

Combat Casualty Care: A Review on Battlefield First Aid Care Provided to Casualties

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Abstract: *Rapid and systematic chain of care is necessary to improve chances of survival in modern warfare. The first Aid care is an important key role to save life and limb of casualty in combat Zone. Thus, training of non - paramedics' soldier by simulation process and drill can strengthen the first hand care and quick evacuation of casualties. The studies started since World War II and the review of studies related combat care and the gap to improve discussed below.*

Keywords: Combat casualty care, battlefield first aid, buddy aid, tourniquet application, massive transfusion protocol, tactical combat casualty care, golden hour, platinum ten minutes, damage control resuscitation, evacuation, non - paramedic training, combat zone medical support

1. Introduction

First aid is the first and immediate basic care given to any person with either a minor or serious injury, to save life, prevent the condition from further deterioration, or to alleviate sufferings. It includes initial intervention in a serious condition prior to professional, trained medical help being available, such as performing cardiopulmonary resuscitation (CPR) while waiting for an ambulance or evacuation, as well as the complete treatment of minor conditions, such as applying bandage to a cut, application of pressure dressings, application of tourniquet to prevent haemorrhage. First aid is generally performed by someone with basic medical training. First aid is not only provided to improve physical health of casualties but also provided mental support and helps to improve mental strength to the casualties who are at risk of developing post - traumatic stress disorder or psychosis in battle field.

Buddy Aid is the term used in US and Iranian military to describe first Aid delivered by fellow troopers on the battle field. It is a basic first aid only, such as dressing gunshot and open wounds, splinting fracture, providing CPR to the unresponsive soldier, mitigating haemorrhages via tourniquets to prevent death and to protect limbs in battlefield casualties.

CASEVAC from combat zone to FDL and further forwarding casualty to FSC can take longer time in case of bad weather condition, availability of ambulance etc. In that case providing continuing first aid by fellow troops can reduce chances of loss of life and limbs of wounded soldier.

It is important to know about what to do, what not to do, and when to seek medical assistance for fellow soldiers because they are the first hand first aid provider to the casualty at combat zone. A trained non paramedic soldier with basic first aid knowledge can do his level best to keep others in good fighting condition, which is a part of the primary mission to fight or to support the weapons system. So that Most injured or ill soldiers are able to return to their units to fight and/or support primarily because they are given appropriate and timely first aid followed by the best medical care possible.

2. Materials and Methods

A literature search was conducted through PubMed journal, research gate, journal of trauma care and surgery and the key search terms were 'Battle field trauma care', 'combat nursing', 'casualty evacuation', 'combat medicine'. The inclusion criteria for the study was studies concerned with lifesaving first aid performed by non - medicos in pre - hospital trauma care. The exclusion criteria for the study was first aid given by medical professionals or other trained person, intra hospital procedures.

Table 1: Summary of studies reviewed

Study	Reviewed article
Brodie et al. (2003 - 2007)	Tourniquet use for massive haemorrhage control in extremity wounds/amputation.
Walters and Mabry (2003)	Enhanced training in first aid for every enlisted soldier and upgraded 'field dressing' packs to include a tourniquet
T J Hodgetts (1999)	Battle field first aid, a systematic approach for every soldier.
Torben Weisberg et al.	A systematic literature review on first aid provided by laypeople to trauma victims.
Allcock et al (2009)	Massive transfusion protocol
Amber shryer Linde (2006)	The need for pre - hospital simulation training platforms in battlefield medicine. Journal of Trauma and Rehabilitation.
Peter Berggren et al (2015 - 2017)	Battle field trauma care.

3. Discussion

Brodie et al (2003 - 2007), the aim of the study was to determine the prevalence of tourniquet use in combat trauma, the contribution to lives saved and the complications of their use in this environment. The study population was among all casualties treated at UK field hospital facilities in Iraq and Afghanistan and meeting criteria for entry into UK Joint Theatre Trauma Registry (JTTR) from 04 Feb 2003 to 30 Sep 2007. Among 1375 patients met UK JTTR entry criteria for the period specified. 70/1375 patients (5.1%) were treated with one or more tourniquets (total 107 tourniquet applications). 61/70 (87%) survived their injuries. 17/70 (24%) patients had 2 or more tourniquets applied. 64/70 patients received a tourniquet after April 2006, when tourniquets were introduced as an individual first aid item. The study shows severe multiple limbs injury outcome by applying tourniquet is not clear whether it is lifesaving or not but it identified that one or more tourniquets help to control pre hospital external bleeding and helped to prevent hypovolemic shock.

Walters and Mabry (2003), a panel discussion had occurred in August 21 and 23, 2003, St. Pete Beach, Florida. Here the review those issues present a summary of the panel's recommendations. Properly applied tourniquet can be extremely effective means of controlling severe extremity wound haemorrhage. However, there are so many confusion present regarding effective use of tourniquets among soldiers, medics, paramedics. What is an appropriate combat tourniquet (A tourniquet tight enough to occlude venous return but not arterial flow can exacerbate bleeding. A properly functioning tourniquet should be tightened until blood flow stops. Tourniquet tightness must increase considerably as limb size increases.) When is it appropriate to use a tourniquet (If a soldier is wounded under fire, then a tourniquet should be used for any severely bleeding extremity wound. While under fire, the use of direct pressure, pressure dressings, pressure points, and elevation may place the casualty and medic at additional risk of injury. In other circumstances a tourniquet use when not under fire is dictated by the inability to control bleeding by other means and panel emphasized to educate regarding application of tourniquet among all soldiers.) When and by whom should a tourniquet be removed (removal only by senior medical provider) Under what conditions should a tourniquet not be released or removed (Limb salvage: Tourniquet application beyond 2 hours can result in progressive neuromuscular injury. However, we do not know at what point limb loss becomes inevitable. Wolff and Adkins²⁰ reported a number of tourniquet applications of 4 to 6 hours without any apparent deleterious effects. Lakstein et al.⁴ reported 90 cases of tourniquet application in the Israeli Defence Forces and found complications only after 150 minutes, none of which resulted in limb loss.)

