

Near-Drowning, Hypothermia, and Avalanches—An Update

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Learning objectives: To discuss the advantages and limitations of noninvasive active external rewarming in the treatment of patients with severe accidental hypothermia and to understand the pathophysiological background of the Avalung, a new avalanche rescue device.

One of the cornerstones in the management of patients with severe accidental hypothermia is a safe strategy of rewarming. Passive rewarming (based on metabolic heat production), noninvasive active external rewarming (rewarming through the skin applying an external heat source), or invasive active internal rewarming (using warm fluid body cavity lavage or direct blood rewarming techniques) may be used.

Although prospective, randomized, clinical data are almost completely missing, many clinicians as well as some published guidelines¹ have rather clear recommendations how the selective use of the various methods of rewarming available should look. Guidelines typically recommend the use of invasive internal rewarming techniques in patients with a body core temperature below 30°C and prefer the restrictive use of active external rewarming techniques when body core temperature falls below 34°C, or even 30°C.¹ The method of rewarming is often selected on the basis of body core temperature¹ and concomitant parameters such as haemodynamics, the level of consciousness, the duration of cooling, and coexisting trauma or diseases are not considered. Such an approach has been questioned repeatedly and duration of cooling as well as haemodynamics² have been reported as important parameters for the selection of an appropriate rewarming technique. Reports in literature^{3,4} consistently demonstrate a large difference between the rewarming rates theoretically possible with invasive methods of active internal rewarming and those found in clinical practice (theoretical rewarming rates: 6°C/h to 8°C/h, in clinical practice 2°C/h to 2.5°C/h). Several more recent publications, reporting the use of noninvasive active external rewarming with convective rewarming, have further questioned the need for an invasive rewarming technique in patients with severe accidental hypothermia and a core temperature <30°C.^{5,6} So, in summary, some work has been published during the recent years suggesting that a noninvasive rewarming strategy may be an efficient and safe therapeutic approach also in patients with a core temperature <30°C.

During the last years we have gained new insights into survival probability in avalanche accidents and have learned that not hypothermia or trauma, but asphyxia (about 80% of all victims) is the major and leading cause of death. Consequently, a rescue strategy to support or enable breathing below the snow masses is a reasonable approach—breathing that is obviously possible for some time, as demonstrated by the high short-term survival rates in avalanche victims with an air pocket.⁷ The density of snow in avalanche debris is in general less than 400g/L, which means that more than 50% of the avalanche debris consists of air.

A device that should enable breathing and thus prolonged survival has become commercially available (Avalung device). The device consists of a mouthpiece connected to an artificial 500-ml air pocket and 2 one-way valves that separate inspired and expired air and direct exhaled carbon dioxide containing air to the back of the body, away from the air pocket. The device has been tested in field experiments and maintained oxygenation with only mild hyperkapnia.⁷ The device allowed prolonged burial under snow for a mean of 1 hour, whereas control group burials without the device were tolerated for a mean of 10 minutes only.⁷ Despite the promising initial experience with the device in these experiments, there are some problems that might limit the usefulness of the device in real-life avalanche accidents.

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Geriatric Trauma: What Do We Really Know?

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Learning objectives: 1) To understand the size of the elderly population and its potential influx into trauma populations, 2) to review the impact of pre-existing conditions on the care of geriatric trauma patients, and 3) to identify changes in the delivery of trauma care that will improve the management of elderly patients.

Trauma in the elderly is one of the rising challenges facing medical professionals as our population ages. It has been estimated that, given the current rate of growth, the over 65-year-old portion of the U.S. population will increase from 13% to 22% by 2030.¹ Furthermore, the resource utilization by the geriatric population of acute care and intensive care resources is growing faster than any other segment of the population.² With that in mind, a reappraisal of what we know about geriatric trauma is in order.

Defining the age range for geriatric needs to be grounded in physiology and survivorship and supported by large database conclusions. Data from evaluating the LD 50 for presentation base deficit, as well as the multi-center study by the American College of Surgeons, suggest a physiologic difference and an outcome difference in favor of those younger than 55 years of age.^{3,4} This age determination has important implications for resource allocation, including post-ED disposition, invasive monitoring, and diagnostic imaging.

