

Analysis of Medical Aid to Croatian Army Soldiers Wounded at the Front Line

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Objective: Analysis of medical aid to Croatian Army soldiers at the front lines. **Methods:** This investigation concerned 115 severely wounded Croatian soldiers (males, median age 29 years, range 17–57 years) at three rehabilitation institutions. All had been wounded at the front line by various explosive devices or bullets. In the investigation, semi-structured clinical interviews were used. **Results:** First aid was provided to 47 soldiers (40.9%) within 15 minutes and to 44 soldiers (38.3%) within 1 hour. First aid was either self-administered or given by fellow combatants in 55 cases (47.8%), by physicians in 37 cases (23.2%), and by medical technicians and orderlies in 21 cases (18.2%). The basic procedures of medical aid were hemostasis, hemodynamic substitution, immobilization, and analgesia. First surgical operations were performed at health stations on 4 soldiers (3.5%), at war hospitals on 43 soldiers (37.4%), and at evacuation hospitals on 68 soldiers (59.1%). **Conclusion:** First aid either self-administered or provided by fellow combatants is the most important procedure at the front lines before medical aid is administered.

Introduction

The Croatian Army was recruited, built, and organized from a handful of volunteer policeman in 1991¹⁻³ to an organization with more than 200,000 soldiers in 1995 (Croatian Regular Army, Home Defense Force, and Croatian Army Reserve). Military medical service accompanied the establishment of the Army, passing through specific but comparable organizational adaptations,²⁻⁵ reaching a high professional level and providing high-quality service.⁶ During this process, the North Atlantic Treaty Organization military medical doctrine of four echelon levels⁷ has been modified⁸ according to various specific local factors such as the inflow of men and material,⁹ the type of battles,^{1,10-12} and the specifics of the terrain.^{9,10-12} Military medical officials were particularly concerned with immediate medical aid at the front lines, because as the extent of military operations grew, the concept changed from volunteer doctors accompanying the soldiers,¹³ through mobile surgical teams,^{1,4} to classic care for the wounded at established battle fronts.^{6,10,11}

In 1993, the Croatian Army Medical Corps Headquarters for North and Central Dalmatia attempted to gain more information

on the characteristics of immediate care for our soldiers wounded at the front line. A survey was organized among the wounded soldiers in several rehabilitation centers; it comprised a number of questions related to the subject of interest and yielded information on this aspect of military medical care in the developing army.

Subjects and Methods

We surveyed 115 wounded Croatian soldiers during their treatment at rehabilitation centers Kalos (Vela Luka, island of Korčula), Biokovka (Makarska, near the city of Split), and Krapinske Toplice (near the city of Zagreb) after their treatment at university hospitals in Zagreb and Split. They were all volunteer, noncommissioned soldiers and low-ranking officers of the Croatian Army who were wounded during the 1991–1992 war. All had been wounded at the front line. Their participation in the survey was voluntary and anonymous. Their median age was 29 years (range, 17–57 years). All were males of low to middle socioeconomic status before the war. The patients had been wounded by various explosive devices and bullets. An overview of the extent of their injuries¹⁴⁻¹⁶ is shown in Table I. The survey consisted of a semi-structured clinical interview prepared for this study. It consisted of a large number of relevant questions related to implementation of first aid (nonmedical and medical) to the wounded soldiers at the front line. All 115 patients completed the questionnaire correctly. In the 1991–1992 war in Croatia, Croatian forces used two levels of medical care within the combat zone: aid stations and war hospitals.³ Sometimes, within the function of a war hospital, civilian health centers^{3,5,12,17} or mobile surgical teams¹ were used. The third (evacuation hospital) and fourth levels of care were provided by civilian hospitals outside of the combat zone.¹⁸ In any case, first aid, either self-administered or provided by fellow combatants, played a key role in the treatment of the wounded before professional assistance could be administered. The wounded soldiers were evacuated to battalion aid stations, where they were examined by a physician and triaged. The next step was transportation of seriously wounded soldiers to the one of the well organized war hospitals, or outside of the combat zone to an established civilian hospital adapted for military needs, using the doctrine of medical care organized in several strictly defined levels.^{19,20}

Results

First aid was given at the place of wounding (from the front line to the battalion aid station) to 64 patients (55.7%), whereas 51 patients (44.3%) received it at the war hospitals, health centers, or civilian hospitals (Fig. 1).

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TABLE I
SEVERITY OF INJURIES IN 115 CROATIAN ARMY SOLDIERS AT THE TIME OF WOUNDING DETERMINED ACCORDING TO THE ABBREVIATED INJURY SCALE (AIS) SCORE

AIS Score	Number of Soldiers	Percentage
1	0	0
2	3	2.6
3	24	20.8
4	85	74.0
5	3	2.6
Total	115	100.0

AIS score, 1, mild wound; 2, mild wound requiring medical treatment; 3, severe wound, not life-threatening; 4, severe wound, life-threatening; 5, severe wound, close to death.

