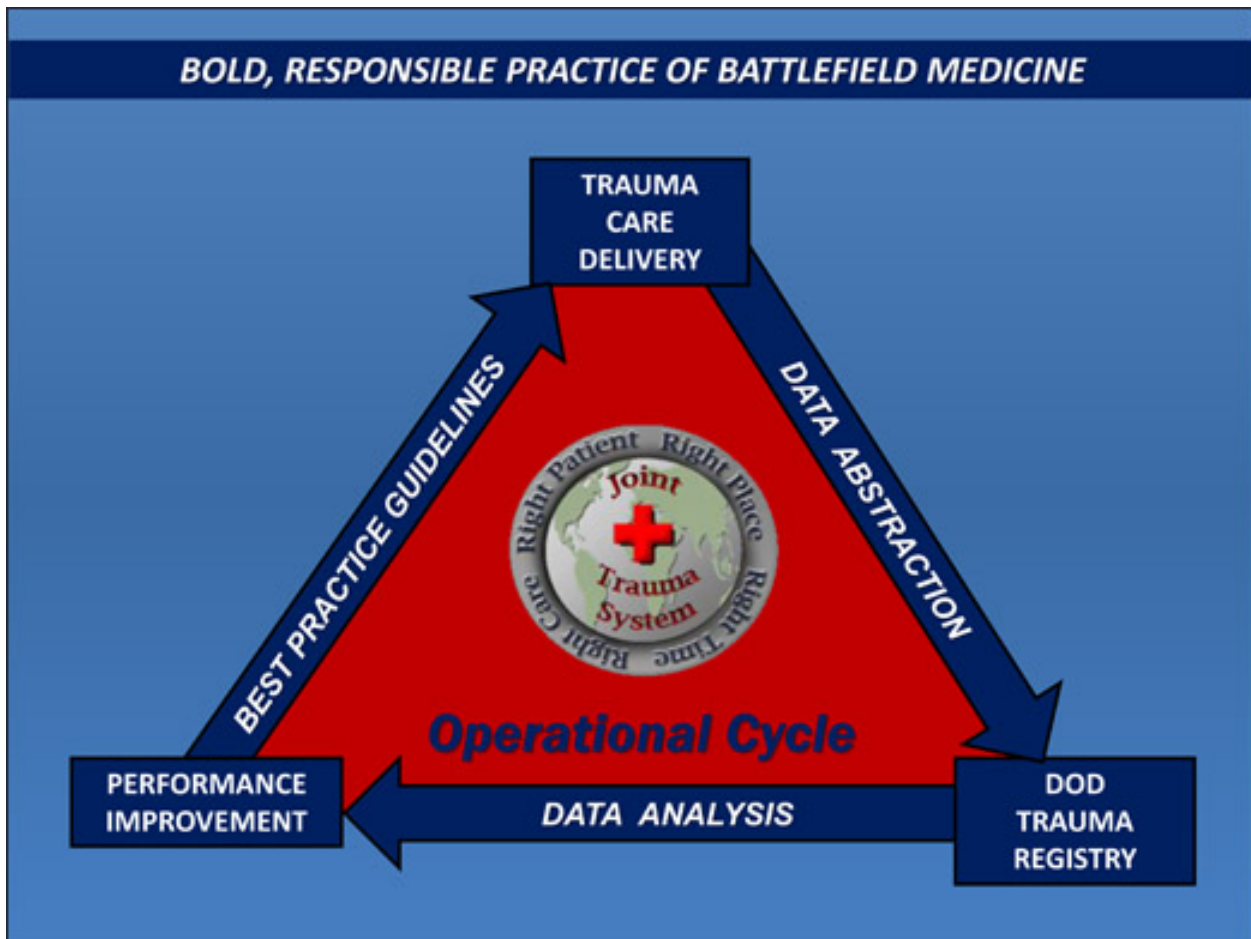


Committee on En Route Combat Casualty Care  
(CoERCCC)



Journal Watch

2nd Quarter

FY2019

## Journal Watch Key Terminology Searched:

Emergency medical services  
Acute coronary syndrome  
Emergency care  
Aeromedical evacuation  
Traumatic brain injury  
Substances for disinfection  
Standardized operating procedures  
Forward MEDEVAC  
Trauma  
Helicopter  
Transportation Vibration  
Spinal cord injury  
Physically demanding occupation  
CASEVAC  
Tactical evacuation  
Drone transportation

Resuscitation  
Myocardial infarction  
Telemedicine  
Inflammation  
Air traffic  
Highly infectious diseases  
Combat  
Joint trauma system  
MRAP  
Porcine model  
Airway management  
ST-segment elevation  
Task analysis  
Ground Evacuation  
Inter-facility Transport

Treatment efficacy  
Pre-hospital  
Hypobaria  
Neuronal cell death  
Disinfection of aircraft  
Stabilization  
FLYP  
PECC  
SCI  
Shock  
Guideline  
Employment standards  
Vibration  
Battlefield Evacuation  
Drones

# Prehospital cricothyrotomies in a helicopter emergency medical service: analysis of 19,382 dispatches.

[Schober P](#)<sup>1,2</sup>, [Biesheuvel T](#)<sup>2</sup>, [de Leeuw MA](#)<sup>1,2</sup>, [Loer SA](#)<sup>1,2</sup>, [Schwarte LA](#)<sup>3,4</sup>.