The impact of pre-existing conditions (PECs) on survivorship is nearly always adverse, especially in light of the known alterations in physiology that accompany aging of all organ systems.⁵ PECs demonstrated to reduce survivorship include age >55, prior MI, malignancy, steroid use, COPD, liver failure, chronic renal failure, prolonged hypotension, acute respiratory failure/bradycardia/GCS <8/pressor requirement on ED presentation.^{6,7} Invasive monitoring has been infrequently well studied, but seems to enhance survival by identifying previously masked hypovolemia (i.e., occult lactic acidosis) and impaired cardiac performance.^{8–10} The impact on previous antibiotic use and pre-existing infection, especially with atypical community-acquired pathogens, as a risk factor for nosocomial infection (i.e., altered flora from prior anti-

microbial dosing) has been investigated and found to be directly related.¹¹ The relationship of this process to induction of extended-spectrum beta-lactamase producing organisms in the elderly needs further clarification. Medical errors may be more common in the elderly since, as a patient population, they are more likely to be prescribed multiple medications than younger counterparts; drug–drug interactions are more likely to occur during urgent or emergent care. Moreover, the length of time required for therapy in the ICU or hospital increases the likelihood of medical error occurrence as a function of time of exposure to that environment. Preventable critical care medicine complications are significantly related to mortality.^{12,13}

Future diagnostic modalities include enhanced 3-D ultrasound, functional MRI, portable CT scanning, as well as the development of instruments capable of assessing regional organ-specific perfusion akin to xenon-CT determination of cerebral blood flow. Routine use of protective devices specifically engineered for the elderly to decrease the incidence of injury complexes like hip fractures may achieve substantial reductions in mortality and morbidity. Enhanced discovery and reporting of geriatric abuse and neglect may reduce the incidence of unrecognized and untreated injury in this rapidly growing segment of our population.¹⁴ Furthermore, emergency medicine based geriatric trauma education and research is sorely lacking in academic centers.¹⁵ Unfortunately, all of these interventions compete for the health care dollar that is already stretched quite thin.

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Poster Presentations

Ease of Tracheal Intubation Using Fiberoptic Laryngoscopy (WuScope) in Patients Receiving Cricoid Pressure

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Purpose. Cricoid pressure is commonly used during rapid sequence induction and intubation to minimize the risk of aspiration. The objective of the study was to evaluate the ease of fiberoptic WuScope intubation in anesthetized adults receiving cricoid pressure.

Methods. The intubation difficulty scale (IDS) was used to measure tracheal intubation difficulties in 33 patients undergoing elective surgery with general anesthesia. Each patient had their trachea intubated under two conditions: with and without cricoid pressure. The order of conditions was determined randomly.

Main Results. Results are summarized in Table 1. An IDS value of 0 (ideal intubation, that is one performed by the first operator on the first attempt, using the first technique with full visualization of the glottis and no vocal cord compression) occurred in 30 of 33 patients (91%) without cricoid pressure and in 22 of 33 patients (67%) with cricoid pressure ($P<0.05$). Cricoid pressure compressed the vocal cords in 9 patients (27%) and impeded tracheal tube placement in 5 (15%). In 3 patients (9%), pressure had to be released in order to successfully intubate.

Conclusions. If cricoid pressure prevents fiberoptic laryngoscopic intubation with the WuScope, pressure should be released briefly under direct vision to allow for intubation.

Table 1: Median time to tracheal intubation using fiberoptic laryngoscopy and reasons for intubation difficulty scale score (IDS) \geq 1

Time to intubation (seconds)	Cricoid Pressure	Control
29*	29*	20
25th-75th	22-40	14-32
Range	11-72	9-250
Reasons for ID \geq 1		
Vocal cord compression	9 (27%)	0
Large tongue	1 (3%)	1 (3%)
External laryngeal pressure	0	1 (3%)
Grade 2 view	2 (6%)	0
Grade 3 view	1 (3%)	0
Separation of Wu extender and handle	0	1 (3%)
Change technique (release cricoid pressure)	3 (9%)	0

Data are median and range or number of patients (%). There could be more than one reason for intubation difficulty. * $P<0.05$ between conditions.

