

REPORT DOCUMENTATION PAGE

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EN ROUTE CARE RESEARCH CENTER EVIDENCE TO GUIDE PRACTICE

Determining Predictors of Survival among Traumatic Cardiopulmonary Arrest Patients in a Combat Theater Environment

Gaps Addressed: 2017 ICL: AFMS (AMC) 140 – Standardized Care from POI through ERC; AFMS (AMC) 224 – Epidemiology & clinical evaluation of clinical outcomes of injured patients during OIF/OEF

2016 AE RDD: CCA – Clinical En Route Care - 2. Epidemiology and Clinical Evaluation Outcomes

Modified Abstract

Background: Trauma represents the leading cause of death for all people between the ages of 1-46 as well as the leading cause of cardiac arrest in military conflicts, yet the approach to resuscitation of traumatic cardiopulmonary arrest (TCPA) patients remains controversial. Survival rates have been reported to be between 0% - 2.6% among civilian TCPA victims. In 2003, the National Association of Emergency Medical Services Physicians and the American College of Surgeons Committee on Trauma established guidelines regarding the withholding or termination of out-of-hospital resuscitation in TCPA, however, in light of some reports of improved outcomes this guidance remains controversial. Guidelines regarding the treatment of TCPA victims are even more controversial in the military setting where the mechanism of injury and injury patterns are dissimilar to civilian injuries. The current tactical combat casualty care (TCCC) guidelines regarding CPR on the battlefield is that resuscitation of victims with no signs of life, “should not be attempted (TCCC 2017),” however, these guidelines may be based on inadequate evidence. Studies of military TCPA patients have reported survival rates from 8 to 24%.

The primary aim of our investigation was to describe patients who received CPR during TCPA in a combat theatre setting; we also aimed to identify predictors of survival among those same patients.

Methods: We conducted a retrospective review of all patients in the DoD Trauma Registry who received cardiopulmonary resuscitation (CPR) within 24 hours of sustaining a traumatic injury, between January 01, 2007 and January 31, 2014. Procedure codes for open or closed cardiac massage were also queried. Subjects were grouped according to the geographic location where they first received CPR – either pre-hospital (PH) or in-hospital (IH). Categorical variables were analyzed using chi-square or Fisher’s exact tests (for sample sizes less than 5) and reported as percentages with confidence intervals. Continuous variables were analyzed using Student’s t-test or Wilcoxon tests and reported as mean \pm standard deviation (SD). After evaluating the measures of central tendency, continuous variables were analyzed using Wilcoxon rank sum test.

Results:

- 582 subjects received cardiopulmonary resuscitation (CPR), (open or closed cardiac massage) within 24 hours of sustaining a traumatic injury.
- 281(48%) subjects received CPR prehospital and CPR was continued after arrival to MTF in 246 (88%).

- There was no difference in gender, ethnicity, injury severity, or anatomic location of injury between the PH and IH groups.
- 45% of PH subjects survived to discharge from the first facility and 8% survived out of theater.
- 71% of the IH subjects survived to discharge from the first facility and 17% survived out of theater.
- Of the 35 subjects that only received CPR in the PH setting, 22 (63%) survived to discharge and 10 (29%) survived to 30 days.
- Of the 246 that continued to receive CPR once they arrived at the hospital, 94 (38%) survived to discharge and 12 (5%) survived to 30 days.
- Among all subjects, those who survived to 30 days had a higher ISS, received more PH procedures and had more complications.
- PH survival was associated with injuries to the face/chest ($p < 0.0001$), hemostatic dressings ($p < 0.0001$), spinal immobilization ($p < 0.0001$), and blood product administration ($p < 0.0001$).
- IH survival was associated with closed chest compressions ($p < 0.0001$), infusion of therapeutic substances ($p < 0.0001$), and blood product administration ($p < 0.0001$).
- The PH survivors that arrived to Landstuhl Regional Medical Center had two more procedures performed in theater (4.0 vs. 2.0, $p < 0.0008$) and experienced less complications up to 30 days following injury (1.0 vs. 3.5, $p = 0.0194$) compared to the IH survivors.
- Non-survivors in the IH group were more likely to have documented bleeding ($p < 0.0001$) and, albeit small numbers, trended toward an increase incidence of coagulopathy (18% vs 42%, $p = 0.0631$).
- Considering prehospital versus hospital CPR and adjusting for ISS, patients that receive blood products had 2.3 times higher odds of survival (CI 1.62-3.27).
- In particular, the IH group had 2.1 higher odds of survival when accounting for blood product administration (CI 1.1-4.0).

Conclusions:

- Resuscitation of T CPA patients in a combat theatre is not futile; we report a 13% survival to 30 days among all patients receiving CPR in theater.
- Prudent and timely prehospital interventions confer survival in patients that experience T CPA in the field.
- Blood product administration to T CPA patients in the hospital may address potential patient bleeding and coagulopathy and confer survival.
- There may be differences between the civilian and military T CPA populations which make civilian T CPA protocols less applicable to the military population.

Evidence Based Recommendations:

- A more comprehensive evaluation of combat casualties experiencing T CPA should be conducted, as well as a detailed review of related published evidence.
- Clinical Practice Guidelines for combat casualty care should consider the uniqueness of the casualty, the environment and military provider training and skills. Civilian guidelines are useful, but may not account for variants found in battlefield care.

Publication

The views expressed are those of the authors and do not reflect the official views or policy of the Department of Defense or its components. The voluntary, fully informed consent of the subjects used in this research was obtained as required 32 CFR 219 and DODI 3216.02_AFI 40-402