dressings, and insertion of Foley catheters (nasopharynx, neck). Contained bleeding from closed fractures requires fracture stabilization with splinting and restoring circulating volume with fluids and blood. Patients with uncontrolled hemorrhage from internal torso injuries and/or unstable pelvic fractures require urgent surgery and/or interventional radiology with angioembolization. If the community hospital is far away from the trauma center and well equipped with expertise and resources for damage control surgery, it is an option to control the bleeding surgically with abdominal packing, for example, and transfer the patient immediately post-surgery to the trauma center. In most scenarios, however, the best option is to transfer the patient without further delay to the trauma center. Conventional fluid resuscitation to normotension before transport is not beneficial.

The Evidence. In animal models with uncontrolled hemorrhagic shock created with vascular injuries, aggressive fluid resuscitation increases bleeding and mortality. The amount of blood loss is associated with both the speed of fluid administration and the urgency with which the fluid resuscitation is initiated.[1] In a clinical study in hypotensive patients with penetrating torso injuries, patients with delayed fluid resuscitation until surgical control of the bleeding had a survival advantage of 70% versus 62% ($P=0.04$).[2] However, if the transport time is long or the patient presents with severe hemorrhagic shock (SBP <70 mmHg), patients with no fluid resuscitation may succumb before reaching the trauma center. Experimental evidence supports the concept of limited or controlled fluid resuscitation, which consists of small-volume fluid resuscitation aiming at subnormal but sufficient tissue perfusion (SBP 40–80 mmHg).[3] This concept produces the best balance between aggravating the blood loss by aggressive fluid resuscitation and suffering the consequences of insufficient tissue perfusion of critical organs, and is associated with lower mortality than the two other concepts.

Conclusions. Hypotensive trauma patients arriving to a small community hospital require establishment of airway and breathing followed by control of external bleeding and stabilization of circulation if the blood loss has been controlled or is contained. Patients with uncontrolled hemorrhagic shock caused by unstable pelvic fractures or internal organ injuries in the chest or abdomen should be transferred as soon as possible to the nearest trauma center with surgical, critical care, radiological, and laboratory resources for the management of complex trauma problems. Patients with severe hypotension (SBP <70 mmHg) or prolonged transport time could benefit from controlled fluid resuscitation aiming at securing critical tissue perfusion without aggravating blood loss.

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Video and Photo Documentation–Useful or Just Another Invasion of the Doctor–Patient Relationship?

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Learning objective: *To understand the proper role of photo documentation of a trauma scene in the clinical evaluation process.*

Photo documentation from the scene of the accident does not alter the principles of trauma care! All patients still have to be evaluated and treated according to the guidelines given by ATLS.

Photo documentation from the scene of an accident has been proposed to improve patient care. The rationale behind this suggestion is that a trained trauma surgeon in his mind should be able to create a clear picture of the kinematics of the crash by taking a quick glance on a few snapshots taken at the scene. Thus he/she will know which injuries to expect in this particular patient and therefore be better prepared.

Photos from the scene of an accident are nothing new in trauma care. It has been used for decades by various EMS, using Polaroid film. The technological improvement that has created an increased interest in photo documentation is the introduction of digital technology. This facilitates photo handling, storage, and transfer but is still based on the same assumption regarding improvement of trauma care. It is therefore astonishing that a Medline search using the key words *photo*, *prehospital*, and *trauma* results in just a few articles published on this matter. In a U.S. study by Dickinson et al, 47% of the receiving physicians altered their rating of the crash severity when presented with photos in addition to the verbal report given by the paramedics. In 59% they also changed their ED management of the patient. However, neither length of stay nor billed cost to the patient was significantly different compared with patients for whom photos did not alter the perception.[1] Also, a discussion on this topic took place on the Web site *www.trauma.org* in 1999. To summarize it, none of the participants could present any evidence that scene photos improved trauma care.

Despite the lack of evidence that photo documentation really improves trauma care, there seems to be an increasing enthusiasm for introducing this concept in different EMS–at least in different parts of Sweden.

There are also some concerns regarding photos of the accident site: Who should take the pictures? Which pictures are needed? What is the quality of the images? Who should have access to those images (legal issue)? And, finally, can the trauma surgeon correctly interpret these images?

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What is the Impact of Anaesthesia on Process of Care and Outcome in Trauma?