Blunt and Penetrating Injuries Caused by Rubber Bullets

During the Israeli-Arab Conflict in October 2000

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Background. Low-velocity rubber bullets were used by the Israeli Police to control riots of Israeli Arabs during early October 2000. The unique feature of this missile to induce blunt as well as penetrating injuries was investigated.

Purpose. To evaluate the factors that determine whether a blunt or penetrating injury is inflicted by rubber bullets.

Methods. The medical records of 595 casualties admitted to a frontline clinic, two regional hospitals, and a level 1 trauma center were analyzed. Subjects included in the study were 151 males and 1 female, ranging in age from 11 to 59 years, in whom 201 proven injuries by rubber bullets were detected.

Findings. The 201 rubber bullet injuries in 152 patients were distributed randomly all over the body surface. The injuries were mostly located in the limbs (73 patients), but injuries to the head, neck, and face (61 patients), chest (39 patients), back (16 patients), and abdomen (12 patients) were also frequently noted. Twenty casualties suffered more than one bullet injury, and in one casualty 13 bullet injuries were noted. Blunt injuries were documented in 61% of the patients, while 39% sustained penetrating injuries. The severity of injury was dependent on the ballistic features of the bullet, firing range, and anatomic site of impact. Most patients with mild injuries (n=83) were treated as outpatients and released after first aid treatment, while moderately and severely injured patients were admitted to the hospital. Three of the 152 casualties succumbed as a result of the injury: two following a penetrating ocular injury into the brain and one as a result of postoperative aspiration following a knee bullet injury.

Interpretation. Rubber bullets have been shown to cause numerous fatal and life-threatening injuries in spite of the efforts of police to avoid serious injury. They should not be considered a safe method of crowd control.

Setting Up a Radio-Medical Advice Service

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Introduction. Our Radio-Medical Advice (RMA) Service provides medical advice to ill and/or injured people on board ships or at remote places.

Background. The Emergency Department in Queen Alexandra Hospital (QAH) is one of only two units in the United Kingdom that provide a Radio-Medical Advice Service to ships. Prior to 2000, this service was provided on a 'grace and favour' basis by two venues: Aberdeen Royal Infirmary (ARI) in the North and Plymouth/Haslar in the South. In 2000, the Maritime and Coastguard Agency (MCA), in an attempt to standardise the RMA service throughout the country, awarded 3-year contracts to the Emergency Departments at QAH in the South and ARI in the North, to provide this service.

Setting Up the Service. The RMA Service was set up as a completely new service in the Emergency Department at QAH, in close collaboration with the MCA, colleagues at ARI, and the local Maritime Rescue Centre. We established a designated RMA Room with a dedicated telephone line, contact information for all the coastguard rescue centres, phonetic symbols, and other relevant maritime information. We drew up a common Data Collection Form for both hospitals. Calls are always received by or discussed with the duty senior doctor to ensure quality control. We have also set up databases at both the centres for the purpose of record-keeping and subsequent audit and teaching/awareness programmes for all the doctors in the department, juniors and seniors.

Results. The service dealt with a large number of advice calls over its first 15 months, increasing from approximately two calls per week at its inception to three times this figure. Advice has been sought from vessels all over the world, with ships in remote locations tending to use Portsmouth rather than Aberdeen. The full spectrum of medical conditions has been encountered, from sprained ankles in the North Sea to diabetic coma in the Southern Ocean.

Thiopentone Inhibits the Activation of the Nuclear Factor of Activated T-Cells

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Introduction. Thiopentone is frequently used for the treatment of raised intracranial pressure and is associated with an increased rate of nosocomial infections.¹ The molecular mechanism remains to be identified.