T J Hodgetts (1999) this study was conducted on 1st April 1999 among soldiers (non paramedics) regarding knowledge, attitude and skill on first aid of battle field casualties through a master drill and simulation training (The drill contents were care of gunshot wounds, care of unresponsive soldier, breathing difficulty, pain management, burns, bleeding control.) The knowledge, attitude and skill scores total 40, 30 and 120 points. The average of knowledge, attitude and skill

scores before training were at 23.1±3.4, 26.0±3.8 and 45.0±18.0 points, respectively. The average after the training courses were 30.7±2.9, 27.6±2.9 and 100.2±10.1 points. The score differences between the pre - test and post test results were statistically significant ($p < 0.001$). Thus it proves that simulation training and master drill can be effective to improve first aid care in combat zone.

Torben Weisberg et al The study was conducted based on eight studies related to patient outcome and two studies were simulation based. The aim of this study was to review the existing literature on first aid provided by laypeople to trauma victims and to establish how often first aid is provided, if it is performed correctly, and its impact on outcome. Ten eligible articles were identified involving a total of 5836 victims. The proportion of patients who received first aid ranged from 10.7% to 65%. Incorrect first aid was given in up to 83.7% of cases. Airway handling and haemorrhage control were particular areas of concern. In this study due to heterogeneity the conclusion could not be drawn whether first aid provided by laypeople is effective or not. Hence further study is required.

Allcock et al (2009), this study was conducted in the UK Defence Medical Services has developed a Massive Transfusion Protocol (MTP) that forms part of the initial Damage Control Resuscitation process for severely injured combat casualties. The key objectives of this retrospective review of MTP recipients are to document the survival rates, level of critical care support required and the blood components transfused as part of the Massive Transfusion Protocol in Afghanistan during 2009. In addition to providing a measure of our current effectiveness it should also provide a reference point for future reviews as the MTP continues to evolve. This was a collaborative project involving the Royal Centre for Defence Medicine and the Critical Care Department, University Hospitals Birmingham. It was limited to UK military personnel who were injured in 2009 and received massive transfusions (defined as the transfusion of 10 or more units of packed red blood cells over a 24 - hour period) at Camp Bastion Role 3 Medical Facility, Afghanistan. During the 12 - month period, 59 personnel received massive transfusions. 51 (86%) personnel survived to be discharged from hospital in the UK. 48 (92%) personnel required ventilatory support for a median of 3 (2 - 8) days. The longest period of ventilation was 40 days; 29 (55%) personnel required vasopressor support and eight personnel (15%) required renal replacement therapy. The median total transfusion of blood components was 45 (28.5 - 62) units. There were seven transfusions of more than 100 units. Five of the personnel in this group (including the recipient of a 237 - unit transfusion) survived to be discharged from University Hospitals Birmingham. On average, 1.21 (SD 0.28) units of packed red blood cells were transfused for every unit of fresh frozen plasma. The use of the current MTP was associated with a high rate of survival. Survivors require a continuity of critical care with a median demand for 3 days. The early use of plasma and platelets can be successfully delivered in the battlefield despite operational and logistic constraints.

Amber shryer Linde (2006), this study was held on tactical combat casualty care. According to them approximately 20% of all battlefield deaths are hypothetically preventable.

Tactical Combat Casualty Care (TCCC) training provided to units has been shown to reduce numbers of preventative deaths. They had emphasis on two concepts for shifting casualties from combat zone (a) Golden hour (b) Platinum 10 minutes' patients, was implemented. "Golden Hour" (transferring a patient in 60 minutes or less to a medical trauma treatment facility) whereas "Platinum Ten Minutes" (ability to assess, initiate treatment and transport the patient within 10 minutes of a Place of injury) address the urgency of trauma care and the push to eliminate all preventable deaths on the battlefield. In 2006, a protocol known as Damage Control resuscitation, which shows how blood components were provided to haemorrhagic casualties to prevent deaths and it was effective to improve preventable deaths. However, the Golden Hour requirement did not affect the number of those who died from their wounds.

Peter Berggren et al (2015 - 2017), the study discussed about expanding knowledge of how the battlefield trauma care affects patient outcome in situation with a large number of casualties in the Swedish armed forces. An empirical study with a convergent parallel mixed methods design, which included observations and semi - structured interviews. The result shows that there was deficiency in transportation of casualty from role 1 to role 2 unit. Thus improvement of logistic support required to improve medical facility in Swedish Arm forces.

4. Conclusion

The main goal of trauma care is to prevent any re - trauma to the affected part which can worsen the condition and ongoing basic first aid till the trained medical facility arrives. The outcome of wounded victim depends on how the first Aid provided at the combat zone, condition of casualty while it reaches to the FSC and the process of evacuation and transfer without further damage. This is a chain of care, where care in every step can prevent loss of life and limbs or permanent disabilities. So, strengthening of 'Buddy Aid' is necessary by providing simulation training programme and master drill among non - paramedic soldiers. In above mentioned studies further efforts are required on improvement of logistic constrains and transfer deficiencies to get a better outcome in the field of combat care.

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