

physicians are involved in all types of death. We are confronted with various challenging situations, which affect emotions, psychological reactions, and behavior.

Death and coping with it is a neglected subject in our society and especially in our action-focused profession. This lecture aims to point out circumstances with trauma death, which can lead to acute and chronic stress reactions in helping personnel, followed by a brief summary of these reactions and possible coping strategies. Then we'll try to find an answer to the question "How do we cope with trauma death?" and finally promote some visions for the future.

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## — Session 2C —

### Hospital Topics

#### Is the Emergency Department the Weak Link in the Trauma Chain of Survival? ABCDE = Airway, Breathing, CT Scan, Death, Eternity?

Peter Driscoll  
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[abstract not available]

#### What the Clinician Needs to Know About Ultrasound and CT Scan Diagnostics in the Severely Traumatized Patient

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#### Echocardiography for Rapid Assessment of the Trauma Patient: What Does It Offer?

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**Learning objectives:** 1) To review the situations in which echocardiography contributes to diagnostic decision making in the evaluation of trauma patients and 2) to compare various echocardiographic approaches.

Echocardiography can play a major role in the diagnosis of injuries in patients with major thoracic trauma. These include the following:

- Hypovolaemia
- Tamponade
- Myocardial damage
- Valvular pathology
- Aortic injuries
- Valve injuries

It can also be used in the initial and ongoing assessment of volume resuscitation, inotropic requirements, and cardiac function.

Transthoracic echocardiography is less invasive, but provides poorer quality images because of lower ultrasound wavelength frequency and air in the chest wall or pleural spaces. Transoesophageal echocardiography provides higher quality images because of higher frequency and proximity to the heart and aorta, without intervening air-containing tissues/spaces.

Emergency physicians and trauma surgeons are increasingly using ultrasound for the diagnosis of intraabdominal pathology. It is even more important that this technology is extended to the care of patients with thoracic injuries also.

#### The Role of the Smaller Community Hospital: Just Initial Stabilisation and Further Referral? (Pro-Con Debate)

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**Learning objectives:** 1) To understand the capabilities of community hospitals in the stabilization and treatment of trauma patients and 2) to describe emerging telemedicine linkages between community hospitals and tertiary care centers.

Southern New Zealand has 320,000 people in an area the size of Norway south of Bergen. The area has one tertiary hospital, two smaller community hospitals (SCHs), and four rural hospitals. Interhospital transport is by road or ICU retrieval using a BK117. There are good personal communication links and teleradiology. The SCHs perform stabilizing surgery and transfer those who need complex, specialized, or prolonged care to the tertiary hospital. This system preserves the ability to manage patients when the SCHs are cut off from the tertiary hospital and works because staff at both SCH and the tertiary hospital communicate with each other and decide what is best for the patient.

For this debate, the smaller community hospital (SCH) is a hospital that has 24-hour orthopaedics and general surgery services; limited ICU capacity (can ventilate, but does not offer dialysis or full resident or specialist cover); and does not offer neurosurgery, cardiovascular surgery, spinal surgery, or specialised burn care.

I will describe the system we have in southern New Zealand. The 350-bed tertiary university hospital is at Dunedin. There are SCHs at Invercargill (100 beds) and Timaru (120 beds), 2.5 hours travel time by ambulance or 45 min by BK117. Both SCHs have orthopaedics,

general/vascular surgery, otorhinology, ophthalmology, ob/gyn, general medicine, and CT scan, and we have teleradiology links with them.

In addition there are four rural hospitals, which offer ATLS (trauma stabilisation plus blood transfusion). They have laboratory and x-ray facilities. From the Dunedin hospitals at Oamaru, Balclutha are 1 hour by road and 15 to 20 minutes by BK117; Alexandra is 2.5 hours by road and 45 min by BK117; Queenstown is 3.5 hours by road and 55 min by BK117. None of these hospitals has surgery or CT. There are teleradiology but not yet working telemedicine links with them. We tried Internet-based systems, but they were too unstable in our hands. We do use video conferencing for case discussions. Now that we have ISDN lines we are re-experimenting with real-time telemedicine for emergencies.

Rogers et al<sup>1</sup> described the use of telemedicine trauma specialists to support rural hospitals, and Celi et al<sup>2</sup> described remote ICUs controlled by central ICU. For those interested in telemedicine, good start points are <http://web.utk.edu/~twelsb/teleweb/telemed.htm> and the American Telemedicine Association <http://www.atmeda.org/>.

Our system functions as a network. Trauma cases are usually taken to the nearest facility that can stabilize them. There is a direct line to the tertiary ICU, where there is always a registrar/trainee specialist on duty and there is always a specialist on call for the ICU, who is also aeromedically trained.