Table. Results (Student-Newman-Keuls Test, medians with 25/75% confidence intervals; *P < 0.05 vs. PMA/I alone)

	Control	THIO 1 mM	THIO 5 mM	THIO 10 mM
Calcineurin Activity Assay free Phosphat [pg/ml]	84.5 (69-100)	78.4 (61.5-95.3)	2.9* (1.94.0)	2.9* (1.34.5)
PMA/I	-	+	+	+
THIO	-	-	100	200 300
NFAT-DNA-Binding Activity [%]				
6 h	0*	100	87 (76-108)	68 (36-75) 24* (24-48)
24 h	0*	100	63* (51-83)	23* (13-37) 3* (1-8)
NFA1-Reporter Gene Activity [%]				
	2* (2.3)	100	14* (14-28)	11* (9-12) 5* (5.6)
Cytokines [ng/ml]				
IL-2	0* (12.9-25.3)	18.2	5.1* (1.8-11.9)	1.4* (0.3-3.2) 0*
TNF	0* (19.3-22.1)	20.5	3.1* (7.7-12.3)	4.0* (3.1-6.3) 0.5* (0.30.7)

Materials and Methods. The effect of thiopentone (THIO; 100-300 (g/ml) on the activity of calcineurin, the enzyme that is crucial for activation of the nuclear factor of activated T-cells (NFAT²), was studied *in vitro* using recombinant human calcineurin²⁻³ (calcineurin activity assay). The effects on the activation by dephosphorylation of NFAT (western blots), on the DNA-binding activity (electrophoretic mobility shift assays), on the NFAT-driven reporter gene activity (transient transfection assays), and on the expression of NFAT target genes (enzyme linked immunosorbent assays) were studied in primary human T-lymphocytes *in vitro*. NFAT activation was induced by phorbol-myristate-acetate (PMA) and ionomycin (I).

Results. In western blotting stimulation with I alone led to a dephosphorylation, evident as a downward shift of the respective band. In contrast, THIO treated human T-lymphocytes (5.75 h) that were subsequently stimulated with I did not show such a complete shift.

Discussion. THIO is an inhibitor of NFAT in human T-cells, which could be due to the negative effect of this agent on the activity of calcineurin. These results may provide a molecular mechanism for its immunosuppressing effects.

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A New Neonatal Retrieval System

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Background. In Australia, each state has developed its own unique system for neonatal retrievals. This situation has created significant problems for retrieval personnel in that these systems are physically large, heavy, difficult to manoeuvre, and energy inefficient and are not interstate compatible.

Methods. A survey completed by all Directors of Neonatology, Nursing Staff, Ambulance Officers and Retrievalists in all Australian states and overseas revealed the problems existing with equipment used to effect neonatal retrievals. Following analysis of the data, a prototype Neonatal Retrieval System was designed, constructed and trialled in the clinical environment, which included hospitals, road ambulances, helicopters and the Royal Flying Doctor Service.

Results. The new neonatal system comprises a very light-weight, heated capsule interfaced to an equipment sled containing monitoring and resuscitation facilities, perfusion pumps and electric suction together with oxygen and power management systems. The whole ensemble, weighing only 84 kg, is supported by a variable height, electrically powered undercarriage. The system has performed numerous retrievals and has been well received by the personnel involved in the trials.

Conclusions. The new neonatal retrieval system is a low-power, light-weight system that is ergonomically designed to load into ambulances with zero lifting, thus minimising the risk of back injury. This system provides a chance for standardisation, thereby enhancing the effectiveness of our national and international neonatal retrievals.



The Effect of MnSOD Gene Administration into Inflammatory Rat Lungs

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It was considered that peroxynitrite (PN, ONOO-) caused tissue injury, which was induced by nitric oxide (NO) and superoxide produced from neutrophil and/or macrophage inflammatory region. In mitochondria, manganase superoxide dismutase (MnSOD) protectively neutralizes superoxide by generating H₂O₂. Previously it was reported that administration of MnSOD plasmid was effective on a radiation-induced injury model.

