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Adaptability of the Revised Trauma Score in Urgency Classification

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It is suggested that the application of the Revised Trauma Score (RTS) of Champion et al during triage in the event of a large number of field casualties. The classification into four urgency classes, as presently is advocated in the Netherlands, can be very problematic for the physician who must choose between the casualties within Urgency Class 1 (T1). A method to further differentiate within T1 will ensure this decision. After a description of the various trauma scores and their application, the adoption of the RTS is taken into consideration. This method should avoid time consuming physical examinations and mathematical calculations. Therefore, the T-classification has been divided into four urgency groups (G1–G4) based on the probable survival of the casualties, as described by Champion.

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A New Approach to Trauma Assessment

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Introduction: Most major emergency medical services (EMS) textbooks and training programs in the United Stated stress rapid transport and short scene times as the standard of care for the management of major trauma. However, very little guidance is given to prehospital providers as to how best to accomplish this goal.
Objective: To teach paramedic students to minimize scene time by stressing teamwork and prioritization in decision-making.
Methods: In addition to a brief primary survey, paramedic students were taught to make all decisions regarding patient care by evaluating mechanism of injury, severity of injury, immediate life-threats, barriers at the scene, available personnel, and transport time. The students also received training in risk/benefit ratios of various prehospital procedures. Then, they were evaluated subjectively by senior instructors and by the medical director on their ability to use these concepts, and to assess and care for trauma patients under simulated conditions.
Results: The vast majority (52 of 53; 98%) of the students were able to learn this new system and demonstrate appropriate assessment and management of simulated trauma patients under a variety of rural and urban conditions. Using this approach, prehospital trauma care was individualized to each patient's particular condition and situation.
Conclusions: Paramedic students can be taught to use rational methods to assess and care for trauma patients by taking into account a variety of logistical factors and establishing priorities for their treatment decisions.

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Physician Performance in Military Trauma Care: Field Quality Assessment

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Introduction/Objective: The study reports on the Israel Defense Forces Medical Corps' initiative to examine the feasibility and validity of various methods to assess physician performance in military trauma care.
Methods: The methods included were: a) debriefing by a senior traumatologist who also evaluated the physician; b) self-assessment by the medical officer; and c) written test. Five senior traumatologists experienced in military trauma were trained to perform the assessment within 24-48 hours of the occurrence of an incident in which sustained moderate to severe trauma injuries were observed.
Results: Seventy-five physicians who had been involved in the field care of trauma patients were assessed. Analysis of the results identify two domains for assessment: 1) knowledge; and 2) performance. The best method found for evaluating knowledge was the written test, not the peer review. However, traumatologist evaluation is a suitable method for assessing the performance of care and is highly correlated with the physician's self-assessment.
Conclusions: For a comprehensive assessment of field care, it is advisable to integrate the two methods: performance reviewed by an expert with a written knowledge test. In the future, the information gained from the assessment could improve the planning of in-service trauma training.

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"Suspended Animation" Research for Otherwise Infeasible Resuscitative Traumatologic Surgery

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Background: Bellamy (U.S. Army Medical Research) suggested studies into "suspended animation" with drugs for use in the field. "Suspended animation" for resuscitative surgery under total circulatory arrest with hypothermia (Hth) was studied. This is meant for use of surgical resuscitation teams of (mobile) ICUs or emergency (field) hospitals, when victims with "uncontrollable" exsanguinating hemorrhage reach pulselessness.
Methods: In five sequential studies on 55 dogs, a new dog outcome model of hemorrhagic shock and emergency cardiopulmonary bypass(CPB)-induced circulatory arrest with Hth and blood washout was used. Recirculation and rewarming also were used with CPB.

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Results: In study #1, after circulatory arrest of one-hour in deep Hth (15°C), recovery was complete, even with histologically almost normal brains. In study #2, after arrest of two hours in profound Hth (±10°C), functional and morphologic cerebral recovery were better than after two hours arrest with deep Hth (15°C). In study #3, adding washout with an organ preservation solution did not improve outcome further. Results were not worse in study #4, with avoidance of systemic heparinization (by heparin-bonded CPB circuit); nor in study #5, in which hemodilution was only to Hct 15%, not 5% as before.

