

Advanced Medical Know-How for servicemen in battlefield

by Dr. André R. Plass

1. Background

A healthy body system is an essential platform for optimal functioning in critical situations. The anatomical, as well as physiological understanding of the body, is critical to the inclusive influence of external factors such as food, stress and trauma. The fast and adequate reaction in an emergency situation caused by trauma is important not only for survival but also for immediate and long-term outcomes that can shorten rehabilitation periods and help prevent long-term damages (Image 1.).



Image 1. War zone injuries require immediate and optimal treatment adapted to situation and constellation

2. A novel approach for modern emergency healthcare

The classical medical first aid guide and cardiopulmonary resuscitation (CPR) are expected as common “know-how” by non-medical specific trained individuals. For servicemen the spectrum is wider and they learn additional techniques like primary care of bleeding by placing a tourniquet (Image 2.) or field tracheotomy by pen (Image 3.).



Image 2. Combat Application Tourniquet® (C-A-T®)



Image 3. "Field expedient" simulator to practice making a surgical airway: an emergency procedure used if a casualty cannot breath (tracheotomy)

Usually, after an incident or injury, a medical doctor is not present or “on-ground”. Before any medical staff is available, transportation is necessary which has to be prepared professionally (Image 4.). The first aid “on-ground” is highly important. It must be adapted to the situation and constellation, especially in a warzone, and must consider the knowledge as well as know-how of the servicemen taking care of the injuries.

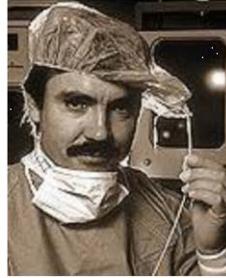


Image 4. Professional transportation to healthcare institution

It is crucial to understand that medicine, research in healthcare and the development of new technologies are not static, it is in continuous movement. This should be considered in the education of medical as well as non-medical individuals. Not all existing opportunities are employed because the knowledge about new technologies, the know-how and the training are missing or unknown. The important role of non-medical educated individuals for first aid is often mentioned but still underestimated in certain levels. For civilians it is acceptable to have basic requirements with little need for updates or continuing instruction. For soldiers the basic medical education program should be much broader, not in details, but for improved general understanding of medical basics as well as the use and handling of technologies including regular updates. New healthcare technologies in the fields of diagnostic as well as treatment offer possibilities which should be not ignored but efficiently used. Continuous education is necessary to update the know-how and skills, and to prevent stagnancy in emergency treatment by non-medical military individuals. Non or minimally invasive techniques and technologies for diagnostic and therapy can be used and applied in nearly all situations. New imaging and diagnostic modalities have been developed which are of small size (→ easy transportation), non-invasive and offer excellent image quality (→ easier to read/understand). Other minimally invasive treatment techniques include catheter/Seldinger techniques which offer a continuous larger spectrum to place different devices (Image 5.).



Werner Forssmann
1929 first catheter in heart



Andreas Grüntzig
1974 first PTA



1953 first publication
of the Seldinger Technique

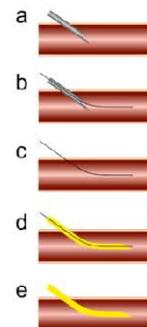
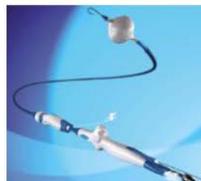
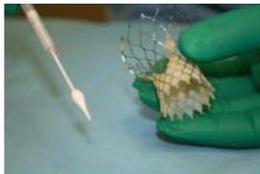


Image 5. Based on the Seldinger technique and catheter combined with imaging, it is possible to place different stent technologies exactly in specific body regions

An example for latest stent technology is the endoluminal occlusion device of the ArtVentive Medical Group Inc. (Image 6.), which can be placed via Seldinger technique in the target vessel to stop bleeding in case of injury. Compared to the use of tourniquet it can be possible to prevent certain collateral damage which could even lead to a loss of a complete limb.

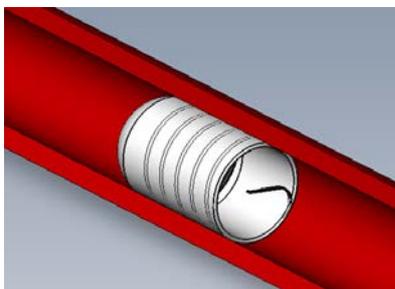


Image 6. The Endoluminal Occlusion device is consisting of a Nitinol scaffold with an ePTFE occlusion cap. It can be placed in arteries as well as veins

For portable imaging one of the best examples is the ultrasound. Starting as huge engines ultrasounds were done with a patient partially submerged in a tank of water. The transducers have been made smaller with improved image quality and gel is used instead of a tank of water. Machines the size of a laptop and even smaller can create high quality images. The technology can even be connected to smartphones which can enable image transfer from all over the world.



Image 7. Portable ultrasound engines become smaller and smaller with very good image quality. The connection with smartphones enables worldwide access to the images

3. The Lockheed Martin Advanced Healthcare Training for Servicemen

Inclusive with the already existing healthcare education program Lockheed Martin can offer a new type of workshop specifically designed for military servicemen organized as an interdisciplinary project group.

- ➔ **Optimized Basic medical understanding**
- ➔ **Advanced Handling of Healthcare techniques and technologies**
- ➔ **Use of Telemonitoring**

The continuous progress in Healthcare includes devices for diagnostic as well as treatment. A very good example in daily life for progress of medical technology is the access and use of defibrillators. In the past defibrillators were only be used by qualified medical staff. Today they can be used by non medical individuals to react in emergency situations in response to heart arrest, where previously only manual CPR was available. The technical progress made the usage much easier to understand allowing non medical qualified persons to be able to use such a device in emergency situations (e.g. in subway stations). This well indicates that technical progress should be not ignored as it opens doors for a wider spectrum of users. The target groups are not the medical specialists in military services, but active soldiers in warzones who would find themselves in situations requiring fast reaction and medical treatments that are crucial for morbidity and mortality. It is necessary to perform a shift in responsibilities and possibilities of applications that is also dependent on specific situations and scenarios; the warzone cannot compare to a hospital in a regular environment.

Soldiers will learn basic medical understanding, not only to understand certain mechanism but also to correlate this knowledge with a bigger picture.

Soldiers will learn to differentiate between diagnostic and therapy, especially to use technologies and techniques to perform.

Scenario 1: Diagnostic + urgent therapy (Therapy: Save Life /Stabilize/ Secure)

Scenario 2: Diagnostic + Telemonitoring + potential therapy

Echocardiography can be one of the major tools; it is mobile (transport everywhere), real-time, can be used for diagnostic as well as navigation for all body regions.

The workshops will be in different stages/ levels:

Stage I: Understanding of medical basics including anatomy and physiology /the role of technology in healthcare

Stage II: Understanding of diagnostic basics including body examination and imaging techniques

Stage III: Understanding of basic handling of diagnostic and treatment tools

For sustainable quality continuous update education and fresh up courses are necessary.

Next steps:

Discussion and identification of opportunities and synergies.

Analysis of feasibility.

sig. Nov 2012 Dr. André R. Plass