In this experiment, we studied the therapeutic effect of MnSOD plasmid on lipopolysaccharide (LPS)-induced lung inflammation, using SD rat as the recipient. Rats were divided into four experimental groups (all groups n=3). The first group was given MnSOD plasmid (400 µg) and LPS (10 mg/kg) through a tracheal gill. The administration was repeated after 24 hours. The animals were sacrificed after another 24 hours. The second group received vehicle plasmid and LPS by the same method and then sacrificed. The third group was given saline and sacrificed 24 hours after as control. The fourth group received LPS and sacrificed after 24 hours. We expected that the administration of MnSOD plasmid could neutralize superoxide, reduce neurotyrosin (NT), which indicated the PN, and suppress tissue injury. However, the results were that, in the group that received MnSOD plasmid, the NT level was elevated and lung injury became significantly worse compared with the control group and the group prescribed vehicle plasmid. The survival rate did not improve. Otherwise, MnSOD and myeloperoxidase (MPO) activity of the former group was elevated significantly compared with that of other groups.

Key words: lung inflammatory model, MnSOD, gene therapy.

**Suboptimal Prehospital Care in Frederiksberg County, Denmark,
Assessed by Interdisciplinary Audit**
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Background. Three different settings of prehospital care have been applied within the past 5 years, comprising ambulances with different equipment and different paramedic qualification and authority level. As part of a Medical Technology Assessment (MTA), an interdisciplinary audit was applied to evaluate the quality of prehospital care with focus on the structural aspects of each prehospital care setting and the care provided by the paramedics.

Method. From April 1999 to April 2000, 14986 patients were included prospectively in a database of prehospital care. In each case, an extensive prehospital record was compiled by paramedics and emergency staff. From this database 186 cases were selected by randomisation to evaluation by interdisciplinary audit. Inclusion criteria were patients reported as 1) having symptoms of heart disease, asthma, anaphylactic reaction, poisoning, or hypoglycaemia or suffering from a trauma and 2) patients with significant morbidity defined as a minimum of 24 hours hospital admission or patients who died after arrival to the hospital. An audit panel assessed the quality of provided prehospital care as satisfactory or suboptimal using implicit criteria.

Results. The response time of the ambulances was satisfactory in 90% of the cases. Handling of rescue calls was suboptimal in 90% of the cases, as important information seemed to be lost between the patient, the police as receiver of the rescue call, and the ambulance on turn-out. Independent of prehospital care setting, the paramedics' ability to make tentative diagnoses based on their own observations was suboptimal in 55% of the cases. Likewise, the care provided by the paramedics was assessed as suboptimal in 44% of the cases.

Discussion. The interdisciplinary audit is a powerful tool when assessing the quality of prehospital care. The audit showed that response time is not a true indicator of quality of prehospital care. Our findings indicate that a potential for improving the communication between patient, police, and paramedic is present in the current organisation of prehospital care in Frederiksberg County. Furthermore, specific focus on clinical decision making in the education and training of Danish paramedics should be implemented.

**The Public Feel More Safe When Informed About Prehospital Care,
Independent of Definite Knowledge About Effectiveness:
Examined by Phone Interview in Denmark**

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Background. Three different settings of prehospital care have been applied within the past 5 years, comprising ambulances with different equipment and different paramedic qualification and authority level. The consequence for the patients, the financial circumstances, how the organisation is structured, and the public opinion after introduction of these ambulance services is to be examined.

A Health Technology Assessment (HTA) has been started with the purpose of evaluating the different kinds of ambulance services. This presentation refers to a part of the HTA, the public's opinion and knowledge about the different kinds of ambulance services in the county.

Method. Phone interview with 900 citizens from August to September 2001 in Frederiksberg County and another county as control. The citizens were asked about expectations, experiences, and opinion about the ambulance response time, the education level of the paramedics, and expectations for survival dependent on the type of ambulance service.

Results.

- The expected ambulance response time is close to the actual response time.
- Large confidence in the paramedics and their treatment of the patients both before and after the citizens got information about the real qualifications for the paramedics.
- According to public opinion, chances for survival will improve if a special educated paramedic arrives, and opinions don't change given the fact that chances for survival aren't better.

Conclusions. Actual and concrete knowledge about response time, effect of survival, or the qualifications of the paramedic did NOT influence people's feeling of being safe. Knowledge about the existence of a prehospital initiative increases by itself the feeling of safety. Providing more information about prehospital care is a method to increase the public's feeling of being safe.