Lars Eriksson
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[abstract not available]

— Session 2D —

The Trauma Chain of Survival in Special Groups and Situations

Total Burn Care–More Than Just Words

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Learning objective: *To understand the need for multidisciplinary, long-term care of burn patients, with the goal of helping them achieve comfort, physical abilities, and social reintegration.*

The title of this lecture, "Total Burn Care," is lent from David Herndon`s excellent textbook on burn treatment.

During the past 15 years, burn care has improved considerably, and young patients with a burn covering 80% of the total body surface frequently survive. This is mostly due to improvements in intensive care, but early excision is also an important approach to better survival.

Patients with large burns are branded for life. Our mutual goal is to make their scars, both in skin and mind, as tolerable as possible.

Dedication is a keyword in the care of heavily burned patients, and engagement is mandatory in order to succeed. The length of stay is approximately one day per percent TBSA, indicating that with a 50% burn injury the patient stays in the burn unit for about 2 months. Therefore he/she is observed during all stages of his/her injury, the resuscitation phase, the struggle against infections and depression, and the early rehabilitation phase. Close follow-up after discharge from the Burn Unit is also necessary to enhance rehabilitation.

It is obvious that burn care is teamwork. The core team comprises the plastic surgeon, the anaesthesiologist/intensivist, the nurses, the physiotherapist, and the psychosocial experts. However, one should not forget that patients with major burns together with their family contribute actively to their own survival and their own improvement.

Surgeons and intensivists usually focus on immediate patient survival. However, in burn care this approach is too narrow-sighted. What is important to the burn patient in the long run is that he/she is integrated in society; that pain and itching are tolerable; and that fingers, arms, legs, and mind function the way they are supposed to do. As others with interest in the field we believe that this is best taken care of in a centralised burn unit.

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One Injury–Two Patients, Trauma in Pregnancy

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Learning objective: *To describe special considerations in the evaluation and management of pregnant victims of blunt and penetrating trauma.*

Initial assessment and stabilization of the pregnant trauma victim is no different than that for the nonpregnant patient, except in the positioning of the injured person: a woman whose pregnancy is more than 20 weeks gestational age should be placed in the left lateral decubitus position. The health care professional must remember that resuscitating the mother resuscitates the fetus!

This presentation discusses the anatomic and physiologic changes in pregnancy and their impact on the shock syndrome. A lack of understanding of these changes may give the health care provider a false sense of security during resuscitation.

Special considerations in penetrating and blunt trauma are discussed, emphasizing the importance in recognizing uterine rupture and abruptio placenta. Abruptio placenta is the most common cause of fetal/neonatal loss resulting from trauma.

A segment of the lecture focuses on the unfavorable consequences of fetomaternal hemorrhage (FMH) in the pregnant trauma victim. FMH occurs in more than 30% of pregnant women with significant trauma.

Preterm delivery as well as predicting outcome is also presented, with emphasis on the importance of continuous fetal monitoring and the viability of the fetus based on gestational age and weight in milligrams.

The obstetrician should be involved early in the resuscitation. Fetal survival depends wholly on maternal integrity. In the management of the pregnant trauma victim, NO drug should be withheld if needed to save the life of the mother, regardless of the known or unknown risk to the fetus! The importance of restoring the mother's circulating blood volume is also emphasized. Uterine assessment and fetal heart tone evaluation are discussed. A pelvic examination is mandatory to assess for trauma to the genital tract, dilation and effacement of the cervix, presenting fetal part(s), station of the presenting fetal part(s), and assessment for the presence of amniotic fluid. Necessary radiographs must be obtained; computerized tomography has been used without fetal complication.

Factors important in predicting the chance of fetal survival in postmortem cesarean include gestational age of the fetus, interval between maternal death and delivery, maternal cause of death, quality of maternal resuscitation, and fetal status prior to maternal death. A moment will be set aside to talk about cardiac arrest during pregnancy.

Tetanus prophylaxis is an integral part of resuscitation of the pregnant trauma victim. Tetanus is readily preventable but may be devastating if unrecognized and untreated.

The Traumatised Child–How to Improve Survival and Secure Adequate Pain Relief?

Phillipe G. Meyer
Paris, France

[abstract not available]

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 guidelines[1] 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 temperature[1] 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 haemodynamics[2] 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 exspired 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) ≥ 1

	Cricoid Pressure	Control
Time to intubation (seconds)	**29***	**20**
25th-75th	22-40	14-32
Range	11-72	9-250
Reasons for ID ≥ 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.