

Selected Topics: Aeromedical Emergency

PREHOSPITAL INJURY SEVERITY OF CHILDREN EVACUATED BY HELICOPTERS FROM COMBAT ZONES: A RETROSPECTIVE REPORT

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Abstract—Background: In Israel, the Airborne Rescue and Evacuation Unit (AREU) provides prehospital trauma care in times of peace and during times of armed conflict. In peacetime, the AREU transports children who were involved in motor vehicle collisions (MVC) and those who fall off cliffs (FOC). During armed conflict, the AREU evacuates children who sustain firearm injuries (FI) from the fighting zones. **Objective:** To report on prehospital injury severity of children who were evacuated by the AREU from combat zones. **Methods:** A retrospective comparative analysis was conducted on indicators of prehospital injury severity for patients who had MVC, FOC, and FI. It included the National Advisory Committee for Aeronautics (NACA) score, the Glasgow Coma Scale (GCS) score on scene, and the number of procedures performed by emergency medical personnel and by the AREU air-crew. **Results:** From January 2003 to December 2009, 36 MVC, 25 FOC, and 17 FI children were transported from the scene by the AREU. Five patients were dead at the scene: 1 (2.8%) MVC, 1 (4%) FOC, and 3 (17.6%) FI. Two (11.7%) FI patients were dead on arrival at the hospital. MVC, FOC, and FI patients had mean (\pm SD) NACA scores of 4.4 ± 1.2 , 3.6 ± 1.2 , and 5 ± 0.7 , respectively. Mean (\pm SD) GCS scores were 8.9 ± 5.6 , 13.6 ± 4 , and 6.9 ± 5.3 , respectively. Life support interventions were required by 29 (80.6%) MVC, 3 (12%) FOC, and 15 (88.2%) FI patients. **Conclusions:** In the prehospital setting, children evacuated from combat zones were more severely injured than children who were transported from the scene during peacetime. © 2013 Elsevier Inc.

Keywords—pediatric; children; transport; evacuation; scene; motor vehicle collision; fall off a cliff; fighting zone; firearm injury

INTRODUCTION

Helicopter Scene Transport (HST) is an integral component of trauma care. It enables rapid transfer of injured patients from the scene to specialized trauma centers (1). In addition, it can bring medical experts and advanced resuscitation resources to patients. Previous studies show that both adult and pediatric trauma patients who are transported by helicopters are usually more severely injured than those who are transported by ground vehicle (1,2).

Israel is a relatively small country, with a surface area of about 20,770 km². This makes it ideal for helicopter transport (3). The country has six Level I trauma centers, with one located in the south and one in the north of the country, as well as 11 Level II trauma centers. During peaceful times, HSTs in and around urban areas are done by the national Emergency Medical Service (EMS). EMS uses MBB Bo 105 helicopters. Trauma patients from remote northern or southern areas are transported by the Israeli Air Force's Airborne Rescue and

Evacuation Unit (AREU). The helicopters used are Sikorsky UH-60 "Black Hawk" or Sikorsky CH-53 "Sea Stallion" helicopters (4,5). During times of armed conflict, such as the 2006 Israel-Lebanon War, and the 2009 Gaza conflict, the AREU is responsible for helicopter evacuation of injured soldiers and civilians, including children, from combat zones. These patients suffer from firearm injuries (FI). In times of armed conflict, all other pediatric patients within Israel are transported by EMS helicopters, even if the injury occurred in remote areas (6,7).

The AREU medical air crew consists of paramedics and specially trained flight physicians who can provide advanced emergency life support care on scene and during transport (6,7).

The mechanism of injury for pediatric patients requiring AREU expertise and transfer during times of peace includes those suffering from blunt trauma due to motor vehicle collisions (MVC) and those who fall off a cliff (FOC) and are in need of specialized extraction or specific medical care.

The objective of this study was to report on prehospital injury severity of children evacuated by the AREU from fighting zones during times of armed conflict. We believe this type of data has not been published previously.

PATIENTS AND METHODS

Setting, Subjects, and Study Design

The study was conducted at an Air Force AREU base in Israel. Since January 2003, AREU has an electronic casualty data registry. Study subjects included all trauma patients under the age of 18 years who required AREU intervention and HST between January 2003 and December 2009. A retrospective analysis was performed. The study was approved by the Israeli Defense Force's Medical Corps Ethics Committee.

Data Collection

The following data were extracted from the registry: patient demographics, mechanisms of injury (FOC, MVC, FI), National Advisory Committee for Aeronautics

NACA Score Level	Definition
1	Not acute life-threatening disease/injury
2	No acute intervention, but further diagnostic necessary
3	Severe, but not life threatening disease/
4	Development of vital danger possible
5	Acute vital danger
6	Acute cardiac or respiratory arrest
7	Death

Figure 1. National Advisory Committee for Aeronautics (NACA) score (8).

(NACA) score (Figure 1), Glasgow Coma Scale score (GCS), and advanced life-support procedures performed by ground EMS personnel on-scene and by AREU medical air crew at the scene or during transport (8).

Data Analysis

The Fisher's exact test and the chi-squared test were used for contingency analysis. The Spearman's rank correlation coefficient non-parametric test examined possible correlation between GCS scores and NACA scores. All statistics were calculated using the StatsDirect statistical software (v2.6.6, StatsDirect Limited, Cheshire, UK).

RESULTS

During the study period, 61 pediatric blunt trauma patients (36 MVC and 25 FOC) had HST during peacetime. Seventeen pediatric FI patients were evacuated by helicopters from the combat area. All patients except 1 MVC patient were brought to a Level I trauma center. Table 1 describes patient demographics, NACA scores, and GCS scores.

Firearm injuries were caused by shrapnel from mortar, artillery, or missiles, gunshot from small firearms, or injury from more than one type of weapon. The exact mechanism of firearm injury was not reported by ground medical personnel at the scene of injury and it was not included in the AREU registry.

Table 1. Demographics, Prehospital Injury Severity, NACA, and GCS scores

	MVC (36)	FOC (25)	FI (17)
Patient demographics			
Age (mean \pm SD, years)	9.2 \pm 4.8	14.7 \pm 2	11.6 \pm 3.9
Male/female ratio	22/14	14/11	12/5
Indicators of prehospital injury severity			
NACA score (mean \pm SD)	4.4 \pm 1.2	3.6 \pm 1.2	5 \pm 0.7
GCS on scene (mean \pm SD)	8.9 \pm 5.6	13.6 \pm 4	6.9 \pm 5.3
No. of children found dead on the scene (%)	1 (2.7)	1 (4)	3 (17.7)
No. of children who were dead on arrival at the hospital (%)	0 (0)	0 (0)	2 (11.7)

NACA = National Advisory Committee for Aeronautics; GCS = Glasgow Coma Scale; MVC = motor vehicle collision (children transported from the scene during times of peace); FOC = fall-off-a-cliff (children transported from the scene during times of peace); FI = firearm injuries (children evacuated from fighting zones during times of armed conflict).

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