The means of hemostasis, infusion, and transfusion are depicted in Figure 2. Most of the wounded (101, 81.8%) were immobilized at the front line (Fig. 3).

After first aid was administered at the front line, the main strategy was to evacuate the patients as soon as possible. First surgical intervention was given to 68 patients (59.1%) at the evacuation hospitals, to 43 patients (37.4%) at the war hospitals, and to 4 patients (3.5%) at the health centers. All the wounded soldiers were treated at evacuation hospitals at different times after wounding: ≤30 days, 33 (28.7%); 31 to 60 days, 35 (30.4%); and >60 days, 47 (40.9%). Most of the wounded soldiers (85, 83.9%) had taken a short course on first aid (self-administered and provided by fellow combatants) before leaving for the front line, and these courses were offered several times during a year in barracks at the front line. According to self-reports by the wounded soldiers, short courses on first aid were

regarded as sufficient by 62.6% and as insufficient by 7%; 30.4% of soldiers did not express an opinion.

Discussion

Most of the interviewed soldiers (83.9%) had taken a short course on first aid (self-administered and provided by fellow combatants) before leaving for the front line, and these courses were offered several times a year. This certainly influenced our finding that almost half of the patients had received first aid, either self-administered or provided by fellow combatants. Thus, the policy of the Croatian Army Medical Corps on education of soldiers and officers in first aid was successful.

The high proportion of first aid provided on the front line directly by physicians (32.2%) reflects the transition of the Croatian Army Medical Corps policy from a doctrine of mobile surgical teams to one of echeloned organization of medical care; the former requires the physicians to be close to the front lines.¹ This transition occurred for practical reasons, because the war grew from local incidents with intervention of the Croatian Police forces in the spring to full-scale war in the fall of 1991.² It is also possible that the high proportion of first aid given by physicians reflects the high number of physicians who volunteered to serve in the Croatian National Guard (the 1991 precursor of the later Croatian Army) at the onset of the war.^{2,3,13} The relatively small number of medical orderlies in the Croatian Army at that time was attributable to a generally smaller number of men in this profession and their greater presence in war hospitals and mobile surgical teams.

Evacuation of the wounded was a particular problem, because it was always performed under barrage and because of the shortage of ambulances.¹³ Efficient control of bleeding, immo-

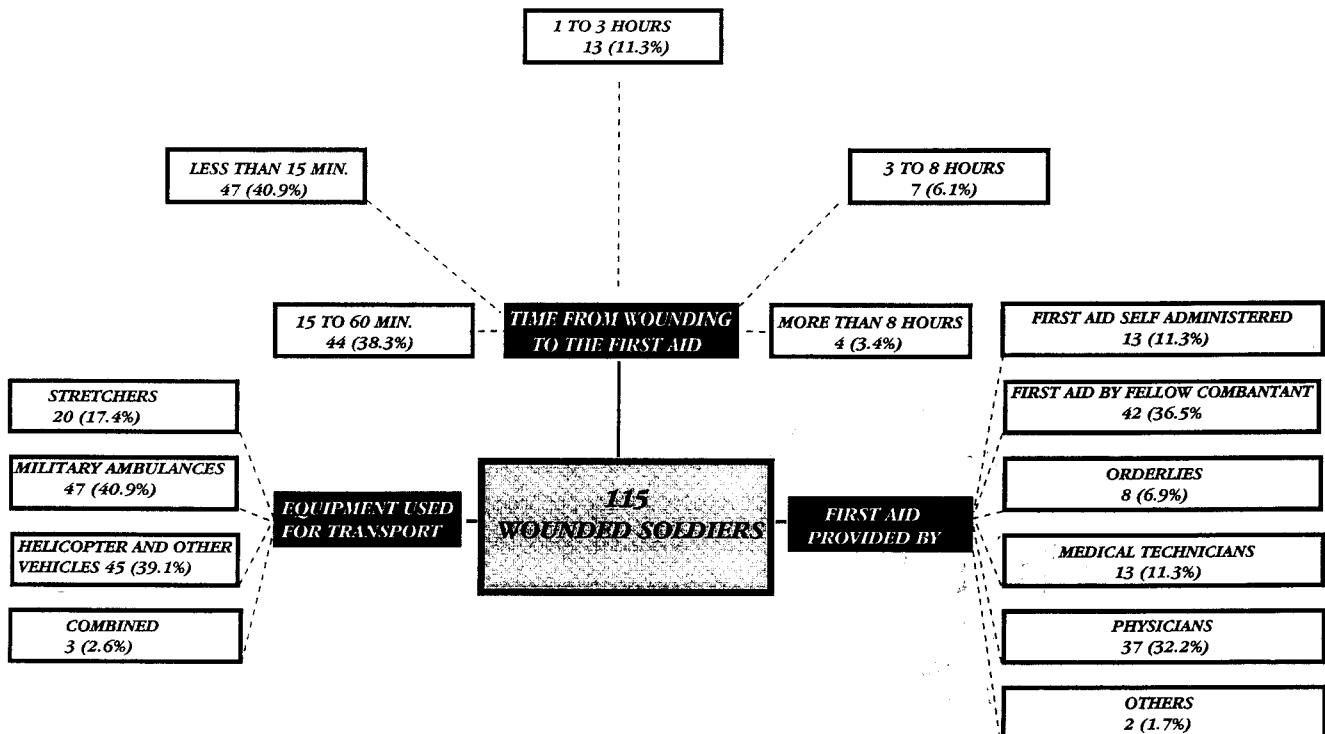


Fig. 1. First aid assistance to Croatian Army soldiers wounded at the front line.