Experiences from Rescue Helicopter Organisation in Rural Northern Sweden

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The northern part of Sweden, called "Norrbottens län," is a region covering one fourth of the total area of the country, with a population of 260,000. However, during summertime there are many more people because of the tourism. To supply this vast area with medical service, we use a Sikorsky S 76 helicopter, allowing transport of one to two patients and crew members (two pilots, an anaesthesiologist, and a nurse).

During the past 5 years, a two-fold increase in demand has occurred, foremost in secondary transport missions, which means transportation of intensive care patients between community and university hospitals. Primary missions also have increased, particularly during spring and summer. They consist mostly of surgical and orthopaedic trauma patients. Children account for 10% of the total amount of patients.

The nature, weather conditions, and distance gives us several challenges, for example, performing intensive care during transportation and the ability to treat hypothermia. For this purpose, the helicopter is specially equipped with intensive care utilities such as a transportation bed, connection for two kinds of ventilators, three infusion pumps, a haemodynamic monitor, and routine laboratory facilities. It is also equipped with a defibrillator, allowing external pacing and modalities for a CPAP system. For temperature control we use "bearhugger," a device based on warm air flow, which is connected to a special box warming system.

Adequate Cerebral Tissue Oxygen Tension (PbrO₂) During CPR in a Brain-Injured Patient Suffering Sudden Cardiac Arrest

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Prevention of cerebral damage by maintenance of adequate oxygenation is among the goals of CPR. Cerebral tissue oxygen tension (PbrO₂) changes during CPR have never been documented in either animals or in humans. We report on a patient affected by traumatic brain injury, who suffered cardiac arrest while staying in our ICU, in whom PbrO₂ was monitored as a part of a multimodal monitoring process.

A 17-year-old man with severe traumatic brain injury was admitted unconscious to our ICU. MABP, ICP, CPP, ETCO₂, PaO₂, and PbrO₂ were monitored continuously. ICP was monitored by an intraparenchymal fiberoptic catheter (Camino) and PbrO₂ by a Clark-type electrode (Licox, Germany) inserted in an uninjured area of the brain. A second Licox electrode was inserted into an artery for continuous monitoring of PaO₂. All parameters were recorded by a monitor and transmitted to a personal computer; data were recorded at 15-second intervals. It is generally accepted that PbrO₂ values above 8–10 mmHg indicate adequate cerebral oxygenation.

On the ninth day, the patient had a sudden cardiac arrest with asystole. CPR was instituted immediately and FIO₂ switched to 1.0. Epinephrine, calcium chloride, and sodium bicarbonate were administered promptly. At the onset of cardiac arrest, CPP dropped to zero and PbrO₂ decreased from 18 to zero mmHg in 2 minutes. Two minutes after the institution of CPR, PbrO₂ gradually increased above 8 mmHg, with a maximum of 28 mmHg, indicating that CPR afforded adequate cerebral oxygenation. At the restoration of spontaneous circulation, which occurred after 13 minutes, MABP peaked at 170 mmHg and ICP, which during CPR remained stable at 25–30 mmHg, increased to 60 mmHg. As a result, CPP was 110 mmHg. The restoration of CPP was associated with a sharp increase of both PaO₂ and PbrO₂ (maximum 440 and 185 mmHg, respectively). Then all parameters returned gradually toward baseline. After this event, the neurologic status of the patient was unchanged.

This case report shows that immediate institution of CPR and 100% oxygen ventilation affords adequate cerebral oxygenation. It also suggests that PbrO₂ monitoring by the Licox system can be suitable to evaluate cerebral oxygenation during experimental CPR.

Key words: CPR, cerebral tissue oxygen tension.

Handlebar Hernia: Case Report and Review of the Literature

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Introduction. Handlebar-hernia is rare traumatic hernia, often with major or even lethal complications.

Materials and Methods. A 43-year-old male was involved in a car accident, during which his right iliac fossa sustained a direct hit by the gear-poke of the car. A traumatic hernia resulted and was complicated by faecal peritonitis due to auto-amputation of the appendix and eversion of the right colon.

Results. A complete recovery followed aggressive operative treatment involving right hemicolectomy, abdominal wall reconstruction, closed loop irrigation of the abdomen, and ICU treatment.

