Methods: Twenty adult Bama miniature pigs were randomly divided into the modified chain-based sponge dressing (MCSD) and standard gauze (SG) groups. The right femoral artery of the pigs was shot at after anesthesia. The Bama miniature pigs were moved to the safety zone immediately to assess the condition according to the MARCH strategy, which evaluates massive hemorrhaging, airway obstruction, respiratory status, circulatory status, head injury & hypothermia. Hemoglobin and coagulation status were checked during the experiment.Among the pigs in which the inguinal hemorrhagic model based on bullet penetrating wounds was successfully established, those in the MCSD group received a disinfected MCSD for hemostasis, while those in the SG group received standard gauze in an imbricate manner to pack the bullet exit and entrance wounds to stop bleeding until the wound was filled, followed by compression for 3 min at sufficient pressure. CT scanning, transmission electron microscopy, and HE staining were conducted after experiment.

Results: The MCSD group showed lower hemostasis time and blood loss than the gauze group. The MCSD group also showed a higher success rate of treatment,more stable vital signs and hemoglobin level. The CT scanning results showed tighter packing without large gaps in the MCSD group. The histopathological assessments and the transmission electron microscopy and HE staining findings indicated good biocompatibility of the polyvinyl alcohol sponge.

Conclusion: The MCSD met the battlefield's requirements of speedy hemostasis and biosafety for junctional hemorrhage in Bama miniature pigs. Moreover, in comparison with the conventional approach for hemostasis, it showed more stable performance for deep wound hemostasis. These findings provide the theoretical and experimental basis for the application of MCSD in the treatment of hemorrhage in the battlefield in the future.

Comparison of the Analgesic Effects of Low-Dose Ketamine Versus Fentanyl in Patients With Long Bone Fractures in the Emergency Department: A Prospective Observational Study

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Abstract

Aim and background In most emergency departments (ED), opioids are the primary analgesic agents for trauma patients. However, safe alternative drugs are required because of possible adverse effects. Ketamine, an anesthetic agent, provides satisfactory analgesia at low doses and is an alternative drug that has begun to be used in numerous areas with fewer side effects. This study aimed to compare low-dose ketamine and fentanyl infusions in terms of their pain-relieving effects and observed adverse effects in patients presenting to the ED with isolated long bone fractures. Materials and methods This single-center observational study was conducted in the ED of the Marmara University Pendik Training and Research Hospital between August 2018 and December 2019. Patients diagnosed with isolated long bone fractures who were administered low-dose ketamine or fentanyl rapid infusions for pain relief were included in the study. Patient pain scores were evaluated using the visual analog scale (VAS) with a standard horizontal 10-centimeter line. The primary outcome of the study was to compare the changes in pain at 30 and 60 min after medication administration for each group. Results A total of 100 patients were included in the study. Ketamine infusion was administered to 48% (n=48) of the patients as a pain reliever. After 60 min of observation, pain was significantly reduced in both study groups. However, the pain scores at baseline (p=0.319), 30 min (p=0.631), and 60 min (p=0.347) after treatment were similar in both groups. In terms of the observed adverse effects, dizziness was more common in the ketamine group (p=0.010). Conclusion The results of this study showed that low-dose ketamine infusion (0.3 mg/kg/h) had a similar effect to fentanyl infusion (1 mcg/kg/h) as a pain reliever in patients with isolated long bone fractures in the ED.

The Effect of Early Severe Hyperoxia in Adults Intubated in the Prehosptial Setting or Emergency Department: A Scoping Review

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Background: The detrimental effects of hyperoxia exposure have been well-described in patients admitted to intensive care units. However, data evaluating the effects of short-term, early hyperoxia exposure in patients intubated in the prehospital setting or emergency department (ED) have not been systematically reviewed.

Objective: Our aim was to quantify and describe the existing literature examining the clinical outcomes in ED patients exposed to hyperoxia within the first 24 h of mechanical ventilation.

Methods: This review was performed in concordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for scoping reviews. Two rounds of review using Rayyan QCRI software were performed for title and abstract screening and full-text search. Of the 2739 articles, 27 articles were retrieved after initial screening, of which 5 articles were excluded during the full-text screening, leaving 22 articles for final review and data extraction.

Results: Of 22 selected publications, 9 described patients with traumatic brain injury, 6 with cardiac arrest, 3 with multisystem trauma, 1 with stroke, 2 with septic shock, and 1 was heterogeneous. Three studies were randomized controlled trials. The available data have widely heterogeneous definitions of hyperoxia exposure, outcomes, and included populations, limiting conclusions.

Conclusions: There is a paucity of data that examined the effects of severe hyperoxia exposure in the acute, post-intubation phase of the prehospital and ED settings. Further research with standardized definitions is needed to provide more detailed guidance regarding early oxygen titration in intubated patients.

Effectiveness of Intranasal Analgesia in the Emergency Department

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Abstract

In the Emergency Department (ED), pain is one of the symptoms that are most frequently reported, making it one of the most significant issues for the emergency physician, but it is frequently under-treated. Intravenous (IV), oral (PO), and intramuscular (IM) delivery are the standard methods for administering acute pain relief. Firstly, we compared the safety and efficacy of IN analgesia to other conventional routes of analgesia to assess if IN analgesia may be an alternative for the management of acute pain in ED. Secondly, we analyzed the incidence and severity of adverse events (AEs) and rescue analgesia required. We performed a narrative review-based keywords in Pubmed/Medline, Scopus, EMBASE, the Cochrane Library, and Controlled Trials Register, finding only twenty randomized Clinical trials eligible in the timeline 1992-2022. A total of 2098 patients were analyzed and compared to intravenous analgesia, showing no statistical difference in adverse effects. In addition, intranasal analgesia also has a rapid onset and quick absorption. Fentanyl and ketamine are two intranasal drugs that appear promising and may be taken simply and safely while providing effective pain relief. Intravenous is simple to administer, non-invasive, rapid onset, and quick absorption; it might be a viable choice in a variety of situations to reduce patient suffering or delays in pain management.