

Time-Critical Decision Making in Casualty Care during Special Operations – A Proposed Tactical Combat Casualty Care (T3C) Flowchart-System as a Learning Tool

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SUMMARY

The in Tactical Emergency Medical Support interested but civilian anaesthetist author tried to create an algorithm for the management of casualties in tactical setting. During this work was he confined over the current civilian pre-/hospital trauma textbooks only to the freely accessible printed and electronic military sources.

An electronic correspondence with two experts of this topic [Col.(ret.) Clifford C. Cloonan MD, FACEP and Capt. Frank K. Butler, Jr, MD] pointed out that the traditional civilian emergency medical approach is suitable for this case only with important restrictions and modifications due to necessities of the special operations. Their advises have changed from an originally pathophysiologically oriented, strictly designed, and slightly complicated algorithm to a more practical, loose and simple flowchart.

Unfortunately there is not any official and organized interest in Hungary for TEMS, therefore the author can't report concrete results but he would get gratefully any feedback from the professional providers.

1.0 INTRODUCTION

The Combat Casualty Care is perhaps the most exciting type and biggest challenge of the pre-hospital emergency medicine. The injury management during special operations could be even more complicated than in conventional warfare (e.g. need for an advanced but covert trauma care because of the permanent tactical threat, by a non-physician provider with spread function, with remarkably limited sources, until an extremely delayed evacuation, mission's concern etc.). [1]

1.1 Time-Critical Decision Making (TCDM)

The term of TCDM derives from informatics. Originally it covers merely those decision processes where the state of the object is permanently changing and the end-state depends on the time of the right decisions. The management of an seriously injured casualty [2] — especially in tactical setting — is its excellent example: critically *important decision*, within a critically *short time*, under critically *difficult circumstances*).

1.2 The Role of the Flowcharts in the Emergency Medicine

During the solving of problems we try often to reduce them from difficult to a simple 'yes/no'-pattern. If we can weight the problems and find the right priority, we can easily manage even life-threatening medical problems (e.g. BLS in cardiac arrest). At least from educational reasons is advisable to make

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simple flowcharts even for non-physician medical personnel to memorize the right sequences of these important tasks, even if it seems to oversimplify the problem.

1.2.1. Basic Life Support Algorithm (BLS)

The Peter Safar's ABC of Life Saving (i.e. Airway–Breathing–Circulation) is since 1960 the standard of the basic level cardiopulmonary resuscitation. The *International Liaison Committee on Resuscitation* uses since 1997 BLS–flowcharts. The current BLS–Algorithm of the *Hungarian Resuscitation Council* [3] shows a good example of a decision aid.

1.2.2 Flowcharts for Management of Seriously Injured Casualties

The use of algorithms in critical care (including trauma management) is associated with the scientific activity of William C. Shoemaker [4]. One of his European follower, the German trauma surgeon Karl–Georg Kanz makes excellent flowcharts about both pre- and hospital trauma care [5]. According its philosophy was based the original version of the T3C–Algorithm on it. The recent (5th) edition of PHTLS — Basic and Advanced Prehospital Trauma Life Support textbook contains didactic flowcharts too.

1.3 The Medical Problem

The management of major traumas is unfortunately not so simple as the BLS. Instead of successive 'step-by-step' approach are often simultaneous interventions necessary; as well as is the classic A–B–C sequence often only theoretically the best answer.

1.3.1 Current Advanced Trauma Life Support Programs

Although have the existing various Trauma Life Support education programs essentially similar ideology, they are not always to interchange.

1.3.1.1 Hospital vs. Pre-Hospital Approaches

The classical Advanced Trauma Life Support™ approach is suitable only for the treatment in hospitals. Its prehospital derivatives (such as the Prehospital Trauma Life Support™ and the Basic Trauma Life Support™) concern in treatment at the scene of trauma without enormous additional danger but with relatively good logistical background (medical material, equipment, rapid transport and appropriate receiving facility). Although all the three programs can be a part of the military medical curriculum, they are not a real solution for the battlefield casualties.