Conclusions: Clinical trials in selected cases of resuscitative surgery under CPB-induced profound hypothermic arrest of one hour are justified.

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Blood Lactate: An Improved Marker of Injury Severity and Outcome in the Triage of Multiple Patients Following Traumatic Injury

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Introduction: Blood lactate has been shown to reflect the severity of tissue hypoperfusion and thus predict survival in shock states. The initial lactate level may be used as an objective measure of prehospital traumatic shock and independently predict injury severity and mortality.

Methods: Data were collected on 4,367 adult trauma victims admitted directly to a Level-I trauma center over a two-and-one-half-year period. Serum lactate was measured pre-resuscitation on admission.

Results: Patients were placed into one of five groups based on serum lactate and compared with respect to Injury Severity Score (ISS) and Mortality (MORT). The lactate groups predicted increasing intergroup differences for ISS (p <.001) and decreasing Glasgow Coma Score (GCS) and Trauma Score (p <.05). Controlling for age, ISS and GCS, there was a significant association between lactate and mortality (p <.001). Lactate had a stronger correlation with both injury severity and mortality (r = .36) than do admit vital signs, blood pressure and heart rate (r = .14).

Lactate (mMol/l)	N	ISS*	GCS*	Mortality (%)*
<2.0	1572	8.2	14.7	1.0
2.1–4.0	1992	14.0	14.0	3.3
4.1–8.0	663	23.7	12.0	16.1
8.0–12.0	91	31.1	9.6	38.5
>12.1	49	37.5	8.6	57.1

*Intergroup Differences p = .05

Conclusions: Lactate can be used as a rapid, independent prognostic indicator of injury severity and mortality for the triage of trauma victims. Lactate levels are much more reproducible and do not depend on level of medical training or experience of the care provider. Advances in lactate analyzers have made prehospital use feasible with levels available in less than 90 seconds. Lactate should be used in disaster triage.

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Brain Trauma by Epidural Brain Compression Canine Outcome Model: Prolonged Resuscitative Moderate Hypothermia

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Objective: The first study with of epidural brain compression dog model revealed that post-insult hypothermia (Hth) of 31°C for five hours (h) prevented secondary intracranial pressure (ICP) rise, but subsequent 35°C did not. The incidence of delayed brain herniation was the same after normothermia versus hypothermia. For this second study, it was hypothesized that Hth of 31°C for 48 h and slow re-warming can prevent brain death.

Methods: Twenty-one dogs were anesthetized with N_2:O_2-halothane, and paralyzed with pancuronium. Ventilation was controlled to 72 h. The insult was produced by epidural balloon inflation to ICP 62 mmHg for 90 min. After balloon deflation, intensive care was continued to 96 h. Group I (n = 10) received surface cooling from 15 min of balloon inflation to core T 31°C, which was maintained to 48 h. Rewarming was from 48 to 72 h.

Results: Nine of 10 dogs in Group I and eight of 10 dogs in Group II followed protocol. After balloon deflation, mean ICP increased to 20 mmHg in Group I at a mean of 2 h 30 min and in Group II at a mean of 22 h 15 min (p = .002). Five of nine dogs in Group I vs eight of eight in Group II survived with intermittent positive pressure ventilation (IPPV) to 72 h (p = .03). Ipsilateral macroscopically damaged brain tissue volume (focus + penumbra) was 2,094 ±1,340 mm^3 in Group I, versus 950 ±626 mm^3 in Group II (p <.08). The volume of the necrotic focus (mean 217 vs 220 mm^3) and the degree of cerebellar downward shift (mean 6.85 vs 4.86 mm) showed no group difference. ICP increase to brain herniation and vermis downward shift occurred in 7/9 in Group I vs 4/8 in Group II, and occurred later in Group II. Bleeding diathesis and pulmonary infection occurred more often in Group II.

Conclusions: Resuscitative cerebral Hth of 31°C for 48 h after brain trauma may help keep ICP low and reduce the volume of damaged brain tissue. It may reduce but does not reliably prevent delayed brain herniation during rewarming. Prolonged moderate hypothermia may cause extra-cerebral complications. Additional ICP control measures are needed.

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