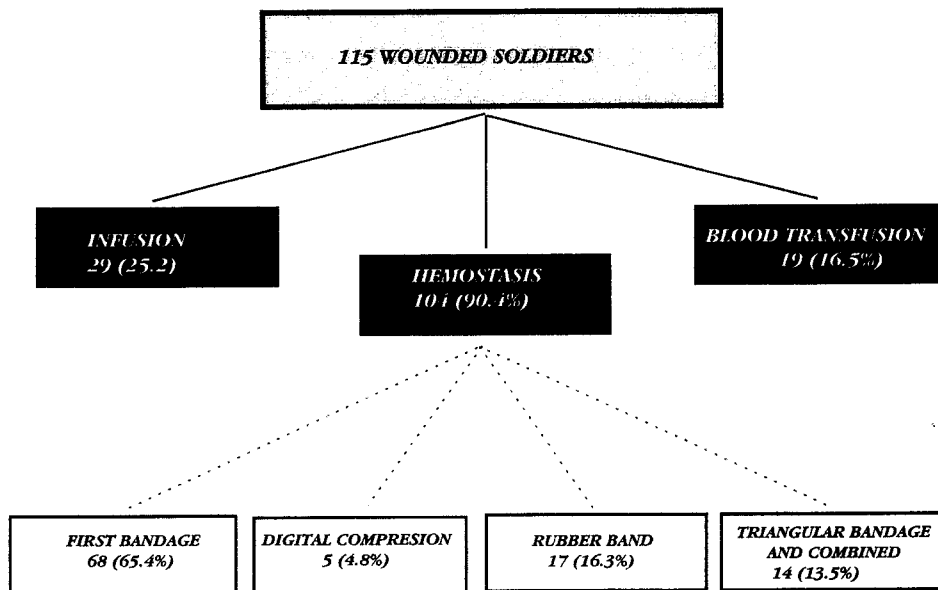


Fig. 2. Hemostasis, infusions, and blood transfusions at the front line.

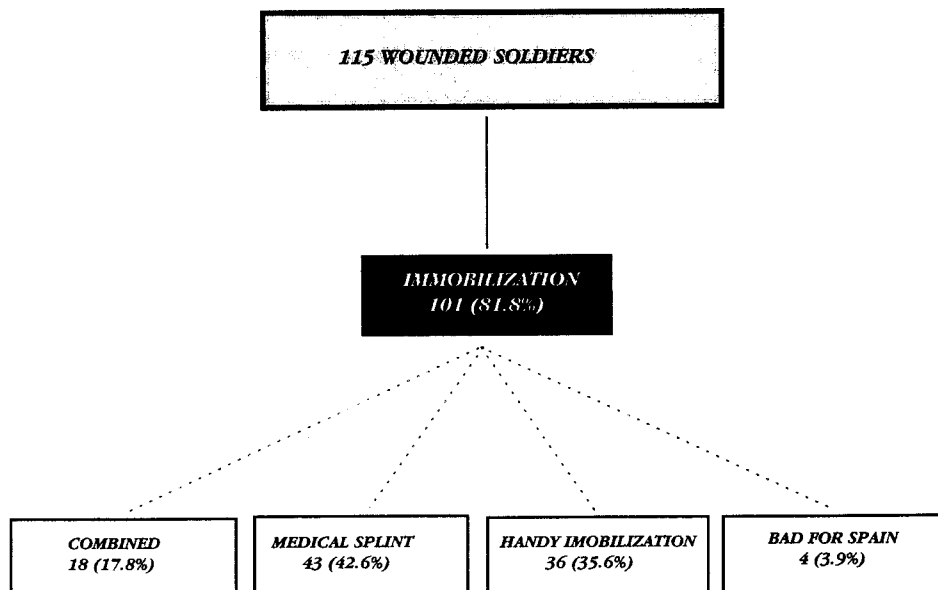


Fig. 3. Different approaches used for immobilization.

bilization, analgesia, and shock prevention were of utmost importance under such circumstances. Furthermore, Belamy and Carey emphasized the importance of early and definitive control of bleeding in the field, showing that most treatable soldiers who die do so because of blood loss from extremity wounds.^{21,22}

Our findings show that simple and easy-to-learn methods such as control of bleeding with digital compression, first-aid bandage, or rubber band can save many lives at the front line.

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