Discussion. Handlebar-hernia is a rare traumatic hernia in high-velocity direct trauma and involves disruption of the abdominal wall muscles. Traumatic abdominal hernias are thought to be caused by shear stress, direct contact, and acute elevation of intra-abdominal pressure. The shear stress is transferred to the muscle, fascia, and peritoneum. The skin is more elastic and remains intact. CT scan provides the most accurate means of diagnosis. Most of the cases in literature are located below the umbilicus due to the weaker musculature, since the posterior rectus sheath is present only above the arcuate line. If seen in polytrauma patients with a high Injury Severity Score, high mortality and major morbidity are common due to associated lesions and intra-abdominal complications of the handlebar hernia. The key to successful treatment of these trauma patients is a high index of suspicion and aggressive operative treatment, including early removal of all necrotic and ischemic tissue, reconstruction of the abdominal wall, and second-look surgery. Late diagnosis results in nearly 100% mortality.

**Time Periods in Treatment of Traumas in the
Emergency Medical Service in Belgrade**

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Introduction. Time is an important indicator of the work quality in prehospital treatment of traumatized patients. The aim of this study was to examine whether the speed of our performance was a good or a weak link in the treatment of traumatized patients.

Material and Methods. We analysed 169 trauma treatments, out of 1,563 treatments of one team in 2001 and 2002. One hundred fourteen were injured in public places.

Results. The most frequent diagnosis was head trauma, found in 90 cases. One hundred forty traumatized patients were transported to hospitals, of whom 53 received therapy.

The calls were waiting in the dispatch centre 4.01 minutes (range, 0–47). Averages are reported throughout (with ranges in parentheses). The team needed 2.3 minutes (0–10) to start out with the ambulance, which means that the team started out for the call on average 6.3 minutes after the call was received. The drive to the patient took 7.6 minutes (0–23), which means that from receiving the call, the team arrived at the patient after 13.9 minutes (0–57). Time spent on scene was 10.9 minutes (0–38). Transportation from the scene to the hospital took 12.2 minutes (3–38). For transported patients, the duration of treatment (from call received until reaching the hospital) was 35.7 minutes (16–83).

Discussion. Delay in answering calls in the dispatch centre occurred because there were often more calls than medical teams. The team needed time to get to the car from the place where it received the call, "the medical base." The average transportation time for getting to the trauma place was acceptable in our opinion. The time from alarm to delivery of the patient to a hospital averaged 36 minutes.

Conclusion. The wait in answering calls in the dispatch centre and a delay in the team's turnout are the weakest links in our trauma care.

Key words: EMS, Belgrade, trauma.

Vehicle Deformity Index as a Predictor of Injury Severity

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Introduction. Road traffic accidents (RTAs) account for some of the most severely injured patients presenting to Accident and Emergency departments in the UK. Greater knowledge of accident scene characteristics has been shown to be useful in the initial management and triage of injured patients. The quality and communication of this information remains poor, to the frustration of both prehospital personnel and medical staff. A retrospective analysis of serious and fatally injured RTA victims demonstrated a close correlation between a collision assessment system, routinely used in police investigation, and severity of injury. This study concerns the prospective use of this system at the roadside, exploring its ability to predict injury severity, and its potential as a prehospital triage tool.

Materials and Methods. A collision assessment system based on the direction and distribution of impact as well as the vehicle deformity gives rise to the vehicle deformity index (VDI). This index was adapted for immediate use at the roadside and applied to all RTAs attended by Grampian Police Force over the 6-month study period. Information relating to the injured was drawn from hospital case notes, postmortem reports, and the STAG database. The Injury Severity Score (ISS) and the pattern and distribution of injuries were recorded for each vehicle occupant.

Results. 153 casualties from 138 RTAs were recorded over the study period. Complete records were available for 78 patients. Of these, 10 were uninjured, 62 required hospital treatment, and 6 died as a result of their injuries. VDI predicted injury severity grouping in 85% of cases. VDI greater than 4 correlated with serious injury ($P < 0.005$). Collision assessment correctly predicted injury to specific body region in between 67% (chest injury) and 96% (head injury) of cases.