1.3.1.2 Civilian vs. Military Community

Also some Armies have own trauma programs of different level (e.g. Combat Lifesaver Course, Trauma AIMS, Battlefield Advanced Trauma Life Support™ [6] etc.). These courses covers then either the Self-/Buddy–Aid or the +2nd Echelon Care. For lack of an appropriate solution for the Special Operations wrote Butler, FK jr. et al. their famous and often cited article about the *Tactical Combat Casualty Care in Special Operations* [7]. The analyse of the SOF casualties wounding and given treatment provides the scenario–base of training for further SOF–medics. [8;9]

1.3.1.3 European vs. American View

There are some differences in the prehospital trauma care policy between USA and Europe, as well as among the European countries (e.g. equipment supply and skill competence of provider, physician presence at the scene, treatment's time restriction, accessibility of Level I/II trauma centres, trauma epidemiology etc.).

1.3.2 Evidence Based Medicine (EBM)

In time of EBM is the lack of scientific evidences particularly troublesome. The traditional prehospital emergency medicine is rather ‘common sense’-based and the apparently logical answers could be debated even on base of results provided by necessarily restricted combat casualty care. Unfortunately it is very difficult to make scientific investigations in prehospital, even in combat setting.

2.0 THE T3C FLOWCHART-SYSTEM

Though is the current version of the T3C-Algorithm approximate to the other usual civilian and military pre-/hospital trauma treatment guidance, is it based on Tactical Combat Casualty Care [1;7–9].

2.1 Structure

The main flowchart (Figure 1) follows the classic triple division of the treatment according to the tactical situation (Care Under Fire, Tactical Field Care and Tactical CASEVAC). In its perpendicular axis align the questions. The symbols with double frame could be opened into separate sub-algorithms. The decisions are supported with various check-up lists and matrices.

2.1.1 Care Under Fire Phase

The upper half depicts the first tasks supplemented by additional flowcharts (an operational risk assessment and management algorithm for the tactical extrication; a Simple Triage and Rapid Treatment™ like or other type solution for multiple casualties and a flowchart about the use of tactical tourniquet).

2.1.2 Tactical Field Care and CASEVAC Phase

For the recognizing of a significant injury requiring an immediate treatment was assembled a specially modified ABC as a mnemonic. Its categories are simple to judge without any instrument even by a non-medic. At the same time — if advanced equipment present (e.g. portable vital sign monitor, continuous vital sign sensing) — is the loose diagnostic framework easily to augment.

2.2 The Part of Advanced Trauma Care

At the bottom of the flowchart are shown parallel the allusions to the advanced supportive treatment. The circulatory support remains centred: after the possible stopping of life-threatening external bleeding helps a left-to-right shift (from E to C) the stabilization. Without a rapid CASEVAC has a demand for advanced respiratory support — caused by either a permanent severe hypotension despite the appropriate volume replacement or a serious traumatic brain injury — a very bad prognoses and poor chances for the casualty in a tactical setting.

2.3 Available Sub-algorithms (not shown here):

2.3.1 Chest Decompression at Suspected Tension Pneumothorax

2.3.2 Airway and Ventilatory Management (with emphasized using of supraglottic airways)

2.3.3 Cervical Spine Clearance and Immobilization

2.3.4 IV/IO-Access

2.3.5 Fluid Replacement — with a 3-D Combat Fluid Matrix

2.3.6 Treatment of the Sceletomuscular Injuries

The Flowchart-System with its cross references as a learning tool is currently for presentations purpose only but with a supervised, validated content and in an appropriate format (e.g. PDA) could it be perhaps a real-time decision aid too.