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## **Abstract**

**BACKGROUND:** Creating a patent airway by cricothyrotomy is the ultimate maneuver to allow oxygenation (and ventilation) of the patient. Given the rarity of airway management catastrophes necessitating cricothyrotomy, sufficiently sized prospective randomized trials are difficult to perform. Our Helicopter Emergency Medical Service (HEMS) documents all cases electronically, allowing a retrospective analysis of a larger database for all cases of prehospital cricothyrotomy.

**METHODS:** We analyzed all 19,382 dispatches of our HEMS 'Lifeline 1', since set-up of a searchable digital database. This HEMS operates 24/7, covering ~4.5 million inhabitants of The Netherlands. The potential cases were searched and cross-checked in two independent databases.

**RESULTS:** We recorded n = 18 cases of prehospital cricothyrotomy. In all 18 cases, less invasive airway techniques, e.g., supraglottic devices, were attempted before cricothyrotomy. With exception of 2 cases, at least one attempt of orotracheal intubation had been performed before cricothyrotomy. Out of the 18 cases, 4 were performed by puncture-based technique (Melker), the remaining 14 cases by surgical technique. Indications for cricothyrotomy were diverse, dividable into 9 trauma cases and 9 medical cases. The procedure was successful in all but one case (17/18, i.e., 94%; with a 95% confidence interval of 72.7-99.9%). Outcome was such that 6/18 patients arrived at the hospital alive. Long term outcome was poor, with only 2/18 patients discharged from hospital alive.

**CONCLUSIONS:** Cricothyrotomy remains, although rare, a regularly occurring requirement in (H)EMS. Our finding of a convincingly high success rate of 94% in trained hands encourages training and a timely performance of cricothyrotomy.

**KEYWORDS:** Airway; Coniotomy; Cricothyrotomy; EMS; Emergency; HEMS; Prehospital; Surgical

PMID: 30674276 PMCID: [PMC6343329](#) DOI: [10.1186/s12873-019-0230-9](#)

# Aeromedical Transfer of Patients with Viral Hemorrhagic Fever.

[Nicol ED](#), [Mepham S](#), [Naylor J](#), [Mollan I](#), [Adam M](#), [d'Arcy J](#), [Gillen P](#), [Vincent E](#), [Mollan B](#), [Mulvaney D](#), [Green A](#), [Jacobs M](#).

**Abstract** For >40 years, the British Royal Air Force has maintained an aeromedical evacuation facility, the Deployable Air Isolator Team (DAIT), to transport patients with possible or confirmed highly infectious diseases to the United Kingdom. Since 2012, the DAIT, a joint Department of Health and Ministry of Defence asset, has successfully transferred 1 case-patient with Crimean-Congo hemorrhagic fever, 5 case-patients with Ebola virus disease, and 5 case-patients with high-risk Ebola virus exposure. Currently, no UK-published guidelines exist on how to transfer such patients. Here we describe the DAIT procedures from collection at point of illness or exposure to delivery into a dedicated specialist center. We provide illustrations of the challenges faced and, where appropriate, the enhancements made to the process over time.

**KEYWORDS:** Ebola virus; United Kingdom; aerospace medicine; aviation; hemorrhagic fever; infection control; patient isolation; patient transfer; viruses

PMID: 30431424 PMCID: [PMC6302577](#) DOI: [10.3201/eid2501.180662](#)

[Mil Med.](#) 2019 Feb 22. pii: usz015. doi: 10.1093/milmed/usz015. [Epub ahead of print]

# A Descriptive Analysis of Causalities Undergoing CASEVAC from the Point-of-Injury in the Department of Defense Trauma Registry.

[Schauer SG](#)<sup>1,2,3</sup>, [Naylor JF](#)<sup>4</sup>, [Bellamy MA](#)<sup>5</sup>, [Maddry JK](#)<sup>2,3</sup>, [April MD](#)<sup>3</sup>.

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## Abstract

**INTRODUCTION:** The recent conflicts in Iraq and Afghanistan entail an asymmetric battlefield without clearly defined forward lines of troops as seen in previous wars. Accordingly, the United States military medical services have increasingly adopted casualty evacuation (CASEVAC) platforms. We describe CASEVAC events reported within the Department of Defense Trauma Registry (DODTR).

