Hemotherapy in the Norwegian Armed Forces

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For decades, standards for blood transfusion in the field have shifted due to logistical constraints combined with identified problems regarding the transmission of infections, immunizations, and depletion coagulopathy. A directive for hemotherapy in the Norwegian Armed Forces was issued in 2008 to ensure that military transfusion standards are comparable to civilian standards.

Blood products, supplied from Norway, only are given at surgical installations. Solvent-detergent-treated fresh frozen plasma (Octaplas®) blood group AB, kept at -20°C), is used to secure concentrations of coagulation factors. Thawing takes 20 minutes. Freeze-dried fibrinogen is optional. Recombinant coagulation factor VIIa (NovoSeven) is available.

Leukocyte filtered erythrocyte concentrates of blood group O in SAGMAN solution, transported and kept at 4–8°C, are used to secure adequate oxygen supply. Fresh whole blood (FWB), donated *ad hoc* by blood grouped personnel and pretested for transmissible diseases, is the only source of thrombocytes. Two units of blood group O can be given regardless of the recipient's ABO group. If more are required, cross-matched units of the recipients own ABO are preferred.

Hemostasis-promoting products start early, administrating SAGMAN and Octaplas® as close to a ratio of 1:1 as possible. Octaplas® is thawed immediately when the arrival of an acutely bleeding patient is announced. If bleeding remains out of control after 4 units of SAGMAN, NovoSeven is given (90 microgram/kg/body weight, single dose), simultaneous FWB donations should be initiated.

Fresh whole blood contains leukocytes, which may induce transfusion-associated lung injury (TRALI), transmit viral genomes, and induce immunization against HLA antigens. As all European nations comply with the European Blood Directive, European allies might supply blood products to each other when needed, taking advantage of, for example, the Dutch and the British system for the supply of active thrombocytes.

Keywords: fresh whole blood, hemotherapy; transfusion standards
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Lessons Learned from Terrorist Attacks

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The Disaster Medicine Center, "Zaschita", is a chief coordinating center of the Health Ministry with the general goal of management and medical relief delivery in response to emergencies. The objective of this study is an analysis of all Disaster Medicine Center activities in complex emergencies and in medical relief delivery in terrorist attacks.

Medical staff of the Russian Disaster Medicine Service has responded to emergencies complicated by local military conflicts and by terrorist attacks. The absence of sufficient information, time necessary for deployment of a hospital, and decision-making on the upper level of management complicated the delivery of emergency medical care to the affected, injured victims during the emergency events and their aftermath.

One of the specificities of major terrorist attacks is a total or partial destruction or insufficiency of local medical facilities (Chechen Republic, Budennovsc, Beslan, and Tschinvali). The mobilization and air transportation of medical products, medical staff, and mobile multi-profile hospitals are detailed during a limited period of time. The collaboration of Emercom is accentuated on-site. The field hospital deployment is prepared on-site by local facilities. The security procedures are accomplished by special teams of the Internal Affairs Ministry. The majority of the injured are evacuated to the nearest regional hospitals after being primary treated on-site. The mechanisms, schemes, and procedures of air evacuation are analyzed.

A probable scenario of the situation in progress is to be the base of the response plan for immediate medical care delivery. The disaster response plan is to be prepared for any potential conflict or terrorist attack.

Keywords: lessons learned; Russia; terrorist attack
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Psycho-Physiological Approach in Health Evaluation and Certification

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Introduction: The selection and training of medical staff preparedness for the accomplishment field activities in emergencies requires a set of quantitative methods. The complex psycho-physiological approach requires the application of tools for the selection and preparedness at the psychological and professional levels. The goal of this study is to introduce into the original system of the computer instruments for the staff selection procedure, a battery of new methods for staff mental preparedness.

Methods: A battery of instrumented, quantitative evaluation methods is proposed for the study and use in laboratory and field conditions for emergency medical staff preparedness and psychological support. The methods are underlined by complicated, bilateral, sensorial reactions in modeled conditions of ipsi- and contra-lateral visual deprivation and conditioned environment on a computer screen. In the conditions of the experiment, the mechanisms of integrative factors regulating the characteristics of hemispheres asymmetry are evaluated and managed as a result of the specific procedures of influence. The conditions of selection and ultimate correction, if necessary, are determined as a result of preliminary professional preparedness and initial mental status. The methods battery is completely objective based on the quantitative criteria. The selection procedure dos not include any subjective evaluation step or any questionnaire.