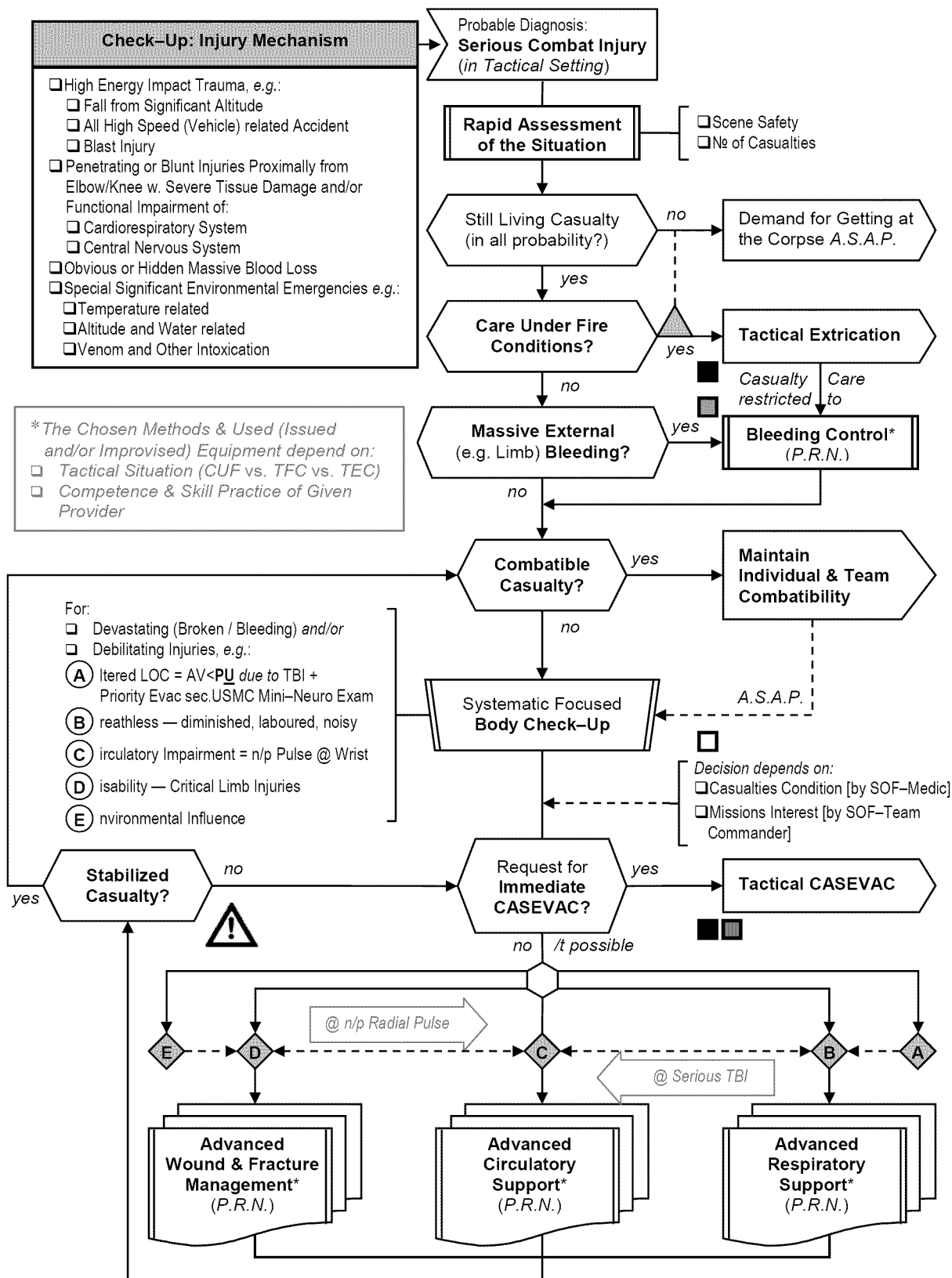


Figure 1: The Proposed T3C Flowchart (Main Algorithm)

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