Discussion. This study demonstrates that a simple crash scene assessment tool may be applied successfully at the roadside. Data routinely collected by police in attendance are utilized, leaving paramedics free for clinical duties. This tool may be useful in prehospital triage in establishing criteria for mobilizing both hospital-based and prehospital trauma teams.

Key words: vehicle, deformity, trauma.

**Immediate Rapid Sequence Intubation:
Is There a Role for Intervention Pre-Hospital?**

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Introduction. Early definitive airway care is the cornerstone of management in both trauma and critically ill medical patients. Improvements in paramedic training have made endotracheal intubation a common prehospital procedure. There remains, however, a group of patients with airway compromise who cannot be intubated without anesthetic drugs. These patients represent a logistical problem both prehospital and in the Accident and Emergency department. There are few published data regarding the numbers and characteristics of this important patient group.

Materials and Methods. Information was derived from a prospective multi-center observational study involving 7 teaching hospitals in Scotland. Data relating to a 2-year period for a single department were analysed. Patients requiring rapid-sequence intubation for airway compromise on arrival in Accident and Emergency were identified. Records were then cross-referenced with prehospital data and hospital notes.

Results. Of the 94 patients intubated during the study period, 48 required rapid-sequence intubation for airway compromise. This took place a median 19 minutes from arrival in A&E. 31 patients had suffered trauma. 17 patients had medical problems resulting in airway compromise. In the majority of cases, airway compromise existed at the prehospital locus. The median time on scene was 19 minutes, with median journey time of 21 minutes, representing a median distance of 10 miles from the receiving hospital. During the study period, some 440 patients presenting to the 7 hospitals fell into this category.

Discussion. Advanced airway care involving rapid-sequence intubation requires a high level of skill and experience in order to be performed safely. Identification of the population of patients requiring this level of care is essential for planning and resource allocation. Diverse solutions exist, ranging from hospital "flying squads" to helicopter-based emergency medical teams. Addressing this problem, both locally and nationally, could lead to significant improvements in the care of the critically ill.

Key words: emergency, airway, prehospital.

Intensive Care Audit of Patients Receiving Hypertonic Saline/Dextran

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Introduction. Hypertonic colloid solutions offer a novel method of small-volume resuscitation and the treatment of trauma-induced hypotension. We audited the use of 7.5% hypertonic saline and 6% dextran-70 in the intensive care units of two UK hospitals.

Materials and Methods. Retrospective audit of patients receiving Rescueflow[®] (7.5% hypertonic saline and 6% dextran-70) in the intensive care units of University Hospital, Aintree and North Cheshire Hospitals Trust. Haemodynamic parameters were measured at baseline (start of administration) then at 5, 10, 20, 30, 60, and 240 minutes. Adverse events were monitored throughout the patients' stay in the unit.

Results. Data were available from 32 patients: 22 had low blood pressure (BP), 7 had raised intracranial pressure (ICP). Between 50 and 500 ml of Rescueflow[®] were administered as a single infusion (250 ml in 17 cases, 100 ml in 5 cases, and 50 ml in 5 cases). Smaller volumes were generally given for raised ICP (5/7 received 50-100 ml), 15/22 patients with low BP received 250 ml. In the low BP group, mean BP rose from 90/49 to 130/71 mmHg after 4 hours and MAP rose from 61 to 98 mmHg. The onset of action was rapid, with a significant increase in BP observed at 5 minutes (mean BP 101/55 mmHg, $P < 0.003$). In the raised ICP group, mean ICP fell from 28 to 15 mmHg after 30 minutes ($P = 0.009$). Mean cerebral perfusion pressure (CPP) rose from 62 to 82 mmHg over the same period ($P = 0.02$). Improvement was seen at 5 minutes (mean ICP 17, CPP 72 mmHg). Even under the close scrutiny of intensive care, the administration of Rescueflow was not associated with any adverse effects. In particular, the transient hypernatraemia was not associated with any long-term effects.

Discussion. Rescueflow[®] appears to be a safe and effective treatment for intensive care patients with raised ICP or low BP.

Key words: small-volume resuscitation; hypertonic fluids; dextran.

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