**MATERIALS AND METHODS:** This is a secondary analysis of previously published data from two datasets spanning from 2007 through 2017. We isolated casualties within our dataset that had a documented evacuation method from the point-of-injury other than dedicated medical evacuation platforms (e.g., MEDEVAC, etc.).

**RESULTS:** During OPERATION IRAQI FREEDOM, three casualties underwent CASEVAC. The median age was 30 and all were male. Most sustained injuries from explosives (67%) and the median composite injury scores were low (10). The most frequent seriously injured body region was the thorax (67%). All survived to hospital discharge. During operations in Afghanistan (OPERATION ENDURING FREEDOM, OPERATION FREEDOMS SENTINEL, OPERATION NEW DAWN), 248 casualties underwent CASEVAC. The median age was 28 and most (96%) were male. Most sustained injuries from explosives (58%) and the median injury score was low (9). The most frequent seriously injured body region was the extremities (24%). Most (97%) survived to hospital discharge. During OPERATION INHERENT RESOLVE, 247 casualties underwent CASEVAC. The median age was 21 and most (96%) were male. The majority sustained injuries from explosives (61%) and the median injury score was low (9). The most frequent seriously injured body region was the extremities (27%). Most survived to hospital discharge (94%).

**CONCLUSIONS:** In our dataset, CASEVAC events most frequently involved US military personnel service members with most surviving to hospital discharge. Developing new terminology that distinguishes different types of CASEVAC would allow for more accurate future analyses of casualty evacuation and outcomes - such as those transports that are truly in a non-medical versus the various medical platforms that do not fall within the confines of the MEDEVAC platforms.

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**KEYWORDS:** CASEVAC; combat; evacuation; prehospital; transport  
PMID: 30793183 DOI: [10.1093/milmed/usz015](https://doi.org/10.1093/milmed/usz015)

[J Trauma Acute Care Surg.](#) 2019 Feb 7. doi: 10.1097/TA.0000000000002224. [Epub ahead of print]

# Thromboelastography On-the-Go: Evaluation of the TEG 6s Device During Ground and High-Altitude Aeromedical Evacuation with Extracorporeal Life Support.

[Roberts TR](#)<sup>1,2,3</sup>, [Jones JA](#)<sup>1</sup>, [Choi JH](#)<sup>1,3</sup>, [Sieck KN](#)<sup>1</sup>, [Harea GT](#)<sup>1</sup>, [Wendorff DS](#)<sup>1,3</sup>, [Beely BM](#)<sup>1,3</sup>, [Karaliou V](#)<sup>1</sup>, [Cap AP](#)<sup>3</sup>, [Davis MR](#)<sup>4</sup>, [Cancio LC](#)<sup>3</sup>, [Sams VG](#)<sup>5</sup>, [Batchinsky AI](#)<sup>1,2,3</sup>.

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## Abstract

**BACKGROUND:** Coagulation monitoring capabilities during transport are limited. Thromboelastography (TEG) is a whole-blood clotting test measuring clot formation, stabilization and fibrinolysis; and is traditionally performed in a laboratory. We evaluated a new point-of-care TEG analyzer, TEG 6s (Haemonetics; Braintree, MA), in a large animal model of combat-relevant trauma managed with extracorporeal life support (ECLS) during ground and high-altitude aeromedical evacuation. The objective was to compare TEG 6s used during transport vs. the predicate device, TEG 5000, used in the laboratory. We hypothesized that TEG 6s would be comparable to TEG 5000 during dynamically changing transport conditions.

**METHODS:** TEG parameters (R, K, Angle, MA, LY30) derived by TEG 6s and TEG 5000 were compared during transport of 8 swine. TEG 6s was transported with animals during ground transport and flight. TEG 5000 was stationary in an adjacent building. TEG 6s activated clotting time (ACT) was compared to a Hemochron Junior ACT analyzer (Accriva Diagnostics; San Diego, CA). Statistics were performed using SAS 9.4 with Deming regressions, Spearman correlations and average differences compared.

**RESULTS:** Correlation between devices was stronger at sea-level (R r=0.7413, K r=0.7115, Angle r=0.7192, MA r=0.8386, LY30 r=0.9099) than during high-altitude transport (R r=0.4787, K r=0.4007, Angle r=0.3706, MA r=0.6573, LY30 r=0.8481). Method agreement was comparable during stationary operation (R r=0.7978, K r=0.7974, Angle r=0.7574, MA r=0.7841, LY30 r=0.9140) vs. ground transport (R r=0.7927, K r=0.6246, Angle r=0.6967, MA r=0.9163, LY30 r=0.8603). TEG 6s ACT trended higher than Hemochron ACT when subjects were heparinized (average difference=1442±1703 sec) without a methodological difference by Deming regression.