Conclusions: The method battery is registered in the National Register of Patents and Inventions. The results

could have implications for search-and-rescue teams, medical emergency teams, and other hazard profession staff.
Keywords: certification; medical staff; phsycho-physiological; training
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Seven Day Storage at 4°C of Previously -80°C Frozen AB Plasma

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Background: The Netherlands military mainly uses deep frozen (-80°C) blood products to support operational medical care. Thawed red cells can be stored for 14 days at 4°C, and are directly available for transfusion, whereas -80°C (refrozen from thawed -30°C) AB FFP must be thawed first for 30–40 min. The possibility of extending the shelf life of this thawed plasma to make both products directly available for damage control resuscitation in trauma patients with (massive) blood loss was studied.
Methods: Apheresis leukodepleted AB plasma (n = 42) were frozen at -30°C, quarantined, and released after repeated donor testing. On average, units contain 296 ±14 ml of plasma and have been stored at -30°C for 316 ±20 days. The units were thawed in a water bath at 37°C (Type 2032, Forma Scientific) repacked, frozen, and stored as deep frozen plasma (DFP) at -80°C for 20–40 days, before the final thawing procedure. Each day, before sampling, the units were inspected visually. Samples were drawn into sample pouches using sterile techniques, after thawing from -30°C (Day minus 1), from -80°C (Day 0), and after storage for 5, 7, and 14 days at 4°C respectively. Samples were immediately processed and APTT, PT, INR, fibrinogen, FV, FVII and FVIII were measured within 4 hours, using an automated coagulation analyzer (Destiny Amelung plus, Trinity Biotech).
Results: Apart from a slight prolongation of the APTT, no significant changes were observed when plasma was refrozen and thawed from -80°C. During subsequent storage at 4°C, only the activity of FVII remained stable. Fibrinogen decreased after 14 days of storage, whereas Factor V and VIII decreased after only 5 days of storage. There was no significant difference between 5 or 7 days 4°C stored units. The appearance of the majority of the thawed DFP units changed after 7–14 days storage at 4°C from clear into more turbid solutions, and sometimes even with clots.
Conclusions: All units contained more than 50 IU/dL FV, FVII, FVIII on Day 7 and had a normal APTT, PT, INR and fibrinogen concentration. In May 2009, a maximum storage time of seven days at 4°C of -80°C refrozen AB plasma was implemented, making this thawed plasma readily available together with thawed red cells for damage control resuscitation in combat casualties.
Keywords: blood products; frozen AB plasma; storage; thawed plasma
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-80°C Red Cells Plasma and Platelets in Combat Casualty Care

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Background: Since 2004, the Netherlands military mainly uses -80°C frozen blood products to cover operational needs. The experiences with these products based on data collected from two NLD blood bank facilities in Afghanistan during the past 33 months are described in this study.
Methods: Apheresis leukodepleted group O platelets in 5% DMSO/plasma are frozen as a concentrate (±15ml) at -80°C. After thawing, the platelets are resuspended in thawed AB plasma, to be used within six hours. Apheresis leukodepleted AB plasma is thawed from -30°C, repacked and frozen to -80°C before the final thawing procedure. Red cells from leukodepleted group O whole blood are frozen at -80°C in 40% (w/v) glycerol. After thawing and deglycerolization, the red cells are stored for no longer than 14 days at 4°C in AS3, before use. All thawed (and washed) products are in compliance with international regulations and guidelines.

All frozen products are produced in the Netherlands, shipped at -80°C (dry ice), stored in theater at -80°C, thawed on demand (all products) or for liquid storage (red cells). Occasionally, standard liquid red cells are sent from the Netherlands as a supplement, to cover periods of (expected) higher usage.
Results: During the past 33 months, 533 patients (85% Afghan) were transfused with 533 units of standard liquid red cells and 3,380 frozen blood products (1,360 red cell units, 1,425 plasma units and 595 apheresis platelet units). On one location, where all blood products were provided by the Netherlands Military Blood Bank, blood usage and survival were further analyzed. It showed that >90% of the transfused patients were trauma victims, of which, 14% (30 out of 209) required >10 red cell units within 24 hours. In these massively transfused patients, survival improved from 44% (n = 16) to 85% (n =14) after the introduction of a new transfusion policy in November 2007 (1:1 red cell to plasma ratio, with or without platelets). No shortages or transfusion reactions were reported.
Conclusions: Fully tested, frozen blood products, readily available after thawing, proved to be an effective and safe blood support for combat casualty care. A 1:1 red cell to plasma ratio appeared to increase survival in MT patients, also when only -80°C frozen blood products were used.
Keywords: combat casualty care; frozen blood products; storage; thawing
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Establishment of NATO Trauma Registry—A Joint Project within the NAT Framework

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In 2004, the Human Factors and Medicine (HFM) panel of the NATO research and technology organization (RTO) arranged a symposium on combat casualty care in order to address the problem of combat injuries in joint operations. The symposium was held together with the American yearly