If the base hospital can cope, they manage the case, e.g., fractured femur, ruptured spleen, haemothorax. If they want help/advice, they call the tertiary hospital. They can discuss the case with the relevant specialty registrar or consultant—ICU, cardiothoracic, neurosurgery, etc. Information is shared, including teleradiology of CT scans or x-ray films. They decide if the patient's condition can be managed locally and, if it can, the SCH staff carry on and seek further advice as needed. If cannot, when is it optimal for transfer?

- At SCH, we keep patients with
- Stabilised trauma with GCS >11 and clear CT head

but WITHOUT

- Major lung contusions requiring FIO<sub>2</sub> >0.6 PEEP >7.5
- Thoracic vascular trauma
- Major liver haematoma
- Mobile pelvic fractures
- Need for renal replacement therapy

Patients we transfer to the tertiary hospital:

- Head injury for ICP monitoring/possible neurosurgery (GCS <12)
- Thoracic vascular trauma
- Abdominal/hepatic injury that may require major transfusion or complex hepatic repair
- Cases predictable to need >2 days ventilation or renal support
- And anything else the SCH staff is uncomfortable managing or think would be managed better at a tertiary hospital. The tertiary ICU operates on a "You Call, We Haul" system.

In turn, the tertiary hospital transfers after stabilisation:

- Spinal injury with cord injury
- Burns >20% or involving hands, face, etc.
- Complex paediatric trauma

Why does it work? **Communication and trust.**

Tertiary hospitals must delete the Ivory Tower attitude from their staff. If somebody wants advice, they have acknowledged they need help – give it. You have to get your staff to be supportive, not condescending or even arrogant.

Why do we do it this way? We can't always fly because of freezing/icing conditions for 40% of nights in winter, storms, or cloud meets ground. Sometimes even the roads are cut by floods or landslides. Our approach preserves skills in the base hospital for initial resuscitation/stabilisation and preserves SCH confidence when transfer is not possible. It also keeps patients in their own communities. The bigger the hospital, the bigger the problems. Bringing all the patients to one place actually removes the teaching and training from those in first contact with the patients who are often capable of dealing with many of them.

The role of the smaller community hospital in trauma is more than just stabilise and refer. It's stabilise, consult, and do what's best for the patient.

#### References

1. Rogers FB, Ricci M, Caputo M, et al. The use of telemedicine for real-time video consultation between trauma center and community hospital in a rural setting improves early trauma care: preliminary results. *J Trauma* 2001; 51:1037-41.
2. Celi LA, Hassan E, Marquardt C, et al. The eICU: it's not just telemedicine. *Crit Care Med* 2001; 29:N183-95.

#### The Role of the Smaller Community Hospital: Just Initial Stabilization and Further Referral? (Pro-Con Debate)

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**Learning objective:** To explore the extent and level of centralization in managing critically injured patients, especially those presenting with hemorrhagic shock.

**Background and Setup.** The modern management of critically injured trauma patients requires considerable surgical, anesthesiological, critical care, radiological, and laboratory resources, including rapid availability of blood products. How far these are available in a small community hospital, as well as the distance to a major trauma center, dictate the type of emergency medical and surgical aid provided in the small community hospital level to achieve optimal results relevant to the trauma care system in general.

**Hemorrhagic Shock.** The most common sources of traumatic blood loss include internal truncal injuries (thoracic and abdominal vascular systems, and parenchymatous organs, especially the liver), external bleeding (cervical and extremity vascular injuries, nasopharynx, scalp lacerations), and pelvic and long-bone fractures. The severity of shock reflects the amount of blood loss varying from less than 750 ml (class I) to more than 2000 ml (>40% of blood volume, class IV shock).

#### Options

1. Resuscitate the patient immediately to the trauma center (with limited fluid resuscitation during transport).
2. Stabilize the patient with fluid resuscitation and transfer to the trauma center.
3. Damage control surgery in the community hospital and transfer to the trauma center.
4. Definitive treatment (surgery, ICU) in the community hospital.

**Solutions.** The first priority in any model is to establish airway and breathing. External bleeding should be controlled with suturing (scalp lacerations), external pressure with pressure

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.<sup>1</sup> 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% ( $P=0.04$ ).<sup>2</sup> 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).<sup>3</sup> 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.<sup>1</sup> Also, a discussion on this topic took place on the Web site [www.trauma.org](http://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?

#### Reference

- Dickinson ET, O'Connor RE, Krett RD. The impact of prehospital instant photography of motor vehicle crashes on receiving physician perception. *Prehospital Emerg Care* 1997; 1:76–9.

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

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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.

#### Reference

David Herndon, ed. *Total Burn Care*, 2nd edition. Philadelphia, W.B. Saunders, 2001.

#### 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 Traumatized Child—How to Improve Survival and Secure Adequate Pain Relief?

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[abstract not available]