**CONCLUSIONS:** Mobile TEG 6s during ground and altitude transport is feasible and provides unprecedented information to guide coagulation management. Future studies should assess the precision and accuracy of TEG 6s during transport of critically ill.

**LEVEL OF EVIDENCE:** Basic science paper, does not require level of evidence.

PMID: 30741883 DOI: [10.1097/TA.0000000000002224](https://doi.org/10.1097/TA.0000000000002224)

# Gap Analysis to Identify Clinical Education Needs of Aeromedical Evacuation Clinicians.

[De Jong MJ](#)<sup>1</sup>, [Dukes SF](#), [Losekamp T](#).

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## Abstract

**BACKGROUND:** The Air Force has unique challenges in ensuring clinical proficiency for en route care clinicians. These challenges pertain to existing care environments, training opportunities, and the spectrum of training needed to care for patients with polytrauma and complicated medical conditions while being transported between medical treatment facilities.

**OBJECTIVE:** The purpose of this study was to identify the clinical education needs of students entering the United States Air Force School of Aerospace Medicine Flight Nurse (FN) or Aeromedical Evacuation Technician (AET) course and Air Force FNs and AETs assigned to active duty aeromedical evacuation units.

**METHOD:** We recruited 198 students enrolled in the FN or AET course and 103 active duty FN and AET aircrew members and conducted a gap analysis to identify the clinical education needs of Air Force FNs and AETs.

**RESULTS:** Training gaps were identified for active duty Air Force, Air Force Reserve, and Air National Guard FNs and AETs. The greatest learning needs included use of the portable therapeutic liquid oxygen unit, manual resuscitators, and negative pressure wound therapy systems, and care of special populations such as patients with a burn injury or mental health disorder.

**CONCLUSIONS:** Results of the gap analysis can be used to select and develop educational and simulation training scenarios designed to foster clinical competence.

PMID: 30702477 DOI: [10.1097/DCC.0000000000000349](#)

# Hypobaria during long-range flight resulted in significantly increased histopathological evidence of lung and brain damage in a swine model.

[Scultetus AH<sup>1</sup>](#), [Jefferson MA](#), [Haque A](#), [Ho LTVT](#), [Hazzard B](#), [Saha BK](#), [Chun SJ](#), [Auker CR](#), [Moon-Massat PF](#), [McCarron RM](#), [Malone DL](#).

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## Abstract

**BACKGROUND:** Aeromedical evacuation to definitive care is standard in current military conflicts. However, there is minimal knowledge on the effects of hypobaria (HYPO) on either the flight crew or patients. The effects of HYPO were investigated using healthy swine.

**METHODS:** Anesthetized Yorkshire swine underwent a simulated 4 h "transport" to an altitude of 2,441 m (8,000 feet.; HYPO, N = 6) or at normobaric conditions (NORMO, N = 6). Physiologic and biochemical data were collected. Organ damage was assessed for hemorrhage, inflammation, edema, necrosis, and for lungs only, microatelectasis.

**RESULTS:** All parameters were similar prior to and after "transport" with no significant effects of HYPO on hemodynamic, neurologic, or oxygen transport parameters, nor on blood gas, chemistry, or complete blood count data. However, the overall Lung Injury Score was significantly worse in the HYPO than the NORMO group ( $10.78 \pm 1.22$  vs.  $2.31 \pm 0.71$ , respectively) with more edema/fibrin/hemorrhage in the subpleural, interlobular and alveolar space, more congestion in alveolar septa, and evidence of microatelectasis (vs. no microatelectasis in the NORMO group). There was also increased severity of pulmonary neutrophilic ( $1.69 \pm 0.20$  vs.  $0.19 \pm 0.13$ ) and histiocytic inflammation ( $1.83 \pm 0.23$  vs.  $0.47 \pm 0.17$ ) for HYPO versus NORMO, respectively. On the other hand, there was increased renal inflammation in NORMO compared with HYPO ( $1.00 \pm 0.13$  vs.  $0.33 \pm 0.17$ , respectively). There were no histopathological differences in brain (whole or individual regions), liver, pancreas, or adrenals.

**CONCLUSION:** Hypobaria, itself, may have an adverse effect on the respiratory system, even in healthy individuals, and this may be superimposed on combat casualties where there may be preexisting lung injury. The additional effects of anesthesia and controlled ventilation on these results are unknown, and further studies are indicated using awake models to better characterize the mechanisms for this pathology and the factors that influence its severity.

PMID: 29985235 DOI: [10.1097/TA.0000000000002014](https://doi.org/10.1097/TA.0000000000002014)